



Gamification as a motivational tool for software systems, as illustrated in a second-language learning environment

Geraldine Exton

Publication date

01-01-2017

Licence

This work is made available under the [CC BY-NC-SA 1.0](#) licence and should only be used in accordance with that licence. For more information on the specific terms, consult the repository record for this item.

Document Version

1

Citation for this work (HarvardUL)

Exton, G. (2017) 'Gamification as a motivational tool for software systems, as illustrated in a second-language learning environment', available: <https://hdl.handle.net/10344/6521> [accessed 1 Sep 2022].

This work was downloaded from the University of Limerick research repository.

For more information on this work, the University of Limerick research repository or to report an issue, you can contact the repository administrators at ir@ul.ie. If you feel that this work breaches copyright, please provide details and we will remove access to the work immediately while we investigate your claim.



UNIVERSITY of LIMERICK

OLLSCOIL LUIMNIGH

**Gamification as a Motivational Tool for Software Systems,
as Illustrated in a Second-Language Learning
Environment**

**Thesis Submitted for the Degree of
Doctor of Philosophy
by**

*Geraldine Exton
Department of Computer Science and Information Systems
University of Limerick*

Supervisors: Dr Jim Buckley and Dr Liam Murray

Submitted to the University of Limerick, November 2017

Abstract

This thesis aims to formalise the relationship between game elements and motivation, towards making gamification use more systematic. Gamification is “the use of game design elements in non-game contexts” (Deterding et al 2011b, p. 9), and it has been shown to be highly effective in motivating behaviour change across a range of applications. There is currently a gap in the literature where existing game elements are not related explicitly to the types of motivational needs they can support. By seeing game elements as “motivational affordances” (Zhang, 2008; Jung et al, 2010; Deterding, 2011b), gamification’s application across many different contexts can be improved, as the psychological needs of users are considered.

It is clear that those involved in gamification are not always familiar with game design (Robinson & Bellotti, 2013). Similarly, attempts to make educational games have been derided for being like “chocolate-dipped broccoli” (Bruckman 1999, p. 75), showing a need for a systematised approach towards aiding the design of gamified educational applications. Such applications currently exist, and a constructive way to delve deeper into the effectiveness of gamification on motivation is to evaluate one such example in the Second Language Acquisition (SLA) field, the language-learning app Duolingo (2012).

This research focuses on three areas. Initially, the focus is on the development of a proposed taxonomy linking commonly occurring game elements with the components of a psychological approach known as the Self-Determination Theory (SDT) of motivation (Ryan & Deci, 2000a). The methodology employed is the gathering of a systematic literature review, followed by refinement after observations through a survey of a self-identified group of gaming experts, to answer **Research Question 1: *How are game elements related to motivational constructs?***

This proposed taxonomy is then used as an evaluative framework to examine Duolingo. This stage of the research necessitates two research questions. **Research Question 2** focuses on the **users** of Duolingo: *Can the framework profile SLA systems consistently with the users’ stated motivational perceptions of the system?* **Research Question 3** shifts the focus to the site’s **designers**: *Can the framework profile SLA systems consistently with the system’s declared motivational intent?*

The results of Content analysis on the two groups suggest that the framework is useful for offering guidelines for the *iterative* process of design needed for good gamification, and works well as a tool to aid in the analysis of existing examples of gamified learning, but needs some refinement. The research found that users are highly aware of the motivational possibilities of certain game elements, but that the use of these elements must be governed carefully, highly cognisant of users’ psychological needs, to avoid detracting from users’ intrinsic motivation. This thesis posits that the use of this framework as both a design tool, and for evaluation, will assist in the meeting of these psychological needs.

Declaration

I hereby declare that this thesis is entirely my own work, except for collaborations as outlined in the list of presentations and publications, and that it has not been submitted as an exercise for a degree at any other university.

Parts of this thesis have been presented at conferences and published. A full list of the publications and conference presentations can be consulted in Appendix A.

Acknowledgements

What a journey this has been.

To Liam, my guide and friend, always encouraging me to keep going, commiserating through my rejections, and helping me with my successes. Thanks for the chats, the coffees, the advice. And always the laughs. Thank you!

To Jim, my knight in shining armour. Your good humour, depth of knowledge, and shift of focus were inspiring, and it was you, really, who got me here. Definitely could not have happened without you. We got over the weirdness pretty quickly, too, I thought!

To Michael, and to Ros; my champions. Cheering me on from the faraway sidelines, knowing that I could do it, but also understanding that it didn't always feel that way to me. Your love and belief in me sustains me, it keeps me grounded, reminds me that I am valued.

To Daragh and Odhran, what a wonderful thing to have two experts living with me and sharing your stories. Finally we could talk about games without guilt or judgement! Your insights and your ideas were so incredibly valuable, and I am just so happy to have been able to include you in my research. Thank you both for all your support and help. (And cups of tea!) And to Saoirse for believing in me and giving me encouragement throughout this whole process. I did this knowing you three were watching; I hope one day you too will face your demons, challenge yourselves, and persevere with something even if it feels like the hardest thing you've ever had to face. I'll be beside you all the way, with tea, I promise.

To Tabea. There aren't enough words, really. I could not have asked for a better partner in crime. I am so glad to have shared this journey with you through everything. And boy, there isn't much more we could have been through along the way! Thank you for being there, for laughing, for whingeing, for writing and inspiring and explaining and listening. You are a shining star.

And to Chris. Once again. For everything.

Dedication

For my Mum, who never knew.

And Dad, this is for all the late night car rides from the station, the hot cocoa in the study room, the chats about politics even though they must have killed you, the roof over our heads, the chance to keep on studying and keep on studying and keep on studying. Thank you for being the best Dad I ever could have had. I love you!

Glossary – customised for the nature of this thesis

Autonomy	<i>“the feeling of volition that can accompany any act”</i> (Ryan & Deci, 2000a)
Competence	The mastery of <i>“optimal challenges that are developmentally appropriate”</i> (Zhang, 2008)
Controlling feedback	Potentially damaging external motivators which players find control their actions (see: <i>External motivators; Informational feedback</i>)
Crowdsourcing	<i>“the act of a company or institution taking a function once performed by employees and outsourcing it to an undefined (and generally large) network of people”</i> (Howe, 2006)
Exploitationware	A negative view of gamification where participants are seen as being exploited into doing tasks they would not otherwise do (Bogost, 2011)
External motivators	Incentives to undertake a task which are not necessarily related to the task itself
Game elements	The discrete parts that are required to make a game, as per example: leaderboards or virtual goods
Gameful design	Alternative term for gamification: attempting to differentiate itself and focus on the importance of <i>design</i>
Gamification	<i>“the use of game design elements in non-game contexts”</i> (Deterding et al, 2011b)
Games with a Purpose (GWAP)	Games which are developed to solve a problem by harnessing the actions of a large group of people (see: <i>Crowdsourcing</i>)
Informational feedback	Feedback which allows a player a feeling of ownership over his or her next move, focusing on how they can improve in their game (see: <i>Controlling feedback</i>)
Intrinsic motivation	Experiencing enjoyment or satisfaction from the act of doing a particular task
Motivation	<i>“having energy to take action and then moving that energy in a specific direction”</i> (Rigby, 2014).
Motivational affordances	<i>“the properties of an object that determine whether and how it can support one’s motivational needs”</i> (Zhang 2008)
Pointsification	A negative view of gamification where the adding of game elements to a non-game context is seen to be without regard to the overall effect, often using only basic elements such as points. (Robertson, 2010)
Relatedness	<i>“the need to feel belongingness and connectedness with others”</i> (Ryan & Deci, 2000a)
Self-Determination Theory (SDT)	A theory of motivation which says that there are three constructs which need to be fulfilled in order to experience intrinsic motivation: Competence, Autonomy, and Relatedness
Second Language Acquisition (SLA)	The development of ability in a language other than a person’s mother tongue.
Target Language (TL)	The language that is the object of a learner’s learning efforts
User-centred design	Keeping the user at the centre of all design decisions, to ensure a totally immersive experience from the end result

Table of Contents

Abstract.....	i
Declaration.....	iii
Acknowledgements.....	iv
Dedication.....	v
Glossary – customised for the nature of this thesis.....	vi
Table of Contents.....	vii
List of Tables	xii
List of Figures.....	xiii
Chapter 1: Introduction.....	1
1.1 Motivation to study.....	1
1.1.1 Games as learning-motivation tools.....	1
1.1.2 Gamification and motivation	1
1.1.3 Self-Determination Theory	2
1.1.4 Determining how gamification can work as a motivational tool in SLA.....	3
1.2 Research questions.....	3
1.2.1 Research Question 1:	3
<i>How are game elements related to motivational constructs?</i>	3
1.2.2 Research Question 2:	4
<i>Can the framework profile SLA systems consistently with the users' stated motivational perceptions of the system?</i>	4
1.2.3 Research Question 3:	5
<i>Can the framework profile SLA systems consistently with the system's declared motivational intent?</i>	5
1.3 Structure.....	5
1.3.1 Chapter 2: Literature Review.....	5
1.3.2 Chapter 3: Methodology	5
1.3.3 Chapter 4: Proposed Taxonomy.....	6
1.3.4 Chapter 5: Results – Refining the proposed taxonomy.....	6
1.3.5 Chapter 6: Results – Application to Duolingo	6
1.3.6 Chapter 7: Discussion	7
1.3.7 Chapter 8: Conclusion.....	7
1.4 Conclusion	7
Chapter 2: Literature Review.....	8
2.1 Introduction.....	8

2.2	Gamification	10
2.2.1	Definitions.....	10
2.2.2	Criticism.....	12
2.3	Game elements	14
2.3.1	Why separate elements?.....	14
2.3.2	Mechanisms of game decomposition and analysis	15
2.3.3	Lists of named elements.....	19
2.4	Game Design.....	23
2.4.1	Design considerations	24
2.4.2	Player types and differing motivations	26
2.4.3	The (over)-importance of achievements	28
2.4.4	Reputation.....	30
2.4.5	Specific design guidelines.....	33
2.5	Second Language Acquisition: a brief background	34
2.6	Motivation.....	37
2.6.1	Introduction.....	37
2.6.2	Gamification for motivating learning.....	40
2.6.3	Motivation in Second Language Acquisition.....	44
2.6.4	Self-Determination Theory	47
2.6.5	Motivational affordances	55
2.7	Conclusion	58
Chapter 3:	Methodology	60
3.1	Introduction.....	60
3.1.1	Methodology outline.....	62
3.1.2	Research questions.....	63
3.2	Method for framework creation	65
3.2.1	Proposed taxonomy.....	65
3.2.2	Preliminary case studies.....	66
3.2.3	Methods used	66
3.3	Method for framework refinement.....	67
3.3.1	Method	67
3.3.2	Survey	73
3.3.3	Question types.....	73
3.4	Method for investigating illustrative example	76

3.4.1	Content analysis	76
3.4.2	Process	77
3.5	Content analysis - Duolingo discussion forum user statements	83
3.5.1	Access to content and sampling	83
3.5.2	Method of analysis	85
3.6	Content analysis - Duolingo official publications	86
3.6.1	Access to content and sampling	86
3.6.2	Method of analysis	87
3.7	Conclusion	87
Chapter 4:	Gamification – A Proposed Taxonomy for Motivation	89
4.1	Introduction	89
4.2	Proposed Taxonomy	90
4.2.1	Detailed analysis of proposed taxonomy	94
4.2.2	Game element descriptions	97
4.3	Illustration scenario – 2 case studies	106
4.3.1	Case study design	106
4.3.2	Minecraft	108
4.3.3	Khan Academy	110
4.4	Conclusion	111
Chapter 5:	Results – Refining the proposed taxonomy	113
5.1	Introduction	113
5.2	Survey Results	113
5.2.1	Demographic details of participants	113
5.2.2	Differences between the proposed taxonomy and the evaluated taxonomy	115
5.2.3	Taxonomies compared by element	119
5.2.4	Taxonomies compared by motivational component	120
5.2.5	Short answer section	124
5.3	Updated taxonomy	127
5.4	Duolingo evaluation using updated taxonomy	128
5.4.1	Competence	130
5.4.2	Autonomy	131
5.4.3	Relatedness	131
5.5	Conclusion	132
Chapter 6:	Results – Application to Duolingo	134

6.1	Introduction.....	134
6.2	Content analysis results - Duolingo users	134
6.2.1	Motivation/Gamification.....	136
6.2.2	Competence/synonyms	136
6.2.3	Autonomy/synonyms	137
6.2.4	Relatedness/synonyms	138
6.2.5	Sentiment scores	139
6.3	Content analysis results - Duolingo Official Publications	140
6.3.1	Motivation/Gamification.....	141
6.3.2	Competence/synonyms	142
6.3.3	Autonomy/synonyms	142
6.3.4	Relatedness/synonyms	142
6.3.5	Sentiment scores	143
6.4	Conclusion	144
Chapter 7:	Discussion	146
7.1	Introduction.....	146
7.2	Survey	147
7.2.1	Demographics	147
7.2.2	Differences arising out of the survey	147
7.2.3	Survey: Key findings – Likert scale questions.....	150
7.2.4	Survey: Key findings - Short answer section.....	154
7.2.5	Recommendations with respect to game elements for gamified system designers.....	165
7.2.6	Limitations to survey	167
7.3	Duolingo Discussion forums – Content analysis	169
7.3.1	Content analysis: Key findings – Discussion forums	170
7.3.2	Limitations	176
7.4	Duolingo official publications – Content analysis.....	178
7.4.1	Limitations	179
7.5	Additional findings	179
7.5.1	Motivation.....	180
7.5.2	Gamification	182
7.5.3	Insights.....	183
7.6	Conclusion	184
Chapter 8:	Conclusion	186

8.1	Introduction.....	186
8.1.1	Why gamification? Why education?.....	187
8.2	Addressing the Research Questions.....	188
8.2.1	Research Question 1.....	188
8.2.2	Research Question 2.....	190
8.2.3	Research Question 3.....	191
8.2.4	Potential deficiencies in Duolingo	192
8.3	Research contributions.....	193
8.3.1	Core contributions.....	193
8.3.2	Originality of contribution	194
8.4	Recommendations and future work	196
8.4.1	Key findings: what next?	196
8.4.2	Integration of elements.....	199
8.4.3	Length of study	200
8.4.4	Other research instruments.....	200
8.4.5	Game designers	200
8.5	Conclusion	201
	Bibliography	202
	Appendices.....	218
Appendix A:	Publications, Reviews and Presentations	218
Appendix B:	Gamer survey	219
Appendix C:	Protocol for coding the content analysis	236
Appendix D:	1000 message threads derived from Duolingo Discussion forums	237
Appendix E:	Official Duolingo publications.....	237

List of Tables

Chapter 2

Table 2.1.....	Commonly cited game elements	21
Table 2.2.....	Comparison of game elements mentioned in three major sources ..	22
Table 2.3.....	Description of game elements	23
Table 2.4.....	How to address commandments via gamification	47
Table 2.5.....	Summary of design principles for motivational affordance	56

Chapter 3

Table 3.1.....	Description of game elements	71
Table 3.2.....	Competence synonyms	79
Table 3.3.....	Autonomy synonyms	80
Table 3.4.....	Relatedness synonyms	80
Table 3.5.....	Results from Duolingo Discussion forums on term: Communicate ..	86
Table 3.6.....	Results from Duolingo official publications on term: Communicate ..	87

Chapter 4

Table 4.1.....	Gamification elements for Motivation	92-93
Table 4.2.....	Truncated taxonomy	108
Table 4.3.....	Gamification elements and Motivation – Minecraft	109
Table 4.4.....	Gamification elements and Motivation – Khan Academy	110

Chapter 5

Table 5.1.....	Elements in proposed taxonomy vs evaluated taxonomy	118-119
Table 5.2.....	T1 - original proposed taxonomy, truncated	119
Table 5.3.....	T2 – evaluated taxonomy, truncated	120
Table 5.4.....	T2 – truncated evaluated taxonomy, with percentages	128
Table 5.5.....	Duolingo evaluation	129

Chapter 6

Table 6.1.....	Motivation and Gamification summary - Duolingo Discussion forums.	136
Table 6.2.....	Competence summary - Duolingo Discussion forums	137
Table 6.3.....	Autonomy summary - Duolingo Discussion forums	138
Table 6.4.....	Relatedness summary - Duolingo Discussion forums	138
Table 6.5.....	Competence summary - Duolingo official publications	142
Table 6.6.....	Autonomy summary - Duolingo official publications	142
Table 6.7.....	Relatedness summary - Duolingo official publications	143

Chapter 7

Table 7.1.....	Game elements which fulfil all 3 constructs, according to the survey	151
----------------	--	-----

Chapter 8

Table 8.1.....	Game elements which fulfil all 3 constructs, according to the survey	197
----------------	--	-----

List of Figures

Chapter 3

Figure 3.1	Method for framework creation and refinement	62
Figure 3.2	Method for investigating SLA illustrative example - Duolingo	62
Figure 3.3	Consent page screenshot	70
Figure 3.4	Screenshot of Question One from the survey	75
Figure 3.5	Protocol for coding the content analysis	82
Figure 3.6	Discussion stream: www.duolingo.com/discussion	83

Chapter 4

Figure 4.1	Interrelationship of game elements	105
-------------------------	--	-----

Chapter 5

Figure 5.1	Percentages of responses to gender question	114
Figure 5.2	Summary of hours per week spent playing games	114
Figure 5.3	Summary of years spent playing games	115
Figure 5.4	Screenshot of Question One from the survey	116
Figure 5.5	Game elements with highest utility per Component	120
Figure 5.6	Game elements to satisfy Competence	121
Figure 5.7	Game elements to satisfy Autonomy	122
Figure 5.8	Game elements to satisfy Relatedness	123
Figure 5.9	Percentage of elements not previously mentioned - Competence	124
Figure 5.10	Percentage of elements not previously mentioned - Autonomy	125
Figure 5.11	Percentage of elements not previously mentioned - Relatedness	126
Figure 5.12	Game elements that support Competence	130
Figure 5.13	Game elements that support Autonomy	131
Figure 5.14	Game elements that support Relatedness	132

Chapter 6

Figure 6.1	Percentages of threads including the terms – Discussion forums	135
Figure 6.2	Percentages of relevant usages: Positive + Negative - Discussion forums	136
Figure 6.3	Percentages of positive/negative usage in Duolingo message threads: Competence	137
Figure 6.4	Percentages of positive/negative usage in Duolingo message threads: Autonomy	138
Figure 6.5	Percentages of positive/negative usage in Duolingo message threads: Relatedness	139
Figure 6.6	Duolingo ranked per component: sentiment score Discussion forums	139
Figure 6.7	Sentiment score for Motivation/Gamification – Discussion forums	140
Figure 6.8	Percentage of sources including the terms in the Duolingo official publications	141
Figure 6.9	Percentage of positive/negative usages of terms across the Duolingo official publications	141
Figure 6.10	Duolingo ranked per component: sentiment scores for official publications	143
Figure 6.11	Sentiment scores for Motivation/Gamification: official publications	144

Chapter 7

Figure 7.1	Level of agreement on game elements which facilitate Competence	149
Figure 7.2	Level of agreement on game elements which facilitate Autonomy	149
Figure 7.3	Level of agreement on game elements which facilitate Relatedness	150
Figure 7.4	Percentage of elements not previously mentioned –	

	Competence	155
Figure 7.5	Percentage of elements not previously mentioned –	
	Autonomy	156
Figure 7.6	Percentage of elements not previously mentioned –	
	Relatedness	156
Figure 7.7	Percentages of relevant usages: Positive + Negative –	
	Discussion forums	170
Figure 7.8	Positive usages across the two analyses	180
Chapter 8		
Figure 8.1	Final version of the proposed taxonomy	189
Appendix		
Figure App.1	Download statistics for ULIR paper as at June 2017	218
Figure App.2	Page One of survey	219
Figure App.3	Page Two of survey	220
Figure App.4	Page Three of survey	221
Figure App.5	Page Four of survey	222
Figure App.6	Page Five of survey	223
Figure App.7	Page Six of survey	224
Figure App.8	Page Seven of survey	225
Figure App.9	Page Eight of survey	226
Figure App.10	Page Nine of survey	227
Figure App.11	Page Ten of survey	228
Figure App.12	Page Eleven of survey	229
Figure App.13	Page Twelve of survey	230
Figure App.14	Page Thirteen of survey	231
Figure App.15	Page Fourteen of survey	232
Figure App.16	Page Fifteen of survey	233
Figure App.17	Page Sixteen of survey	234
Figure App.18	Page Seventeen of survey	235

Chapter 1: Introduction

1.1 Motivation to study

In order to implement gamification systematically as a motivational tool for learning, links between commonly used game elements and their relationship to constructs known to motivate learning must first be made explicit. My reasoning for this approach is influenced by the fact that games have been shown to be effective learning tools, and research is now branching out into the efficacy of gamified learning applications. Consequently it seems that a strong understanding of motivational theory with respect to gamification can be effective as an aspect underpinning the systematic design of that gamification.

1.1.1 Games as learning-motivation tools

It is apparent that players of games are highly engaged (Prensky, 2003), thus attracting interest in other domains that wish to capitalise on this engagement. One such domain is learning, and much research has been written about the power of games as learning tools (Gee, 2003; 2014; 2015). Gee also argues that the manipulative possibilities of utilising game elements can be used positively, to encourage people to learn (2014).

This is backed up for Second Language Acquisition (SLA) in particular, by research which shows that there are motivational issues specific to SLA (Dörnyei, 1998; Dörnyei, 2001; Dörnyei et al, 2015a), suggesting that new approaches for teaching languages could be a useful way to address these issues. Gamification is one such new approach.

1.1.2 Gamification and motivation

Gamification is the process of applying elements made popular in games to other contexts, such as education. Organisations looking to promote social change (Recyclebank, 2004), groups creating games where players are solving an unrelated problem (von Ahn, 2006), educational websites (Stack Overflow, 2008), and companies looking for ways to increase loyalty and engagement with customers (Foursquare, 2009) have successfully used game elements in these other contexts in order to achieve their specific aims.

Ferrara argues that, as games “are able to contain and communicate persuasive messages” (2013, p. 294), there is perhaps a place for what he calls “persuasive gamification” (2013, p. 299). While this can be seen as a negative phenomenon, where innocent game players are exploited by gamification designers (Bogost, 2011), we see in Gee (2014) that persuasion can of course be used for *positive* behavioural change as well. According to Ramirez and Squire (2014) gamification should be an item in an educator’s motivational toolbox, with which to stimulate students.

Since its inception, gamification has been dismissed as “pointsification” (Robertson, 2010), derided as “exploitationware” (Bogost, 2011), and labelled a “fad” (Ferrara 2013, p. 289). Games designers have attempted to distance themselves from what they see as unnecessarily simplistic renditions of what can be so very powerful in well-designed games, setting themselves apart from those who would just “tack” on these game elements (Ferrara 2013, p. 291) to their systems. However, while many of these criticisms are undeniably valid, it would seem that there has been something of a shift in the attitudes of game designers towards the concept. Some game designers are now offering design principles to make gamification better, thus signalling a significant shift away from the universally negative discussion of gamification of such earlier criticisms. Gamified systems which demonstrate a clear understanding of the psychological needs of their proposed participants can be utilised to engender a sense of intrinsic motivation in these participants (Ryan & Deci, 2000a).

1.1.3 Self-Determination Theory

This research aims to make explicit the links between these game elements and the constructs of motivation, as identified in Self-Determination Theory (SDT) (Ryan & Deci, 2000a), so as to provide more formalised guidelines to the developers of such gamified systems.

It has been suggested (Deterding 2011a; Nicholson, 2012; Werbach & Hunter, 2012; Mekler et al, 2013; Weiser et al, 2015) that gamification should not be applied without a deep understanding of these psychological motivations. To this end, certain motivational theories have been put forward as the best place for designers to start in order to gain some understanding of their intended players. SDT (Ryan & Deci, 2000a) is one such theory of motivation which has been empirically tested across a range of different domains and has been shown to be an extremely effective prism through which to evaluate the motivational possibilities of games (Ryan & Connell, 1989; Standage et al, 2005; Denis & Javelot, 2005; Ryan et al, 2006; Rigby, 2014).

SDT posits that a person will experience a feeling of intrinsic motivation to undertake a task if three constructs are satisfied – a feeling of:

- *Competence* or mastery;
- *Autonomy* or choice;
- *Relatedness* or social connection

(Ryan & Deci, 2000a).

1.1.4 Determining how gamification can work as a motivational tool in SLA

Research shows that gamification is a particularly useful tool for motivating learning (Ramirez & Squire, 2014), and many of the observations made about how to motivate second language learners in classroom situations (Dörnyei, 1998) contain lessons which are applicable in gamification leveraged for learning (Rigby, 2014). This research first creates a proposed taxonomy identifying the links between game elements and the SDT motivational constructs, and then assesses a learning app, Duolingo (2012), for coverage of these three constructs via the game elements it incorporates and these links.

My second and third research questions use the framework I have designed to look at the user forum data and official publications from the creators, to determine the perception of Duolingo with respect to the three SDT constructs from both the users' and the developers' perspectives. I then go on to compare the experience of those who use the app with those who created Duolingo, to see where there is crossover, and where there are problems in the design, which could be better addressed in order to improve learner motivation, in terms of learning a second language.

1.2 Research questions

This thesis discusses how we can use parts of games to increase motivation in non-game contexts, and in particular, to allow participants to feel motivated to learn a second language. In educational settings, where rewards have long been offered for academic achievement, gamification fits as a motivational structure, with specific relevance to SLA. As yet, prescribed guidelines for the design of gamification are scarce, so I am looking to develop a framework that makes the link between game elements and motivational concepts more formal.

In order to do this, I must first ascertain how game elements can be related to these motivational concepts, allowing an exploration of how this association can inform the use of gamification in learning. I will then evaluate an example of gamified learning in current use, in the form of Duolingo.

1.2.1 Research Question 1:

How are game elements related to motivational constructs?

So as to argue that certain game elements are useful for fulfilling specific motivational constructs, I must first elicit a list of elements from which to choose to be parts of a system. To do this, I offer a detailed analysis of the literature, ultimately coming up with an aggregated set of game elements from which to populate a gamified system. This is a necessary precursor to linking game elements to motivational constructs.

Little has been written about the *design* of good gamification. Arguments from game design can offer lessons for gamification design, specifically that a design which includes game elements that will allow a system to provide for all three motivational constructs is one important aspect of designing a successful gamified system.

Of course, this also requires a certain level of understanding of motivational theory. There is significant research on motivation:

- in terms specific to SLA
(Dörnyei, 1998; Dörnyei, 2001; Dörnyei et al, 2015a);
- in relation to playing games, particularly video games
(Yee, 2007; Przybylski et al, 2010);
- exploring how games work to motivate learning
(Prensky, 2003; Koster, 2005; Deterding, 2011b; Gee, 2014);
- expanding this idea to show that *gamification* is also an effective way to motivate learning
(Linehan et al, 2014; Ramirez & Squire, 2014; Rigby, 2014).

It is in this final research stream that we see game elements as providing “motivational affordances” to participants (Zhang, 2008; Jung et al, 2010; Deterding, 2011b). Therefore, I present a proposed taxonomy which, through a conjectural analysis (Dickey, 2007), links the game elements identified in the literature with the tenets of SDT (Ryan & Deci, 2000a). With this framework, the aim is to simplify the process of understanding these links and offer a checklist to those who would wish to design gamified systems.

In order to test the validity of our hypothesised framework, I develop a survey asking gamers to decide whether they feel the various game elements presented facilitate any of the three constructs of SDT (Competence, Autonomy and Relatedness). As a result of this survey, the proposed taxonomy is revisited and refined, resulting in a consensus across the gaming community which makes it a useful contribution to the literature, explicitly relating gamification with motivation.

1.2.2 Research Question 2:

Can the framework profile SLA systems consistently with the users' stated motivational perceptions of the system?

By conducting Content analysis on the discussion forums of the gamified SLA system, Duolingo (2012), I am able to explore how many users are aware of their motivational needs being fulfilled

through their use of the site. Searching for the terms Competence, Autonomy, Relatedness, and related synonyms, I am able to see how users consider these constructs to be facilitated by Duolingo.

Each component has a sentiment score created for it, based on the results of the Content analysis, and compared with the percentage of motivational constructs we see as being fulfilled by the mix of game elements in our analysis. Thus, comparing the results of this Content analysis with the revised framework as presented in answer to the first Research Question, we are able to see where there are differences in the design of Duolingo, from the perspective of the users.

1.2.3 Research Question 3:

Can the framework profile SLA systems consistently with the system's declared motivational intent?

Statements on the Duolingo website outline the most important aspects of the site, and Luis von Ahn, the co-creator, has been involved in numerous publicly accessible discussions about Duolingo. These comments have been analysed using the same framework, to explore whether it is possible to see the relative prevalence of (and thus emphasis of) Competence, Autonomy, Relatedness, and synonymous terms, as part of the process in the design decisions taken by the team behind the site.

As set out above, the results of this analysis are compared with the results of the previous two analyses, in order to investigate where there are similarities and differences.

1.3 Structure

1.3.1 Chapter 2: Literature Review

Chapter 2 presents the state of the art in literature concerning gamification and motivation. In this chapter, I start with definitions of gamification, before discussing the specific game elements mentioned in the literature. These game elements are described in order to give a justification of the elements chosen in the proposed taxonomy. Next, I set out criticisms of gamification, to highlight areas that can be addressed in order to improve the practice. Similarly, general arguments from the game design community regarding the lessons which have been learnt in 40+ years of game design are presented for those designing gamified systems. Following this discussion, I give an overview of motivational theory, in particular SDT, and motivation in SLA, before drawing the strands together to show how game elements could work as “motivational affordances” (Zhang, 2008) in a gamified language learning application.

1.3.2 Chapter 3: Methodology

Chapter 3 sets out the mixed methods employed in the different aspects of the research that was undertaken for this thesis. I begin by detailing the rationale for the Research Questions and the ways in

which I intend to answer them. This is followed by a discussion of the methodology behind the creation of the proposed taxonomy.

In order to test the assumptions behind the proposed taxonomy, a survey of gamers was conducted, and in Chapter 3 I set out the clear reasons for interrogating their attitudes towards our selection of game elements, along with their opinions of the ability of each element to facilitate the motivational constructs. I discuss the methods used in this survey, and our reasons for their choice.

The chapter also discusses the Content analysis applied to both the Duolingo Discussion forums, and the official publications. As detailed in these sections, the Discussion forums offered an opportunity to access the users' attitudes, while examining the official publications gives a window into the design decisions taken by the developers of the system. In this chapter I show the process involved in isolating the texts, and conducting the analysis, and the reasons behind all of the decisions in this process.

1.3.3 Chapter 4: Proposed Taxonomy

Chapter 4 describes the proposed taxonomy, and the methodology used in its creation, which arose out of the literature. Taking the game elements identified in the literature review, and applying a conjectural analysis of their usefulness in order to facilitate each of the three constructs of SDT, I present a framework which can be used to decide which elements would be helpful in providing for each of the specific motivational constructs. The process applied in order to develop this proposed taxonomy is an attempt to find the answer to **Research Question 1**, examining how game elements are related to motivational constructs.

1.3.4 Chapter 5: Results – Refining the proposed taxonomy

The survey of gamers served to assess our own analysis of the links between game elements and motivation, and provided suggested changes which were blended in to the proposed taxonomy. The findings from across the survey, along with this revised framework, improved by those findings, is presented in this Results chapter. This evaluates and refines our assertions in the formation of the proposed taxonomy, and adds to the depth of our findings addressing **Research Question 1**.

1.3.5 Chapter 6: Results – Application to Duolingo

In this chapter I present the results of our evaluation of Duolingo as a gamified language learning site, compared with the initial evaluation undertaken briefly in Chapter 5. The results of the Content analysis performed on the Duolingo Discussion forum users are presented, and finally those arising from the analysis of the Duolingo official publications.

1.3.6 Chapter 7: Discussion

In Chapter 7 I discuss all of the findings from across the research. In searching for a way to make gamification practice better, I have attempted to draw explicit connections between the game elements available to gamification designers and the psychological effects these might be hoped to produce, with a focus on Duolingo.

1.3.7 Chapter 8: Conclusion

Chapter 8, the final chapter, summarises the findings and reviews recommendations regarding refining and reworking the proposed taxonomy so that it can be presented and utilised as a checklist in systematised, gamified design.

1.4 Conclusion

In this research, I have explored the expertise of academic literature and the experiences of gamers known to us, before testing our assessments through the interrogation of highly-motivated gamers. These evaluations have been compared to those of users of the gamified SLA app Duolingo, and its creators, to see if the observations are consistent across the evaluations, so as to understand the impact of game elements and their capacity to motivate behaviour.

Chapter 2: Literature Review

2.1 Introduction

Gamification is a trend that has been adopted rapidly, often without full understanding of games as systems (Brathwaite & Schreiber, 2008). Game elements have the potential to afford participants considerable opportunities to feel motivated (Deterding, 2011b; Ferrara, 2013), but many people looking to design gamified systems do not have experience in the area of game design (Robinson & Bellotti, 2013), and do not always have full cognisance of motivational theories. Well-designed gamification, with a full understanding of the motivational power of specific game elements and their interaction with each other, can motivate users to do a range of activities (Werbach & Hunter, 2012). Examples can be found in the areas of social change (Recyclebank, 2004), having players solve an unrelated problem (von Ahn, 2006), education (StackOverflow, 2008), and fitness (FitnessKeeper, 2016).

Those arguing about gamification often come from different disciplines, with criticism being levelled at gamification especially as it is practised in the world of marketing and customer loyalty. Like game designer Koster (2005), academic Deterding argues (2011c) that it is in the attainment of mastery of skills that games provide fun. Entrepreneur Zichermann (2011), however, says that he only needs to provide users with rewards and status, in order to encourage them to participate in a system. This paring down of the powerfulness of games into nothing more than rewards aggravates critics such as Bogost (2011; 2014), and Deterding, who sees Zichermann's approach as allowing customers to be "(fleeced) to the benefit of the company" (2011d). Rather than games that enhance a participant's life, Deterding says Zichermann lauds those that "dupe customers" (2011d), manipulating them to undertake tasks they would not otherwise do. However, if the persuasive power of gamification can be harnessed for learning, this sense of manipulation may be put to use in a positive, "socially valued" way (Gee 2014, p. 37) and lead to people improving their position in life through, for example, learning another language (von Ahn, 2011b). Gamification is particularly suited to motivating second language learners, through its use, for example, of goals, rewards, and the building of communities (Dörnyei & Csizér, 1998), so its potential to persuade participants in a positive manner could be illustrated using gamified SLA.

In this work I aim to formalise the relationship between game elements and motivation, and show how the two concepts can work together for motivating specific behaviour change, particularly in relation to second language acquisition. Using the concept of game elements as "motivational affordances" (Zhang, 2008) I will offer a systematic approach to help designers to work out the right combination of game elements to choose, in order to utilise them as effective ways to motivate learning behaviour. Game design which is user-centric has been shown to be more effective in games (Hunicke et al, 2004), and this chapter will show that game designers are urging gamification designers to adopt their methodologies in order to improve the approach (Deterding, 2011d; Ferrara, 2012a).

The chapter reviews academic and grey literature in this area, and is organised into four sections.

Section 2.2: *Gamification* begins with definitions of gamification, in order to provide a shared language with which to discuss the concept as it emerges as a field of study, followed by a survey of the criticisms of the approach from across the literature.

Section 2.3: *Game elements* gives a full description of game elements starting with a justification for separating elements out from games, before moving through from the abstract to the concrete in terms of actual elements that exist in games. This level of detail is required in order to isolate game elements from games, so that they can be examined for their usefulness as part of the design of a gamified system.

Section 2.4: *Game design* details the ways in which gamification design can learn from game design, with sub-sections exploring various design considerations and discussions taken from the game design community which have direct relevance for designers of gamified systems. The section ends with a consideration of game designer John Ferrara's guidelines for the design of good games and how this can benefit gamification design (2012a).

The language-learning app Duolingo (2012) is an example of successful gamification, which continues a tradition of computer assisted language learning in the Second Language Acquisition (SLA) field. There is no doubt that my profile impacted on the direction of this work. For example, there are many possible system-types that this work could have focused on, in evaluating the framework. My experiences and interest in language-learning probably implicitly directed the study towards SLA, as will be further explored in section 8.1.1. Background issues specific to SLA are briefly examined in **Section 2.5: *Second Language Acquisition***. Krashen (1987), sees acquisition and learning as separate, while Ellis (1994) suggests that these distinctions are artificial, and maintains that it is the learners' motivation which is more important as to how well they will learn. Duolingo's method of instruction is to provide opportunities for learners to practise their target languages without explicit explanations of linguistic rules, suggesting that there may be an awareness of these arguments behind the site's creation. The notion of motivational issues which are specific to SLA forms the research interest of one academic in particular (Dörnyei), whose work will be examined in the following section, particularly in sub-section 2.6.2.

Section 2.6: *Motivation* deals with the literature surrounding theories of motivation. In particular, there is a focus on how an understanding of motivational theory is relevant to a discussion of gamification, concentrating on commentators from game design who have suggested a deeper knowledge of these theories in order to improve the design of such systems. This is followed by the conversations around

Ryan & Deci's SDT (2000a) and why it is considered to be the best prism through which to examine the intersection of gamification and motivation. The section also looks at literature specific to motivational issues in SLA, and the ways in which games and gamification have been shown to be useful for motivating learning in general and SLA in particular. The section ends by examining the ways in which game elements can be used as motivational affordances, thus allowing participants in gamification the opportunity to feel a sense of motivation to continue the activity that has been gamified.

2.2 Gamification

2.2.1 Definitions

The term “gamification” appears to have been initially coined in 2002 by Nick Pelling, who used it to describe “applying game-like accelerated user interface design to make electronic transactions both enjoyable and fast” (Pelling, 2011). In subsequent years, this term has come to be more widely applied, whereby game design elements are implemented in non-game settings in order to change user behaviour. Some commentators have spoken simply of placing a “game layer” over everything (Priebatsch, 2010), but the most commonly cited definition is that gamification is “the use of game design elements in non-game contexts” (Deterding et al 2011b, p. 9).

This definition includes all types of gamification, whether it is for marketing, an addition to games themselves, aimed at engaging users, or engendering behaviour change. Each of these areas adds further depth to the definition of the exact nature of gamification.

2.2.1.1 Gamification as marketing tool

Many gamification proponents have attempted to capture the concept of positive interaction in these non-game environments, placing game elements into business contexts in order to market products and engage users more successfully (Zichermann & Cunningham, 2011). This use is somewhat out of the scope of this thesis.

2.2.1.2 Gamification of games

It has been argued that gamification can also be applied to games themselves: a game can be further enhanced with extra rules, feedback, and rewards, creating “so-called meta games” (Huotari & Hamari 2011, p.6), and thus creating a layer which provides feedback but does not affect performance in the actual game. In this view, gamification is “where a core service is enhanced by a rules-based service system that provides feedback and interaction mechanisms” (Huotari & Hamari 2012, p. 20).

2.2.1.3 Gamification to engage

For some commentators, the players are the most important aspect of gamification. For them, gamification is “the integration of game-inspired elements” (Thom et al 2012, p. 1067), the purpose of

which is to “create a sense of playfulness in non-game environments ... so that participation becomes enjoyable and desirable” (Thom et al 2012, p. 1067).

Game designer Koster has pointed out (2005) about *games*, that “engaging in interaction with games need not be fun ... but might indeed be fulfilling, thought-provoking, challenging, and also difficult, painful, and even compulsive” (p. 144). Similarly, gamification can be deployed to motivate these very same reactions.

Ferro et al see gamification as “applying elements and mechanics of games in order to engage a user in a task outside of a game context” (2013, p. 7). This explicitly makes the user or the player of the game a focal entity, and introduces this very important concept of *engaging* them in the task, thus signalling the importance of placing the user at the centre of the design (see Hunicke et al, 2004; Brathwaite & Schreiber, 2008; Garrett, 2010; Huotari & Hamari, 2012; Nicholson, 2012; Ferrara, 2012a; see also section 2.4.1 *Design considerations*).

2.2.1.4 *Gamification for behaviour change*

For Flatla et al, however, gamification “refers to the use of gameplay mechanics in non-gaming applications to encourage a desired type of behavior” (2011, p. 404). Likewise, other observers state that gamification is applied to systems in order to be “persuasive” (Llagostera 2012, p. 12) signalling that, in this view, it is the behaviours, rather than the users, that are most important. We see this in particular where gamification is used to create positive behaviour change in areas such as social change (Recyclebank, 2004), or education (Stack Overflow, 2008; Decker & Lawley, 2013). It would even appear that as long as the activity is framed to *look* like a game, certain positive responses can be elicited (Lieberoth 2015c, p. 230).

2.2.1.5 *Gamification, or ‘Gameful Design’?*

There is movement away from the convention of using the word “gamification.” Some commentators have looked to “drop the ‘g’ word” (Ferrara, 2012b) because they contend it is not useful. Others talk of “ludic elements or qualities,” “gameful design,” and “gameful experiences” (Walz & Deterding 2014, p. 7; McGonigal 2014, p. 656), in order to move away from its use, and perhaps distance themselves from criticisms levelled at the approach. There is, however, no general agreement on replacing the term as yet, and still others argue *for* the “gamified” term: “games offer people engaging and motivating experiences. The process of recreating this type of experience in systems that are not typically considered games is called ‘gamification’” (Cheong et al 2014, p. 233).

The criticisms associated with the field are now reviewed in more detail.

2.2.2 Criticism

Gamification has been the focus of several criticisms. For many, a core problem with gamification is that players may be encouraged to participate in behaviour they would not otherwise do (for example Bogost, 2011; 2014). It is posited that the potential for gamification to cause harm (or disengagement) to participants has been ignored by many of its proponents. Ferrara, demonstrating a common attitude among game designers, sees gamification as “an impoverished, cynical, and exploitative view of games” (2013, p. 291).

2.2.2.1 Exploitationware

Some critics argue that those who participate in gamified systems are being used, characterising these game elements as “exploitationware” (Bogost, 2011). Bogost’s thesis, aimed most particularly at gamification’s use in business (see e.g. Zichermann & Cunningham, 2011), is that gamification is a way of masking the real task at hand, and that persuading people to do something they do not want to do, or would not want to do if they were fully aware of the implications involved, amounts to no more than exploitation. He suggests that gamification is “primarily a practice of marketers and consultants who seek to construct and then exploit an opportunity for benefit” (Bogost 2014, p. 65).

The counter argument is that manipulating people is not always a negative: people can, for example, be manipulated to learn (Gee 2014, p. 36). For Gee, games are an extremely effective way to do this (2003; 2014; 2015). If the core of a gamified system is learning, and if, as supporters of gamification advocate, all elements feed into that core (Andersen et al, 2011), any manipulation or exploitation that happens will be to the end of providing a learning experience, thus removing the negative connotations expressed in these earlier criticisms. Thus, rather than seeing game elements as affording *manipulation*, they can be viewed as having “persuasive” properties (Llagostera 2012, p. 12; Ferrara 2013, pp. 298-302) which can encourage learning.

2.2.2.2 Pointsification

Another, related, criticism of gamification is that it “exposes a disdain for games” (Ferrara 2013, p. 291) by being ignorant of how powerful games can be. For some, its application is nothing more than “pointsification” (Robertson, 2010), where game elements such as points, badges and leaderboards (Werbach & Hunter, 2012) are overlaid onto a system, without any thought being given to their underlying usefulness. The suggestion is that gamification is “the process of taking the thing that is *least* essential to games and representing it as the core of the experience” (Robertson, 2010 [my emphasis]).

For Sierra (2011), gamification, particularly in the form of rewards, cheapens the actual product to which it’s been applied. She feels that if a product or service needs to be gamified in order to attract

business, on some level users will feel that the product itself was substandard, and *needed* to be gamified in order to be attractive (Sierra, 2011). This argues for the *appropriate* use of game elements in a system, a goal that aligns with the research goals of this thesis.

2.2.2.3 Lack of understanding of psychological impact

Similar to findings in psychological studies of motivation in general (Deci et al, 2001), and those specific to SLA (Dörnyei, 2001), the proposition of applying game elements to a system, without an integrated sense of the design and the objectives behind the change to that system, has been shown to be a significant de-motivator (Rigby, 2014; Forde et al, 2015; Weiser et al, 2015). Whereas leaderboards which showcase active, engaged players can add to player motivation (Kim, 2011), one study showed that their use to introduce competitiveness to staff in a particular hotel led to *lower* achievement of these targets, and considerable dissatisfaction among the workers (Werbach & Hunter, 2012).

Similarly, the application of an award system to a workplace in another study was shown to be a de-motivating factor, and led to a reduction in productivity among the workers (Gubler et al, 2013). This demonstrates that attempting to reward behaviour without cognisance of motivational issues can have a detrimental effect on the participants, and suggests that a tool is needed, which could aid in the design of gamified systems that use game elements aware of their psychological effects.

2.2.2.4 Lack of understanding of good game design

Good design should take the experience-driven approach as advocated by various designers (Hunicke et al, 2004; Garrett, 2010; Huotari & Hamari, 2012), where the experience of the end user is taken into direct account. Nicholson (2012) finds:

gamification tactics that rely upon points and levels leading to external rewards that are not related to the underlying activity are not concerned about the long-term benefits of the gamification on the user; they are focused on increasing the organization's bottom line in the short term

(p. 5).

Game designer Ferrara says that gamification epitomises an approach which is unheeding of all that games have to offer, including their inherent ability to “solve real problems, ... to persuade people to adopt a particular point of view or to take some action in the real world” (Ferrara 2013, p. 303). His approach to this perceived failing in gamified systems is to outline a perspective of player-centred design, using his own design guidelines (Ferrara 2012a) [presented in section 2.4.5 *Specific design guidelines*]. In offering these design guidelines, Ferrara is suggesting that game designers can teach

designers of gamified systems how to make better systems, which will improve the overall experience for all gamers, whether in games *or* gamification.

A number of empirical studies carried out on gamified systems (Thom et al, 2012, Decker & Lawley, 2013, Morrison & Di Salvo, 2014; Ibanez et al, 2014; Hamari et al, 2014) give feedback which reinforces the types of criticisms above, and suggest that a systematic approach to designing gamification is needed. Thus, in line with Ferrara's observations, it is asserted that the application of carefully chosen game elements can serve to greatly enhance user motivation and participation, when coupled with detailed context-specific design (Nicholson, 2012; Werbach & Hunter, 2012; Mekler et al, 2013).

2.3 Game elements

Some critics of gamification suggest that its proponents do not understand the power of games at all, while others are openly calling for gamification to learn from game design (Bogost, 2011; Ferrara, 2012a), and this shows that a fuller, explicit discussion of specific game elements is required. The use of game techniques does not equal the core experience of a game (Kim, 2011), but specific mechanics do lead to different dynamics being produced in a game, and the *goals* for a system can be tied to those mechanics that are chosen for that system (Hunicke et al, 2004), so it is important that gamification designers have a clear sense of the different game elements available to them, and the ways in which they work.

2.3.1 Why separate elements?

If we see game elements “as a set of building blocks” (Deterding et al 2011b, p. 12), from which to construct a game, or, conversely, with which to analyse a game, it is possible to begin to understand the role that each element plays in the overall system. For the purposes of this thesis, the underlying reason for doing this is so as to examine the “motivational pull of game elements” (Deterding 2011b, p.1) and, in particular, how they apply to a gamified system. The choice of elements, however, is also influenced by the way various elements interact; Ferrara suggests that fun will only emerge from the experience “when all of the elements work well together” (2012a, p. 33). For Kapp, it is the “interplay of the elements that makes for the most effective games” (2012, p. 50).

Collating a definitive list of game elements is a highly debatable enterprise. Because such a list is so very difficult to delineate, any useful attempt must be restricted to the “elements that are found in most (but not necessarily all) games, readily associated with games, and found to play a significant role in gameplay” (Deterding et al 2011b, p. 12).

With these guidelines in mind, it must be remembered that any such list must, by its very nature, be non-exhaustive. However, the usefulness of enumerating these elements can be summed up by the fact that designers of gamified systems are often not game designers, and they therefore do not necessarily know “what gamification elements there are to choose from and to judge accurately which might work best for their particular context and expected level of user commitment” (Robinson & Bellotti 2013, p. 4).

2.3.2 Mechanisms of game decomposition and analysis

There are numerous approaches to the concept of differentiating specific parts of games, which can then be lifted from their game environments, and placed in other contexts. In this section we see that much of the literature concerns high-level ideas of elements as important to design, without specifying exact elements. Hunicke et al, for example, posit taking a formal perspective with game design: the MDA framework. This breaks games down into distinct constituent parts: Mechanics, Dynamics and Aesthetics (Hunicke et al 2004).

- *Mechanics* are the “particular components of the game,” for example “weapons, ammunition and spawn points” in shooter games;
- *Dynamics* describe how the system works, for example “time pressure and opponent play”;
- and the *Aesthetics* are the “desirable emotional responses” the player exhibits while playing the game, for example that “all parties want to win”

(Hunicke et al 2004, pp. 2-3).

This framework encourages designers to think of games “as systems that build behavior via interaction” (Hunicke et al 2004, p.2), and this idea of a system being able to build, or influence, behaviour is an important technique in gamification design.

For Salen and Zimmerman, “a game’s core mechanic contains the experiential building blocks of player interactivity” (2004, p. 317). A game that is not fun to play probably has its core mechanic to blame, as it is “the mechanism through which players make meaningful choices and arrive at a meaningful play experience” (p. 317).

In the literature, there have been numerous lists of these “artifactual” components gathered (Deterding et al 2011b, p. 11). One study interviewed children on their game preferences, and found that “the most important feature determining game popularity ... was whether or not the game had a goal” (Malone 1981, p. 343). This same study also found that other popular features were “scoring, audio effects, and randomness” (Malone 1981, p. 343).

When designing a game, Brathwaite and Schreiber (2008) advocate the splitting of game systems into “atoms, (or) the smallest identifiable parts of a game,” (p. 25). Splitting these systems to this level of granularity is useful both for design and analysis, and this perspective allows designers to build from individual game atoms to design for the users they will have, and the behaviours they wish them to display. After all, “a given game will be unlikely to appeal to everyone,” (Koster 2005, p. 106), and this type of universal appeal is more likely to come from an integration of elements of different types (Salen & Zimmerman, 2004).

For Reeves & Read (2009), the “Ten Ingredients of Great Games” are:

- Self-Representation with avatars;
- Three-dimensional environments;
- Narrative Context;
- Feedback;
- Reputations, ranks, and levels;
- Marketplaces and economies;
- Competition under rules that are explicit and enforced;
- Teams;
- Parallel communication systems that can be easily reconfigured;
- Time pressure

(pp. 64-90).

Similarly, Fogg (2009) does not name any atoms or ingredients specifically, but leaves it up to the designers to decide how to implement an atom which he calls “triggers” (p. 40), for example, “an alarm that sounds, a text message, an announcement that a sale is ending, a growling stomach, and so on” (Fogg 2009, p. 40).

At a more process level, the use of “engagement loop” elements (Kim, 2011) encourages the inclusion of these specific motivations, or “triggers” (Fogg, 2009; Kim, 2014a). These might be:

- a craving such as hunger, or a wish to play a game;
- an external event or reminder like a notification or alert;
- a social trigger like a message or a meet up

(Kim, 2014b).

Following the trigger, a “compelling activity” (Kim, 2014a) is provided, by which to fulfil that motivation, for example, “a task, a mission, a mini game, a quiz, a gift” (Kim, 2014a).

Once the activity has been completed, the system must provide “feedback and progress,” in the form of:

- statistics, challenges, awards, messages

(Kim, 2014a).

When the feedback has been absorbed, and the player has crafted an avatar, updated their profile, reviewed their stats or earned points in a system, they are “deepening (their) investment in that system ... making it harder to leave” (Kim, 2014b).

Flatla et al (2011) list the *ideas* required in games, such as feedback, challenges, and achievement markers, as well as referencing aesthetics (pp. 404-406), while Deterding also discusses elements at a high conceptual level, cautioning along the way that merely removing a game element and placing it in a non-game context does not necessarily imply that the effect will therefore be the same; we must, he suggests, take care to “situate” these elements in the specific circumstance being designed or discussed (2011b).

Kapp (2012) mentions some game elements specifically, such as the common badges, points and leaderboards, but he also presents a thorough list of “abstractions of concepts and reality” (p. 26). This list consists of:

- Goals;
- Rules;
- Conflict, Competition or Co-operation;
- Time;
- Reward structures;
- Feedback;
- Levels;
- Storytelling;
- Hero’s Journey;
- Curve of interest;
- Aesthetics;
- Replay or Do over

(Kapp 2012, pp. 26 – 29).

In this list, Kapp is speaking at a high level about the concepts that different game elements can cover, sometimes offering examples, but often keeping the discussion at this high level. He cautions that “multiple elements are required” so as to avoid being “superficial” in the application of these elements (pp. 49 – 50).

One list discusses six major categories of gamification elements:

- General framing, giving “context and motivation for participation”;
- General rules and performance framing, explaining “in general what is expected”;
- Social features, permitting “the user to interact with others”;
- Incentives, which may be “practical, material or ... purely virtual”;
- Resources and constraints, or boundaries;
- Feedback and status information, allowing “the user to understand what is going on”

(Robinson & Bellotti 2013, p. 3).

Aparicio et al (2012) list actual tangible examples of “game mechanics,” but do not give detail about why they have chosen these specifically:

profiles, avatars, macros, configurable interface, alternative activities, privacy control, notification control ... Positive feedback, optimal challenge, progressive information, intuitive controls, points, levels, leaderboards ... Groups, messages, blogs, connection to social networks, chat.

(Aparicio et al 2012, p. 2).

Similarly, Sailer et al identify nine more concrete instances of elements, but in talking about their inclusion, state only that they are “typical” (2013, p. 30):

- Points;
- Badges;
- Leaderboards;
- Progress bars;
- Performance graphs;
- Quests;
- Meaningful stories;
- Avatars;
- Profile development

(2013, p. 30).

In a general sense, there is a distinction made between these types of *concrete* elements such as:

- “interface design patterns” (Linehan et al 2014, p. 82);
- or “badges and leaderboards” (Cheong et al 2014, p. 234);

and the more *abstract* concepts required in game design such as:

- “game design methods” (Linehan et al 2014, p. 82);
- or “time constraints” (Cheong et al 2014, p. 234).

McGonigal talks broadly about the “key structural and aesthetic elements of a game” (2014, p. 655).

In a taxonomy designed to look at the motivational capacity of game elements to assist in changing user behaviour around travel and lifestyle issues, elements, enunciated only as “components that persuasive and gamified technologies typically utilize” (Weiser et al 2015, p. 273), were split into seven sections:

- 1) Assignments, Quests and Goals;
- 2) Points, Credits and Levels;
- 3) Achievements and Badges;
- 4) Virtual goods;
- 5) Leaderboards and Collections;
- 6) Friends, Teams and Groups;
- 7) Reminders

(Weiser et al, 2015).

There are many other works targeted at game elements, most overlapping to some degree, but not identical. The lack of aggregation into a more definitive list which has been associated with motivational affordances can be confusing for those trying to gamify their system. Also, these lists are of higher-level ideas, and when specific elements *are* discussed, there is no justification given for their inclusion. If designers are not familiar with game elements (Robinson & Bellotti, 2013), this higher-level thinking will not necessarily be a useful aid in the design process, as they won’t know how to translate it into an implementation.

2.3.3 Lists of named elements

As the previous section implies, there are many perspectives on the decomposition of games. What is true in terms of general decomposition is also true of game elements specifically and so, a designer

interested in gamification is likely to be overwhelmed by the literature when trying to determine the core, or essential game elements. This section attempts to review this literature to address the provision of a list of these elements.

As a first step towards a taxonomy of game elements, the most commonly referenced game elements in the literature were identified (see Table 2.1 for citations). The most frequently cited elements from the articles reviewed were badges, avatars, leaderboards, and points. In fact, the most common approach to gamification is summarised as “PBL” or “points, badges and leaderboards” (Werbach & Hunter 2012, p. 69), and in fact, these are the top three most commonly cited game elements in our search. Some elements are given different names across the literature, but appear to be performing the same function, as, for example, in the case of rewards and achievements.

Game element	Cited by	Mentions
Badges	Deterding et al, 2011a; Antin & Churchill, 2011; Flatla et al, 2011; Lee & Hammer, 2011; Bista et al, 2012; Gnauk et al, 2012; Kapp, 2012; Werbach & Hunter, 2012; Mekler et al, 2013b; Cheong et al, 2014; Morrison and DiSalvo, 2014; Hanus & Fox, 2015; Fitz-Walter, 2015; Seaborn & Fels 2015	14
Points	Lee & Hammer, 2011; Aparicio et al, 2012; Gnauk et al, 2012; Kapp, 2012; Nicholson, 2012; Werbach & Hunter, 2012; Mekler et al, 2013b; Cheong et al, 2014; Morrison and DiSalvo, 2014; Hanus & Fox, 2015; Fitz-Walter, 2015; Seaborn & Fels 2015	12
Leaderboards	Deterding et al, 2011a; Aparicio et al, 2012; Gnauk et al, 2012; Kapp, 2012; Werbach & Hunter, 2012; Mekler et al, 2013b; Cheong et al, 2014; Lampe, 2014; Fitz-Walter, 2015; Seaborn & Fels 2015	10
Rewards/Achievements	Salen & Zimmerman, 2004; Lee & Hammer, 2011; Flatla et al, 2011; Kapp, 2012; Werbach & Hunter, 2012; Mekler et al, 2013b; Hanus & Fox, 2015; Fitz-Walter, 2015; Seaborn & Fels 2015	9
Avatars	Brathwaite & Schreiber, 2008; Zhang, 2008; Annetta, 2010; Aparicio et al, 2012; Werbach & Hunter, 2012; McGonigal, 2014; Fitz-Walter, 2015; Seaborn & Fels 2015	8

Table 2.1: Commonly cited game elements

Three particularly useful lists emerge defining a consensus of game elements: Werbach & Hunter (2012), Fitz-Walter (2015), and Seaborn & Fels (2015). See Table 2.2, below, for a comparison of the

three. Werbach and Hunter (2012, p. 71) collate an inventory of specific features which are taken from many games and gamified systems, and although not a comprehensive list, these are “specific characteristics of games that you can apply in gamification” (p. 80). There are “levels of game-design elements” (Deterding et al 2011b, p. 12), and these are lower-level, or “concrete” elements (Cheong et al 2014, p. 234), rather than more abstract, higher-level elements which would be “more suited for integration in the pedagogy rather than the physical implementation of the activity” (Cheong et al 2014, p. 235).

Game element	Werbach & Hunter, 2012	Fitz-Walter, 2015	Seaborn & Fels, 2015	<i>Alternative names across articles</i>
Achievements	•	•	•	
Avatars	•	•	•	
Badges	•	•	•	
Gifting	•	•	•	
Leaderboards	•	•	•	
Points	•	•	•	
Levels	•	•	•	Status/Progression
Quests	•	•	•	Narrative
Teams	•	•		
Virtual goods	•	•		
Boss fights	•	•	•	Competition/goals/mini-games
Combat	•	•	•	Challenges
Collections	•	•	•	Feedback/tangible rewards
Content-unlocking	•	•	•	Feedback/tangible rewards
Social graphs	•	•	•	Feedback/tangible rewards

Table 2.2: Comparison of game elements mentioned in three major sources

The second two articles survey over 30 papers (Fitz-Walter 2015, p. 34; Seaborn & Fels 2015, p. 27) for the most commonly cited game elements in gamification implementations. There is considerable overlap between these two publications and Werbach and Hunter’s list. Where the lists differ is that Werbach and Hunter, themselves game players, take the elements they consider to be the most important from their own experience of game playing, whereas both the surveys arose from studies of other published works.

As we see in Table 2.2, Werbach and Hunter’s categories of Achievements, Avatars, Badges, Gifting, Leaderboards, and Points (2012, p. 80) appear under the same classification names in the two survey lists (Fitz-Walter, 2015; Seaborn & Fels, 2015). Levels, Quests, Teams and Virtual goods appear directly in Fitz-Walter’s list, whereas Seaborn & Fels discuss Levels by detailing methods of showing status and progression; and Quests under the heading of narrative (2015, p. 27). Boss fights and Combat

(Werbach & Hunter 2012, p.80) are represented as competition, goals, mini-games and challenges (Fitz-Walter, 2015; Seaborn & Fels, 2015). What Werbach & Hunter identify as Collections, Content-unlocking and Social graphs (2012) are not referred to directly by the survey lists, however in their discussion of feedback and tangible rewards (Fitz-Walter, 2015; Seaborn & Fels, 2015) there is significant overlap with the earlier concepts, some of which are also referred to directly in other publications (see, for e.g. Huotari & Hamari 2012, p. 19; Ramirez & Squire 2014, p. 635). Table 2.3 provides a description for each of the aggregated elements.

Game element	Description
Achievements	In-game content that is earned by player behaviour, e.g. Content for Avatar customisation
Avatars	Visual representation of a player in a game, personalised with chosen elements
Badges	Visual representations of rewards or Achievements
Boss fights	Final challenges in order to Level up
Collections	Sets of in-game items that may or may not be useful within the game
Combat	Fights, battles, duels within games
Content-unlocking	Content withheld from players until a certain level of ability is reached
Gifting	The practice of giving in-game Virtual goods to other players, as a reward or as part of a Team strategy
Leaderboards	All players' positions in a system, usually in relation to the number of Points they have been awarded
Levels	Levels express the number of Points a player has, and subsequent Levels become more difficult as a player progresses
Points	Awarded for various deeds in a game
Quests	Specific tasks which act as goals and can further a narrative thread in a game
Social graphs	Information data sets presented to specific groups or Teams of people within a game, e.g. To spur one group on to compete against another
Teams	Groups of people who may or may not know each other outside the game
Virtual goods	In-game items which may be purchased by performing tasks within a game

Table 2.3: Description of game elements

2.4 Game Design

Gamification and games are two distinct entities, but in the sense that one borrows elements from the other, there are certainly lessons to be learnt from the world of game design which can be very effective when applied to gamification. This section discusses game design to illustrate its importance and thus to show that careful consideration should be given to the adoption of game elements for gamification. Increasing the motivation is the implicit principle behind all of these design considerations.

2.4.1 Design considerations

2.4.1.1 *User-centred design*

In a holistic sense, many game-design practitioners advocate concentrating on the experiences of the end-user (Hunicke et al, 2004; Brathwaite & Schreiber, 2008; Garrett, 2010; Huotari & Hamari, 2012; Nicholson, 2012; Ferrara, 2012a), and this level of knowledge of the end-user has likewise been shown to be imperative in good gamification design (Werbach & Hunter, 2012). Good games work well when user experience is taken into account, and there is a seamless connection between the various parts needed in order to make up that game “from systems and code, to content and play experience, and back” (Hunicke et al 2004, p. 1).

This is true of gamification as well. Good games also need to balance skill and challenge to keep players engaged (Kim, 2011). If the behaviours desired from the users are included as part of the design stage of gamification, these will inform all of the different stages of the system, keeping the user at the centre of the design and hopefully producing a product which engages and interests those users. Indeed, Ferrara’s detailed design approach towards the creation of games *and* gamified systems, specifies that the user must be central to all design decisions (Ferrara, 2013).

Gamified systems are used by participants who may be students, customers, employees, volunteers, or any number of possibilities depending on the system. Once using the system, however, what they have in common is that they become *players*. It would seem that the more the designers of gamified systems keep this idea in mind, in order to achieve the full potential of the gamified aspects of the system, the more successfully that gamified system will work. Time and effort, therefore, need to be given to improving the game-like qualities of the system, in order for players to be more likely to engage successfully with what is offered. Game designers are urging designers of gamified systems to think more like them; to understand the use of game techniques as a way to guide and motivate the player’s journey (Kim, 2011).

2.4.1.2 *Informational feedback*

It is difficult to generalise about the needs of gamers and participants in gamified systems, but there is a recurring theme across the literature, of participants looking to receive *information* about their performance, often *instead of* the gathering of points and rewards. In game design, there is talk of giving “informative feedback” (Shneiderman 2004, p. 49), and it has been found that the “presentation of ... skill-level information strongly influences player motivation and behavior” (von Ahn & Dabbish 2008, p. 63). Keeping feedback informational is a positive way to engage users or players (Hecker, 2011; Kapp, 2012), and numerous studies confirm this (see, *e.g.* de Alfaro et al, 2011; Bista et al, 2012).

There has been some research published to date which looks at design issues specific to gamification, particularly in relation to the need for feedback, and especially for informational feedback (Abramovich et al, 2013). This acknowledges that gamification is applied to sites that are not primarily, in and of themselves, games, so in such cases, participants are involved for varying reasons, and this needs to be reflected in the kinds of feedback that are provided. If game elements are included in a gamified system, their specific ability to provide feedback, and the types of feedback they can provide, are very important considerations for their inclusion.

Sometimes game elements which are seen, in one system, to be awarded in a competitive environment, can be used in merely an informational way, thereby avoiding any confusing feelings of introduced competition. One study points out that Badges, for example, can be used as a way of categorising user contributions, rather than as a way to display in-game Achievements, making them utilised as a way of giving information to participants (Bista et al 2012, p. 611).

2.4.1.3 *Elements feeding in to the core of the system*

Andersen et al (2011) remind us that the design of the elements introduced either to a game *or* a gamified system must reinforce the primary goals of the site, or the game components may end up detracting from the overall site. Users may visit the site just to play the game, rather than exhibiting the target behaviours desired by the designers of the site, or, worse, they may be discouraged from returning at all, if they feel that the game components have taken over from the site itself. Motivation theory suggests that it is highly possible to distract a person who has formerly displayed intrinsic motivation to be involved with a certain project, by introducing external motivational affordances, and when applied to the design of a gamified system, it is clear this must be examined thoroughly (Deci et al, 1999; Deci et al, 2001; Cameron, 2001; Deci & Ryan, 2008; Hecker, 2011; Kim, 2011; Nicholson, 2012; Deterding, 2012b; Mekler et al, 2013b; see section 2.5.2 *External motivators and intrinsic motivation*). If these “secondary game objectives” can detract from the enjoyment of a game, we must be very wary of applying them to a gamified system (Andersen et al 2011, p. 30).

2.4.1.4 *Games with a purpose (GWAP)*

GWAP are often very close to gamified systems, in that their main reason for being is not the game itself but the underlying purpose behind the game’s design (von Ahn, 2006). Like gamification, GWAP often use crowdsourcing to harness large numbers of people into doing what would otherwise be a tedious or difficult task. Crowdsourcing is “the act of a company or institution taking a function once performed by employees and outsourcing it to an undefined (and generally large) network of people” (Howe, 2006).

GWAP differ from gamification in that gamified systems tend to have a purpose that is not necessarily fulfilled by the actions of its users while the users are playing the various aspects of the game, but instead the purpose may be simply to have people visit the site (Huotari & Hamari, 2012). GWAP have “as a side effect of game play ... (the collection of) ... valuable information” (von Ahn et al 2006, p. 79). When playing GWAP, “people play not because they are personally interested in solving an instance of a computational problem but because they wish to be entertained” (von Ahn & Dabbish 2008, p. 60).

Similarly, in gamification, users are not there primarily to play the game, but have another purpose in mind, depending on the main purpose of the site. In GWAP, the purpose is built in to the game being played; the player completes the task (the “purpose”) without necessarily knowing this is happening. In gamification the purpose may or may not be contained within the game. For example, at its inception von Ahn’s Duolingo (2012) had two main purposes: one to provide a free language-learning platform; the other to crowdsource the translation of the web (Duolingo, 2012). When learning a chosen language, users engage in a gamified platform, with levels, points, and other elements of games. At this point in the system, their responses are being harnessed to improve machine translation, and users may or may not be aware of this.

When translating, an optional activity previously offered on the site, users could also access different levels and gain points, but their translation activities were fully explicit. GWAP invite players to play a game, which has an outcome additional to their own in-game experiences, through which they may earn points or level up or display a profile, but which is completely separate to their own game. By playing, they presumably fulfil their own aim, perhaps to have fun, but at the same time, they fulfil the GWAP’s aim, which may be to solve a particularly challenging scientific problem. A nice example is the case of the protein-folding game, Foldit (Khatib et al, 2011). In this way, GWAP offer some interesting lessons for gamification design, in that gamification, too, is attempting to take tasks and provide an environment for undertaking them which is also fun.

2.4.2 Player types and differing motivations

Over twenty years ago, game design academic Richard Bartle developed a theory of player types. These relate specifically to a particular type of multi-player game, but the tendencies he noted can be applied, with some modification, to understanding players of a gamified system, in terms of their different motivations for participating (Bartle, 1996). The idea of differing motivations is very powerful within the context of gamification, as the elements chosen to engage users of a gamified system ought to vary according to the types of behaviour to be elicited from the players, if the full potential of these elements is to be realised (Robinson & Bellotti, 2013).

Bartle identifies four distinct player types in his research:

- Achievers: who are “always seeking treasure”;
- Explorers: who “dig around for information”;
- Socialisers: who “empathise with other players”; and
- Killers: who “hit people”

(Bartle, 1996).

These types have since been refined and adapted into four groups of social actions (Kim, 2011). This approach suggests that game designers need to explore which social actions their games enable, or which social needs they will afford their participants the chance to satisfy (Kim, 2011). This concept of facilitating players’ social needs corresponds with the Relatedness strand of SDT (Ryan & Deci, 2000a).

Consideration of game player types is relevant to a user-centred approach to designing gamification. For example, Achievers “regard points-gathering and rising in levels as their main goal” (Bartle, 1996). This type of interest can easily transfer to users of a gamified system, and in fact many examples of gamification use elements that appeal to Achievers: introducing levels and points and other forms of achievement. Although this feeds in to the “pointsification” argument (Robertson, 2010), if applied intelligently, and in conjunction with other features, this type of gamification can be highly effective. Some of the social actions being fulfilled here are, for example, players who wish to be challenged, or who want to compare their mastery with others (Kim, 2011). It has been pointed out that there are problems with the theory, and Bartle’s different player types may not exist independently of each other, (Yee, 2007), but when designing tasks to encourage participation, it is useful to understand that not all participants experience the same desires when playing games, so it is possible to extrapolate out from Bartle’s theories and understand that a mixture of tasks is required.

Likewise, Socialisers, who “are interested in people, and what they have to say” (Bartle, 1996) can be engaged by elements in a gamified system just as effectively as they can be in a simple game. When offered the opportunity to comment or help others, their need for social connectedness is being fulfilled (Kim, 2011). The programming question and answer site, Stack Overflow (2008), has a strong social function, which combines with an achiever function, whereby its users upvote other users’ answers to questions, with users whose answers are most upvoted developing a high social profile on the site. Users visit the site in order to ask, or answer, specific programming questions, but the social aspects encourage return visits and incentivise involvement from social, achievement-oriented experts.

Some care must be exercised when attempting to apply these player-type theories to gamification, because a gamified system has at its heart something other than a game, so there is more to be considered than just the player types (Yee, 2007). The company or organisation that is gamifying its site has its own agenda to keep in mind as well, which is where the element of control, or manipulation, enters the equation.

2.4.2.1 User motivations

Similarly, the underlying psychological needs of the players must come in to the design phase, as we shall see below in section 2.5 *Motivation*. One study looks at the motivations of people who contribute to online communities, defining their reasons as:

- reciprocity;
- reputation;
- increased sense of efficacy; and
- attachment to and need of a group

(Kollock, 1999).

If game designers keep these motivations in mind when designing their games “they can proceed to design opportunities for the users to act in ways that become expressions of the users’ motives” (Järvinen 2009, p. 97). In this way, the elements the designers choose to implement become the conduit for these “expressions.” Designers also need to consider offering challenges and rewards which change with the participants, who may:

- enter the site as intermittent visitors;
- be novice players;
- become regulars; and
- over time as their competence develops, become leaders or even elders on the site

(Kim, 2011).

In this way, the changing nature of players’ motivations throughout the time they engage with the site is being considered (Robinson & Bellotti, 2013).

2.4.3 The (over)-importance of achievements

Games programmer Chris Hecker’s discussion of achievement types within games raises interesting questions that are also applicable in the gamification realm (Hecker, 2011). Hecker discusses different types of achievements available to game players, and references the connections between motivation and rewards. Once again, the discussion centres around the world of games, and investigates how

achievements are received within game contexts. However, there is much to be learnt from his findings when applied to gamification, namely that gamification designers must attempt, like the game designers he implores to follow his advice, to “do less harm” when implementing rewards (Hecker, 2011). Rewards are given to players at every different stage of games, and fulfil a wide range of functions. In most cases, these rewards are included in order to attract, retain, and maintain the levels of engagement by users of games and gamified systems, and there is considerable argument about the differences between intrinsic and extrinsic motivation and how rewards fit with these concepts (Deci et al, 1999; Ryan & Deci, 2000b). As one study found, participants in gamified systems display different levels of commitment over the course of their interaction with the system, and the use of rewards and other game elements on the site must be deployed with an awareness of this variance in level of commitment (Robinson & Bellotti, 2013).

Hecker offers five rules in order to minimise the damage rewards can do:

- award them without a fuss;
- introduce some rewards unexpectedly;
- use absolute, not relative measures;
- use endogenous rewards (rewards related to the behaviour you are trying to encourage);
- make them informational, rather than controlling

(Hecker, 2011).

All of these points crossover to the requirements of designing a gamified system, because if points and rewards are overused, they can detract from the potential results of the system, and can turn users or players away. Already, these ideas have some currency within gamification discussions; in her criticism of rewards programs, Sierra noted that unexpected rewards were more effective (Sierra, 2011), and the idea of the importance of informational feedback is covered very fully in the literature (Deci et al, 1999; Dörnyei 2001; Deci et al, 2011; Shneiderman, 2004; von Ahn & Dabbish, 2008; Zhang, 2008; de Alfaro et al, 2011; Kapp, 2012; Deterding, 2012b; Bista et al, 2012; Abramovich et al, 2013; Mekler et al, 2013b; Rigby, 2014; Forde et al, 2015; Weiser et al, 2015).

Reinforcing the idea that rewards must be applied carefully, one study showed that “achievements are ... perceived as separate from the core game” (Hamari & Eranti 2011, p. 3). This study went on to point out that achievements must have one signifying element, one or more completion logics, and one or more rewards (Hamari & Eranti 2011, pp. 5-6).

In this way, a player will feel that the achievements are worthwhile, because they have *earned* them, thus differentiating them from the types of elements that are just given to all participants.

Although this checklist is offered for the study of game design, these are crucial elements to be understood by those designing a gamified system as well, because so much about gamification revolves around the giving of rewards, and these can easily be cheapened if this feeling of earning them is not fostered (Andersen et al, 2011).

Some achievement systems, however, provide useful gameplay benefits (Montola et al, 2009). Where there are achievements in a game that offer rewards for their own sake, but also act as tools, perhaps to teach users how to use the site, these achievements can be responsible for encouraging further use of that site. Also, having other users award achievements, rather than the *system*, affects the way those achievements are received by the players, sometimes making those rewards more socially valued (Montola et al, 2009). Often, gamification is applied in order to effect behaviour change, and, in such systems, rewards are regularly used in order to recognise this change (Recyclebank, 2004; FitnessKeeper, 2016). These rewards can be customised for discrete user types, or to suit various purposes within the game, and do not have to have an overall bearing on the course of the game, or whether the player completes the game successfully. Gamification rewards are often offered in order to encourage players to continue to visit a site, or to increase their level of engagement with it, for example by rewarding return players, recognising number of visits, or signalling the length of time a player has spent on the site (e.g. Duolingo, 2012).

2.4.4 Reputation

For many sites which use crowdsourcing, offer a service, or form the basis of an online community, the rewards that are offered to their users are comprised of points, badges or labels that can be shared on an online profile, but have as their main focus building users' reputations. "Reputation systems have both a descriptive role, providing information on content and user quality, and a prescriptive role, providing incentives for constructive behavior" (De Alfaro et al 2011, p. 81).

2.4.4.1 Communities of practice

Gamification and reputation are closely related, especially in a site which performs some kind of socially relevant purpose. Two such sites are Stack Overflow, the site for computer programmers to ask questions, answer questions, and vote on other users' answers (2008); and Quora, the question and answer site for general users (2010). By allowing users to vote on the helpfulness and relevance of answers to questions, those answers are guaranteed to achieve a certain level of quality: namely, that they satisfy the needs of the community who asked the question in the first place; and secondly, the needs of the rest of the community that views the website subsequently, looking for answers to similar questions. Publicly displayed measures of the reputation of users of the site utilising game elements such as avatars and badges encourage those users to continue to post questions and answers, and to

continue to vote on the usefulness of others' answers. In this way, the sites are building communities of practice (Lave & Wenger, 1991) which employ game elements to foster the reputations of their community members.

In Stack Overflow expert users are given privileges on the site or access to previously locked content (Werbach & Hunter, 2012), along with badges and other bonuses (Movshovitz-Attias et al, 2013). Other users are able to see how to become expert users, with specific activity rewarded. On the site, "expertise and user participation is recognized and rewarded, (including rewarding) users who answer questions more than ... users who ask" (Movshovitz-Attias et al 2013, p. 886).

In this way, Stack Overflow is building a repository, an archive of questions and answers that users from the community have rated for their usefulness. Stack Overflow does not offer incentives to *all* users to return to the site, but is interested in motivating *expert* users to return and to continue to build the site into a resource that is used widely and often (Stack Overflow, 2008). Tabs on the page show questions that have remained unanswered, give profiles of users, show the various badges that can be awarded, and the tags under which users can search questions and answers.

Reputation systems can be:

- "content-driven"
 - more reliable;
 - taking feedback from all users uniformly;
 - analysing all interactions;
- or "user-driven"
 - which can "suffer from selection bias" where only certain users rate other users or the services and/or information they provide

(De Alfaro et al 2011, p. 82).

Content-driven systems are "more resistant to manipulation," because the feedback is derived from user actions, rather than opinions (De Alfaro et al 2011, p. 82). This is extremely important in sites that are based around a community of users and especially those, like Stack Overflow (2008) and Duolingo (2012), which present themselves as a repository of information. A site where the building of reputation among its users is important will differentiate itself from other sites with a less committed community at their core. "User reputation is consistently related to the perceived quality of their answer" (Movshovitz-Attias et al 2013, p. 887). This link between reputation and quality lends an air of authority to the site and encourages people to visit it as the answers are seen to be very useful explorations of the issues.

Reputation systems take some of the elements of gamification such as rewards and badges, but don't always take on the form of something to be played, or a game. By using the reward of social connectedness through displaying one's abilities to others, reputation systems offer a drawcard for users both to return to the site and to engage with it in ways its authors wish to encourage. By allowing users to rate each other's performances, the end product presented by the website is also seen to be a quality offering that becomes yet another draw for further visitors to use the site (Resnick et al, 2000).

The concept of reputation as incentive suggests that users like to be perceived as knowledgeable, and wish to see this ability rewarded in some way. Reputation is seen as both a "badge earned through past work (and) an indicator of future behavior" (De Alfaro et al 2011, p. 84). Rewarding reputation encourages users to continue to contribute, as they are receiving recognition for what they do well, and this suggests that they will return, continuing to engage in the same behaviour which has earned them this recognition in the past. Properly regulated reputation systems serve to keep the communities they rate honest. They are "the online equivalent of the body of laws regulating the real-world interaction of people" (De Alfaro et al 2011, p. 87).

2.4.4.2 Reputation building recognition

Different kinds of feedback, offered by users of a site, can be collected to "construct a meaningful history" of other users (Resnick et al 2000, p. 46). There are many reasons participants choose to contribute to various sites, but a common strand is that of recognition and awareness of their abilities, where effort and helpfulness are rewarded in some way (Robinson & Bellotti, 2013). Looking at Quora (2010), there is no financial reward for volunteers to answer other users' questions, so the recognition given to those who answer well must fulfil some other form of criteria for those users to continue to engage with the site. It is argued that a sense of intrinsic motivation is built when certain psychological conditions are met (Ryan & Deci, 2000a; see section 2.5 *Motivation*). Reputation systems can tap into this desire for recognition and therefore fulfil some of these motivational considerations, and demonstrate to fellow community members which users are worth listening to, or worth seeking out, often by using iconography and mechanisms with which users are more familiar in game contexts.

The concept of being valued, and using this high opinion as a way of constructing connections, is highly desirable. Also, the possibility of building a good reputation, and communicating this throughout a particular community, seems to work as a motivator to individuals to use a particular site and abide by its community's rules. It is possible to impress fellow users with the high ratings one has developed over time using a site, either through badges and other forms of visual recognition, or perhaps by displaying rewards in a profile or in-site bio (Paul et al, 2012). In some sites it is possible to offer privileges to expert or "power" users (Wang et al 2013, p. 1342). Perhaps site admin can choose to give extra qualities to specific users, such as maybe opening up a new type of avatar available only to these

“power” users. Achievements can also be publicised using a social graph showing other users’ statuses; either orchestrated to show all users of the site, or specific groups or communities within a site. The integration of reputation systems using game mechanics thus greatly enhances the user experience on a site.

2.4.5 Specific design guidelines

Game designer John Ferrara is a commentator who has spoken openly about the problems with gamification (Ferrara, 2013). His approach to solving this issue, however, is to publish specific design guidelines, learned from game design, which he says will improve gamification across the spectrum. Although targeted at *game* design, these guidelines offer useful advice to proponents of gamification as well, and would be beneficial for designers to consider, when choosing which elements to include in a system, and why.

2.4.5.1 Define a core message

Ferrara’s first principle is to define a core message (2012a). For example, good design practice in educational games is to start by selecting and defining target behaviours, because the core of the designed object is behaviour change (Linehan et al, 2011). Indeed, all gamification design should start by identifying “the main objective” (Aparicio et al 2012, p. 2). Gamification has its own core, or specific aim, which is not the same as the core of a game, to entertain; nor is it the disparate elements which have been used to make the game (Robertson, 2010). The core message of the game, and by extension, the gamified system, is therefore its most important aspect.

2.4.5.2 Tie the message to the win strategy

The second principle is to tie this core message to the winning strategy (Ferrara, 2012a). When a player can only experience the win state by adopting the core message, they will “prove to themselves that it’s true” (2012a, p. 208), thus absorbing the message that the gamified system is trying to express. Points awarded for something “relevant to the learner” help that learner to develop their knowledge of the core message of the system, and if those points also give “feedback about the learner’s performance,” they will continue to improve and hopefully achieve the aim of that system (Cheong et al 2014, p. 242).

2.4.5.3 Offer meaningful choices

The third suggestion is to offer “meaningful choices” (2012a, p. 208), echoing designer Sid Meier’s contention that players need to be offered “interesting decisions” (Alexander, 2012). “Learning to create great game experiences for players – experiences that have meaning and are meaningful – is one of the goals of successful game design, perhaps the most important one” (Salen & Zimmerman 2004, p. 33). Whether playing a game for enjoyment, or for learning, if a player must apply what they have learnt throughout the game when making choices, then there are real, in-game consequences for the player if

they do not do this. Choices that are meaningful in the sense that players understand *why* the choices need to be made are vital for players being able to experience a fulfilment of the sense of Autonomy.

2.4.5.4 Keep it real

The fourth step urges designers to keep the simulated situations presented in games authentic. In-game situations must mirror their real-world applications, without any “unrealistic leaps of logic,” or players will lose interest in participating (Ferrara 2012a, p. 209). Game designers need to be cognisant of the sophistication of their player-base, as games are “designed objects that make conceits and simplifications in representing complex phenomena” (Ramirez & Squire 2014, p. 638).

2.4.5.5 Enable self-directed discovery

The fifth and final guideline is to enable self-directed discovery, thus satisfying “explorers” (Bartle, 1999), and facilitating a sense of Autonomy and ownership in the players. Allowing players to move freely through a game-world and discover the rules, the limitations and the parameters of the game on their own, opens them up to the type of unconscious learning which has been shown to be one of games’ greatest strengths (Prensky, 2003; Gee, 2014).

By offering these guidelines, Ferrara is suggesting that there is a world of experience and research that designers of gamified systems can benefit from, and that this will ultimately improve gamification as a whole. Dickey makes the link between the narrative design of certain types of games and instructional design, by pointing out that the “commonalities of game design ... include ... clear goals and tasks, reinforcing feedback, and increasing challenge” (2007, p. 256).

All of these are addressed by Ferrara’s guidelines. Ramirez & Squire (2014) also suggest that patterns in educational theory, such as those of “cognitive apprenticeship” can be designed into games, where the game process offers the chance for “modeling, coaching, scaffolding, and fading” (p. 632). By keeping these guidelines at the forefront of gamification design, the choice of elements in a system ought to be better informed.

2.5 Second Language Acquisition: a brief background

The motivational possibilities in gamification are currently being utilised in SLA, with one example of this being the language-learning website, Duolingo (2012), evaluated from the perspective of gamification in Exton and Murray (2013 [2017]). Before using this website for illustrative purposes in this research, it is pertinent first to take a brief look at SLA research.

Ellis wrote as far back as 1994 that there is a “plethora of frameworks, models and theories now available” (p. 1). This thesis is not trying to position itself as a deep discussion of SLA, but wishes

merely to touch on the issues in SLA research which can be addressed via gamification, specifically those to do with motivation in SLA. One researcher in particular (Dörnyei 1998; 2001; 2003; 2014; Dörnyei & Csizér, 1998; Dörnyei et al, 2015a; 2015b) has been extremely active on this issue, and much of his work forms the basis of section 2.6.2.

Briefly, SLA is “a complex, multifaceted phenomenon and it is not surprising that it has come to mean different things to different people” (Ellis 1994, p. 15). Krashen (1987) details five main hypotheses in relation to how people learn languages:

- the acquisition-learning distinction;
- the natural order hypothesis;
- the monitor hypothesis;
- the input hypothesis;
- the affective filter hypothesis

(pp. 13 – 30)

Krashen equates “acquisition” of a language with the subconscious way in which children develop ability in their first language (1987, p. 13). For him, “acquired competence” (p. 14) is achieved when the language can be used for communication. “Grammatical sentences ‘sound’ right, or ‘feel’ right, and errors feel wrong” (p. 14). In contrast, “learning” is described as “conscious knowledge of a second language, knowing the rules, being aware of them, and being able to talk about them” (p. 14).

In addition to this theory, the “natural order hypothesis” asserts that grammatical structures are acquired in a particular, “predictable” order (p. 15), whether learning one’s first language, or second or subsequent languages. The third theory, “the monitor hypothesis,” suggests that “acquisition” and “learning” are used in two different ways by the speaker. Acquisition, Krashen says, “‘initiates’ our utterances in a second language and is responsible for our fluency ... Learning comes into play only to make changes in the form of our utterance, after it has been ‘produced’ by the acquired system” (1987, p. 18).

The fourth theory, “the input hypothesis” (p. 21) states that “we use more than our linguistic competence to help us understand” (Krashen 1987, p. 21). In this view, we “‘acquire’ ... only when we understand language that contains structure that is ‘a little beyond’ where we are now” (Krashen 1987, p. 21). This theory suggests that, contrary to much language teaching, we create our own knowledge of linguistic and grammatical structures by using the language, rather than learning the structures first, and then

practising them (Krashen, 1987). Practising using language, Krashen says, “is how fluency develops” (p. 23).

The final theory is “the affective filter hypothesis” (Krashen 1987, p. 29). In this theory, there are three variables which affect a person’s ability to learn languages:

- motivation:
 - “performers with high motivation generally do better in second language acquisition”;
- self-confidence:
 - “performers with self-confidence and a good self-image tend to do better in SLA”;
- anxiety:
 - “low anxiety appears to be conducive to SLA, whether measured as personal or classroom anxiety”

(p. 30).

For Krashen “comprehensible input and the strength of the filter are the true causes of second language acquisition” (1987, p. 31). Ellis (1994) disagrees that there is a distinction between “acquisition” and “learning” and in his seminal work he says they are “used interchangeably” (p. 14). His proposed framework for SLA research consists of four major areas:

- learner-language;
- learner-external factors;
- learner-internal factors;
- the language learner as an individual

(p. 36).

Here, we can see that, like Krashen before him, there is a concentration on a number of different factors which affect a learner’s ability to absorb and use a second language. He identifies that, at the time of publication of that research, the existence of a “rich literature on motivation in general psychology, (had) not been fully exploited in SLA” (Ellis 1994, p. 36). This signals the beginning of the importance of this research area, as Dörnyei would soon step into that gap. His theories form much of our discussion on SLA-specific motivational issues, and their relationship to gamification. I shall address these issues in section 2.6.

Our evaluation of Duolingo as a gamified language-learning platform is very much from the perspective of its ability to motivate learners to continue with their studies. It is outside the scope of this thesis to

decide whether or not Duolingo is an effective place to *learn* a language, but it is interesting to note that the structure of the language-learning offered on the site aligns with Krashen's "monitor hypothesis," which suggests that "formal rules, or conscious learning, play only a limited role in second language performance" (1987, p. 18).

The real area of interest for this thesis is whether game elements are useful for motivating behaviours, in this case language-learning, so it is important now to turn to theories of motivation, and whether there are lessons in motivational theories that can be applied to effective usage of gamification.

2.6 Motivation

2.6.1 Introduction

Many of the design considerations as described in section 2.4 are about increasing motivation, through challenging players, allowing them to master skills, showing them they are valued, or helping them feel part of a community. Given that the core of gamification is to elicit a particular behaviour, motivation is the key to its effectiveness. Gamification can be seen as a "motivational system" (Mitchell, 1982) with participants being given the opportunity to express their motivation to act on that system. Motivation can be described as the sense of being "moved to do something" (Ryan & Deci 2000b, p. 54), and is also about the "choice" of an action and the "effort" expended on it (Dörnyei 2001, p. 7).

Motivation is "a psychological construct that is a combination of two dimensions: having energy to take action and then moving that energy in a specific direction" (Rigby 2014, p. 118). Many stakeholders are constantly looking for ways to direct this energy. Educators strive to find ways to inspire learners towards effective learning, particularly "for prolonged lengths of time at heightened states of productivity" (Dörnyei et al 2015a, p. xi). As a way of studying these longer-term motivational needs, Dörnyei et al (2015b) propose the idea of "heightened motivational periods," which they label as "directed motivational currents" (DMCs). These "have the capacity to override or modify the multiple pushes and pulls that people experience in their busy lives" (Dörnyei et al 2015b, p. 96).

When designing games and gamified systems, all users are more likely to have their motivational needs satisfied, if we understand that different "mechanisms may work better for different demographic segments" (Yee et al 2012, p. 2806). This references the importance of understanding the psychology of gamers when deciding which elements to include. In order to use gamification effectively in educational settings, the ability to "understand and motivate behavior at the level of the individual" is key to providing enough interest in a system to motivate as many users as possible (Rigby 2014, p. 114).

It is impossible to talk about which elements of gamification will be useful for a system without taking time to analyse different aspects of motivation; the interplay of the use of game elements and the ways in which these feed into a sense of motivation for participants is a vital part of the gamification process, if it is to avoid the pitfalls set out by its critics. It is argued that these criticisms of gamification, especially the notion of “pointsification” (Robertson, 2010) and the overuse of “points, badges, leaderboards,” or “PBL” (Werbach & Hunter 2012, p. 69), can largely be addressed by a careful and detailed examination of the types of behaviour that will be elicited by the application of these game elements. In addition, it is critical to understand what it is *behind* those behaviours that motivates people to use specific systems (Deterding, 2011b; Werbach & Hunter 2012; Robinson & Bellotti, 2013; Rigby, 2014).

Game designers have long suggested there is a “need to integrate more variables ... such as human psychology” (Koster 2005, p. 38) into game design in general, and this is particularly relevant for gamification, when the actions to be motivated, such as fitness, education, or language-learning, are often separate from the core of the games.

The correlation of games and motivation, along with the observation that, in educational settings, aspects of game design fostered engagement (Dickey, 2007), is reflected in a range of research which has shown games and gamification to be excellent for learning purposes (see, *e.g.* Koster, 2005; Dickey, 2007; Gee, 2014; Ramirez & Squire, 2014). Combined with a knowledge of the motivational issues specific to SLA (Dörnyei, 1998; Dörnyei, 2001; Dörnyei et al, 2015), it is clear that there is potential for gamification to be a useful tool in the design of language learning sites. I will attempt to use this potential as an illustration of gamification’s utility for motivating learning.

2.6.1.1 Schools of motivational thought

There are, of course, “over twenty internationally recognised theories of motivation” (Dörnyei 2001, p.12). Some of the major schools of thought are relevant to the discussion here, particularly in how they have impacted upon our understanding of learning, however the scope of these works do not allow for thorough presentation in this thesis. The need, however, for an overview, is very widespread, as is evidenced in the collection of “theories of human learning” discussed in Ertmer and Newby (1993). The justification for that particular paper is given as the fact that “many designers are operating under the constraints of a limited theoretical background” (Ertmer & Newby 1993, p. 50). Similarly, such an overview is also useful for situating the discussion in this research and this is now presented.

According to Ertmer and Newby, Behaviourism describes learning as a response to “a specific environmental stimulus” (1993, p. 56). In behaviourism, responses “that are followed by reinforcement are more likely to recur in the future” (p. 56). Cognitivism, on the other hand, sees the learner as an

“active participant” (p. 60), with an emphasis on the “role of practice with corrective feedback” (p. 60). Constructivism allows for learning to happen when an “individual creates meaning from his or her own experiences” (p. 64), and is a particularly useful approach for solving “ill-defined problems” (p. 64). Cognitive Development Theory introduces a social aspect to learning, and concentrates on the concept of a zone of proximal development, where a learner is pushed to achieve at the very limits of his or her abilities (Vygotsky, 1978). Constructionism, as championed by Papert, sees learners as constructing their own mental models (Littleton et al, 2002), while Socioculturalism “considers the learner in a social and environmental context” (Littleton et al, 2002). The ability for an individual to become completely immersed in an activity so that all around them dissolves as they are swept away in the “flow” of that activity (Csikszentmihalyi, 1991) certainly describes the way a good game captivates a player and leaves them engrossed. Through all of these frameworks, there is one major aspect which is not addressed, and that is the underlying reasons why this learning occurs, and the consequent implications of that reasoning.

2.6.1.2 SDT

As we shall see in section 2.6.4, SDT theory (Ryan & Deci, 2000a), addresses this extra aspect. Where *Behaviourism* highlights that positive reinforcement works, SDT offers a reason why, by positing Competence, Autonomy and Relatedness as the constructs that that reinforcement fulfils. Similarly, SDT takes *Cognitivism* one step further, by nuancing the *types* of feedback that may be offered: distinguishing between informational and corrective feedback. The idea of an individual constructing their own meaning as seen in *Constructivism* is also extended in SDT, as the reasons *why* this is important are underscored through SDT’s exploration of the importance of an individual being afforded the chance to experience Autonomy. Vygotsky’s *Cognitive Development Theory* is also enhanced by SDT, in that the capacity to extend one’s conceptual abilities is reflected in the fulfilment of a feeling of Competence. The concept of learners constructing their own mental models in *Constructionism* is covered by SDT, both through the concept of Competence, where those mental models allow for a feeling of mastery, and Autonomy, as the same act of constructing these models assists in the feeling that the individual has been heavily involved in their own learning. SDT fleshes out the social and environmental context in which *Socioculturalism* occurs, by examining *why* the context is important. Finally, “flow,” the approach heavily favoured by much of the existing game design literature (Csikszentmihalyi, 1991), is further developed by examining it through the perspective of SDT, where the fact that flow occurs is incidental to the reasons *why* it does, being that participants experience flow because they are fulfilling each of the senses of Competence, Autonomy and Relatedness while being immersed in a well-designed game which has taken all of these needs into account.

SDT has been tested across a range of disciplines (Ryan & Connell, 1989; Standage et al, 2005; Denis & Jouvelet, 2005; Ryan et al, 2006) and has been shown to be a highly useful prism through which to

examine motivation in relation to games and gamification (Deterding, 2011b). One of the main arguments surrounding the use of game elements as motivational tools is that external motivators can take away from participants' feelings of intrinsic motivation (Ryan & Deci, 2000a). However, Deterding (2011b) argues that a good understanding of SDT allows designers to understand how to implement external motivators that will support, rather than thwart, a person's intrinsic motivation to perform a task (p. 3). Hence SDT is presented in this chapter, as a basis for interpreting game elements later in the thesis.

Looking at the design of a gamified system as a way of utilising game elements as “motivational affordances” (Zhang 2008; Jung et al 2010; Deterding 2011b) ties gamification and motivation together. In this view, game elements are seen as a way of affording participants the chance to feel motivated, by tying specific motivational needs to the types of elements that may be used to bring about behaviour change. With an understanding of motivational theory, game elements can be understood as conduits for affording a sense of motivation, and thus lead to better design in gamified systems.

2.6.2 Gamification for motivating learning

It has been found that many instances of gamification in an educational context merely add game elements in terms of additions to already existing incentives in the classroom, and this does not utilise games in a more creative way, or exploit the “huge motivational potential of games, play, and extending them beyond games” (Deterding, 2011d). This has “proved detrimental to learning” (Deterding 2014, p. 46), underscoring that “gamification techniques are a critical set of design tools in an educator's toolbox” (Ramirez & Squire 2014, p. 647).

2.6.2.1 Why games?

The quest to decipher what it is that works so well about games has been a research interest for many years. In 1981, researchers looking to understand why games, and computer games in particular, were so “captivating” (Malone 1981, p. 334), came up with the notion of “challenge” as a motivating factor (Malone 1981, p. 360). It was found that “success ... in any challenging activity can make people feel better about themselves” (Malone 1981, p. 360).

Games are shown to “support intrinsic motivation by providing feedback, fantasy and challenge” (Rieber 1996, quoted in Dickey 2007, p. 256). Similarly, “real fun comes from challenges that are always at the margin of our ability” (Koster 2005, p. 97). It is argued that the concept of flow, when someone is completely lost in an activity (Csikszentmihalyi 1991) comes about from “precisely matching challenges to capability” in games (Koster 2005, p. 98). Ultimately, “playing games is the prototypical example for an autotelic, intrinsically motivating activity” (Deterding 2011b, p. 2).

2.6.2.2 *Why games for learning?*

Games would seem to be the perfect medium for promoting learning, because “all humans love to learn when it isn’t forced upon them” (Prensky 2003, p. 2). Bruckman (1999), however, notes that historically, educational games are often more like “chocolate-dipped broccoli” (p. 75), where learning is presented as “an unpleasant core that you need to hide in a chocolate coating” (Bruckman 1999, p. 75). She goes on to suggest that it is possible to design educational games with an awareness of particular educational theories, where certain aspects stand out as important:

- Piaget’s *constructivism* focuses on the fact that, as in games, there are:
 - “many ways to solve any given problem;”
- Papert’s *constructionism* reminds designers that:
 - “people learn better when they are having fun, and are doing something they really care about;”
- Vygotsky’s focus on:
 - “the social context of learning” allows for the development of the social facets of games (Bruckman 1999, p. 77).

Building feedback into game systems, especially informational feedback, which is shown to have been useful for motivation, should also “prompt the learner to reflect constructively on areas that need improvement and identify things ... to increase the effectiveness of learning” (Dörnyei 2001, p. 123). Games offer themselves as a perfect resource for improved learning, because regardless of whether they are designed for instructional purposes or not, game players learn:

to take in information from many sources and make decisions quickly; to deduce a game’s rules from playing rather than by being told; to create strategies for overcoming obstacles; to understand complex systems through experimentation

(Prensky 2003, p. 2).

Games, as described by Prensky, allow players to build on their existing knowledge, and potentially extend the very limits of their abilities. This idea of building further knowledge by repeating previously learned concepts is an important tenet of constructivist learning theory, where constructivists argue that we bring prior knowledge to everything that we learn, and it is the way in which this previous understanding is enveloped into the new material which will ensure its appropriation. As described in Vygotsky’s zone of proximal development, students are encouraged to develop beyond their boundaries through guidance from adults or more able peers (Vygotsky 1978, p. 86). This resonates with Krashen’s assertion that language acquisition happens when our boundaries of understanding are continually

pushed “‘a little beyond’ where we are now” (1987, p. 21). Games which have their learning objectives blended into the action of the game are pushing the boundaries of those playing, in effect edging them towards their own zone of proximal development, and so it is clear that games can work well to promote a positive attitude towards learning.

We see also that “motivation and learning are closely related values” (Denis & Jouvelot 2005, p. 462), thus suggesting that providing motivational strategies within learning contexts is possible, and desirable. Indeed, games give players the opportunity to experience fun as “the act of mastering a problem mentally” (Koster 2005, p. 90). As noted by Prensky (2003), in their experimentation, game players display emergent behaviour which allows them “to do things that the designer did not foresee” (Koster 2005, p. 128). This highlights a way in which games are excellent for learning, even beyond the targets which the designers themselves build in to the games. In addition, the “personalized and contextualized environment” of a game can lead “to increased motivation and learning” (Dickey 2007, p. 266).

For some commentators, the problems with educational games as identified by Bruckman (1999), need to be addressed as far back as the design phase, where “a successful educational game must integrate the learning with the game play mechanics, rather than as an addition to (them)” (Linehan et al 2011, p. 1981). A game’s “focus on repetition and discipline” (Linehan et al 2011, p. 1982) and its ability to adapt to student performance (Linehan et al 2011, p. 1986) mean that games are an excellent way to promote learning.

Kapp introduces the idea of gamifying the *content*, in addition to the *structure* of the system, when he suggests that:

well-designed educational games blend a task-related story with interactive game elements to help the player learn the desired behaviors, actions, and thinking patterns that support the desired outcome within a particular context

(2012, p. 42).

An important aspect of games, in that they are more likely to help something learned to stay in the learner’s memory, is also highlighted by Kapp when he says “a well-crafted game-based story focused on helping learners to solve problems educates learners and is easily recalled when the actual situation arises” (2012, p. 42).

Researcher James Paul Gee has written extensively on the power of games as educational media. He suggests that humans:

think best when they reason on the basis of patterns they have picked up through their actual experiences in the world, patterns that, over time, can become generalized but that are still rooted in specific areas of embodied experience

(Gee 2014, p. 9).

Gee finds that, in active learning, there are three things involved: “*experiencing* the world in new ways, forming new *affiliations*, and *preparation* for future learning” (2014, p. 24). Games are therefore the natural way of harnessing these components for promoting such active learning. He sees “the game as a system and a designed space” (Gee 2014, pp. 34-5), offering opportunities for designers to develop games which build on players’ abilities and enhance them further. Unlike Bogost (2011, 2014) he sees manipulation as not necessarily negative, as people can be manipulated positively, such as being manipulated to *learn* (Gee 2014, p. 36).

Just as Dickey (2007) saw the personalised environment as conducive to learning, Gee sees that a learner can “customize the identity the game offers him” and for him, this “is an important feature of good video games” (2014, p. 37). This personalised, customised approach to games is seen to be extremely beneficial in an educational context, where the learning can be tailored to the individual.

2.6.2.3 *Why gamification, not games?*

Even as early as 1981, the language that would ultimately be adopted by gamification scholars was in place in the literature connecting games, motivation, and learning. One study looked to identify “the features that make computer games captivating (so that they can) be used to make learning – especially learning with computers – interesting and enjoyable” (Malone 1981, p. 334).

Subsequently, this discussion turned to goals that are:

- “personally meaningful” (p. 356);
- differentiated between “fixed” and “emergent” (p. 358);
- infused with “performance feedback” (p. 358);
- identified as having “variable difficulty” and therefore offering “multiple level goals” (p. 358);
- offered along with “hidden information” and “randomness” (p. 359).

This entire discussion prefigures aspects of games which have subsequently been identified as relevant in the quest to make successful gamified systems.

Game designers repeatedly return to the concept that it is what is at the *core* of the game that is most important (Brathwaite & Schreiber, 2008; Andersen et al, 2011; Linehan et al, 2011; Ferrara, 2012a; Aparicio et al 2012; Ferrara, 2013), and gamification is seen to have something very different at its core than games do (von Ahn, 2006). In the case of gamification for learning, the core of the system is the learning that the designers aim to have their participants experience. The core of a gamified learning system is behaviour change (Linehan et al, 2011), and a journey through such a system can be seen as a “cognitive apprenticeship” (Ramirez & Squire, p. 632), if it is well designed.

As we have seen earlier, if used judiciously, the “persuasive” properties (Llagostera 2012, p. 12; Ferrara 2013, pp. 298-302) of game elements used in gamified learning systems can encourage learning to take place. In writing specifically about gamification for education, Ramirez and Squire (2014) list a number of game elements which work well in educational applications. They discuss the use of:

- just-in-time feedback;
- well-ordered problems;
- the ability to learn through failure

(Ramirez & Squire 2014, p. 629).

This last aspect, concerning failing without serious consequences, is particularly important for “effective educational interventions” (Ramirez & Squire 2014, p. 629). They caution that “gamification structures, such as achievements, can function to promote learning if used carefully” (Ramirez & Squire 2014, p. 638), however, they are adamant that “gamification techniques are a critical set of design tools in an educator’s toolbox” (Ramirez & Squire 2014, p. 647).

2.6.3 Motivation in Second Language Acquisition

In writing about motivating students to learn another language, direct reference is made to “game-like activities that are not taken seriously ... (and which) ... promote cooperation” (Dörnyei 2001, p. 93). This distinction between games and “game-like activities” also presages findings made in the gamification discourse, and offers one of the most explicit calls for gamification in education, where such “game-like activities” are used for learning, rather than merely *bringing games* into the classroom.

We have seen some background describing the nature of SLA research, and it is equally important to understand some SLA-specific motivational issues. Research in this area has shown that when teachers use “motivation-sensitive teaching practice” (Dörnyei 2001, p. 4) they are better able to afford learners the chance to demonstrate their own motivation to learn a language. These findings relate directly to traditional classroom learners, and different models need to be added when looking at online language

learning in particular, but there are many lessons which can be learnt for anyone interested in promoting SLA, regardless of the medium.

A survey of writing about motivation in SLA has shown that motivation is a process (Dörnyei 1998, p. 118). It can be described by using an “expectancy-value framework” (Dörnyei 1998, p. 8), whereby individuals decide how much they wish to do something based on their expectancy of success, weighed up against the way they perceive the value of that success. Research shows that the kinds of achievements which lead to an expectancy of success are tied to a sense of self (Dörnyei 1998, p. 119). The value of that success often manifests in goal-oriented behaviour where “proximal sub-goals ... have a powerful motivating function” (Dörnyei 1998, p. 121). This reiterates the earlier finding that “goals are important to intrinsically motivating environments” (Malone 1981, p. 356). Goals are often present as pacing and rewards systems in gamification, lending themselves to the “proximal” ideal.

Research has also found that a “teacher’s motivational practice has a highly significant positive correlation with the learners’ motivated behavior” (Guilloteaux & Dörnyei 2008, p. 69). It is argued that there are “techniques to increase motivation” (Dörnyei & Csizér 1998, p. 208), so a knowledge of these would be useful in the design of a gamified system (see, e.g. section 2.6.3.1.1). The types of “motivational strategies” (Guilloteaux & Dörnyei 2008, p. 57) useful in online language-learning opportunities will not always correlate to those used in a classroom, but gamification does lend itself to being used in this situation.

2.6.3.1 Relationship to gamification

Within the context of gamification, rewards are often used as goals, encouraging a goal-setting set of behaviours for individuals, and thus fulfilling the notion of goals as motivators. Dörnyei speaks of “mastery” goals, which relate to the gathering of skills, and “performance” goals which offer the chance to show others these skills (1998, p. 121).

There is a wide array of terms concerning the target or direction of motivated behaviour – such as ‘goal,’ ‘orientation,’ ‘need,’ ‘aspiration,’ or ‘vision’ ... (and) different targets may have different motivational *pulls* on an individual

(Dörnyei et al 2015a, p. xi).

Achievements, Badges, Points and Levels are often used as “targets” for participants in gamified systems, and show the characteristics of motivational “pulls” associated with these motivational strategies.

In addition, in traditional classroom language learning, “attitudes related to the L2 community exert a strong influence on one’s L2 learning” (Dörnyei 2001, p. 16). This need to be part of a community can be replaced in gamified situations by well moderated discussion forums. In fact, the emerging communities of practice (Lave & Wenger, 1991) apparent in the discussion forums in sites such as Stack Overflow (2008) and Quora (2010) are evidence of this, marking the strength of the approach as potentially much broader than just language-learning situations.

2.6.3.1.1 *Language classroom “commandments” as bases for gamification*

A series of “commandments” developed for use in the language classroom (Dörnyei & Csizér 1998) are relevant when considering gamifying SLA. Where the first “commandment” is classroom-specific, the other nine are concepts which easily transfer to a gamification scenario. The ten commandments are:

- 1 set a personal example with your own behaviour;
- 2 create a pleasant, relaxed atmosphere in the classroom;
- 3 present the tasks properly;
- 4 develop a good relationship with the learners;
- 5 increase the learners’ linguistic self-confidence;
- 6 make the language classes interesting;
- 7 promote learner autonomy;
- 8 personalize the learning process;
- 9 increase the learners’ goal-orientedness;
- 10 familiarize learners with the target language culture

(Dörnyei & Csizér 1998, p. 215).

There are clearly many different ways to implement these “commandments,” but gamification offers one set of possibilities. As we see in Table 2.4, substituting the atmosphere of the classroom (2), and the need to develop relationships with learners (4), with well moderated discussion forums, these commandments can be addressed. Commandments 3, 6 and 10 become issues of good design, as does 5, by suggesting that self-confidence can be built by good incremental skill acquisition in a gamified application. Autonomy is directly referenced in 7, showing how in SLA it is important to develop a learner’s self-confidence so that they can communicate effectively on their own, in the target language (TL). Gamification has been shown to be a valid way to allow participants to personalise their learning, as they create and alter their own profiles, avatars, and narrative journeys through gamified systems (8). As we have seen earlier, goal-orientedness, as referred to in 9, can be addressed by presenting rewards as goals. Thus, these ten commandments, although designed for classroom teaching, are useful as a reference point in the gamified design process in SLA.

	“Commandment”	How to address via gamification
2	Create a pleasant, relaxed atmosphere in the classroom	Well moderated discussion forums
3	Present the tasks properly	System design issue
4	Develop a good relationship with the learners	Well moderated discussion forums
5	Increase the learners’ linguistic self-confidence	Design issue: skill development
6	Make the language classes interesting	Design issue: games pique interest
7	Promote learner autonomy	Use of elements that address autonomy, e.g. offering meaningful choices
8	Personalize the learning process	e.g. profiles, avatars, narrative journeys
9	Increase the learners’ goal-orientedness	Rewards as goals, e.g. achievements, badges, levels, points
10	Familiarize learners with the target language culture	e.g. Discussion forums/links to TV, news, websites in TL

Table 2.4: How to address commandments via gamification

Much of the research into SLA motivation is concerned with “longer currents of intensive action” (Dörnyei et al 2015a, p. x), and it is not yet clear that gamification will address these long-term practices. However, there is crossover in the utility of many of these findings. Longitudinal studies of the efficacy of gamification should be able to address this issue, but this is unfortunately outside of the scope of this thesis.

2.6.4 Self-Determination Theory

Self-Determination Theory (SDT) suggests that a person will not feel a sense of intrinsic motivation unless three constructs are fulfilled: Competence; Autonomy and Relatedness. If we take the “commandments” of the previous section (Dörnyei & Csizér 1998, p. 215), not alone are they able to be addressed via gamification; each of them relate to the three constructs of SDT in the following ways:

- Commandments 3, 5, 6, 9, and 10 speak to Competence;
- Commandments 7 and 8 are relevant to Autonomy;
- Commandments 2, 4, 8 and 10 could be helpful in facilitating Relatedness.

In other research into motivational issues in SLA, Dörnyei:

- talked of the importance of “mastery” and “performance” goals, both of which are relevant to a feeling of Competence
(1998, p. 121);
- found that motivation in SLA is tied to a sense of self, and can be facilitated via a sense of Autonomy

(1998, p. 119);

- spoke about the importance of attitudes towards the community who uses the target language, in close proximity to ideas around Relatedness

(2001, p. 16).

This section contains an overview of SDT, briefly outlining its main tenets and its application to an understanding of gamification.

2.6.4.1 What is Self-Determination Theory?

SDT is “one of the most general and well-known distinctions in motivation theories” (Dörnyei 1998, p. 121). It is an “approach to human motivation and personality” in which a person’s “innate psychological needs” are investigated as “the basis for their self-motivation” (Ryan & Deci 2000a, p. 68). SDT can “accommodate ... a variety of potential motivation styles” (Model 2005, p.5). It is a “broad theoretical framework that addresses the personal and situational factors that elicit differing types of motivation in various settings” (Standage et al, 2005).

It offers an understanding of “need satisfactions” as against “need frustration,” where the satisfaction of a need should “predict subsequent motivation to play, whereas need frustration should predict a lack of persistence” (Ryan et al 2006, p. 348). SDT is seen as “a macrotheory of human motivation that is principally concerned with the potential for social contexts to provide experiences that satisfy universal human needs” (Przybylski et al, 2010, p. 154).

SDT suggests that, in order for a person to feel motivated, three elements must be satisfied. These are: Competence, Autonomy, and Relatedness.

- Competence is the ability to put “forth the effort necessary to master optimal challenges that are developmentally appropriate”

(Zhang 2008, p. 146);

- Autonomy is “the feeling of volition that can accompany any act”

(Ryan & Deci 2000a, p. 74);

- Relatedness is “the need to feel belongingness and connectedness with others”

(Ryan & Deci 2000a, p. 73).

The architects of SDT argue that:

research on the conditions that foster versus undermine positive human potentials...can contribute...to the design of social environments that optimize people's development, performance and well-being

(Ryan & Deci 2000a, p. 68).

Dörnyei et al (2015b) say that SDT:

offers a detailed discussion of autonomous engagement with tasks as well as of the psychological nutrients that the social context of the task needs to supply, which is invaluable for our understanding of what is needed for a (Directed Motivational Current) to occur

(p. 103).

2.6.4.2 SDT's continuum of human motivation

In addition to the three constructs of Competence, Autonomy and Relatedness, the SDT theory outlines a continuum of human motivation:

- A person who has none of these constructs satisfied is said to have little intrinsic interest in performing a specific task, or is:

- “amotivated”

(Ryan & Deci 2000b, p. 60);

- An individual may, once introduced to external motivators, eventually internalise this motivation and move to a point where they could be described as exhibiting intrinsic motivation. They are experiencing:

- “extrinsic motivation”

(p. 60);

- Within the section of the continuum dealing with *extrinsic motivation*, there are four possible positions expressed:

- When an external motivator is applied, an individual may initially comply with these motivators, reacting to their presence in order to perform the task, or be behaving under:

- “external regulation”

(p. 62);

- Although the continuum is seen as the progression from amotivation to intrinsic motivation, it is not necessarily implied that a person will move step by step from one end to the other. Individuals may experience a sense of involvement with an external motivator if they wish to gain approval from others, through a feeling of:

- “introjection”

(p. 62);

- Individuals may identify with the goals that the successful performance of the task will achieve, thus experiencing:
 - “identification”

(p. 62);
- or they may feel that their goals synthesise with the goals of the task itself and they may internalise those goals - bringing about a feeling which is very close to intrinsic motivation, or:
 - “integration”

(p. 62).

Ryan and Deci (2000b) argue, however, that this internalisation of external motivators is different from intrinsic motivation, where there are no external conditions required: intrinsic motivation occurs when there is enjoyment or satisfaction experienced in doing the task itself.

While there are external motivators present, there is a chance that intrinsic motivation may not be experienced, as the desire to achieve the external motivators may outweigh the pleasure derived from doing the act itself. This is particularly relevant to a discussion of gamification, where badges, points, levels and other rewards are regularly introduced as external motivators. To that end, see section 2.5.3.3 *External motivators and intrinsic motivation* for a fuller discussion of this point. However, if these external motivators produce a desire to undertake the specific task for which they are awarded, regardless of where a person may appear on the continuum, it could be argued that the motivators have been successful, as they have allowed the individual to satisfy that desire for the rewards which those motivators bring (Ryan & Deci 2000b, pp. 60-65). This continuum of motivation suggests a *process* of change (Dörnyei 2001, p. 133) and is presented here because it “provides a ... blueprint for creating gamification mechanics that are focused on facilitating deeper internalization” (Rigby 2014, p. 128).

2.6.4.3 External motivators and intrinsic motivation

“An activity is said to be intrinsically motivated if people engage in it ‘for its own sake,’ if they do not engage in the activity in order to receive some external reward such as money or status” (Malone 1981, p. 335). The research team behind SDT says that intrinsic motivation is about doing “an activity for its inherent satisfactions rather than for some separable consequence” (Ryan & Deci 2000b, p. 56).

Intuitively, offering rewards would appear at first to be something which would increase motivation. However, much research shows that there is a possibility that external motivators can detract from an individual’s feeling of intrinsic motivation if carelessly applied, or, indeed, if taken away unexpectedly (see, e.g., Deci et al, 1999; Deci et al, 2011; Ryan & Deci 2000b; Deterding, 2012b). Discussion around the potential for rewards to be detrimental to participants experiencing intrinsic motivation has centred

on the argument that rewards can produce differing effects, based on whether the feeling they engender is positive or negative. This is extremely important in gamification, as proponents do not wish to harm participants' sense of motivation with inappropriate external motivators. Relating it back to SDT,

in many cases, rewards have conflicting effects, being experienced to some extent as controlling (thus thwarting satisfaction of the need for autonomy) and to some extent as informational (thus providing satisfaction of the need for competence)

(Deci et al 1999, p. 628).

This concept of external motivators de-motivating participants is one of the biggest threats to the ability of gamification to motivate people, with badges, rewards and other achievements being offered to participants across the gamification spectrum. As an example of how to avoid this problem, this section looks in detail at how rewards can be de-motivating.

2.6.4.3.1 Controlling vs informational rewards

In a meta-analysis of research in the area, the distinction was made between “controlling positive feedback (which) leads to less intrinsic motivation” and “informational positive feedback” which aids satisfaction of the motivational needs required in order to feel a sense of intrinsic motivation (Deci et al 1999, p. 629). We have seen this mirrored in the game design literature (see Hecker, 2011; de Alfaro et al, 2011; Bista et al, 2012).

Some have argued against this idea, suggesting that for many years, teachers have been rewarding students, and achieving great results (Cameron, 2001). However, in answer to this criticism, Deci et al (2001) point out that the *way* in which the feedback is received must be taken into account when deciding whether it is detrimental or not. They detail that “the informational aspect conveys self-determined competence and thus enhances intrinsic motivation. In contrast, the controlling aspect ... undermines intrinsic motivation” (Deci et al 2001, p. 3). In fact, they argue that the types of “tangible rewards” which teachers often use are seen as controlling, rather than encouraging behaviour (Deci et al 2001, p. 9).

Dörnyei differentiates controlling feedback, for example, as “comparing a student's rather low test score to the average score of the class ... whereas information feedback would compare the same score to the student's previous achievement” (Dörnyei 2001, p. 124). In the final analysis, it is suggested that external rewards should not be the focus for motivating students' learning, but rather, “it is important to focus more on how to facilitate intrinsic motivation (where educators start) to develop more interesting learning activities, to provide more choice, and to ensure that tasks are optimally challenging” (Deci et al 2001, p. 15).

This idea is also echoed by Dörnyei (2001, p. 25) in relation to motivating language learning, who suggests that educators need to do more to create the conditions where learners are enabled to experience a sense of motivation. Additionally, “under certain circumstances – if they are sufficiently *self-determined* and *internalised* – extrinsic rewards can be combined with, or can even lead to, intrinsic motivation” (Dörnyei 1998, p. 121).

In games, it has been shown that external rewards, or “secondary game objectives” (Andersen et al 2011, p. 30), can contribute to participants losing interest in a site or a task, thereby bringing about the opposite effect to the target behaviours for which designers are aiming. They can also become something of a distraction for participants in that they partake in the activity purely for the receipt of these external motivators, rather than playing for enjoyment’s sake. Similarly, as we saw in section 2.4.3, rewards must be applied carefully, as they can create “harm” (Hecker, 2011).

Much further research has refined and developed these notions of controlling versus informational rewards (Deterding, 2012b; Mekler et al, 2013b; Rigby, 2014; Forde et al, 2015). Rigby (2014) offers practical advice to designers where he suggests that rewards should be offered not for performance, but for engagement, such as Duolingo’s daily streak, awarded for daily participation (Duolingo, 2012). He also says systems should be designed with rewards that open up content and enhance deeper engagement, such as sites where further content is unlocked as users become more proficient at the use of the site (Rigby 2014, p. 124). Like many others before him (Deci et al, 2001; Dörnyei, 2001; Sierra, 2011; Hecker, 2011), Rigby suggests the use of unexpected rewards (2014, p. 124). For Rigby, “if we deploy gamification techniques that emphasize motivation for behavior that is pressuring, controlling, or otherwise ‘push’, the prospects for long-term engagement, loyalty, and lasting behavior change are in jeopardy” (2014, p. 127).

Forde et al (2015) use the SDT continuum of motivation as a theoretical framework for the design of an experiment to test the effects of feedback. In their experiment, one condition has controlling feedback and one has informational feedback. In the controlling condition the word “must” is used, whereas the informational condition simply says “if” (Forde et al 2015, p. 520). Their hypothesis is that the latter condition will encourage participants to continue, whereas the first will have the opposite effect. As the literature suggests, the study confirms this hypothesis.

Likewise, in developing their taxonomy, Weiser et al (2015) find that “it can be demotivating to receive feedback that contradicts aspects of one’s own conceptualization because it introduces inconsistencies into one’s mental representation” (Weiser et al 2015, p. 275).

Overall, the literature suggests the use of effective extrinsic rewards in gamified SLA would seem to be possible, where informative, non-controlling and not conflicting with the participants' mental models. Dörnyei's useful, interesting notions about rewards could be worked into the design of a gamified system, and echo much of the language across the literature on this topic. He suggests rewards:

- should not be overused;
- should not be treated seriously;
- should be meaningful;
- should take the form of a “lasting visual representation ... so that students have something in hand to take home and show people”

(2001, p. 130).

2.6.4.4 How can we use SDT?

SDT's ability to predict “sustained engagement over time” (Przybylski et al 2010, p. 155) makes it extremely useful for measuring *changes* to motivation. The usefulness of SDT can be summarised by the fact that evaluations have shown SDT helps to explain what works to motivate participants in the areas of education (Ryan & Connell, 1989), sport (Standage et al, 2005), music (Denis & Jouvelet, 2005) and video games (Ryan et al, 2006). There is more complexity in SDT than we have discussed here, however, the focus of this thesis means that further detail on these complexities is not as relevant in this context. Readers are directed to Deci and Ryan (2002), Deci and Ryan (2011), and Vansteenkiste et al (2010) for further details.

Likewise SDT has been a “core aspect” of numerous studies on “the psychology of games” and has many times shown a relationship to two of the main target results from gamification:

- keeping participant interest;
- “lasting behavior change”

(Rigby 2014, p. 117).

Much of this research has concentrated specifically on games, and not on the use of game elements in non-game situations, but an understanding of the main tenets of SDT will have a direct impact on the study of the issues of gamification.

The implication of motivation being the act of being moved is that something exerts a force over an individual, which then prods them into action. When this motivation is intrinsic, this force comes from within, but because “people are moved to act by very different types of factors” (Ryan & Deci 2000a, p. 69) research has centred around finding, or creating, optimal conditions for the satisfaction of

motivational needs that may lead to the development of this type of intrinsic motivation. Seeing game elements as potential forces to act in the meeting of these motivational needs is at the root of good gamification (Deterding 2011b; Werbach & Hunter, 2012). Where these game elements are seen as “motivational affordances” (Zhang, 2008; Deterding, 2011b), an understanding of SDT can help gamification designers know how to use those game elements to create motivational need supports for participants.

Yee (2007) offers a useful taxonomy which looks at game play motivation, identifying ten sub-constructs of motivation, which fit into three overarching components:

- Achievement;
- Immersion;
- Social

(p. 773).

These three components map to SDT, with:

- *Achievement* covering the feelings associated with the mastery of skills, similar to Competence;
- the feeling of *Immersion*, which is related to Autonomy, where a participant feels completely at home in the environment;
- *Social* being comparable with Relatedness.

Yee’s taxonomy is particularly salient, as it documents a “myriad of motivations” (Yee 2007, p. 774), and this overlap underlines its usefulness for aiding understanding of the motivational issues. However, as another study showed, it “does not extend to the gamification features that satisfy the motivations” (Robinson & Bellotti 2013, p. 2). This criticism has direct relevance to this thesis as one of the aims here is to provide a list of such gamification features and their extension to a motivation framework. We can, therefore, take SDT, which is closely related to Yee’s work, as a basis from which to begin with the analysis for this work.

Sailer et al identify six different perspectives on motivation, because they all “focus on different aspects” (2013, p. 33). However, the three constructs of Ryan and Deci’s SDT theory of motivation (2000a) cover all relevant aspects of player behaviour that one would wish to capture in a gamified system and, as a method of trying to decipher which elements will be the most useful to produce that sense of total engagement that Csikszentmihalyi labelled “flow” (1991), SDT has been shown to be a beneficial way to study the effectiveness of those elements (Ryan & Connell, 1989; Standage et al, 2005; Denis & Jouvelet, 2005; Ryan et al, 2006).

In fact, Deterding states that SDT is:

arguably the empirically most well-researched psychological theory of intrinsic motivation ... (referring to) ... several empirical studies (which) show strong correlations between video game features, need satisfaction, and other relevant constructs like enjoyment or intrinsic motivation (2011b, p. 2).

There is, therefore, a match between games, gamification, and SDT as a prism with which to understand them.

2.6.5 Motivational affordances

Gamification, particularly when used in educational settings, can be seen as a “motivational system” (Mitchell, 1982), with participants being given the opportunity to express their motivations. In this view, game elements included in a gamified system are offering, or affording, participants that opportunity, or in other words, providing “motivational affordances” (Zhang 2008, p. 145, Deterding 2011b, p. 1).

Gamified systems have, at their core, the evocation of particular behaviours, so it is useful to look at game elements as motivational affordances which may bring about those behaviours. This concept describes “the properties of an object that determine whether and how it can support one’s motivational needs” (Zhang 2008, p. 145). This definition is useful if we see game elements as such objects that can be utilised in order to address the motivational needs, stated or unstated, of a user of a particular system. These motivational needs may have been identified by the participants themselves, or they may relate to the behaviours desired from the system itself.

The impetus to allow an individual to demonstrate their motivation to undertake a particular action may simply be the opportunity to do it, and certain game elements may offer that opportunity, and it has been suggested that “sometimes simply providing a good opportunity is enough to do the trick” (Dörnyei 2001, p. 25).

For Deterding, the idea needs to be refined one step further (2011b). In this interpretation, the motivational affordances must be “situated”, meaning that the *context* of each affordance:

- is relevant;
- changes its motivational pull;
- and must be considered when deciding upon using particular elements in a gamification setting (p. 1).

The most salient condition here is “the relation between the features of an artefact and the abilities of a subject in a given situation” (Deterding 2011b, p. 3). People’s motivations for taking part in a game or gamified system will change according to their situation, and this must be factored into the design (Robinson & Bellotti, 2013). For example, one typology of player engagement lists six types of causes of engagement with games, being:

- intellectual;
- physical;
- sensory;
- social;
- narrative;
- emotional

(Schønau-Fog & Bjørner 2012, pp. 406-407).

Many of these causes may need to be taken into consideration when designing for "motivational affordances” in order for a participant to experience a sense of fulfilment. This typology also maps to SDT, as the ability to master *intellectual* and *physical* challenges fulfils a user’s need to experience Competence, and the need for Relatedness is encompassed in the *social* and *emotional* causes of engagement and perhaps *narrative*, where there can be identification with the game-world by the player. The fact that this study looked only at the initial phase of player’s engagement with video games explains why there is little emphasis on the development of Autonomy, the third component of SDT (Ryan & Deci 2000a; Schønau-Fog & Bjørner 2012).

Zhang (2008) lists five areas of motivational sources and needs, and offers two design principles for creating supports for each need. These motivational needs, and the design principles, are presented in Table 2.5.

Motivational Sources and Needs	Design Principles
Psychological: Autonomy and the Self	1. support autonomy 2. promote creation and representation of self-identity
Cognitive: Competence and Achievement	3. design for optimal challenge 4. provide timely and positive feedback
Social and Psychological: Relatedness	5. facilitate human-human interaction 6. represent human social bond
Social and Psychological: Leadership and Followship	7. facilitate one’s desire to influence others 8. facilitate one’s desire to be influenced by others
Emotional: Affect and Emotion	9. induce intended emotions via initial exposure to ICT 10. induce intended emotions via intensive interaction with ICT.

Table 2.5: Summary of design principles for motivational affordance,

(adapted from Zhang 2008, p. 146)

Zhang matches existing design examples with her design principles, some of which are:

- Autonomy and the self:
 - desktop skins;
 - online avatars;
- Competence and achievement:
 - various challenge levels;
 - immediate performance feedback;
- Relatedness:
 - chat sections;
 - visualisations of email exchanges;
- Leadership and followership:
 - blogs;
 - virtual communities;
- Affect and emotion:
 - Engaging games;
 - ICT that induce optimal flow experience

(Zhang 2008, p. 146).

Zhang posits that these elements which are currently being used fulfil the motivational needs she has outlined. Her principles link up with need satisfaction theories of motivation, specifically SDT, which is echoed in her use of the words Competence, Autonomy and Relatedness. Her design principles 7 and 8 (facilitate one's desire to influence others; facilitate one's desire to be influenced by others) reference ideas covered by the notion of Relatedness, and 9 and 10 (induce intended emotions via initial exposure to ICT; induce intended emotions via intensive interaction with ICT) could also be argued as facilitating this same sense (Zhang 2008, p. 146). Using this framework as a guide, game elements could be interleaved with the design examples given, in order to be examined further for their efficacy as motivational affordances (Deterding, 2011b).

Empirical tests of some of Zhang's design principles (Jung et al, 2010) positively indicate that "performance improvement mechanisms" can be "effective in motivating individuals to do their best" (Jung et al 2010, p. 737). This suggests that there is validity in the idea of utilising such mechanisms for motivational purposes, and therefore that there is merit in investigating individual game elements for their motivational effectiveness.

Game elements can be viewed as such mechanisms, when separated out from their game contexts, and evaluated for their usefulness to “improve performance.” In this way, if we see game elements as potential motivational affordances, and design gamified systems accordingly, addressing participants’ psychological needs, we should be able to avoid the shallow “pointsification” (Robertson, 2010) of other gamified applications.

2.7 Conclusion

Gamification is still a relatively new area of research. The interest in it from a scholarly perspective arises from its usefulness across a range of disciplines, and it has particularly piqued the interest of educators worldwide. The continual refinements to the definitions offered demonstrate the sustained significance of the phenomenon and also point to some confusion as to the way in which the approach is best used. Criticisms are clearly centred around perceived attacks by the world of game design, and the use of game elements without a full understanding of the inherent power of games. These criticisms are now being joined by directives from game designers, who suggest that designers of gamified systems have much to learn from their discipline, and they are willing to share their knowledge to make gamification better. Even these more sympathetic critics still caution, however, that the use of game elements will be unsuccessful without full recognition of the importance of understanding the psychological needs underpinning game players’ behaviours.

Specific motivational theories such as SDT are being promoted as useful pathways to gain this understanding. The three constructs of Competence, Autonomy and Relatedness, as detailed in SDT, relate directly to all aspects of player behaviour that a gamified system might look to motivate. Currently, there is no detailed taxonomy linking a full list of available game elements to these motivational constructs. This is a gap in the research which I hope to address, by proposing a taxonomy which takes game elements identified in the literature, and, applying a conjectural analysis of the type explored by Zhang (2008 – see Table 2.5), showing how these elements may work towards enabling the fulfilment of these three motivational constructs. In addition, I assess this analysis by a survey of game-players, before evaluating the taxonomy against a language-learning website, Duolingo (2012). In this way, this research offers a classification of the ideas present across the literature, bolstered by the opinions of gaming experts via the survey, before being applied as an analysis to a successful gamified application. This proposed taxonomy will be presented in Chapter 4.

Much of the current research has been undertaken over a very short time-frame, and has examined only a minimal number of game elements. The scope of this thesis has allowed a more thorough investigation of the number of elements under study here, especially through the survey conducted on gamers, and it is intended that this will improve the efficacy of the results, and the degree to which they are holistic. In addition, testing the awareness of motivational issues, through Content analysis of both users and

developers of the Duolingo site, adds further depth to our observations. The results of these analyses will be presented in Chapter 6, and discussed in Chapter 7.

The following chapter, Chapter 3: Methodology, details how I arrived at the Research Questions, informed first by this Literature Review, and then by our need to drill down into our own observations and find consistency across the different evaluations conducted for this research.

Chapter 3: Methodology

3.1 Introduction

There are, of course, numerous research methodologies one could choose when linking game elements to motivational constructs. One approach could well have been to go to a group of independently highly motivated gamers, observe them playing games of varying types, and try to determine, empirically, which game elements they used, and which game elements motivated them to return to play. An inductive analysis of these observations could then result in a proposed taxonomy (Gray 2009, p. 14). In fact, it could reasonably be argued that further research performing just such a task would be extremely useful, and could lead to a more profound degree of understanding of the issues I have examined here.

Instead, coming first from a more deductive perspective, the approach for this project was to start with the literature, examine patterns which emerged, and attempt to connect the disparate aspects of that literature in a more cohesive way. Identifying these patterns led to the development of a theory as to the relationship between the established game elements and their usefulness in motivating key behaviours. In this way, “the deductive process move(d) towards hypothesis testing, after which the principle is confirmed, refuted or modified” (Gray 2009, p. 14).

Assisting in improving the process of gamification design, especially for education, is the ultimate goal of this research, and this could be construed as coming from the critical theory approach (Easterbrook et al 2008, p. 291), however, in starting with the literature, developing a theory, and subsequently constructing a research plan that would test the hypotheses arising from this theory, the overarching principle guiding the research design for this project is more positivist in nature (Easterbrook et al 2008, p. 291).

In order to conduct this study and ensure its thorough evaluation, what is required is a mixed methods approach. This has been described as “a more complex research strategy that emerged in the recognition that all methods have limitations, and the weaknesses of one method can be compensated for by the strengths of other methods” (Easterbrook et al 2008, p. 303).

This chapter will begin by exploring the process which resulted in the wording of the research questions, before setting out in detail the “careful blend of techniques” that I have employed so as to answer each of the questions. With this blend of methods, I hoped to “help to offset potential bias and (lead) to a more comprehensive understanding of the research topic” (*both* Easterbrook et al 2008, p. 305), as well as controlling for any weaknesses present in each of the various methodologies taken on their own.

For classifying ideas, and providing a common language, I have developed a proposed taxonomy using a conjectural analysis (section 3.2). A potential weakness in a study of this kind is its largely theoretical nature (Bailey, 1994), thus I have strengthened its perspective by the use of a survey of self-reported gamers (Gray, 2009), who give their insights into the nature of this taxonomy (section 3.3). In this way, the introduction of the survey respondents' observations both acknowledges, and addresses, the weaknesses of the more theoretical approach behind the taxonomy development. One limitation of survey research is that participants know they are being surveyed for a study and this may bias the research, (see the "Hawthorne effect," as, e.g. in McCambridge et al 2014). This limitation notwithstanding, the survey results led to the proposed taxonomy being refined, leading into the answering of the first Research Question.

In order to address Research Questions 2 and 3, the thesis goes on to look at the motivational intent embodied in the game elements included in a gamified language-learning platform. So as to see the extent to which users and creators of the website are aware of the motivational issues inherent in the site, I have conducted Content analysis on forum messages from both the users and the creators of Duolingo (2012) (see sections 3.4 – 3.6). Possible problems in interpretation, which sometimes diminish the usefulness of Content analysis (Neuendorf 2016, p. 185), are limited in the analysis undertaken for this project, due to the very specific nature of the terms for which I searched, thus addressing one of the weaknesses inherent in Content analysis as a method.

Section 3.1.1 presents a graphical outline of the processes and deliverables of this research thesis.

3.1.1 Methodology outline

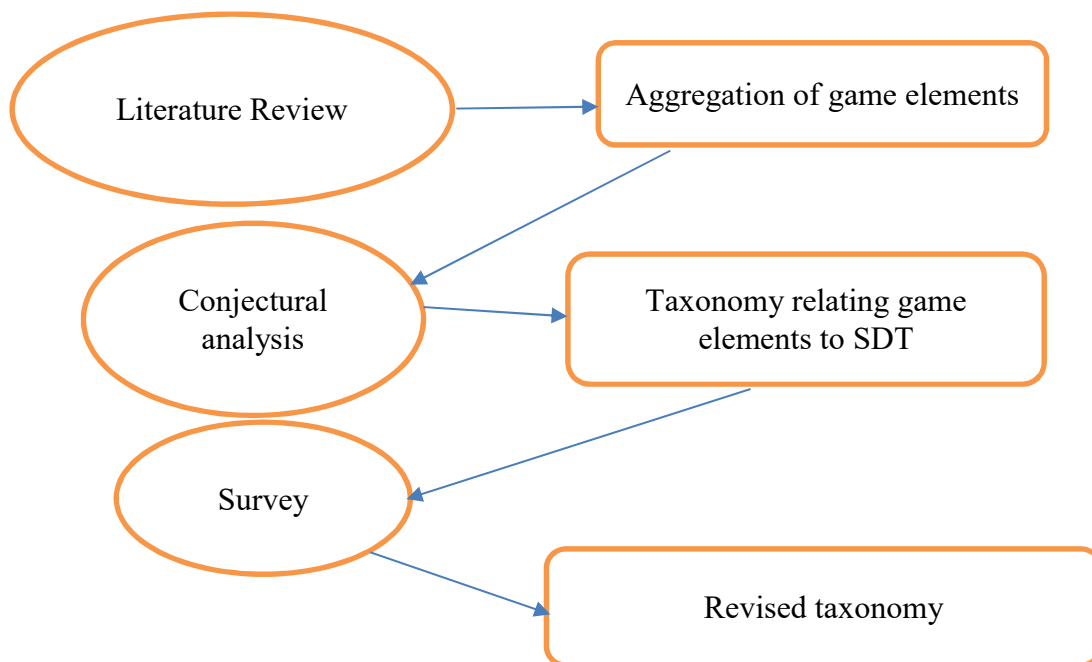


Figure 3.1 Method for framework creation and refinement

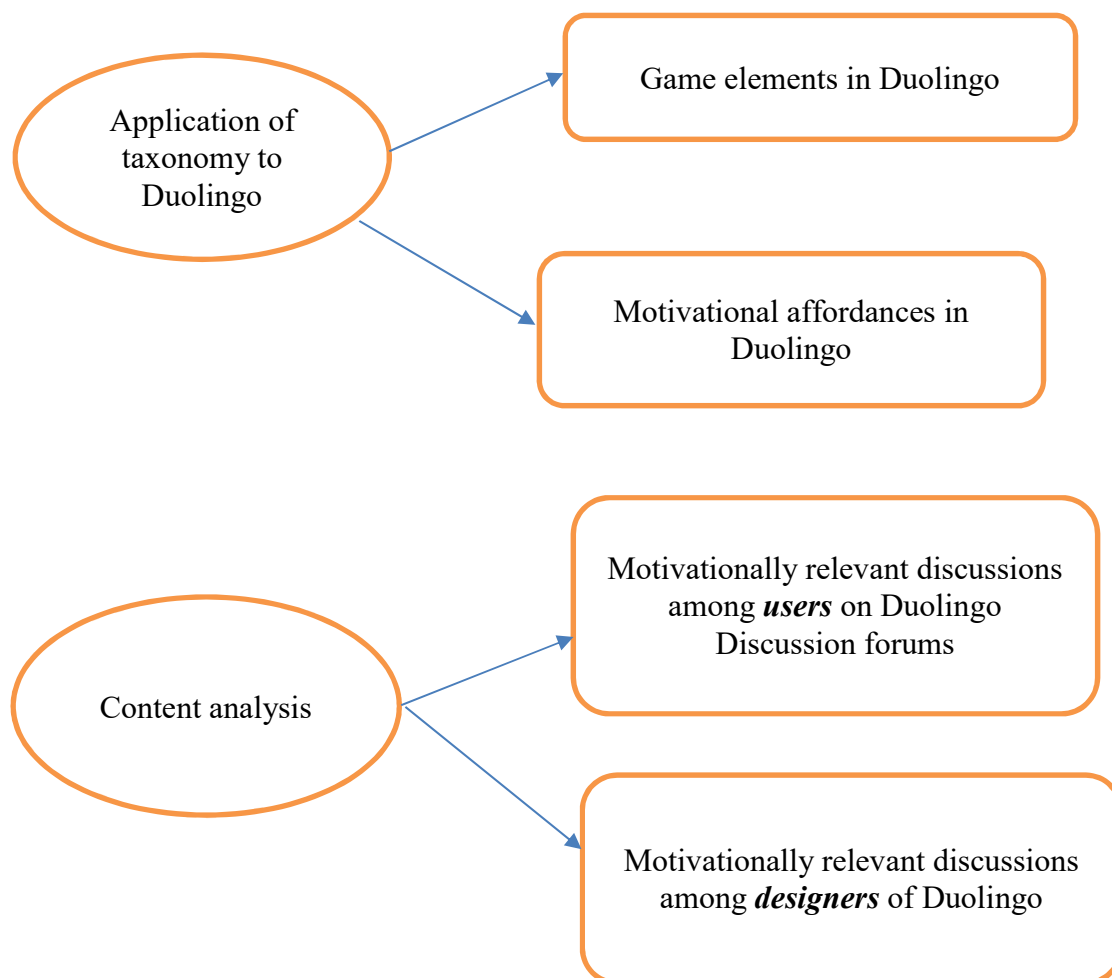


Figure 3.2 Method for investigating SLA illustrative example - Duolingo

3.1.2 Research questions

Ibrahim (2008) suggests interrogating an idea in three ways, before turning it into a research question.

- After deciding *who* is impacted by the study;
- a researcher must then decide what body of knowledge needs to be known in order to *inform* the problem;
- before then working out a course of *action* upon that body of knowledge, in a way that will be helpful for the *who* of the first part of the question

(p. 70).

In order to determine the response to these problems, the literature was reviewed with the following in mind, “the core issues that emerge from the literature gradually build into significant sets of themes, or concerns that link to, and help to specify, the research questions and the research design for solving them” (Gray 2009, p. 132).

Throughout this literature review process, the lack of guidance for designers of gamified systems arose as a major focus on a number of occasions (see Chapter 2 Literature Review), thus making it clear that the *who* of this study ought to be those designers. The body of knowledge it is necessary for them to access, in order to be successful in designing those systems, is both the literature around game design, and that concerning motivation, and, most importantly, where they intersect. In this way, the lack of an explicit, detailed taxonomy linking the two branches of thought led to the formation of the first Research Question:

- *How are game elements related to motivational constructs?*

In designing the proposed taxonomy to seek an answer for the first question, a need to apply these findings in a real world situation prompted the development of two sub-Research Questions, which would be informed through the use of the framework. These are Research Question 2:

- *Can the framework profile SLA systems consistently with the users’ stated motivational perceptions of the system?*
- and 3: *Can the framework profile SLA systems consistently with the system’s declared motivational intent?*

These questions allow for the framework to be used as an analytical tool to understand the design decisions made by an already successful system. Taking these research questions one by one, I will discuss the research design in terms of the methods to be utilised in answering each question.

3.1.2.1 Research question 1: Methods

How are game elements related to motivational constructs?

The methods employed to address this question are:

- the development of a proposed **taxonomy**;
- a **survey** to assess the assumptions behind the taxonomy.

The proposed taxonomy explicitly links game elements and constructs of a motivational theory. It is derived by classifying the elements found in the game design literature, and then applying a conjectural analysis of the motivational benefits of these elements as described in the literature concerning motivation. Because of its importance as a contribution in its own right, this proposed taxonomy is considered in much greater detail in Chapter 4.

Additionally, a survey of self-identified gamers examines the assumptions in the taxonomy, and provides for some reworking of these links between game elements and motivational aspects. Surveying a group of people well versed in game elements allows for the application of that community's knowledge to our more theoretical assumptions in the construction of the proposed taxonomy. This survey is discussed in full detail in subsequent sections of this chapter.

3.1.2.2 Research question 2: Methods

Can the framework profile SLA systems consistently with the users' stated motivational perceptions of the system?

The compilation of the proposed taxonomy provided a common language for all stakeholders in the process of gamification design. A **Content analysis**-based search for aspects of this common language in an already established gamified system grants the opportunity to investigate the level of awareness of the ways in which motivation is being stimulated by that system among its users. Finding sentiment scores based on the Content analysis allows for quantifying the existence of game elements in Duolingo and their effects on its users. So as to construct a comparison across the methods, I will then contrast these with the analysis of official publications from Duolingo.

3.1.2.3 Research question 3: Methods

Can the framework profile SLA systems consistently with the system's declared motivational intent?

Similarly, **Content analysis** is applied to official publications from the creators of Duolingo, so as to conduct a comparison across the published documents. A fuller discussion around Content analysis is contained in sections 3.4–3.6 of this chapter.

3.2 Method for framework creation

3.2.1 Proposed taxonomy

After a close reading of the literature it became apparent that there was no list associating a significant number of specific game elements, giving full justification offered for their inclusion, with ways in which these elements could potentially fulfil the various aspects required for a participant to feel motivated to continue a gamified activity. After isolating a list of such elements from the literature, an initial conjectural analysis (Dickey 2007) was applied, whereby the various elements were examined for their motivational possibilities. This initial “interpretive” analysis (Dickey 2007, p. 255), arose out of a reflective process informed by the researchers’ experiences with games, along with several informal conversations with a number of gamers known to the team.

With the proposed taxonomy, I have a specific purpose in mind. I am looking to solve the problem of deciding which elements of games can be manipulated in order to increase motivation. It is a descriptive taxonomy developed from the basis of a review of game elements discussed in the literature. There were three lists of game elements in the literature which gave rise to our list (Werbach & Hunter, 2012; Seaborn & Fels, 2015; Fitz-Walter, 2015). Seaborn & Fels (2015) and Fitz-Walter (2015) collated their lists out of surveys of other literature about gamification. Werbach & Hunter (2012) brought a different perspective to their work in that it was influenced by the fact that they were game players themselves. Similarly, the extra game element of Discussion forums was added to our proposed taxonomy, because forums function as places for the satisfaction of the Relatedness strand of SDT, through:

- their social aspects; and
- their building of community.

Further exploration of the rationale behind including Discussion forums can be found in section 4.3.2.8, where I look at their strength in helping participants in a game or gamified system develop a sense of community.

The proposed taxonomy is a conceptual framework which aims to give a shared frame of reference to all in the field who wish to identify motivationally salient game elements. In the style of Zhang’s “design principles for motivational affordances” (2008, p. 146), the proposed taxonomy takes existing examples of game elements and matches them to potential motivational needs, speculating about the target behaviours that those elements could engender in participants. Based on this, and examples of

SDT applied in other domains, this mapping of desired behaviours to constructs of the theory is interpretive, with the purpose of aiding in the development of a joint vocabulary on the topic (see e.g. Standage et al, 2005; Ryan & Deci, 2000a; Ryan et al, 2006).

3.2.2 Preliminary case studies

For the preliminary case studies, I chose to situate myself within two sites: one game and one gamified system. A case study is “an empirical inquiry that investigates a contemporary phenomenon within its real-life context” (Easterbrook et al 2008, p. 296). By participating in each of the systems, and taking the *critically reflective* aspect of action research methodology (McNiff 2002, p. 6; Oates 2006, p. 35; Easterbrook et al 2008, p. 301; McNiff and Whitehead 2010, p. 20), I have evaluated the two sites.

This initial phase of the analysis was conducted as a series of “initial investigations” (Easterbrook et al, p. 296); informal studies to explore how our interpretation of the literature aligned with my objective assessments of the two environments, for the presence or absence of these game elements, and for any additional game elements not reflected in the literature.

The decision to start with a game, Minecraft (2011), arose out of a need to ascertain if these *game* elements were actually present *in a game*, and if present, how they function there. Similarly, Khan Academy (2006), a gamified learning application, was examined with the same questions in mind.

3.2.3 Methods used

As detailed in Chapter 4: A Proposed Taxonomy for Motivation, each game element was examined for its potential to allow a participant to experience a sense of one of the three constructs of the Self-Determination Theory of Motivation: being Competence; Autonomy; and Relatedness. Examples of each of the game elements were sought from the literature and from personal experience, and the types of feelings engendered by such elements examined for their similarity to one of the three constructs.

Through this conjectural analysis (Dickey 2007), I suggest that there is a relationship between specific game elements and one or more of these constructs. The framework lists each of the elements determined by the three works in the area as illustrated in Table 2.2, and then identifies which motivational constructs are fulfilled by their use, with a view to being an aid in the design of motivationally salient gamified systems. This analysis was an interpretive inference based initially on the literature, before beginning a process of refinement through informal conversations with a number of gamers. I was helped enormously by my two teenage sons, who have extensive gaming experience, along with having used the gamified site. Their insights were invaluable to help hone our observations. Similarly, members of the Department of Computer Science and Information Systems at the University of Limerick, specifically those involved in teaching into the Bachelor of Science in Computer Games

Development, added to our discussions of game elements and how they might help motivation. These included Dr Chris Exton and Ms Brenda Romero, herself also a highly experienced game designer (Alexander, 2014), and the two supervisors of this work.

Werbach and Hunter identified 15 elements as being “specific characteristics of games that you can apply in gamification” (2012, p. 80) and this analysis was applied to each of those elements:

- Achievements;
- Avatars;
- Badges;
- Boss fights;
- Collections;
- Combat;
- Content-unlocking;
- Gifting;
- Leaderboards;
- Levels;
- Points;
- Quests;
- Social graphs;
- Teams;
- Virtual goods.

For the purposes of good gamification design, I also included Discussion forums. A justification for this is offered in section 4.3.2.8, where I argue that Discussion forums are an integral part of developing a community of practice (Lave & Wenger, 1991; Li et al, 2009; Annetta, 2010), and this is one aspect of gamification that has been seen to be extremely positive (Movshovitz-Attias et al, 2013). In Chapter 4 this analysis is discussed in much greater detail.

3.3 Method for framework refinement

3.3.1 Method

In order to validate our choice of game elements, as well as our analysis of their usefulness in the promotion of the motivational constructs listed above, I developed a survey to ask people familiar with games and game environments to reflect on their own experience of gaming. I wished to complement our understanding of the motivational affordances (Zhang 2008; Deterding 2011b) of the game elements by asking those familiar with games to offer a rating of what they saw as those game elements’ usefulness as motivators, and widen the shared vocabulary of game elements as developed in the

proposed taxonomy. The survey assesses the accuracy of the mapping that the framework presents, and potentially deepens our understanding of the connections between game elements and their motivational uses. Utilising informal opinions of gamers in the earlier stages of the formation of the proposed taxonomy suggested the process of asking numerous gamers to offer their opinions. This would strengthen our assertions about the various game elements, particularly when offering the taxonomy as a design tool to people who may not be familiar with game contexts themselves.

The survey was conducted online, using Google forms. I began with a statement outlining the overall purpose of the research, a request for consent, and a brief explanation of the concepts behind the three motivational constructs. After a short demographics section, I then presented each of the game elements separately, offering the participant a Likert scale (Dörnyei 2003, p. 36) with which to decide whether their experience of that particular element in a game context could fulfil a sense of any of Competence, Autonomy or Relatedness. The survey ended with three open questions, looking to see if respondents had an opinion on other elements which I had not included, for each of the three motivational constructs.

3.3.1.1 Feedback Phase

Our testing group was made up of nine gamers known to the researcher: seven male and two female.

- One tester was in the 40+ age bracket;
- three were aged 31-40;
- three were aged 18-24;
- and, although their responses would not be kept for the actual survey, two of our testers were aged 17 and 15.

This pilot group was presented with four elements that had not been included in the original proposed taxonomy.

- *Audio effects*, which I describe as background music or sound effects, appear in the literature (Malone, 1981), but with such scarcity that they did not originally emerge as a potential element for inclusion. However, following several informal conversations about games among the pilot group, these trial participants gave feedback to say that Audio effects ought to be added.
- *Haptic effects* were mentioned in the literature only once, in passing, as “haptic information” (Weiser et al, 2015, p. 275), without going into any further detail. Haptic effects, which are physical effects such as a tremor in the mouse when a character moves, are a relatively new phenomenon in gaming, which might explain why they are not as present in the literature,

however the trial group are familiar with the technology, and agreed that they should be included.

- *Realistic graphics*, or the importance given to good aesthetics in a game (Schell, 2014), were included as a distractor, or confounding factor (Easterbrook et al, 2008; Gray, 2009), in order to test our own hypothesis that they are *not* regarded as “elements” by those in the gaming community, and that they would *not* engender feelings of any of the three constructs of SDT.
- *Reminders* appeared only once in the literature, where it was said that they “have little effect on habit formation” (Weiser et al 2015, p. 277). As with graphics, they were included as a distractor.

At this stage, a background explanation of the Self-Determination Theory of Motivation was also presented. The testing group felt that this was too wordy, and that participants would lose interest and perhaps abandon the survey if the information was presented in this way. For this reason, it was decided to present participants with an abbreviated explanation of the concepts instead, repeated on each page.

The survey title was also changed at this stage, from *Gamification and Motivation* to *Game elements and Motivation*.

3.3.1.2 Presentation of the survey

The survey was presented using Google forms, using the new title. The first page explained that the purpose of this research project is to look for relationships between elements found in games and ways to motivate people, and detailed that the survey questions would be about some commonly occurring game elements and their relationship to components of a motivational theory. It also included an informed consent statement, in line with approval from the Ethics Committee of the University of Limerick, (approval number: 2016_10_06_S&E).

This page is presented in Figure 3.3.

Game Elements and Motivation

Thank you for taking the time to do this survey.

The purpose of this research project is to look for relationships between elements found in games and ways to motivate people.

This is a research project being conducted by Geraldine Exton, Dr Jim Buckley and Dr Liam Murray at the University of Limerick in Ireland. You are invited to participate in this research project because you play computer games.

PROCEDURE

The procedure involves completing an online survey that will take approximately 12 minutes. Your responses will be confidential and we do not collect identifying information such as your name, email address or IP address. The survey questions will be about some commonly occurring game elements and their relationship to components of a motivational theory.

ANONYMITY

As we capture no identifying information, the information provided by the participants cannot be traced back to individuals and so anonymity is guaranteed. All data is stored in a password protected electronic format. To help protect your confidentiality, the surveys will not contain information that will personally identify you. The results of this study will be used for scholarly purposes only and will only be presented in anonymised, summary form.

VOLUNTARY PARTICIPATION

Your participation in this research study is voluntary. You may choose not to participate. If you decide to participate in this research survey, you may withdraw at any time. If you decide not to participate in this study or if you withdraw from participating at any time, there is no penalty.

This research has been reviewed according to University of Limerick Ethics Procedures for research involving human subjects.

FURTHER INFORMATION

If you have any questions about the research study, please contact jim.buckley; liam.murray; or geraldine.exton@ul.ie

If you have concerns about this study and wish to contact someone independent, you may contact: The Chair, Faculty of Science & Engineering Research Ethics Committee, University of Limerick, Limerick. Tel: 061 202802

ELECTRONIC CONSENT

Please select your choice below.

Clicking on the "agree" button below indicates that:

- you have read the above information
- you voluntarily agree to participate
- you are at least 18 years of age

If you do not wish to participate in the research study, please decline participation by clicking on the "disagree" button.

* Required

1. Consent *

Mark only one oval.

☐ Agree

☐ Disagree

Stop filling out this form.

Figure 3.3: Consent page screenshot

Participants who clicked "Disagree" were taken to the final page, where they were then asked to click "Back" or "Submit." If they clicked "Submit" that was the end of their participation, and no record was kept of their involvement.

Due to ethical considerations, I was not able to take responses from gamers under 18. It was felt that turning people away in the initial information stage would not lead to a positive experience, and, being thankful for anyone taking the time to respond, I asked all participants to fill in a set of demographic questions. If they selected “under 18” they were directed, upon completion of all of the demographic questions, to the final “Submit” page and were thanked for their participation.

Likewise, rather than offering a multiple choice question for gender, it was considered important to allow participants the chance to state their gender so that no one was left feeling uncomfortable.

3.3.1.3 Survey questions

Participants in the survey were given the name of a game element (arranged in alphabetical order), with a brief description of the element, as presented in Table 3.1.

Game element	Description
Achievements	In-game content that is earned by player behaviour, e.g. Content for Avatar customisation
Audio	Background music or sound effects
Avatars	Visual representation of a player in a game, personalised with chosen elements
Badges	Visual representations of rewards or Achievements
Boss fights	Final challenges in order to Level up
Collections	Sets of in-game items that may or may not be useful within the game
Combat	Fights, battles, duels within games
Content-unlocking	Content withheld from players until a certain level of ability is reached
Discussion forums	Forums which give an opportunity to ask and answer questions, rate other users, and communicate with other players.
Gifting	The practice of giving in-game Virtual goods to other players, as a reward or as part of a Team strategy
Haptic effects	Physical effects such as a tremor in the mouse when a character moves
Leaderboards	All players' positions in a system, usually in relation to the number of Points they have been awarded
Levels	Levels express the number of points a player has, and subsequent Levels become more difficult as a player progresses
Points	Awarded for various deeds in a game
Quests	Specific tasks which act as goals and can further a narrative thread in a game
Realistic graphics	The importance given to good aesthetics in a game
Reminders	To encourage you to play the game
Social graphs	Information data sets presented to specific groups or Teams of people within a game, e.g. To spur one group on to compete against another
Teams	Groups of people who may or may not know each other outside the game
Virtual goods	In-game items which may be purchased by performing tasks within a game

Table 3.1: Description of game elements

Offering a short descriptor was deemed necessary as some elements are given different names in different gaming domains, and it was felt this would familiarise participants with the specific element under discussion. Following the descriptor was a condensed explanation of the three components of SDT, under the heading *Reminder*, reading:

- **Competence** – mastering skills;
- **Autonomy** – feeling of choice;
- **Relatedness** – social connection.

Participants were asked:

If you think that [element name] may make you feel any of those, please choose the relevant component(s).

Following the presentation of the 20 elements, the final three questions of the survey asked respondents whether there were game elements I had not listed, which they would associate with the three components.

The exact wording of the question was:

What game element not already listed would you include as most closely associated with [component]?

3.3.1.4 Survey release

The survey was released on Google forms and the URL copied and pasted to a number of sources in October 2016. This link was live for one month, during which time it was shared among personal networks using social media. A link was posted as a public post on Facebook, using hashtags such as #gamification and #motivation to attract attention. Similarly, the same link was posted on Twitter, both on a personal Twitter account and a second Twitter account used for academic and professional purposes, with a University of Limerick-based email address. Game designers Brenda Romero (Romero Games, University of Limerick) and John Ferrara (Vanguard) also publicly shared the link to the survey to their Twitter followers. Games academics Jennifer Lade (RMIT University, Melbourne), Chris Exton (University of Limerick) and gamification academic Kevin Werbach (University of Pennsylvania) also publicly shared the link.

In total, a number of 107 responses were received, with four unable to complete due to our requirements that participants be over 18. Results were then tallied for a total of 103 responses.

3.3.2 Survey

A survey allows for the possibility of “gathering a large amount of information quickly in a form that is readily processable” (Dörnyei 2003, p.1). Such data may then be generalised “to a larger population than the group you targeted” (Oates 2006, p. 93). Given that our purpose was to validate the assumptions in the creation of our proposed taxonomy, the responses to this survey were of great consequence to our analysis if they could assist in the improvement of the utility of the taxonomy. Although “survey research is used to identify the characteristics of a broad population of individuals” (Easterbrook et al 2008, p. 298), with this group of self-identified gamers, I am working with a “self-selection” sample (Oates 2006, p. 98), offering insights “into particular practices that exist within a specific location, context and time” (Gray 2009, p. 180).

It is these very practices that are so vital to be examined: the ways in which *this particular community* view games and game elements, and how these elements manage to motivate their behaviours; so as to strengthen the hypotheses that govern our proposed taxonomy.

When using Likert scales, the questions return data that is quantitative in nature, but the inclusion of short answer questions also provide for a small amount of qualitative questioning, where:

the researcher enters the (participants’) world and through ongoing interaction, seeks the (participants’) perspectives and meanings

(Creswell 2003, p. 198).

3.3.3 Question types

3.3.3.1 Likert scales

In designing the survey, Likert scales were chosen, as they are “the most commonly used scaling technique” (Dörnyei 2003, p. 36). They are a “simple, versatile, and reliable” method which “require the respondent to make an evaluative judgement of the target” (Dörnyei 2003, p. 36). By seeking these types of evaluative judgements, I was looking to quantify how emphatically our proposed taxonomy had measured the perceived links between game elements and motivation, and to restructure a revised taxonomy if the results required such a rethink.

The Likert scale offered in this survey was set up so that respondents must select one answer for each component.

The choices from which they were to select their response, per component, were as follows:

- Not important at all
- Of little importance

- I don't know
- Of average importance
- Very important

The option to select “I don't know” was included as it was felt that some participants may not understand what the different elements were, in spite of the descriptor, and may need this further ability to opt out of commenting. See Figure 3.4 to give an idea of layout and style. Appendix B contains the full survey.

Game Elements and Motivation

* Required

1/20: Achievements - in-game content that is earned by player behaviour, eg. content for avatar customisation

Reminder:

- Competence – mastering skills
- Autonomy – feeling of choice
- Relatedness – social connection

If you think Achievements may make you feel any of those, please choose the relevant component(s).

1/20: Achievements *

	Not important at all	Of little importance	I don't know	Of average importance	Very important
Competence	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Autonomy	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Relatedness	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

BACK

NEXT

Page 3 of 25

Never submit passwords through Google Forms.

Figure 3.4: Screenshot of Question One from the survey

3.3.3.2 Short answer questions

Following the presentation of all 20 of the elements, for which answers were obligatory, three optional short answer questions were asked, in order to delve into the thinking of the respondents. Short answer questions:

involve a real exploratory enquiry about an issue; that is, they require a more free-ranging and unpredictable response

The question wording was open, space was given for an answer between one word and one sentence in length, and the question was asked for all three of the components, Competence, Autonomy and Relatedness. The exact wording was:

*What game element not already listed would you include as most closely associated with
[component]?*

The aim of this question was to catch any thoughts from gamers about game elements I may inadvertently have left out of the initial 20 questions, and also to offer respondents the chance to feel that they had something interesting to add to our research. This could subsequently be analysed to identify any commonly occurring elements towards inclusion in the framework.

As Easterbrook et al (2008) point out, “it is instructive to compare survey research with other empirical methods” (p. 299). In order to broaden our results, I complemented the research undertaken to this point with Content analysis on the Duolingo (2012) population.

3.4 Method for investigating illustrative example

3.4.1 Content analysis

Content analysis has been defined as a “technique for making replicable and valid inferences from texts (or other meaningful matter) to the contexts of their use” (Krippendorff 2004, pp. 18-19). It is a quantitative approach in that the number of times a particular term or phrase is used is able to be counted, but there is room for interpretation in the analysis as usage can additionally be assessed for sentiment.

Texts chosen for Content analysis have been written for another purpose entirely, for readers and in communities which are completely unaligned with the research for which they are being used in this current context (Krippendorff 2004, p. 22). After investigating the gamer community’s attitudes towards our assessment of the relationships between specific game elements and their motivational usefulness, two separate rounds of Content analysis were conducted for the purposes of our research: one on a selection of message threads from the Discussion forums on the language-learning site Duolingo (2012); and another on official publications from Duolingo, accessible on the web. All of these texts are in the public domain, were not written for the purpose to which I am using them, and require, therefore, to be interpreted in order to be assessed for their relevance to our research aims.

While the fact that the texts were created for another purpose negates the fear of researcher interference in their formation (Krippendorff 2004), it is important to understand the role that the researcher plays

in apportioning new meaning to these texts, in the context under study. In interpreting a text, a researcher must “make his presuppositions explicit, and attempt to become conscious of how certain formulations of a question to a text already determine which forms of answers are possible” (Kvale & Brinkmann 2009, p. 211).

The proposed taxonomy gave a theoretical framework through which to view gamified systems, strengthened by its inclusion of the observations made by gamers. A successful example of gamified language learning, Duolingo (2012), has claimed to have over 100 million users (Protalinski, 2015), making it an ideal candidate for exploration of whether users and creators of such a site had an awareness of motivational issues.

Where the survey was conducted with willing volunteers, self-reported gamers, who have an interest in the subject under consideration, Content analysis allows the investigation of texts written without any conscious bias of being used for research (Krippendorff, 2004). In this way, these texts are more likely to reflect common attitudes towards the terms under study, as they are “unfettered, natural communication” (Neuendorf 2016, p. 218). By studying a group of message threads which were originally dynamic, publicly available messages which form the basis of online conversations, I am also able to see the impact they have on the community which produced them, and compare the stated aims with the users’ perception of the reality of Duolingo.

By searching through the texts for examples of discussions that focus on motivation, using the actual term and its derivatives (motivat*); gamification as a term itself; the three terms from SDT; and synonyms of these three components; I have attempted to address a common problem associated with Content analysis, that “analytical constructs that are derived from theories tend to be skeletal as well, accounting for far smaller amounts of variation than may be evident in the context” (Neuendorf 2016, p. 185). I have attended to this problem of a “skeletal” viewpoint via the thoroughness of our synonym search, as set out below.

3.4.2 Process

3.4.2.1 Generation of synonyms

The first step in the Content analysis was the generation of synonyms for the three terms from SDT (Ryan & Deci, 2000a): Competence, Autonomy and Relatedness. The three SDT terms are very specific, and generally speaking not in widespread use in normal conversation. For this reason, it was important to generate a list of synonyms which people might use when discussing issues of gamification and motivation in a lay manner. A corollary of this, however, is that many of the usages found in the content would naturally be irrelevant, necessitating a schema for identifying whether such usage is

relevant, and if so whether it is positive or negative. See Figure 3.5 for the protocol followed for this purpose, repeated for ease of access in Appendix C.

To ensure the widest possible range of synonyms, so as to catch any relevant discussions, two sites were consulted online (Oxford University Press, 2017 [OUP]; Dictionary.com, 2016). When the SDT terms yielded very few synonyms, applicable terms from the literature were searched, along with any answers from the short answer section of the survey, and these were then noted as potential alternative synonyms. Recalling that Content analysis is a method to turn qualitative data, in this case texts, into quantitative data, it was crucial to find enough terms to construct a significant bank of instances from which to make the count.

3.4.2.2 Synonyms for use in Content analysis

Tables 3.2, 3.3 and 3.4 are an amalgam of the synonyms for the three terms, that were found across the methods of collection. The first column is the relevant words taken from the Oxford University Press website (OUP, 2017), the second from the Roget website (Dictionary.com, 2016), the third from the short answer section of the survey of gamers, and the fourth a summary of terms from the literature.

OUP	Roget	Survey	Literature
ability			able/ability
	appropriateness		
accomplishment			
adeptness			
Adequacy	adequacy		
aptitude			
artistry			
bent			
capability	capability		capable/capability
capacity	capacity		
competency	competency		
Control		control	
expertise expertness	expertise		
fitness	fitness		
			fluent/fluency
know-how knowledge	know-how		knowledge
mastery			mastery
proficiency	proficiency		proficiency/proficient
prowess			prowess
	qualification qualifiedness		
savvy	savvy		
skilfulness/skill	skill	skill	skill
suitability	suitability		
talent			
virtuosity			

Table 3.2: Competence synonyms

OUP	Roget	Survey	Literature
		choice	choice/choose
flexibility			
freedom	freedom		freedom
freethinking			
independence			
individualism			
latitude			
leave			
liberty	liberty		
			opt/option
self-determination	self-determination		
self-direction			
self-reliance			
			self-responsibility
self-sufficiency			
self-support			

Table 3.3: Autonomy synonyms

OUP	Roget	Survey	Literature
			access
			associated
			common/ commonality
		community	community
connectedness			connect/connection
		interaction	
interconnected- ness			
			related
			social

Table 3.4: Relatedness synonyms

3.4.2.3 Analysis schema/protocol

The purpose of the Content analysis is to ascertain the ways in which the various stakeholders see Duolingo's role in the motivation of language-learning. Terms are only of interest to this research if they are used in a discussion that is relevant to motivation. To that end, the unit to be considered will generally include the entire comment where the term occurs, in order to read the surrounding discussion to see whether or not it contains discourse around motivational issues. Such discourse could contain references to the ways in which Duolingo helps users return to study languages, the building of skills towards learning languages, the interaction of users with each other and with the site so as to build an interest in learning languages, or some other mention of matters concerning motivation. Of course it may also reveal negative sentiment towards Duolingo's fulfilment of each motivational affordance.

Bearing in mind that I am looking to quantify positive and negative sentiment, the unit is important, although the texts are not uniform in size, so sometimes the unit will be an entire message, and at other times just a sentence or a paragraph. Figure 3.5 shows the schema for the Content analysis, which can also be found in Appendix C.

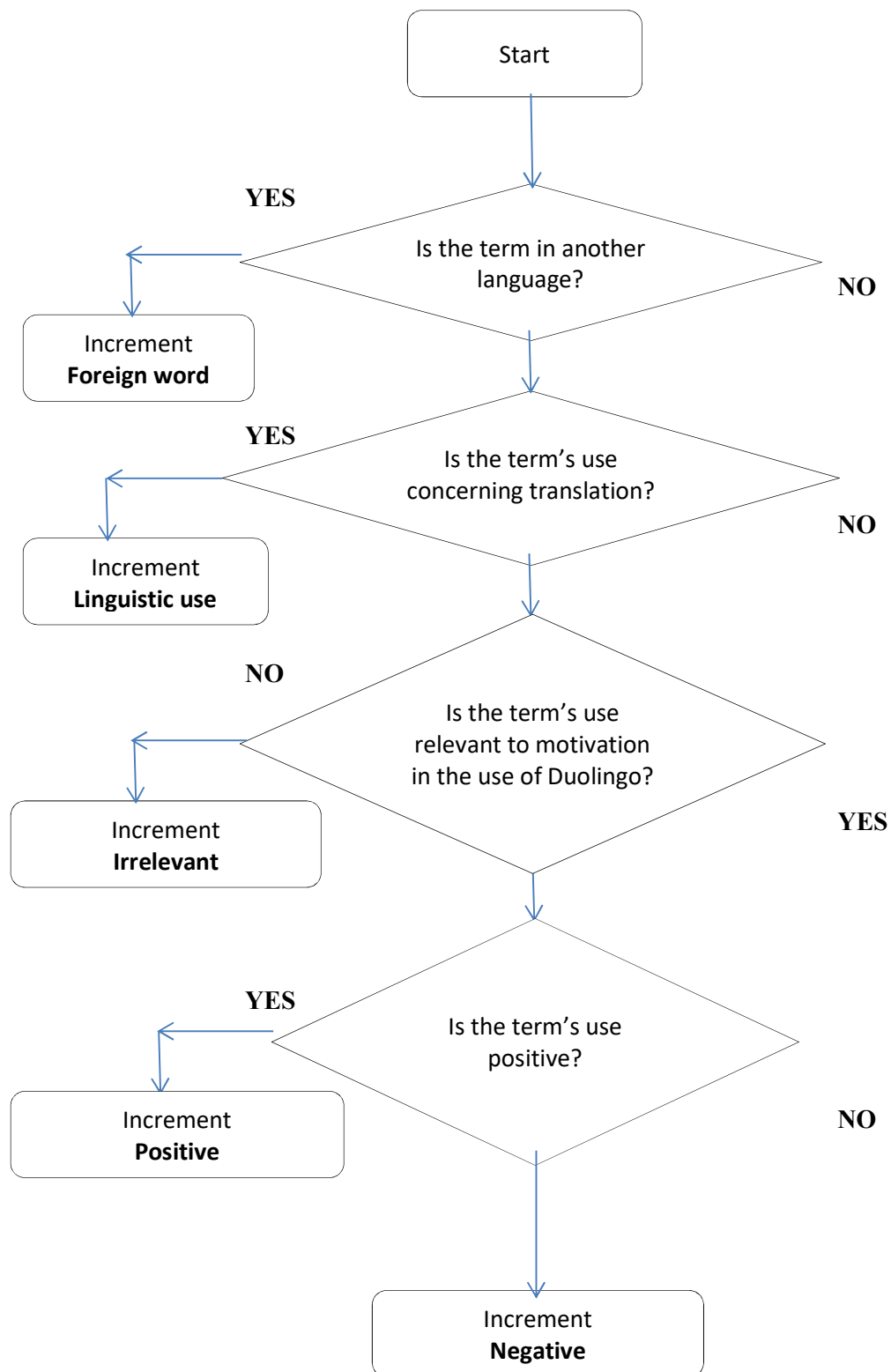


Figure 3.5: Protocol for coding the content analysis

3.5 Content analysis - Duolingo discussion forum user statements

In the case of the Duolingo (2012) Discussion forums, the texts for analysis came from a search on the Duolingo website, where anyone signed up to the site can search for any word across the Discussion streams, accessible via the “Discussion” tab across the top of the page. See Figure 3.6 for a screenshot of the Discussion Stream page, showing the message threads which show up under the “Popular” tab, and the Search box which takes the search term.

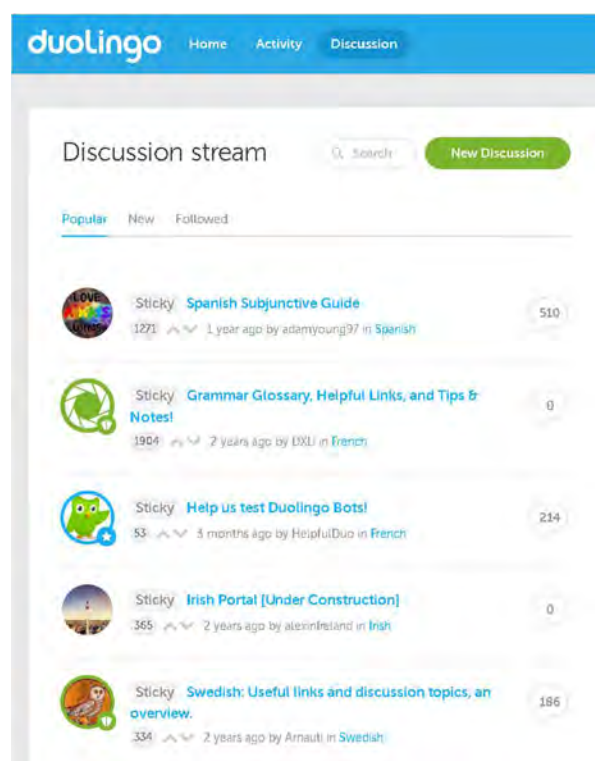


Figure 3.6: Discussion stream: www.duolingo.com/discussion

Given that these texts are web-based, initially it was felt that they would be easily accessible, however, as Duolingo is a proprietary entity, there were certain restrictions as to the number of message threads available, and the randomness with which they were generated, which caused some challenges for the validity of the study. Once the documents were isolated, the application of the coding schema in Figure 3.5 was the next step in the process.

3.5.1 Access to content and sampling

In order to analyse the statements of Duolingo users, it was necessary to go onto the website (Duolingo, 2012). By creating a user profile, all Discussion forums on the site are accessible, and any discussion can be read by clicking the “Discussion” tab at the top of the Homepage and entering a search term into the “Search” field. All discussion on the site is hosted in this “Discussion stream,” but there is a very high amount of traffic, and at this stage, the fact that the data is owned by the company, and that in scope, it is in the range of “big data” (Neuendorf 2016, p. 204), made access difficult.

The initial trawl through the Discussion forums took the form of searching for the specific terms across all of the message threads. The user interface on the site is problematic in that when entering a search term into the Discussion stream, the returned answers are given as links, and the page where the search term was entered is not saved. In practice, this means that it is not possible to use the back arrow to return to the Discussion stream for the particular search term, and returned items need to be opened in subsequent windows. The development team was contacted on a number of occasions, but no information was forthcoming as regards their algorithms for matching search terms, or in terms of granting access to the forums for research purposes. Initially the decision was taken to search for the three specific terms from the SDT Motivation Theory, being Competence, Autonomy and Relatedness, and the results of these searches were kept in Word documents and added to subsequent lists of messages from the Discussion forums. However, the numbers returned on these searches were too high to be workable, necessitating another approach.

In order to sample messages in a more representative fashion, the search term “the” was entered into the Discussion Stream. This was used as a way of identifying how many messages were on the forums altogether. Because Duolingo is a proprietary site, the results were not entirely accurate, and the algorithms for their return were not transparent. The initial search returned 800,000+ answers. Returning to the search, however, the number of messages had increased, until a final search, left working overnight (March 29, 2017), appeared to suggest somewhere around 1.2 million responses altogether. According to Oates, a representative sample for a “population of 1 million or more ... (is) ... just over 1000” (2006, p. 101). Thus, it was determined that I would conduct the analysis on 1000 message threads.

Isolating 1000 messages in a random manner also proved difficult. Due to the proprietary nature of the data, I was forced to rely on the randomness of the messages returned in Duolingo’s own searches, without knowing how this was determined by the site. This meant that the initial search from the 1.2 million+ responses generated only 920 messages, presumably because the data was too big to be handled by our servers. The documents associated with these responses were copied into a spreadsheet. Among these, duplicates were found, and 51 more results appeared at the end of the original 920 messages. After all duplicates were removed from the 971 messages, 913 entries remained. A further two duplicates were isolated, leaving 911 unique message threads from the Discussion forums.

This left the problem of how to bring the number to a total of 1000. A further 90 messages were generated using the three search terms from SDT and taking the first 30 responses from each search. This ensured that the data set contained a proportion of documents relevant to the analysis, but may slightly neutralise the relative differences between prevalence figures of each motivational component. Although this is not a fully replicable methodology, given the constraints of working with this

proprietary website, this was determined to be the best way to approach the generation of a representative sample. That is, it should be noted that if the search were to be conducted on a different day, the results could well be different both because of the lack of transparency in the search algorithms, and also because the site is live, and users visit and update it daily.

As stated in Appendix D, the 1000 message threads used as texts in this analysis were too long to include in the Appendices. For this reason, they are in a separate file contained on a CD in the back cover of the thesis and available from the author, on request.

3.5.2 Method of analysis

The texts taken from the Discussion forums were isolated into units consisting of either the paragraph in which the term appeared, or the entire comment. Sometimes the entire comment needed to be included because the term appeared a number of times within that comment, each time performing the same function, and counting each appearance as a separate use of the term would have skewed the results. The decision on the length of the unit was made when conducting the search for the term as set out below.

After collating the messages into one pdf document, a search was begun, so as to isolate the terms and their synonyms. These synonyms were as identified in sections 3.4.2.1 and 3.4.2.2, but once again the numbers of responses made handling the data in any meaningful way very difficult. It was clear at this stage that the Duolingo official publications were much smaller in number, and I took the decision to conduct the Content analysis on these documents first. Given that I was looking to compare Duolingo from the users' perspective with Duolingo as described by its creators, it was decided that the search would be most useful for comparison if I used only terms found to be present in the Duolingo official publications. The Discussion forum message threads were explored only after that search was complete.

Terms were entered into the Advanced search box in Adobe Acrobat Pro DC Reader, where users are given the option of entering a word or phrase, and then selecting whether the search should be whole words or not. A separate screen returning all the responses then appears. From here, instances of the terms were isolated, and the entire comment was copied and pasted into a Word document before being copied into a table, with the term highlighted in bold text. Once all of the words were found, these separate units were analysed according to the analysis schema as set out in section 3.4.3.3.

A separate count of occurrences was kept, detailing:

- overall number of units;
- number of foreign words;
- number of linguistic usages;

- number of irrelevant usages;
- and, where relevant:
 - number of positive usages;
 - number of negative usages.

In Table 3.5, we see an example of how the incremental information was kept. These results will be discussed in detail in Chapter 7 Discussion.

Term	Occurrences		Percentages
<i>Communicate</i>	<i>Overall</i>	54	3.5% of threads including the term
	<i>Foreign word</i>	-	
	<i>Linguistic use</i>	3	
	<i>Irrelevant</i>	40	
	<i>Positive</i>	9	82% positive usages
	<i>Negative</i>	2	18% negative usages

Table 3.5: Results from Duolingo Discussion forums on term: Communicate

3.6 Content analysis - Duolingo official publications

Searching for official publications by the Duolingo team involved a different set of parameters, as we knew there were many documents available both on and outside of the official website. There is a proliferation of information written by one of the creators in particular, Luis von Ahn, and in comparison to isolating the texts from the Discussion forums, it was relatively easy to access these files.

3.6.1 Access to content and sampling

In order to locate statements from the developers of Duolingo, the various information pages on Duolingo (2012) were copied and pasted into a Word document. Searches on the Google search engine for Duolingo, and co-creators Luis von Ahn and Severin Hacker returned a number of documents, including von Ahn's five stints on the Ask Me Anything (AMA) events on the website Reddit (von Ahn 2012b; 3013c; von Ahn 2014b; von Ahn 2014c; von Ahn 2017). All of these were then collated into one document, which can be seen in Appendix E. This document contained approximately 20,000 words, of which just over 13,500 were written by von Ahn himself, and therefore the words upon which the analysis was conducted, being from 14 different sources. Once again, all of these texts were publicly available at the time of searching.

The nature of the search for these texts meant that sampling was not an issue. I was looking to find any information published by the developers of the site, interviews with the creators, or any kind of mission statements setting out the aims of the website. Any information I found was therefore included.

3.6.2 Method of analysis

The notably smaller number of texts from which this analysis was taking place, as opposed to the analysis of the Discussion forums, allowed for the units of analysis to be clearly set as sentences, from the outset.

Once the texts were found, they were copied and pasted into a Word document. From here, using the “Find” feature in Word, each of the terms were searched for in the document. Any occurrence was copied, surrounded by the sentence in which it occurred, and pasted into a separate document for analysis. Once isolated into occurrences, these sentence units were analysed according to the protocol as set out in section 3.4.3.3.

As with the Discussion forums, a separate count of occurrences was kept, detailing:

- overall number of units;
- number of foreign words;
- number of linguistic usages;
- number of irrelevant usages;
- and, where relevant:
 - number of positive usages;
 - number of negative usages.

In Table 3.6, we see an example of how the incremental information was kept. These results will be discussed in detail in Chapter 7 Discussion.

Term	Occurrences		Percentages
<i>Communicate</i>	<i>Overall</i>	2	14% of sources including the term
	<i>Foreign word</i>	-	
	<i>Linguistic use</i>	-	
	<i>Irrelevant</i>	2	
	<i>Positive</i>	-	
	<i>Negative</i>	-	

Table 3.6: Results from Duolingo official publications on term: Communicate

3.7 Conclusion

In this Methodology chapter, we can see an overview of the methods used for data collection and analysis in this research project. Figures 3.1 and 3.2 showed a graphical representation of the processes taken in this research, and the deliverables which resulted from each process. Beginning with a Literature Review, identifying the gap in the literature led to a systematic review to produce an aggregated list of game elements. A conjectural analysis was then applied to this list, in order to see which aspects of the three constructs of SDT were afforded by each of the elements, thus leading to the development of the proposed taxonomy, linking the two. This was then followed by the refinement of the proposed taxonomy via the survey of self-reported gaming experts.

The next step focused on investigating an illustrative example of gamification as a way of evaluating the usefulness of the proposed taxonomy. An initial identification of which game elements were present in Duolingo was followed by a conjectural analysis of the motivational possibilities afforded by these elements in the specific gamified instance of Duolingo. Once it was established that game elements were a) present in Duolingo; and b) potentially affording some sense of motivational incentivisation, Content analysis was conducted. The initial phase of Content analysis was undertaken on statements from users of the Duolingo platform, via the Discussion forums on the website. Secondly, official statements from the design team behind Duolingo were analysed for instances of the same types of motivationally relevant discussions. Finally the motivational affordances, as suggested by the game elements identified, were compared to the motivation perceptions of users and developers.

The following chapter will delve into further detail about the taxonomy.

Chapter 4: Gamification – A Proposed Taxonomy for Motivation

4.1 Introduction

Taxonomies “are often seen as purely descriptive (rather than explanatory) tools” which may “provide for the study of relationships and even the specification of hypotheses concerning these relationships” (Bailey 1994, p. 14). One purpose of a taxonomy is to anchor the language, resulting in “a conceptual classification” (Bailey 1994, p. 5) of a topic, thus ensuring that researchers are working in a common space where there is agreement on the terminology and definitions being used. The implication of offering the definitions in this proposed taxonomy for the purposes both of design and analysis is that there is a potential long-term utility for further studies, because, “by defining the key terms, the results of empirical studies can be compared” (Easterbrook et al 2008, p. 293). This proposed taxonomy defines key game elements available to designers, and allows for those elements to be seen as motivational affordances.

Previously published studies have produced information which is similar to the proposed taxonomy developed as part of this research. One such study offered a list of game elements, but gave no justification as to their inclusion, no explanation of where these items originated, and only a limited number of elements (Aparicio et al, 2012). Similarly, Weiser et al (2015) offer no background on the source of the elements they chose to include. In contrast, Chapter 2: Literature Review sets out very clearly where the various game elements chosen for inclusion in the proposed taxonomy were mentioned in the literature, and the resultant framework thus attempts to be as comprehensive as possible.

Sailer et al (2013) give six different perspectives on motivation, whereas the focus of this research was very much to match the elements with one particular theory of motivation in order to streamline the design process, and provide a first step in the systemisation of gamification towards motivation. Preliminary design frameworks and taxonomies for gamification currently exist (see Werbach & Hunter, 2012; Robinson & Bellotti, 2013; Seymour, n.d.), however their reach is not extensive, and I see our proposed taxonomy as offering much greater detail than what is currently published.

Research has shown the importance of having an awareness of the motivational needs of participants in a system (Deterding 2011a; 2011b; Nicholson, 2012; Werbach & Hunter, 2012; Mekler et al, 2013a; Weiser et al, 2015), and this proposed taxonomy attempts to provide guidance to practitioners on presenting a full mix of elements for their systems. By seeing game elements as motivational affordances (Zhang, 2008), and utilising this design tool as an aid, designers are offered a way to allow participants the opportunity to fulfil all three motivational needs.

In the spirit of taxonomies being “purely descriptive” (Bailey 1994, p. 14), this chapter presents:

- the game elements;
- a conjectural analysis (Dickey, 2007) of the behaviour change that each game element may produce;
- how this tallies with their suitability as “motivational affordances” (Zhang, 2008) in the promotion of the fulfilment of SDT’s three motivational needs.

A brief selection of preliminary case studies are offered, in order to test some of the assumptions made in this analysis, and going on to show how the framework can be used to answer Research Question 1: *How are game elements related to motivational constructs?*

4.2 Proposed Taxonomy

The proposed taxonomy is presented below in Table 4.1.

- **Column One** - Each of the identified elements are presented in alphabetical order, in column one: “Game elements.”
- **Column Two** - target behaviours which could be promoted by each element are inferred, and presented in column two, “Target Behaviours.”
- **Column Three** - The third column has been split into three sub-columns to show the components of SDT, presented separately as C for Competence; A for Autonomy; and R for Relatedness.
- **Column Four** - The “Why?” column is a descriptive explanation of how the SDT component is addressed by the particular game element under investigation;
 - this is an interpretation based on the pertinent features of the game element and the ways in which participants interact with these features. Thus it is an informal discussion of how the element affords the satisfaction of the particular motivational need with which it has been matched.
- **Column Five** - The final column, “When?” specifies when each of the elements could be used across various systems. These timing insights arise out of literature concerned with game design (see Hunicke et al, 2004; von Ahn & Dabbish, 2008; Brathwaite & Schreiber, 2008), along with a number of studies which have looked at the various elements which engender specific behaviours in their participants (Jung et al, 2010; Yee, 2007; Yee et al, 2012). One study suggests that if we can infer motivation from in-game behaviour, we can “dynamically tailor” a player’s experience, meaning that the values in the “When?” column could quite conceivably transform in response to a player’s behaviours as they make their way through a system (Yee et al 2012, p. 2806).

As with any attempt to categorise something of this nature, there is potential here for this taxonomy to be refined and reworked, and as such it is to be seen merely as a point of departure. In fact, the analysis of a survey of self-identified gamers to be presented in Chapters 5 and 7 helps to do this, and arising out of this, a further refined taxonomy will also be presented.

Game elements	Target behaviours	Motivational constructs			Why?	When?
		C	A	R		
Achievements	Show skill; strive towards progress; try harder	•			Reflect player's ability	Throughout the system: occasionally there should be randomly awarded achievements to keep up interest levels
Avatars	To identify with the game; feel involvement; feel empowered by choices offered	•	•	•	Show ability through unlocked content on avatar (C) Allow choice for player (A) Share with others (R)	On joining. New content can be added/unlocked as players commit to the system
Badges	To show progress; to show level of immersion in the system	•		•	Reflect player's ability and level of engagement with system (C) Share with others (skills and interests) (R)	Throughout the system: occasionally there should be randomly awarded badges to keep up interest levels
Boss Fights	To feel capable; to increase their sense of power; to try harder	•			Only able and/or committed players can engage successfully in such a high level test of skill	Immediate precursor to levelling up
Collections	To invest in the rewards of the system; to develop bonds with the system	•		•	Collections cannot be amassed without skill (C) Can be advertised on a profile so others can see the skill level of the user (R)	Throughout the system
Combat	To feel capable; to show skill; to show progress	•			Only able and/or committed players can engage successfully in such a test of skill	As part of engagement loops (see section 2.3.2). Timing will vary according to system/user types
Content-unlocking	To show skill; to build a sense of privilege and investment with the system	•		•	Only available to users who have achieved x, y or z (C) Can be advertised on a profile so others can see the skill level of the user (R)	Throughout the system, but specifically when certain quests/levels/achievements have been mastered
Discussion forums	To communicate; build community; be social; increase their power; engage with the system; develop social bonds through helping others	•	•	•	Rating and helping other users (C) Choice whether to use or not (A) Socialising (R) Reputation forms part of these forums, where users can vote on others' contributions (C, A, R)	Throughout the system. Particularly useful for participants to feel a sense of ownership over problems encountered – that they can find answers to their own problems and help solve others' issues. Also useful for fun exchanges and building community.
Gifting	To develop social bonds by helping others		•	•	Allow choice for player (A) Share with others (R)	Throughout the system, but specifically when certain quests/levels/achievements have been mastered
Leaderboards	To show skill; to try harder	•		•	Reflect player's ability and level of engagement with system (C) Share with others (R)	Throughout the system. Could be shared with all participants, or with a select group.

				NB: can be competitive and therefore potentially negative	
Levels	To show skill; to try harder; to show progress	•	•	<ul style="list-style-type: none"> • Reflect player's ability and level of engagement with system (C) Can facilitate autonomy when there is a choice of whether to use levels or not (A) Can be advertised on a profile so others can see the skill level of the user (R) NB: could be shown only to other members of team/community in order not to discourage others 	Throughout the system (cognisant of the engagement loops required for a player to advance)
Points	To show skill; to try harder; to show progress	•		Reflect player's ability and level of engagement with system	Throughout the system
Quests	To show skill and progress; to experience the reward of helping others if used alongside Teams; to try harder; to engage with the story-world of a system	•	•	<ul style="list-style-type: none"> • Ability to complete shows competence (C) Offers choices (A) Can be combined with team or community building in order to achieve sense of synthesis with others (R) 	At particular points in the system, similar to Boss Fights. Could also be used to progress a narrative thread in a system
Social Graphs	To develop social bonds; to help others	•		<ul style="list-style-type: none"> • Reflect player's ability and level of engagement with system (C) Can be advertised on a profile so others can see the skill level of the user (R) NB: only visible to other members of team/community so as not to discourage others and also to promote sense of working together 	Throughout the system
Teams	To develop social bonds; to show progress			<ul style="list-style-type: none"> • Promotes communal sense of achievement 	Throughout the system
Virtual goods	To show progress and demonstrate skill; to try harder; to engage with the rewards of the system	•	•	<ul style="list-style-type: none"> • Reflect player's ability and level of engagement with system because goods can only be purchased by able players (C) Allows choice for participants who may or may not wish to purchase goods (A) Can be advertised on a profile so others can see the skill level of the user (R) 	Throughout the system: upon attainment of levels/points/achievements which allow purchases

Table 4.1: Gamification elements for Motivation

4.2.1 Detailed analysis of proposed taxonomy

4.2.1.1 Column one: *Game elements*

Each of the 16 game elements (column one) in Table 4.1 arise out of the literature (see Chapter 2: Literature Review). Where elements were present in the literature with differing names, the decision was taken to follow the wording used by Werbach & Hunter (2012), as their list was collated from game-playing experience. Discussion forums were added due to their salience for the fulfilment of the need for Relatedness, as described in SDT (Ryan & Deci 2000a). Further discussion of this point occurs in section 4.3.2.8, where I look at the ways in which Discussion forums can help to build community in a system.

4.2.1.2 Column two: *Target behaviours*

To inform our evaluation of the usefulness of specific elements to encourage target behaviours, I returned to the literature to find explicit associations between identified game elements and resultant behaviours. In column two, I have described these target behaviours, and how they map to the particular element being discussed. We saw in section 2.6.4.4 that Yee (2007) set out a list of three overarching motivational constructs. This list shows significant crossover with these desired behaviours, with the three components being:

- Achievement;
- Social;
- Immersion

(Yee 2007).

These three are further broken down to provide sub-constructs, which delineate behaviours that players manifest when playing different types of games.

- *Achievement*, which maps to the Competence strand of SDT (Ryan & Deci, 2000a), comprises desires for:
 - progress,
 - power,
 - optimisation and
 - domination;
- *Social* collates with Relatedness in SDT;
- There are elements of the need for Autonomy in Yee's *Immersion* strand.

(Yee, 2007).

Our proposed taxonomy takes Yee's distinctions (Yee, 2007), but unlike Yee, then goes on to give specific examples of "gamification features" (Robinson & Bellotti 2013, p. 2) with which to elicit these responses.

Flatla et al (2011) match tasks to "common game mechanics" in a study focused on a particular type of game. The task in their study is found to be more interesting to the participants when it is gamified, and, they say, "the addition of encouragement and reward structures ... motivate(s) people to try harder" (Flatla et al 2011, p. 408). Affording participants this opportunity "to try harder" is one of the main objectives of many of the elements outlined in this framework. Defeating a "boss", allowing access to locked content, or levelling up are examples of in-game actions that may encourage this type of motivation.

In looking for ways to "increase retention" and "engage" a university population, Decker and Lawley created a "game-like experience" made up of game elements which they hoped would "reinforce intrinsic satisfaction and reward" (2013, p. 233). They found that "the reward of helping other students was the real value in this activity" (Decker & Lawley 2013, p. 236), and this is relevant to a number of elements set out here. Discussion forums and Gifting are examples of elements that may allow participants to express altruism by sharing their knowledge and helping other users to achieve their best within a system, even when there is no apparent gain in their doing this.

It has been found that "people in fact interact with game-like systems in different manners, and for different reasons" (Hamari et al 2014, p. 3030). Because of this, the choice of game elements and the way in which they will impact upon a system's users cannot be definitive. We should, instead, aim for the objective of an *iterative* process of design, where all of the very different users and their disparate motivational needs will be considered, hence the need for a taxonomy, but also some discretion when creating this column delineating desired target behaviours.

4.3.1.3 Column three: C A R

Column three is split into three sub-columns, each one covering either Competence, Autonomy or Relatedness, the three constructs of SDT. The manner in which each chosen game element reflects the selected component of SDT is inference, based on Ryan & Deci (2000a), and compared with previous studies linking SDT in other domains (see e.g. Standage et al, 2005; Ryan et al, 2006).

Examples of the ways in which various elements may provide for the three needs to be satisfied according to SDT are: elements which encourage the use of *skill* will fulfil the need for *Competence*; those that provide "in-game *choices* over goals and strategies and varied opportunities for action" will

engender the feeling of *Autonomy*; and features such as Discussion forums “enable players to *develop social bonds*” or fulfil *Relatedness* (Przybylski et al 2010, p. 156 [my emphasis]).

In this conjectural analysis, it was found that of the 16 elements:

- 14/16 could be used to afford Competence;
- 6/16 could be used to afford Autonomy;
- 12/16 could be used to afford Relatedness.

How this is achieved, via the various elements, is discussed in section 4.3.2.

4.2.1.4 Column four: *Why?*

The “Why?” column, (column four) is an informal description of why that particular game element could be the right choice as a motivational affordance for that specific component of SDT which has been identified. So, for example, from the literature we learn that Achievements reflect a player’s ability, because they are awarded upon the attainment of a particular skill (Hecker, 2011), and thus feed a player’s sense of Competence. Reflecting on the experiences of the gamers listed in section 3.2.3, and the ways in which these aspects are discussed in the literature, this analysis is given for each game element.

4.2.1.5 Column five: *When?*

Column five relates to the timing of the use of each element. This is situational (Deterding 2011b). There will be provisos, such as the requirement for certain Levels or Achievements to have been attained before a participant may, for example, acquire their first Virtual goods. Offering feedback to participants as “skill-level information ... strongly influences player motivation and behavior” (von Ahn & Dabbish 2008, p. 63), so the optimal use of any of these elements ought to relate to the idea of giving participants regular, positive information to guide their choices throughout a game or gamified system (Jung et al, 2010). Boss fights, Combats and Quests offer such immediate feedback due to the fact that only able players will be successful in the challenge. The player who defeats others, or achieves the goal of the Quest, receives immediate confirmation of their level of ability and interest in the system, thus forming an “engagement loop” (Kim, 2011) as discussed in section 2.3.2.

Elements which may occur at various times *throughout* a system:

- | | |
|---------------------|-----------------|
| • Achievements | • Leaderboards |
| • Avatars | • Levels |
| • Badges | • Points |
| • Collections | • Social graphs |
| • Content-unlocking | • Teams |

- Discussion forums
- Gifting
- Virtual goods

Elements which are *tied* to particular points in a system:

- Boss fights
- Combat
- Quests

It has been shown that awarding random non-contingent achievements can serve to combat any negative effects on intrinsic motivation which arise due to the introduction of external motivators (Cameron, 2001). Achievements can therefore be more effective if occasionally awarded unexpectedly (Hecker, 2011), meaning that the timing of their being awarded should not necessarily be prescribed at the outset. Avatars, for example, are usually chosen or created when a participant joins a system, but when certain achievements have been attained, features may be added through the concept of Content-unlocking, thus allowing for change throughout the system. Being able to unlock content allows users to feel valued and privileged, promoting a sense of mastery, and therefore fulfilling the need to demonstrate Competence (Movshovitz-Attias et al, 2013).

We know that different players are motivated by different things (Yee, 2007; Robinson & Bellotti, 2013; Hamari et al, 2014) and therefore decisions about when to implement game elements will come down to individual designers, and the specific core of the particular system being designed. Paying careful attention to the tools we use when designing a system “helps us develop techniques for iterative design and improvement,” which will result in games that are tuned “for desired behaviour” (Hunicke et al 2004, p. 5). Perhaps an ultimate outcome for future work would be if we could learn from players as they play, so that we could continually tailor “their experience to better match their motivations” (Yee et al 2012, p. 2806).

4.2.2 Game element descriptions

4.2.2.1 Achievements

Achievements: in-game Content that is earned by player behaviour, e.g. Content for Avatar customisation.

Achievements fulfil the need for Competence, and can take many forms. Examples are Badges, content used to make Avatars, and visual representations of a player’s “streak” (the number of days they have played on a particular system). Some of these are covered in other elements (see, for example, Badges, Avatars, Points, below), but Achievements are always *earned*, whereas some elements, such as Badges, are sometimes awarded for *engagement* with a system, rather than for performing a specific task. In this way, Competence is fulfilled in that participants must *earn* these rewards. In the game *Sunless Sea*

(Failbetter Games, 2016), Achievements are earned by discovering information that is significant to the story. For example, a sacrifice made to an ancient god will see that god protecting your character in the game. Without knowing that a sacrifice must be made, this protection will not be provided, and therefore the Achievement will not be awarded, so the information needs to be uncovered from the action of the game before a player can move forward.

4.2.2.2 Avatars

Avatars: visual representation of a player in a game, personalised with chosen elements.

Avatars are a visual representation of a player, or “how players mark their location in the game view” (Brathwaite & Schreiber 2008, p. 26). They can fulfil all three needs of Competence, Autonomy, and Relatedness. Avatars facilitate Competence when designers use Content-unlocking to allow participants to access specific content only when they have attained particular Achievements. One example would be being able to adorn themselves with a sword that is only available to players of a high level of skill in the game, thus reflecting their ability. Avatars lend themselves very naturally to fulfilling Autonomy, when systems are designed so that participants can decide how their Avatar will look. Even a system which allows a participant to choose an undecorated silhouette instead of an actual Avatar is allowing a certain level of choice, and therefore fulfilling some sense of Autonomy. When an Avatar is shared throughout a site, or even in a certain part of a site, other users are able to recognise a fellow player’s level of commitment and involvement in the site, as well as possibly identifying other players with whom they wish to interact, thus fulfilling Relatedness. Online game *World of Warcraft* Avatars show items of clothing and weapons demonstrating mastery of skills because they are only obtainable when a required skill level is reached (Blizzard Entertainment, 2016).

4.2.2.3 Badges

Badges: visual representations of rewards or Achievements.

Badges can be used in many different ways. Badges are usually visual representations of:

- specific tasks;
- skills; or
- levels
 - that a user has *achieved*,
 - or been *awarded*.

Badges fulfil Competence when they are awarded for achieving a particular skill, and because they can be shared, they can fulfil a sense of Relatedness, as they are a way of communicating with other members of a site. On the website Codecademy (Sims, 2011), Badges are used both as rewards *and* as

Achievements, as users are presented with Badges upon joining the site (rewards), and they are given other Badges when they complete lessons in particular languages or skills on the site (Achievements). The organisation Mozilla (Mozilla Open Badges, 2014) has designed Badges which can be given on one site, and displayed wherever the user wishes to show them, as for example on an online CV. This has particular relevance for Badges earned for learning skills, as this ability to share the Badges could potentially form a new kind of recognition for online learning, which acknowledges that a person's online learning activity is as legitimate as other forms of learning, for example in relation to SLA.

4.2.2.4 Boss fights

Boss fights: final challenges in order to Level up.

Boss fights are the major challenge aimed at a player prior to their moving up a Level in a game. Usually they are very tough, to emphasise the significance of attaining the next Level in the system, and therefore fulfil the need for Competence. In the role-playing game *Fallout 4* (Bethesda.com, 2016), for example, in order to finish the entire game, players must defeat the toughest opponents in the game, who in this case are non-player characters (NPC), or characters whose actions have been programmed into the game.

4.2.2.5 Collections

Collections: sets of in-game items that may or may not be useful within the game.

Many items within a game system could be used as Collections (e.g. Badges). As a discrete element, I am specifying that the *collection* of an item demonstrates a particular level of interest and ability in that system. This ability aspect fulfils the need for Competence. Often these items will be useful for particular purposes in the system. Also in *Fallout 4* (Bethesda.com, 2016), bobbleheads depicting the creators of the vaults where players retreat from nuclear fallout are randomly placed throughout the game. Each bobblehead has a different ability that upgrades a player's "perks," for example allowing a player to brawl, give persuasive speeches, or perform medical aid for themselves or others. Once collected they can be shown off in a "bobblehead stand" or sold on to amass more of the game's virtual currency, bottle caps. In a multi-player game, something like this bobblehead stand could be shared on a profile, as a method for fulfilling the need for Relatedness, as other users of the system could see the skill level of the collection's owner.

4.2.2.6 Combat

Combat: fights, battles, duels within games.

Similar to Boss fights, but not necessarily with the added challenge of allowing a player to Level up at the end, Combat can take many forms, and speaks to the need to show Competence. Only a skilled

player could manage to beat another player: either another person, or an NPC. Much of the game play in *Fallout 4* (Bethesda.com, 2016) revolves around Combat. A player may have to face, for example, Gunners, who are mercenaries, or Raiders, who are dangerous antagonists across the city, who have nothing to lose. There are Boss Gunners and Boss Raiders, against whom Combat would form a Boss fight, however, standard Combat also takes place throughout the game with various members of each of the groups.

4.2.2.7 Content-unlocking

Content-unlocking: content withheld from players until a certain level of ability is reached.

Content-unlocking refers to the practice whereby various elements within a system are not publicly available to every member, but are withheld until a player reaches a certain level of mastery, relating the concept to the need to show Competence. In practice this is often linked with features available to customise Avatars, thus Relatedness is also fulfilled, by demonstrating prowess to one's community. Some games open access to items such as a sword for skilled players to display on their Avatars or profiles. Other members of that game community recognise that only a player of a certain Level could achieve the sword, and in that way they are demonstrating their Competence, and fulfilling a sense of Relatedness at the same time.

In *Empire Total War* (Games Workshop, 2016), for example, Content-unlocking can take the form of a technology tree, where participants make decisions about the profile they wish to create for themselves, and the trajectory of the narrative they wish to pursue, from options that are restricted until certain play has taken place. For example, if a player wishes to build tenanted farms, this is not offered as a choice until they have unlocked the "common land enclosures" feature. The choices a player makes influence the direction of the narrative in the game. Similarly, in *Sunless Sea* (Failbetter Games, 2016), a character must speak to someone on one island if they wish to access a subsequent island. In this game, the unlocked content also unlocks the story, so that a player can gather information and knowledge about where their character has come from, who they are, and what connections they have. The more connections the player makes, the more of the story, and thus more of the Content, is unlocked.

4.2.2.8 Discussion Forums

Discussion forums: forums which give an opportunity to ask and answer questions, rate other users, and communicate with other players.

Some elements are introduced into gamified systems for purposes such as providing "new models of social organization" (Ramirez & Squire 2014, p. 633) rather than simply triggering the types of responses usually associated with playing games. For example, Discussion forums allow for the

development of “game-playing communities” (Ramirez & Squire 2014, p. 633) adding to the sense of games “as sociotechnical systems of communities and artifacts” (Deterding 2014, p. 46) where communities of practice (Lave & Wenger, 1991; Li et al, 2009; Annetta, 2010) can be established and nurtured. Thus, they are important game elements *for gamified systems*.

Discussion forums often include various types of reputation systems (Resnick et al, 2000) which give an opportunity to ask and answer questions, rate other users, and communicate with other players, thus bringing an added dimension to a game or gamified system. In the literature, Discussion forums are referred to obliquely, in the sense that many commentators suggest that one of the benefits of game playing is in the forming of communities around those games, and the initial inclusion of Discussion forums as salient game elements in this proposed taxonomy arose out of studies examining the community-building happening in gamified systems (as regards Stack Overflow, 2008: see Movshovitz-Attias et al, 2013; Cavusoglu et al, 2015; for Quora, 2010: see Paul, 2012; Wang et al, 2013).

Because participation is optional, Discussion forums are a highly Autonomous form of social communication. Individuals may display their level of mastery or Competence in such forums, particularly when there are Q and A sections. In allowing users to build on a sense of community by demonstrating what that community values, communities of practice are growing around these virtual information-sharing groups. This sharing of information, and the fact that Discussion forums are often a way for online communities to socialise, facilitates Relatedness. It is possible that Discussion forums are particularly well-suited to use in *gamified* systems, especially education-related systems, because of this facilitation of information, however it is not clear that this is particularly necessary as a feature of *games*, which goes some way to explaining the lack of detail about Discussion forums in the literature. However, as we see in Minecraft (Minecraft, 2011), Discussion forums can be very popular – in this case as a place to talk about how to program various mods for the game – so at least some games do have a role for Discussion forums to play.

4.2.2.9 Gifting

Gifting: the practice of giving in-game Virtual goods to other players, as a reward or as part of a Team strategy.

Gifting occurs when in-game Virtual goods are given by one player to another. A feeling of Autonomy is engendered when the choice is made whether to give a gift or not, and sharing in this way also helps to build Relatedness. Players can use Gifting to help other players, and it may also increase their sense of privilege. For example, in *World of Warcraft* players can share healing potions with their group in order to complete a mission (Blizzard Entertainment, 2016), thus strengthening their group bond, and their group performance.

4.2.2.10 *Leaderboards*

Leaderboards: all players' positions in a system, usually in relation to the number of Points they have been awarded.

Leaderboards are published representations of individual players' positions in a system, usually in relation to the number of Points they have amassed, so may give rise to feelings of Competence. Because they are generally publicised throughout a system, they can facilitate Relatedness, however it is possible to restrict the groups who see their results (see 4.2.2.14 Social graphs, below). They are a direct expression of progression through feedback (Huotari & Hamari, 2012), however, due to their competitive nature, they may not always exude a positive function (Zhang, 2008) and so should be used with caution, perhaps being more effective when presented as a Social graph, especially in an educational context.

4.2.2.11 *Levels*

Levels: Levels express the number of Points a player has, and subsequent Levels become more difficult as a player progresses.

Levels usually express the number of Points a player has garnered in a system, and levelling up is a progression (Huotari & Hamari, 2012) demonstrating Competence. Where there is a choice of whether to use Levels or not, they can facilitate Autonomy, and their public expression of a player's position in the system engenders Relatedness.

4.2.2.12 *Points*

Points: awarded for various deeds in a game.

Points can be awarded in numerous ways, and are one of the most ubiquitous game elements applied to non-game contexts (Werbach & Hunter, 2012). They demonstrate Competence and can function as timely, positive feedback (Jung et al, 2010). Some commentators find that gamification has overused Points (Robertson, 2010) at the expense of more interesting aspects of games, and caution that this overuse may have negative long-term effects on participants.

4.2.2.13 *Quests*

Quests: specific tasks which act as goals and can further a narrative thread in a game.

Quests are a way for participants to take on extra challenges which may serve to further their position in a system. Being successful in Quests shows Competence, while offering choices within Quests satisfies the need for Autonomy. Combining with a Team or community to complete a Quest offers

satisfaction of the need for Relatedness. Quests are an example of goals, and they “typically provide rewards that motivate players” (Brathwaite & Schreiber 2008, p. 31). They may also be used to progress a narrative thread in a system. In *Fallout 4* (Bethesda.com, 2016) players need to complete Quests to move through the game. In order to win the game, a player must complete missions, or Quests, for each of three factions that have been programmed into the game: the Brotherhood of Steel, the Commonwealth Minutemen, and The Railroad. Success in missions opens up further Quests with each faction, the end result of which is the win state.

4.2.2.14 *Social graphs*

Social graphs: information data sets presented to specific groups or Teams of people within a game, e.g. to spur one group on to compete against another.

Social graphs are particular data sets which offer information to users about their level of participation in relation to other members of a specified group within a system. Recyclebank (2004) publish results of local areas’ recycling rates to compare neighbourhood against neighbourhood in order to encourage levels of recycling, and thus, behaviour change. Only those within the targeted neighbourhoods see this information, and the only identification of participants is the area in which they live. The use of the Social graphs may be timed to fit in with certain objectives of the system, for example to spur one group on to compete against another, in this case to improve their level of recycling. Social graphs demonstrate Competence when participants see their ability reflected in these graphs. The fact that this information is only visible to other members of a Team or community promotes the feeling that they are working together, or Relatedness.

4.2.2.15 *Teams*

Teams: groups of people who may or may not know each other outside the game.

Teams may be made up of individuals who know each other outside of the game environment, or people who have come together in the use of the system. In promoting a communal sense of achievement, the use of Teams fits in with the need for Relatedness. Teams can be utilised to further Quests or to populate Social graphs, i.e. Leaderboards which only show details of other users who are known to the participant. In *World of Warcraft* (Blizzard Entertainment, 2016), Teams can take two forms:

- *Guilds* are set up by players, who then invite other players to join. They are a long term association, with a shared bank of in-game resources which other players can access. There is a hierarchy in the guild, which is not necessarily skill related, and guilds are usually populated with participants known to the player in-game;

- *Groups* are created in a more ad hoc fashion. A player may, for example, walk up to a cave and find four other players standing outside the cave. None of the players can enter the cave alone, and so it is beneficial to all of them to join the group momentarily, in order to take on the challenge inside the cave. Group members are random, meaning they may be from different guilds or may be known to the player. In a case like this, the group disbands once it has performed the function for which it came together.

4.2.2.16 *Virtual Goods*

Virtual goods: in-game items which may be purchased by performing tasks within a game.

Virtual goods are any in-game items which may be purchased (with real, *or* virtual, currency) by performing tasks within a game system. It may be that goods are available after a certain amount of Points are gathered, a specific Level is reached, or some other Achievement is attained, facilitating a sense of Competence. The choice of whether to buy or not satisfies Autonomy, but only where there is a meaningful choice (Ferrara, 2012a; Nicholson, 2012; Mekler et al, 2013; Cheong et al 2014). The ability to show others purchases fits with the concept of Relatedness. The virtual currency in *Fallout 4* (Bethesda.com, 2016) is bottle caps, which can be found on characters a player kills, earned in exchange for the sale of items, or found randomly. Bottle caps can be used for a player to buy a selection of in-game Virtual goods, such as food, alcohol, drugs, bullets, ammunition, guns, clothes or medical supplies. The game can be won without the use of Virtual goods, however, their use improves the player experience. A player can die in-game, at which point they have to return to their last saved position to restart, however, a player who has virtual food, drink and shelter, can recover in-game and continue on from the point where they were injured.

4.2.2.17 *Interrelationship of game elements*

While the sections above detail the relationship between the game elements and the motivational constructs, it is also important to recognise that there are quite complex relationships between the game elements themselves, and that some are not possible without the presence of others. Figure 4.1 aims to present the interrelationships between these game elements to illustrate these associations.

The elements described here can be grouped into two categories:

- activities;
- rewards.

These lead into one another, and knowledge of this integration may add to their motivational benefit. Those elements placed under the category of “activities” require some action to be performed by a

player: Boss fights and Combat require some kind of fight or battle, and lead to the reward of Points, which help a player Level up, and can affect their position on a Leaderboard and/or Social graph. Quests may also lead to Points, or they could unlock further Content. Similarly, Discussion forums and Teams require active participation – those who post on forums may receive Virtual goods, or Content-unlocking, while Team players may receive Points or improve their position on a Social graph. The element of Gifting allows a player to give some of their own Virtual goods to another player, who in turn will receive them as a reward.

In terms of “Rewards” it is not particularly clear what reward a player who Gifts to another receives, but it could well be that the reward is intrinsic, and requires no representation in the game. The diagram below is a first step toward understanding the ways in which these elements can work together. There are further connections possible, as for example, a player in receipt of the Gifted Virtual goods could use them to further customise their Avatar, or add to their Collections. This analysis could also be further refined for use alongside the proposed taxonomy.



Figure 4.1: Interrelationship of game elements

4.3 Illustration scenario – 2 case studies

In the interests of providing an illustration of how the proposed taxonomy could look when applied to a system, two preliminary case studies were conducted. These case studies, which are “initial investigations” (Easterbrook et al, p. 296) of a game and a gamified system, examined:

- a) for the presence of the game elements as outlined so far in this work; and
- b) to align the conjectural analysis performed in the creation of the proposed taxonomy with an objective assessment of the two environments.

This analysis was done in conjunction with gamers familiar to the author, who have experience on the two sites. In informal conversation with the author over several occasions, the sites were examined for the presence of the elements, before discussing:

- a) the types of behaviours these elements produce; and
- b) conjecture about the ways in which these behaviours might feed into a sense of fulfilment of the various constructs of the motivational constructs also previously outlined.

Although I see this proposed taxonomy as a tool to aid in the *design* of systems, its use as an *analytical* tool is a workable entry point to:

- a) see whether I have identified game elements that are in use; and
- b) test whether the framework’s links are credible.

It was our intent to capture the potential of applying this taxonomy as a tool for design, by illustrating its usability through these case studies. Part of the process of “constructing” this proposed taxonomy (Bailey 1994, p. 9) involved the identification of specific cases which would illustrate the points being made in each of its cells. These specific illustrative cases led very naturally to the small-scale case studies presented below.

4.3.1 Case study design

In setting up our case studies, I was looking to explore the ways in which these systems used the elements I had identified out of the literature (Easterbrook et al 2008). Our first step was to ask specific questions about each system. First:

- are the 16 game elements present in the system?
 - If not, then which elements *are* present?

In each case, the sites were examined to see which of the game elements as described in the proposed taxonomy were present, taking one element at a time from the list of 16, and interrogating the site to see how they might be present in the system. Achievements were, for example, found to be present in both Minecraft (2011) and Khan Academy (2006):

- **Element:** Achievements
- **Minecraft:** Badges, Experience Points and Levels
- **Khan Academy:** skill mastery leading to Badges.

In both cases, some game elements were not present on the site: one example being Quests. I have previously described Quests as specific tasks which act as goals and can further a narrative thread in a game (see 4.2.2.13), and in our informal discussions with experienced users of the two sites, it was found that Quests were not part of the game elements used in either system.

Reflecting on these experiences of interacting with the system, and the elements I have identified as being present, then the second question was posed:

- do the experiences *align with* our conjectural analysis of the motivational benefits of the elements that I have located in the system?
 - i.e. do the elements do what I said they do?

Once again, cycling through the list of 16 elements one by one, an informal analysis was conducted to see whether the types of behaviours engendered by these game elements supported the three motivational constructs, as I have identified them. In Minecraft, the sense of Achievements being earned by players was very strong, leading to the feeling that a sense of Competence is being facilitated by their use. Achievements on Minecraft are awarded for skill-mastery, rather than purely for participation. Similarly, Achievements on Khan Academy were also related to the mastery of specific skills, and were awarded upon attainment of these skills. It is our contention that that link between the Achievement and the mastery of a skill would lead to a sense of Competence. The two systems were analysed in this way for both the game elements and their relationships with the motivational constructs.

Game elements that were not present in the particular cases were removed from the tables, for the purpose of clarity. In this way, initial inferences could be drawn about the overall aims of the game and gamified system, which I was hoping to confirm, informally, through our familiarity with each of the systems. The final two columns of the initial framework, the “Why” and the “When,” were merged for this evaluation, with a new name applied: “Description of application,” in order to summarise the ways

in which the particular elements are applied in each case study. These case studies are a first, informal step to test if the assertions I have made in the formation of the framework are useful. I present a truncated version of the proposed taxonomy as an abbreviation to refer to while reading the case studies (see Table 4.2).

Game Element	Competence	Autonomy	Relatedness
Achievements	•		
Avatars	•	•	•
Badges	•		•
Boss fights	•		
Collections	•		•
Combat	•		
Content-unlocking	•		•
Discussion forums	•	•	•
Gifting		•	•
Leaderboards	•		•
Levels	•	•	•
Points	•		
Quests	•	•	•
Social graphs	•		•
Teams			•
Virtual goods	•	•	•
Totals	14/16 Competence	6/16 Autonomy	12/16 Relatedness

Table 4.2: Truncated taxonomy

4.3.2 Minecraft

In the first case I examined a popular game (Minecraft, 2011), because it is salient to begin by analysing a game so as to ascertain whether these aggregated “game elements” are actually present *in games*. Minecraft was set up by Markus Persson in 2011 (Minecraft, 2011). In order to see whether these game elements are present in *games*, rather than just gamified systems, I consider Minecraft first. As can be seen from Table 4.3, 13 of the 16 game elements in the proposed taxonomy are identified as being included in the game.

Of these 13, according to our framework:

- 10 could be affording players the opportunity to feel a sense of Competence;
- four cover Autonomy;
- eight speak to Relatedness.

Game Elements	C	A	R	Description of application
Achievements	●			Badges, experience points, levels.
Avatars		●	●	Players draw their own avatar. This does not reflect skill level.
Badges	●		●	Badges for building, upgrading and collecting items.
Boss fights	●			After a boss-fight, the winner levels up.
Collections	●		●	Elements such as music discs can be collected and used to play music in the game.
Combat	●			Fights are part of the progression of the game. Part of the narrative. Can earn points from fights.
Content-unlocking	●		●	Items allow players to unlock other, incrementally improved items.
Discussion forums	●	●	●	An official Minecraft discussion forum exists external to the game, and is very popular.
Gifting		●	●	Any item can be given to any other player.
Levels	●			Only visible to the player.
Points	●			Points allow players to level up and buy virtual goods.
Teams			●	Teams (within known communities) can work together to perform specific tasks.
Virtual goods	●	●	●	Virtual goods can be collected or created upon attainment of a certain level.
Leaderboards				NONE
Quests				NONE
Social graphs				NONE
Summary				Competence Autonomy Relatedness
Minecraft				10/14 4/6 8/12
Original taxonomy				14/16 6/16 12/16

Table 4.3: Gamification elements and Motivation – Minecraft

4.3.2.1 Competence

In the original proposed taxonomy, 14 of the 16 game elements were seen to be constructs which could provide participants with a sense of Competence. Of these 14, 10 of those elements are used in Minecraft. This appears to demonstrate the contention that challenge, especially challenge that has been calibrated to push a player to the edge of their ability, is an extremely important aspect of what makes games successful (Koster 2005, pp. 97–98). Csikszentmihalyi’s concept of flow suggests that a person involved in the solving of difficult challenges will become absorbed in the task (1991), and as of February 2017, 122 million Minecraft games have been sold, which would seem to attest to that absorption (Blake, 2017).

4.3.2.2 Autonomy

Six of the original 16 elements were seen by our analysis to be effective in allowing participants a sense of Autonomy. Four out of those original six are present in Minecraft. These elements all afford players an opportunity for choice. In addition, although not *facilitating* Autonomy, by allowing only the player to see their own Level, a sense of Autonomy is not *thwarted*, meaning that ultimately players feel that it is under their *control* whether to publicise their Level or not (Deci et al 1999). By their very nature, games fit very well with facilitating a sense of choice, as participation in a game is entirely voluntary. It is therefore not surprising that the creators of Minecraft have included four of the six elements identified as offering “meaningful choices” (Ferrara, 2012a) for their players.

4.3.2.3 Relatedness

Twelve of the 16 elements in the proposed taxonomy were identified as promoting a sense of Relatedness. It is highly significant that eight are present in Minecraft. The elements discussed here promote a sense of identity and belonging, and encourage players to form bonds with other players in a type of community of practice (Lave & Wenger, 1991; Li et al, 2009; Annetta, 2010). This high number of elements is reflected in the game's popularity, and shows that our observations on game elements appear to be useful.

4.3.3 Khan Academy

Our second case study was the gamified educational website: Khan Academy (2006), used to teach many subjects, but largely for the teaching of mathematical skills. It was set up to allow individuals to develop academically, at their own pace. It is not, first and foremost, a game, but uses game elements as part of its overall delivery. As demonstrated in Table 4.4, eight game elements are identified as being used on the site.

- seven of these relate to Competence;
- three to Autonomy;
- three to Relatedness.

Game elements	C	A	R	Description of application
Achievements	●			Participants master skills or can display that they are struggling with them: only displayed to their chosen coach.
Avatars		●	●	Players choose from a selection. Available selection changes as you amass points
Badges	●			Many badges are awarded. Some for persistence, some for points, some for mastery of skills. Only visible to player.
Boss fights	●			One final big test in order to level up
Content-unlocking	●		●	Only in relation to avatars
Discussion forums	●	●	●	Very small - not many use it. Questions can be left unanswered.
Levels	●	●		Players choose whether or not to play using levels. Levels are private (only seen by player)
Points	●			Points are amassed. Sometimes badges are awarded based on them. Displayed privately.
Collections				NONE
Combat				NONE
Gifting				NONE
Leaderboards				NONE
Quests				NONE
Social graphs				NONE
Teams				NONE
Virtual goods				NONE
Summary				CompetenceAutonomyRelatedness
Khan Academy				7/143/63/12
Original taxonomy				14/166/1612/16

Table 4.4: Gamification elements and Motivation – Khan Academy

4.3.3.1 Competence

In the original proposed taxonomy, 14 of the 16 game elements were seen to be constructs which could provide participants with a sense of Competence. Of these 14, seven of those elements are used in Khan Academy.

4.3.3.2 Autonomy

Six of the original 16 elements were seen to be effective in allowing participants a sense of Autonomy. Three out of those original six are present in Khan Academy. There is some consideration given to Autonomy, particularly in the choice of Levels and skills that the player decides to focus on, however players are not afforded much opportunity to express themselves via their Avatars, and questions on the Discussion forums are often left unanswered. The result is that, in spite of the elements being present on the site, they do not appear to facilitate a feeling of Autonomy to any great degree.

4.3.3.3 Relatedness

Twelve of the 16 elements in the proposed taxonomy were identified as promoting a sense of Relatedness. It is significant that only three of these are present in Khan Academy. There is no competitive element to Khan Academy, and the social aspects are limited, so it is not surprising that the development of Relatedness is not particularly well supported on the site. Although the site is awash with Badges, these are only displayed to the user, again to promote the developing sense of Competence since they have joined the site, and so they are not useful in the fulfilment of Relatedness. If we think of the continuum of motivation from amotivation to intrinsic motivation (Ryan & Deci, 2000a; discussed in section 2.6.4.3), it would seem that Khan Academy is not doing as much as it could to afford its participants the chance to experience much other than Competence.

One case study examining Khan Academy found that the use of Badges and other game elements on the site does not fulfil their motivational possibilities. This study reminds us that:

the user must want to learn the material to earn points; simply having the points isn't enough to motivate the user to learn

(Morrison & DiSalvo 2014, p. 42).

In this same study, the authors disparagingly claim that Khan Academy is not:

finding the balance between what is challenging and requires effort and what is so difficult that it [sic] overwhelming

(Morrison & DiSalvo, 2014, p. 42).

4.4 Conclusion

In this chapter I have detailed the proposed taxonomy created in an attempt to address a need identified in the literature. By producing an aggregated list of game elements, taken from the literature, I began

the process of creating a shared language for all who are interested in this area. A conjectural analysis was applied via our own experiences, complemented by the experiences of gamers known to the author. In this analysis, I interpreted the ability of those game elements to afford participants the opportunity to fulfil a sense of each of the constructs of SDT: Competence; Autonomy; and/or Relatedness. As a result, I produced this provisional document which would serve as a basis for further research to be conducted for this study.

There is no doubt that this taxonomy would benefit from a real-world application. At this stage, it is proposed as a way of systematising the challenge of designing a gamified system, because such systemisation is “a foundation for understanding” (Bailey 1994, p. 15), and building higher quality gamified systems. It is vital to remember that we must not just take the game elements on their own, but must attempt to discover “how game attributes work to create a whole game” (Bedwell et al 2012, p. 753), so this framework cannot consider game elements in isolation. This observation was buttressed in section 4.2.2.17 where game elements were shown to be inter-dependent regardless of motivational construct. Our initial case studies were illustrative studies towards “reveal(ing) the mechanisms by which cause-effect relationships occur” (Easterbrook et al 2008, p. 296).

We see the work as an unrefined artefact which has the potential to become a design guide, specifically for educators looking to create gamified systems, after further discussion and research. By making connections between specific game elements and the motivational needs they can support, I am moving toward a solution for **Research Question 1**. This solution, however, needs to be triangulated by the use of a technique that allows for more external, more general feedback, which I envisage being accomplished via the survey of gamers.

In the process, I hope I have created a tool which may be used to help make gamifying a project more straightforward. Many gamified systems appear to be simply an application of Points, Badges and Leaderboards (Werbach & Hunter, 2012) onto an otherwise non-game context, and they are not effective because they don’t produce a sense of engagement in their users, and it is hoped that our proposed taxonomy could help to address this problem.

In Chapter 3: Methodology I described a survey presented to self-identified game players, in which I asked gamers to apply their own analysis of the motivational benefits of the game elements I identified. The results of this survey are presented in Chapter 5, and the ensuing changes to the framework are implemented. In section 5.4, the initial analysis of Duolingo is updated with the observations from the survey.

Chapter 5: Results – Refining the proposed taxonomy

5.1 Introduction

In order to answer **Research Question 1**, “*How are game elements related to motivational constructs?*” Chapter 4 detailed the development of a proposed taxonomy linking game elements and constructs of the SDT theory of motivation. To verify claims made in the conjectural analysis as to the utility of each of the game elements in promoting the particular aspects of SDT, a survey was conducted on self-identified gamers (see Chapter 3 Methodology, section 3.3). As I set out in Chapter 1, the results of this survey are presented in this chapter. In addition to these findings, the changes suggested by the survey respondents are presented, and blended in to the revised version of the proposed taxonomy. These changes serve to refine our assertions in the formation of the proposed taxonomy, and add to the depth of our findings addressing **Research Question 1**.

Subsequently, the language-learning website Duolingo (2012) was analysed from a gamification perspective, utilising this updated taxonomy, in order to quantify the level of gamification features implemented on the site, and their utility as motivational affordances (Zhang, 2008).

5.2 Survey Results

In Chapter 3: Methodology, section 3.3, the survey was fully detailed. The following sections show the results of this survey. (See Appendix B for a copy of the survey as it was sent out to participants.)

5.2.1 Demographic details of participants

5.2.1.1 Age

107 participants responded to the survey. In line with Ethics approval from the University of Limerick, I accepted only responses from those over the age of 18: by clicking on the “Agree” button it was stated that one aspect of the respondents’ agreement was that they were at least 18 years of age. For this reason, I set up the survey so that those who chose the response “under 18” would be directed to the final page of the survey immediately after completing all of the demographic questions. Only four respondents fell into the under-age category, so in total I had 103 finished responses to examine.

5.2.1.2 Gender

The question of gender has become a difficult area to capture succinctly in surveys since the conversation in greater society has broadened to include gender-fluidity. For this reason, it was felt that a short answer question was necessary for this item in the demographic information. The shortcoming of asking for this information in this manner is, of course, that some participants discovered they were able to enter less factual options. Only six respondents chose to do this, leaving 20 respondents self-identifying as female (18.7%), and 81 respondents as male (75.7%). Of the six humorous responses, two were identifiable as male: “I’m a fella. A handsome fella;” and “sexy bro” (1.9%). The remaining four were non gender-specific, however, given the ratio of female to male respondents, it is plausible

to conclude that these four respondents were also male (3.7%). The four under 18 responses, which I had to discount, were also all male. See Figure 5.1 for a summary.

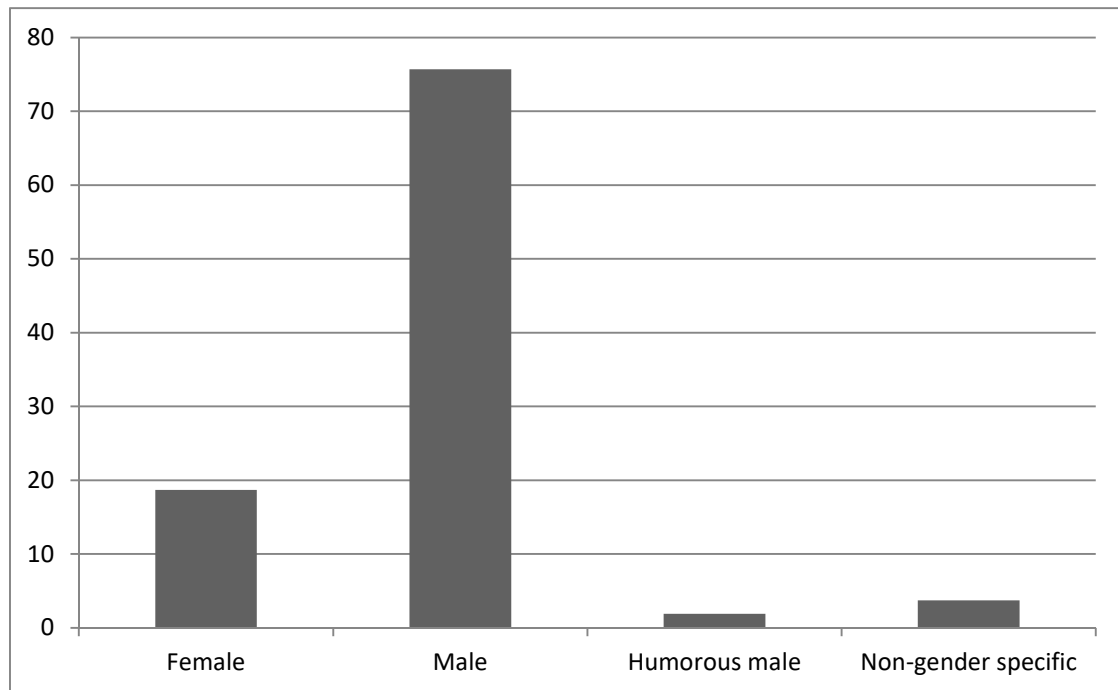


Figure 5.1: Percentages of responses to gender question

5.2.1.3 Hours spent playing games

To ensure I was working with participants who were highly interested in gaming, I gave three options from which to choose the amount of hours per week that were spent playing games. See Figure 5.2 for a summary.

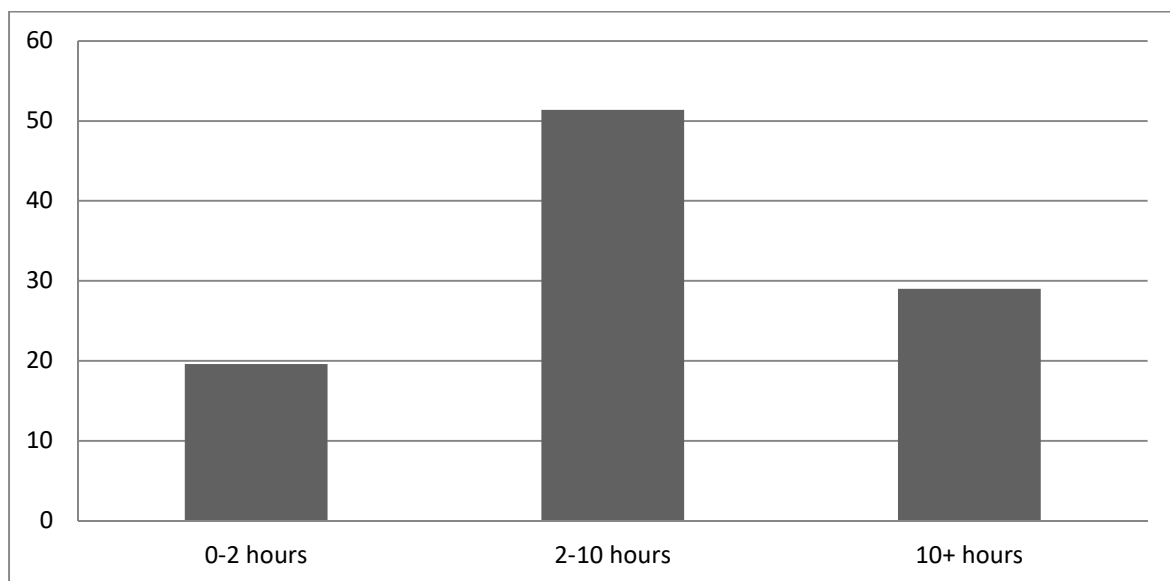


Figure 5.2: Summary of hours per week spent playing games

Adding the respondents who play games for 2-10 hours a week (51.4%) with those who play over 10 hours a week (29%) gives 80.4% of the total, so a significant majority of our respondents are actively involved in gaming.

5.2.1.4 Years spent playing games

Participants were given four options from which to choose in this question, to ascertain how long they had been playing games. See Figure 5.3 for a summary.

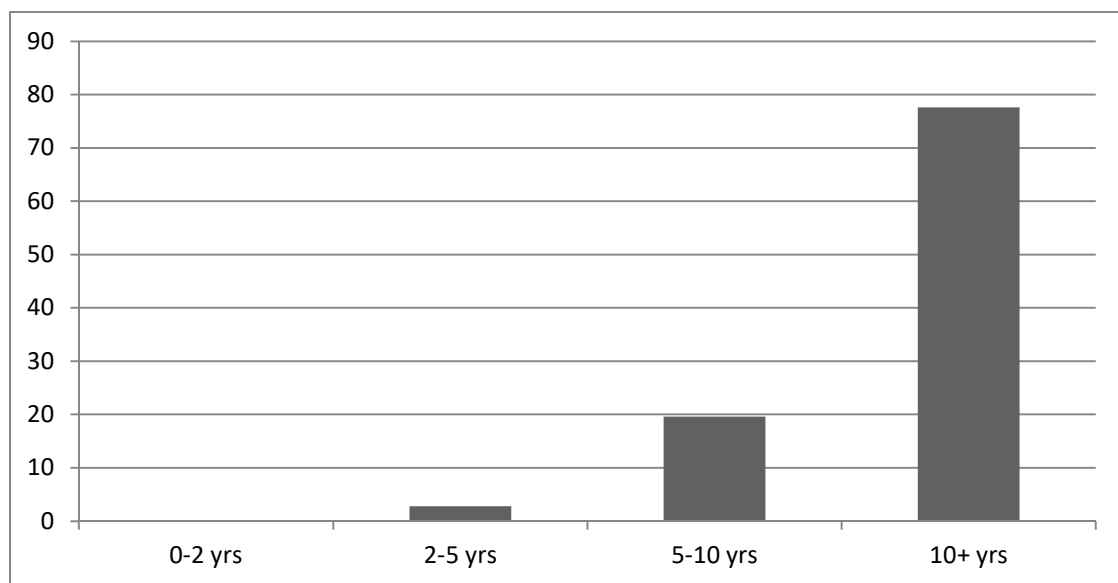


Figure 5.3: Summary of years spent playing games

As we can see, 97.2% of our respondents have been playing games from five to more than ten years, so they have a high level of experience as gamers. Interestingly, no respondent chose the first option, 0-2 years, as the amount of time they had been playing.

5.2.2 Differences between the proposed taxonomy and the evaluated taxonomy

Survey respondents were presented with 20 game elements, and asked to rate each element's usefulness with respect to facilitating the three SDT constructs. See Figure 5.4 for an indication of the way in which the questions were asked.

Game Elements and Motivation

* Required

1/20: Achievements - in-game content that is earned by player behaviour, eg. content for avatar customisation

Reminder:

- Competence – mastering skills
- Autonomy – feeling of choice
- Relatedness – social connection

If you think Achievements may make you feel any of those, please choose the relevant component(s).

1/20: Achievements *

	Not important at all	Of little importance	I don't know	Of average importance	Very important
Competence	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Autonomy	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Relatedness	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

BACK

NEXT

Page 3 of 25

Never submit passwords through Google Forms.

Figure 5.4: Screenshot of Question One from the survey

In the original proposed taxonomy, I suggested 16 game elements. As a response to our feedback group (Chapter 3: Methodology, section 3.3.1.1), I also included:

- Audio effects;
- Haptic effects;
- Realistic graphics;
- Reminders.

Audio and Haptic effects were suggested by the literature, and agreed upon by our testing group, whereas Graphics and Reminders were included as confounding factors (Easterbrook et al, 2008; Gray, 2009).

By rating their ability to facilitate one or more of the motivational constructs in the majority of cases, responses to the survey resulted in the inclusion of two of these additional game elements:

- Audio effects;
- Realistic graphics.

Haptic effects and Reminders did not receive a majority of responses in favour of their inclusion, and they were deemed therefore not to be useful enough to include as base game elements. This brought the count of game elements to 18. Additionally, the instances of perceived fulfilment of the motivational constructs increased across all three of Competence, Autonomy, and Relatedness.

Table 5.1 presents the elements, the results of our conjectural analysis, and two columns showing how many respondents agreed or disagreed with our assertions. Specifically, if the game element was proposed to heighten an SDT construct in the conjectural analysis, then that element is ticked in Column 2. The percentage degree to which the participants agreed or disagreed with that conjectural analysis assertion is documented in columns 3 and 4. The final column presents the actions to be taken in order to align the taxonomy with these evaluations. For example, because 81% agreed that Achievements were related to Competence, the relationship suggested by the conjectural analysis was supported. In contrast, 58% disagreed that there was no link between Achievements and the SDT construct of Autonomy (a finding of the conjectural analysis). Hence there was an action taken to relate Achievements to Autonomy in the updated taxonomy. Where percentages given are under 50%, an action was taken if this still represented a majority of respondents, when removing “don’t know”s from consideration.

Element	Conjectural analysis	Agreement	Disagreement	Action
Achievements	C ✓	81% include		Add Autonomy
	A		58% include	
	R	48% exclude		
Audio [not in taxonomy]	C		51% include	Add as element, meeting all 3 CAR
	A		46% include	
	R		51% include	
Avatars	C ✓		54% exclude	Remove Competence
	A ✓	70% include		
	R ✓	61% include		
Badges	C ✓	64% include		Remove Relatedness
	A	49% exclude		
	R ✓		50% exclude	
Boss fights	C ✓	91% include		Add Autonomy
	A		51% include	
	R	46% exclude		
Collections	C ✓	64% include		Add Autonomy
	A		60% include	
	R ✓	44% include		
Combat	C ✓	89% include		Add Autonomy & Relatedness
	A		69% include	
	R		49% include	
Content-unlocking	C ✓	84% include		Add Autonomy
	A		61% include	
	R ✓	47% include		
Discussion forums	C ✓		50% exclude	Remove Competence & Autonomy
	A ✓		44% exclude	
	R ✓	68% include		
Gifting	C	62% exclude		NO CHANGE
	A ✓	56% include		
	R ✓	72% include		
Haptic effects [not in taxonomy]	C	50% exclude		NO CHANGE
	A	52% exclude		
	R	64% exclude		
Leaderboards	C ✓	64% include		NO CHANGE
	A	58% exclude		
	R ✓	71% include		
Levels	C ✓	92% include		NO CHANGE
	A ✓	64% include		
	R ✓	46% include		
Points	C ✓	85% include		Add Autonomy
	A		49% include	
	R	48% exclude		
Quests	C ✓	83% include		NO CHANGE
	A ✓	86% include		
	R ✓	47% include		
Realistic graphics [not in taxonomy]	C		46% include	Add Competence & Relatedness
	A	46% exclude		

	R		49% include	
Reminders [not in taxonomy]	C	74% exclude		NO CHANGE
	A	73% exclude		
	R	71% exclude		
Social graphs	C ✓	46% include		NO CHANGE
	A	51% exclude		
	R ✓	53% include		
Teams	C		60% include	Add Competence & Autonomy
	A		53% include	
	R ✓	80% include		
Virtual goods	C ✓	61% include		Remove Relatedness
	A ✓	67% include		
	R ✓		52% exclude	

Table 5.1: Elements in proposed taxonomy vs evaluated taxonomy

Of the elements approved per component, the average level of agreement was 70.9% for Competence, 60.8% Autonomy and 57.2% Relatedness.

5.2.3 Taxonomies compared by element

In our original proposed taxonomy (T1) there were 16 game elements identified. The updated taxonomy (T2) has a further two elements added. See Table 5.2, and Table 5.3. These tables show that there is 68% agreement between the conjectural analysis and the revised taxonomy, updated with these results.

There was total agreement between the two evaluations for seven elements:

- Gifting;
- Haptic effects;
- Leaderboards;
- Levels;
- Quests;
- Reminders;
- Social graphs.

Where there was disagreement, survey respondents felt that the game elements were *more* useful in facilitating one or more of the three constructs, in 14 cases. In fact, where the conjectural analysis found a total of 32 cases where the motivational constructs of Competence, Autonomy and/or Relatedness could potentially be fulfilled by these game elements, survey responses increased this to 41. Gamers appear to perceive even more motivation from the use of various game elements than was anticipated.

Game Element	Competence	Autonomy	Relatedness
Achievements	•		
Avatars	•	•	•
Badges	•		•
Boss fights	•		
Collections	•		•
Combat	•		
Content-unlocking	•		•
Discussion forums	•	•	•
Gifting		•	•
Leaderboards	•		•
Levels	•	•	•
Points	•		
Quests	•	•	•
Social graphs	•		•
Teams			•
Virtual goods	•	•	•
Totals	14/16 Competence	6/16 Autonomy	12/16 Relatedness

Table 5.2: T1 – original proposed taxonomy, truncated

Game Element	Competence	Autonomy	Relatedness
Achievements	•	•	
Audio effects	•	•	•
Avatars		•	•
Badges	•		
Boss fights	•	•	
Collections	•	•	•
Combat	•	•	•
Content-unlocking	•	•	•
Discussion forums			•
Gifting		•	•
Leaderboards	•		•
Levels	•	•	•
Points	•	•	
Quests	•	•	•
Realistic graphics	•		•
Social graphs	•		•
Teams	•	•	•
Virtual goods	•	•	
Totals	15/18 Competence	13/18 Autonomy	13/18 Relatedness

Table 5.3: T2 – evaluated taxonomy, truncated

5.2.4 Taxonomies compared by motivational component

In Figure 5.5, we see the three elements that are seen by the gamers to be the most useful in the fulfilment of each of the three motivational constructs.

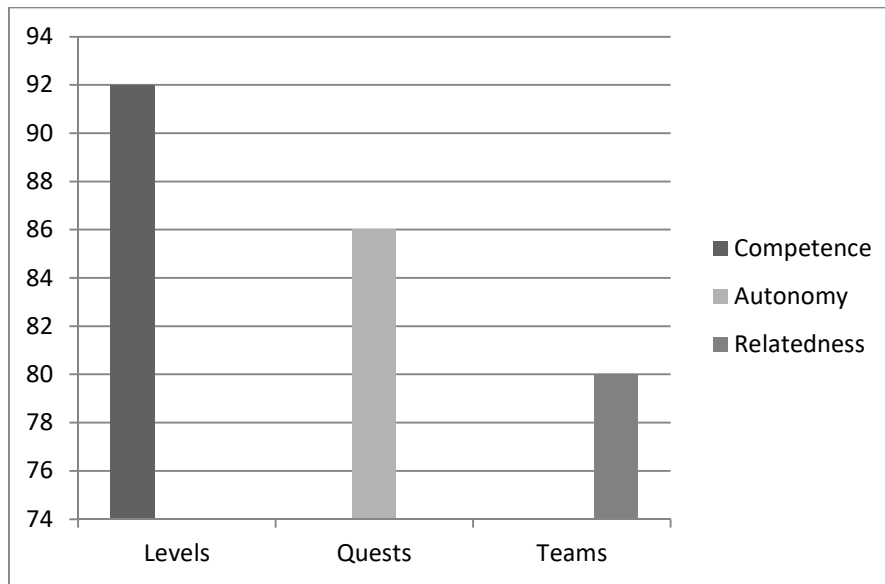


Figure 5.5: Game elements with highest utility per component

5.2.4.1 Competence

In Figure 5.6 we see the percentages by which the respondents felt that the game elements facilitated a sense of Competence.

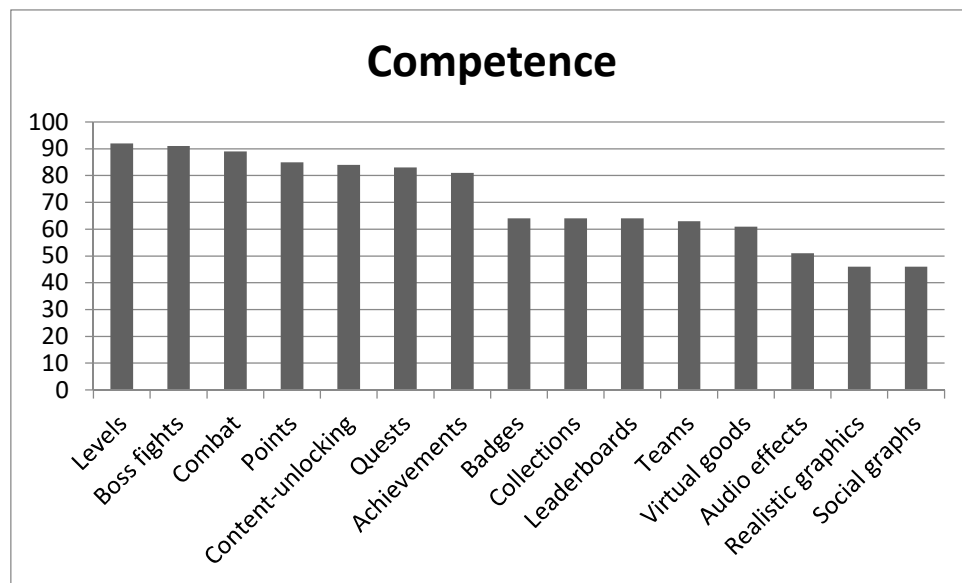


Figure 5.6: Game elements to satisfy Competence

In the survey 15 out of the 18 game elements were said to contribute to Competence. This number does not differ markedly from our original proposed taxonomy, where it was found that 14 out of the 16 elements were useful for fulfilling Competence, although a delta of two elements out (Avatars and Discussion forums) and three elements in (Audio effects, Realistic graphics and Teams) reflects a bigger churn than the number difference suggests. Seven of the elements were seen as useful for over 80% of respondents, and none of those differed from the initial conjectural analysis. Of the eight, four were present in the group of elements that were felt to facilitate all three motivational constructs. The average agreement across the 14 was 70.9%, the highest of the three constructs.

5.2.4.2 Autonomy

In Figure 5.7 we see the percentages by which the respondents felt that the game elements facilitated a sense of Autonomy.

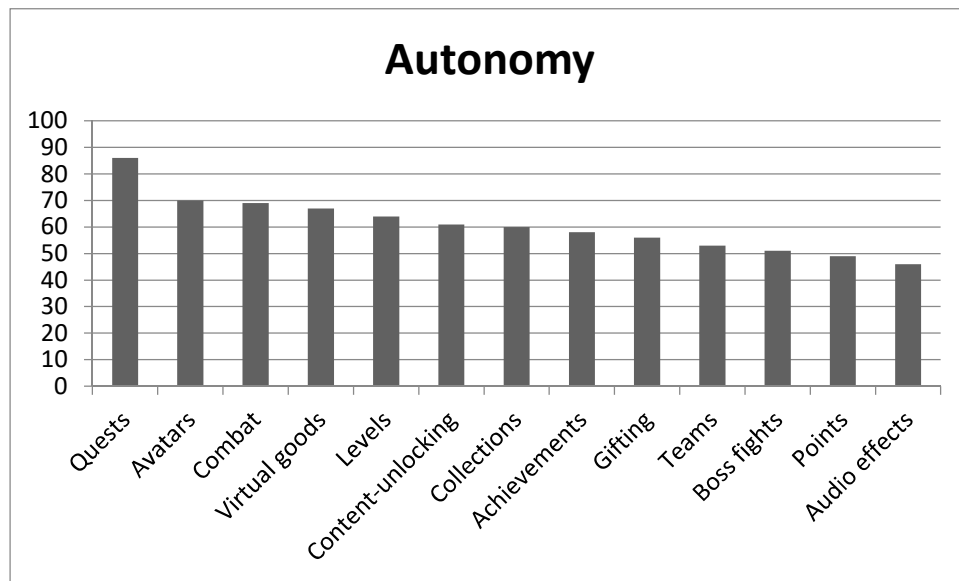


Figure 5.7: Game elements to satisfy Autonomy

13 of the 18 elements were associated with Autonomy in the survey, over double the number that were associated with the construct by the conjectural analysis. The churn here closely reflects this change with eight elements newly associated (Achievements, Audio effects, Boss fights, Collections, Combat, Content-unlocking, Points and Teams), and one element disassociated: Discussion forums. 13 is a high number of useful elements, however only one element, Quests, received over 80% as a score of its usefulness, and again it was consistent with the findings of the conjectural analysis. The remaining 11 received between 46–70%, giving an average approval rate of 60.8%. Five elements were rated as not useful for facilitating Autonomy, including two of Werbach and Hunter’s “PBL triad,” Badges and Leaderboards (2012). Discussion forums, Realistic graphics, and Social graphs were also not seen as useful in promoting Autonomy, and these findings will be returned to in Chapter 7: Discussion, where I shall explore the ramifications of this for gamification design.

5.2.4.3 Relatedness

In Figure 5.8 we see the percentages by which the respondents felt that the game elements facilitated a sense of Relatedness.

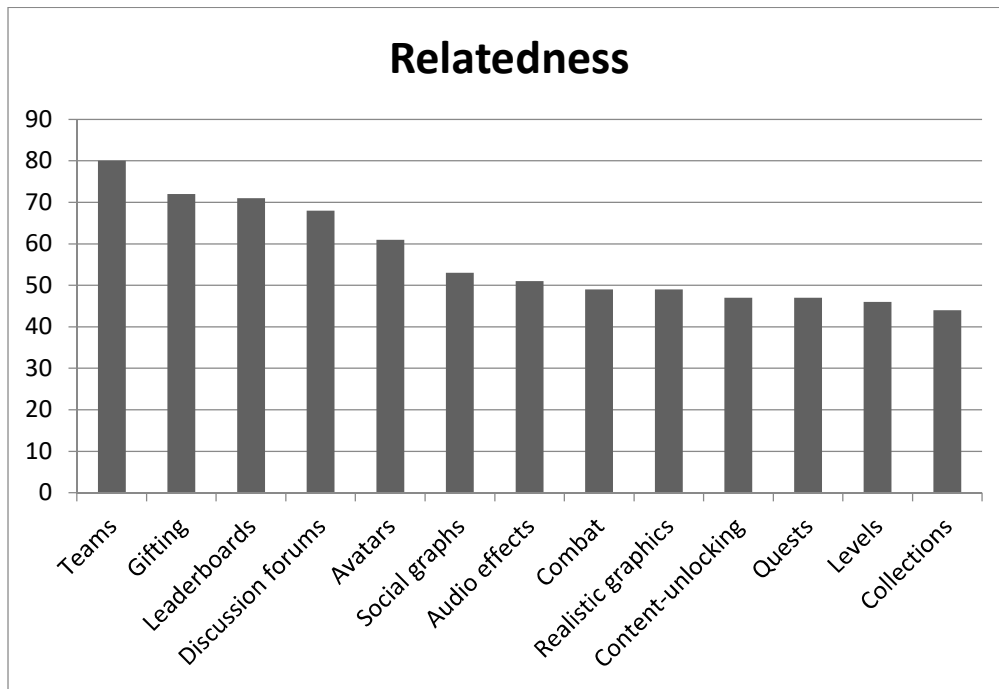


Figure 5.8: Game elements to satisfy Relatedness

13 out of the 18 elements in the survey were associated with Relatedness. In the original proposed taxonomy I found that 12 of the 16 elements were useful in promoting a sense of Relatedness, so the overall findings after the survey are not hugely different. Although, again, a delta of two elements out (Badges and Virtual goods) and three elements in (Audio effects, Combat and Realistic graphics) reflects a bigger churn than the number difference suggests.

Relatedness appears to be the least well represented as a motivational component, with only one element reaching 80% approval for this sense (Teams), and the spread of approval of the other 12 elements being low, from 44–72%. In addition, of the five elements seen as not useful for Relatedness, one, Badges, was also excluded from facilitating Autonomy. Badges are one of only two elements that are seen to facilitate just one motivational component, the other being Discussion forums (which appears only here, in Relatedness).

In contrast, seven elements receive scores as facilitating all three constructs of Competence, Autonomy and Relatedness:

- Audio effects;
- Collections;
- Combat;
- Content-unlocking;
- Levels;
- Quests;
- Teams.

Present in this list are Levels (Competence), Quests (Autonomy), and Teams (Relatedness), which were also the elements which received the highest approval ratings for their ability to facilitate the respective constructs.

5.2.5 Short answer section

The final three questions of the survey asked respondents whether there were game elements I had not listed, which they would associate with the three constructs. The wording of the question was:

What game element not already listed would you include as most closely associated with [motivational component]?

5.2.5.1 Competence

In Figure 5.9 we can see terms used multiple times by those answering the short answer question about Competence.

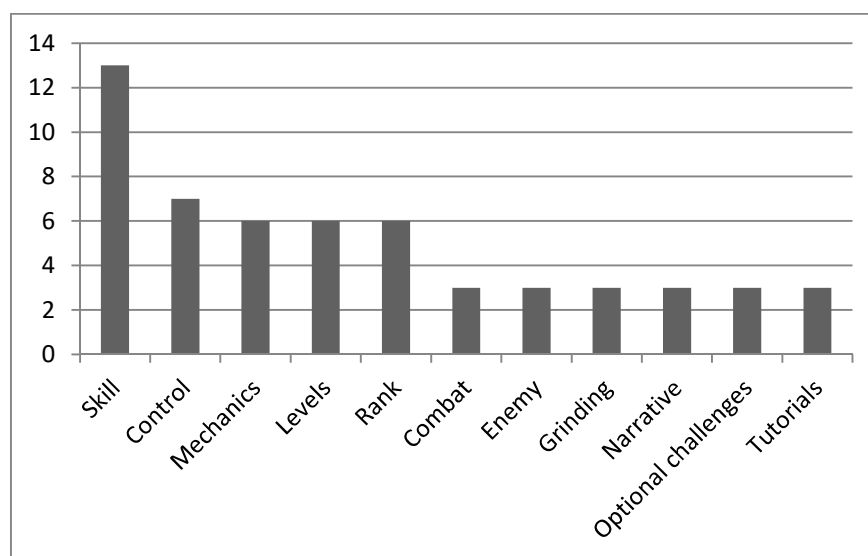


Figure 5.9: Percentage of elements not previously mentioned - Competence

The question concerning Competence was answered by 65% of the respondents, with 2% of those responses unusable due to being “I don’t know” or similar. A further 25% mentioned a unique feature, some of which were related to terms already offered in the survey. These will be examined in detail in Chapter 7, where we see a mixture of differences of opinion over terminology, and some comments which are irrelevant in the sense that they do not discuss these lower-level, “concrete” elements (Cheong et al 2014, p. 234). The percentages given in Figure 5.9 relate to the numbers who gave answers in this section.

5.2.5.2 Autonomy

In Figure 5.10 we can see terms used multiple times by those answering the short answer question about Autonomy.

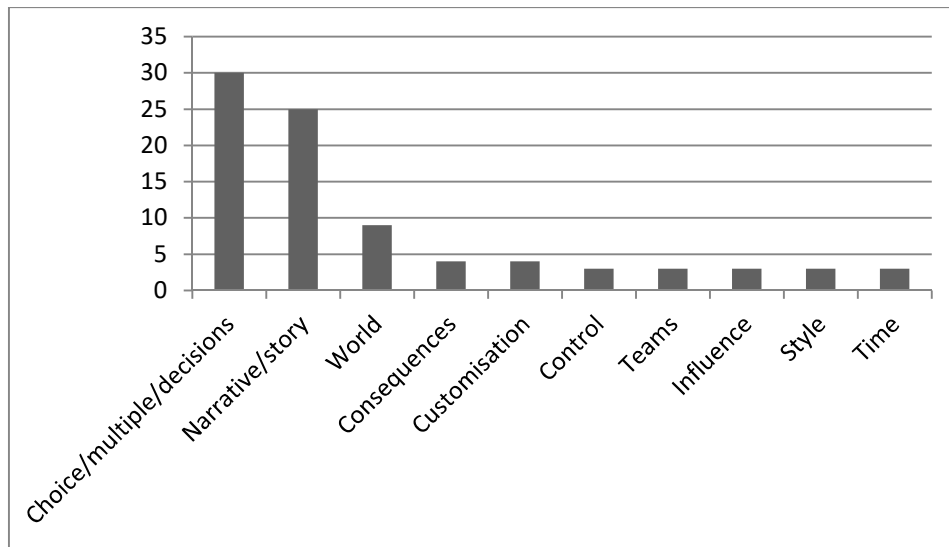


Figure 5.10: Percentage of elements not previously mentioned - Autonomy

The question concerning Autonomy was answered by 67% of the respondents, with 7% of those answers unusable due to being “I don’t know” or similar. A further six responses, or 6% of the total, mentioned a unique feature. In section 7.2.2.2 I explore the ideas raised in this section, particularly those around “*narrative*” and “*story*.” As above, the percentages in Figure 5.10 relate to those who answered the questions.

5.2.5.3 Relatedness

In Figure 5.11 we can see terms used multiple times by those answering the short answer question about Relatedness.

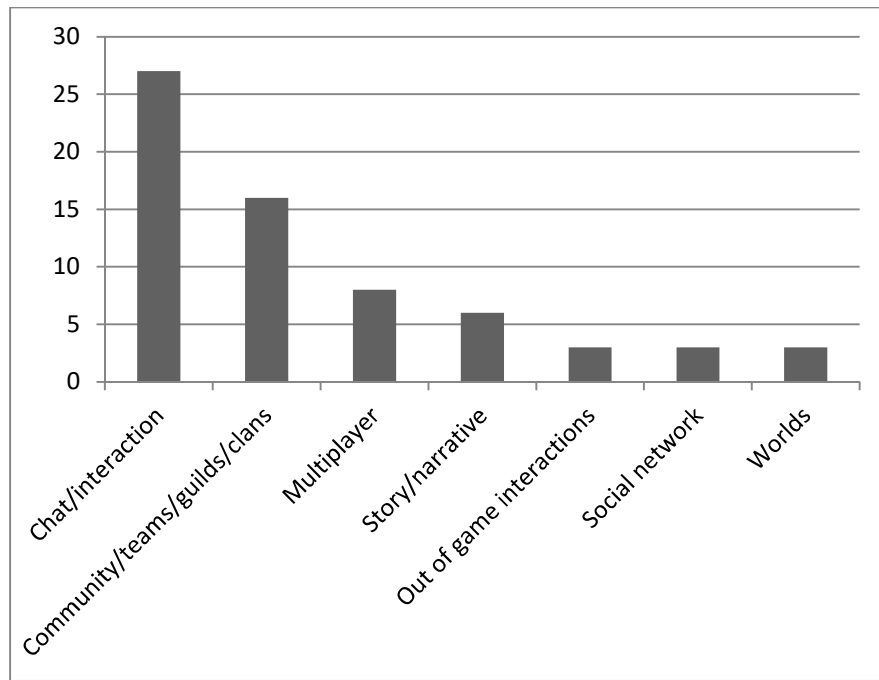


Figure 5.11: Percentage of elements not previously mentioned - Relatedness

The question concerning Relatedness was answered by 60% of the respondents, with 8% of those answers unusable due to being “I don’t know” or similar. A further 11 respondents, or 11% of the total, mentioned a unique feature. In section 7.2.2.3 we see that the respondents in this section of the survey also mentioned differences from the research team as regards terminology, particularly around Discussion forums.

5.2.5.4 Features found across all three motivational constructs

Three features were mentioned by respondents across the three different motivational constructs:

- Narrative;
- Teams;
- Turn-based play.

For the purposes of clarity, I chose to present the game element Quests in the survey, and earlier I have argued that, as Quests often serve to move the game narrative forward, I was including this sense of narrative in that element. It would appear that this might not be clear to the respondents, and is therefore a shortcoming in the survey. Teams, however, were explicitly named as an element. “Turn-based play” was not an element considered for inclusion. I will return to these observations in section 7.2.2, as they contain some very interesting ideas for further work, which may need to be elaborated upon.

Three features also come up under two of the constructs:

- Control (Competence and Autonomy);
- Multiplayer (Competence and Relatedness);
- Worlds (Autonomy and Relatedness).

The significance of these terms and how they may or may not relate to a reworking of the proposed taxonomy will be discussed in section 7.2.2, and again in section 8.4, where I detail recommendations for further work.

5.3 Updated taxonomy

Based on the results of the survey, the taxonomy has been updated to reflect the views of the majority of the respondents.

This updated taxonomy, shown in Table 5.4, is enriched with the percentages of respondents who considered the given elements to be important for facilitating the various motivational constructs.

Game Element	Competence	Autonomy	Relatedness
Achievements	• 81%	• 58%	
Audio effects	• 51%	• 46%	• 51%
Avatars		• 70%	• 61%
Badges	• 64%		
Boss fights	• 91%	• 51%	
Collections	• 64%	• 60%	• 44%
Combat	• 89%	• 69%	• 49%
Content-unlocking	• 84%	• 61%	• 47%
Discussion forums			• 68%
Gifting		• 56%	• 72%
Leaderboards	• 64%		• 71%
Levels	• 92%	• 64%	• 46%
Points	• 85%	• 49%	
Quests	• 83%	• 86%	• 47%
Realistic graphics	• 46%		• 49%
Social graphs	• 46%		• 53%
Teams	• 60%	• 53%	• 80%
Virtual goods	• 61%	• 67%	
Totals	15/18 Competence	13/18 Autonomy	13/18 Relatedness

Table 5.4: T2 – truncated evaluated taxonomy, with percentages

5.4 Duolingo evaluation using updated taxonomy

In Chapter 4: Gamification – A Proposed Taxonomy for Motivation, I used the proposed taxonomy as a framework to apply my evaluation of the usefulness of the game elements I had identified to the game Minecraft (2011), and the gamified learning website Khan Academy (2006).

Using the updated framework after the survey results, I have applied the framework to Duolingo, and this assessment is presented in Table 5.5. This evaluation also includes the percentage of survey respondents who found the various elements to be important, along with the average agreement per component across the elements chosen to facilitate that component. From the table we can see that my evaluation shows that Competence is the most highly supported of the three constructs in Duolingo, having 75% coverage, with an average agreement of 78.5% across those elements.

Element	Description	Competence % in agreement	Autonomy % in agreement	Relatedness % in agreement		
Achievements	Displayed on player’s skills tree, and alongside avatar, showing how long a player has been using the site.	81	58			
Audio effects	Listening skills are practised on the site, along with sound effects to denote the awarding of points	51	46	51		
Avatars	Upload own picture or use anonymous silhouette		70	61		
Badges	Elements on players’ skills trees light up when achieved. Flags denote which languages players are learning and number of days online.	64				
Content-unlocking	Upon moving through levels, specific tests become accessible.	84	61	47		
Discussion forums	Users can comment and vote on each game segment. Very useful for learning Q&A and building community. Users can vote on the quality of a submitted translation in the Immersion section. Also the source of a lot of fun.			68		
Gifting	Players can choose to give others “lingots” (see below)		56	72		
Leaderboards	Only followed players are visible	64		71		
Levels	A visible element of each player’s journey. Skill-related as each level becomes more difficult.	92	64	46		
Points	Used to level up and to gather “lingots”	85	49			
Social graphs	Points are visible to those who are followed. These players can also communicate.	46		53		
Virtual goods	Upon accruing points, virtual currency is awarded, called “lingots”. These can be used to buy various virtual goods.	61	67			
Summary	Competence	Average agreement	Autonomy	Average agreement	Relatedness	Average agreement
Updated taxonomy	15/18	70.9%	13/18	60.8%	13/18	57.2%
Duolingo	9/15	78.5%	8/13	58.9%	8/13	58.6%

Table 5.5: Duolingo evaluation

This reflects more game elements being associated with Autonomy in the minds of gamers, as discovered in the survey results, and shows that both Competence and Relatedness are still highly facilitated in Duolingo, in spite of the numbers being lower than in my initial evaluation. The evaluations were quite close, in that I found a combination of 22 elements working to facilitate the three constructs, and after this update, that has only changed by the addition of one element overall.

Interestingly, seven of the game elements were found to facilitate all three SDT constructs by the gamers in my survey, and three of these are present in Duolingo:

- Audio effects;
- Content-unlocking;
- Levels.

Of the other four, only Quests have not been mooted publicly for inclusion in Duolingo:

- Combat was planned in the form of Duels, but was never introduced across the whole site;
- Teams are promised as being in the planning stages;
- Collections – it is possible that the flag icons which appear next to a user’s name to denote the languages they are learning act as Collections, especially as they give a number beside the icon which details the user’s level in that particular language.

5.4.1 Competence

In Figure 5.12 we can see the game elements which survey respondents feel would facilitate Competence. The elements coloured dark grey are the combination used in Duolingo, while the light grey elements show which game elements could also be used to further support the motivational construct, showing in particular that two elements that are not present in the site (Boss fights and Combat) are highly rated by the survey respondents as being useful for facilitating Competence.

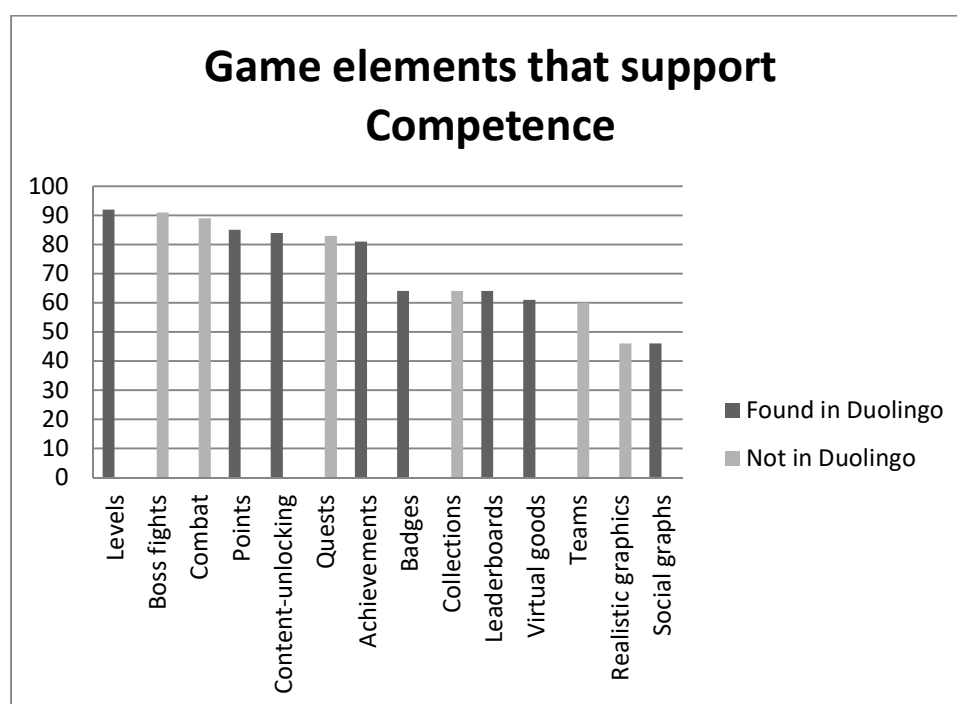


Figure 5.12: Game elements that support Competence

Based on the survey results, Duolingo has an average of 78.5% agreement on these elements as facilitating the component. Three of the top five elements which achieved the highest percentages for Competence in the survey are present:

- Levels (92%);
- Points (85%);
- Content-unlocking (84%).

5.4.2 Autonomy

In Figure 5.13 we can see the game elements which survey respondents feel would facilitate Autonomy. The elements coloured dark grey are the combination used in Duolingo, while the light grey elements show which game elements could also be used to further support the motivational construct. It is clear that, according to the survey respondents, there are a number of other game elements which could be used, in order to facilitate a sense of Autonomy on the site.

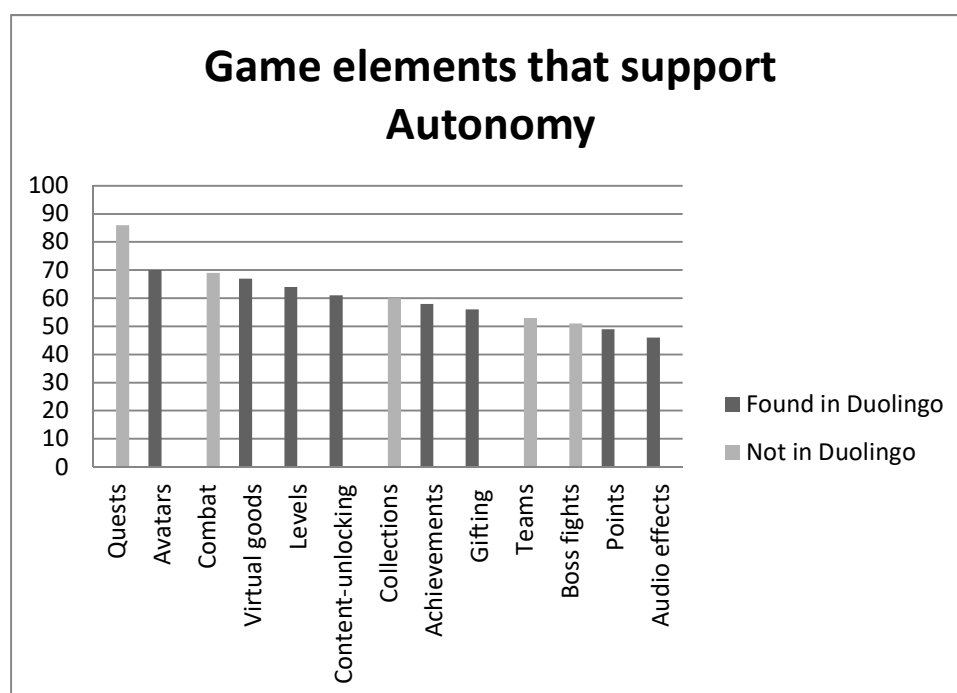


Figure 5.13: Game elements that support Autonomy

Three out of the top five elements as rated for Autonomy are present in Duolingo, but not the top rated element, Quests (86%). According to this assessment, the average agreement as to the link between elements and Autonomy, for the elements observed in Duolingo, is only 58.9%.

5.4.3 Relatedness

In Figure 5.14 we can see the game elements which survey respondents feel would facilitate Relatedness. The elements coloured dark grey are the combination used in Duolingo, while the light

grey elements show which game elements could also be used to further support the motivational construct,

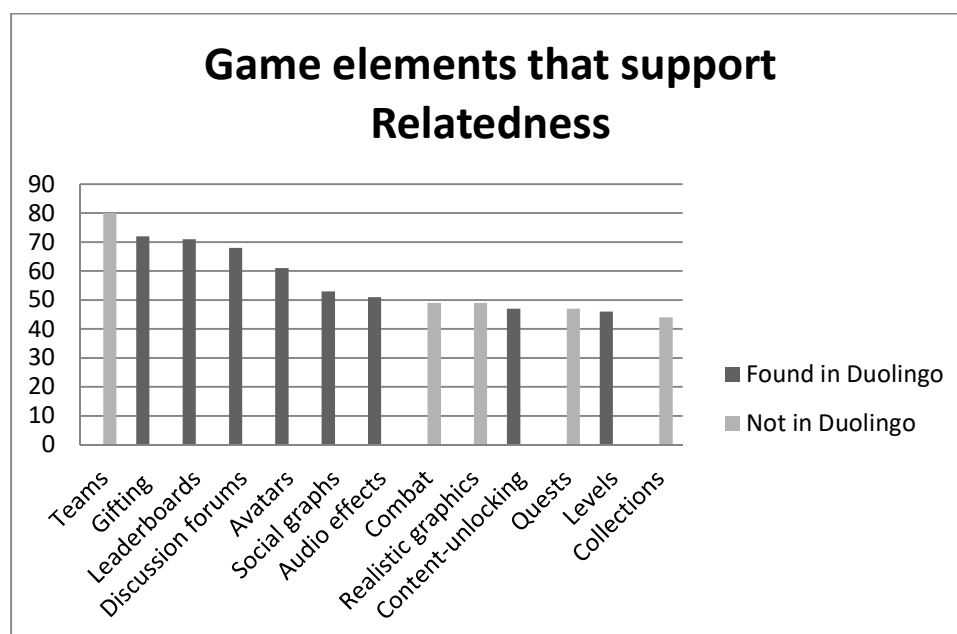


Figure 5.14: Game elements that support Relatedness

Although the top rated element for Relatedness from the survey results, Teams (80%), is not present in Duolingo, this is an element that has taken up some space on the Duolingo Discussion forums, and it has definitely been mooted as an upcoming feature. This could serve to strengthen the site’s ability to afford participants the opportunity to feel Relatedness on the site in the future. Teams is the only game element from the five top-rated elements for this component which is not present on the site. At an average agreement of 60.3%, the identified elements do not seem to support Relatedness well. Overall, this analysis suggests that only 61.5% of the Relatedness elements have been incorporated into Duolingo, suggesting that Duolingo might be able to strengthen itself by increasing the number of these game elements (as per the mooted discussion of including Teams).

Three elements included in the original assessment: Badges; Content-unlocking; and Virtual goods; all still present in Duolingo, were nevertheless found by respondents to the survey not to support Relatedness, therefore they were removed as facilitating this component from the updated proposed taxonomy. The addition of Audio effects as an element did add one more element which was seen as facilitating Relatedness, but at 51% approval it is not a particularly definitive addition.

5.5 Conclusion

This chapter has detailed the results from the analysis conducted in order to answer **Research Question 1, “How are game elements related to motivational constructs?”** more fully. This arose out of the survey of gamers who were asked to rate the conjectural analysis applied so as to create the proposed taxonomy. Additionally, the updated taxonomy is presented, and then utilised to offer an evaluation of

the language-learning website Duolingo (2012). The proposed taxonomy, updated with the observations from the survey of gamers, suggests that usage of the game elements as detailed would give 83% coverage for Competence, and 72% coverage for both of Autonomy and Relatedness. Various terms arose in the short answer sections of the survey which give rise to some interesting observations, to be discussed in Chapter 7, but there was general agreement between the original, more theoretical, proposed taxonomy, and the revised taxonomy informed by the observations of the gamers in the survey.

Overall, when the survey results were applied to Duolingo, the game elements identified as being present on the site give 60% coverage for Competence, and 61.5% coverage for Autonomy and Relatedness. The following chapter will review the results from the Content analysis, in order to seek the perspectives on Duolingo of its users, and its creators, so as to explore all of the results, for their consistency.

Chapter 6: Results – Application to Duolingo

6.1 Introduction

The first part of the research, the results from which are presented in Chapter 5, was complemented by Content analysis run on a selection of entries from Duolingo’s Discussion forums (see Appendix D, and Chapter 3 Methodology, sections 3.4 and 3.5). Similarly, statements issued officially by Duolingo, or by its co-creator Luis von Ahn, were searched for the same terms, to look for areas of overlap, and areas of concern to users, in terms of their motivations to use the site to learn languages (see Appendix E, and Chapter 3 Methodology sections 3.4 and 3.6).

In this chapter, the results from the two separate Content analyses are presented. Initially, the results from the Content analysis conducted on the texts written by the Duolingo users are given. Chapter 3 detailed how the Content analysis was undertaken, including the generation of synonyms for the terms arising out of the SDT approach to motivation. Here, the instances of these terms are quantified, along with the percentage of those instances which are positive or negative, in order to give an indication of how the terms are perceived overall.

These results are then followed by those from the Content analysis on the texts written by the design team behind Duolingo. In both cases the results are arranged so that it is possible to contrast the ways in which the same terms were discussed in the two sets of texts. The first set of results in both cases relate to the terms “motivat*” (being words such as motivate, motivation, motivating, etc.) and “gamification.” The subsequent sub-sections of the chapters present, respectively, the results for instances of Competence and its synonyms, Autonomy and its synonyms, and Relatedness and its synonyms. In both cases, this is then followed by the sentiment score, reckoned by deciding whether the usages of these terms are negative or positive.

6.2 Content analysis results - Duolingo users

In Chapter 3: Methodology, I showed how Content analysis is useful for taking texts which are written for other purposes, and therefore reflect naturally occurring preoccupations of a particular community (Neuendorf, 2016), and searching through them in order to infer certain attitudes and beliefs (Krippendorff, 2004). In this case, the terms for which I was searching related to motivational issues, so as to assess the users’ communications regarding the motivational emphasis of Duolingo with regard to SDT constructs. In this way I was looking to construct a profile of the relative emphasis of SDT constructs in Duolingo based on users’ perceptions.

In Figure 6.1, we see that each term for which I searched was not particularly prevalent, with the most commonly occurring term across the Duolingo Discussion forum message threads being “skill” (or its derivatives). This appeared in only 17.1% of the total message threads under study. Figure 6.1 shows only those terms that were found to have been used in a sense relevant to motivation. The first two terms

are “motivation” and “gamification.” The next nine terms represent the results for the searches for Competence and its synonyms. The following two terms are the searches conducted for Autonomy and its synonyms, while the final four terms are those found under the search for synonyms of Relatedness. These will be discussed in Chapter 7: Discussion.

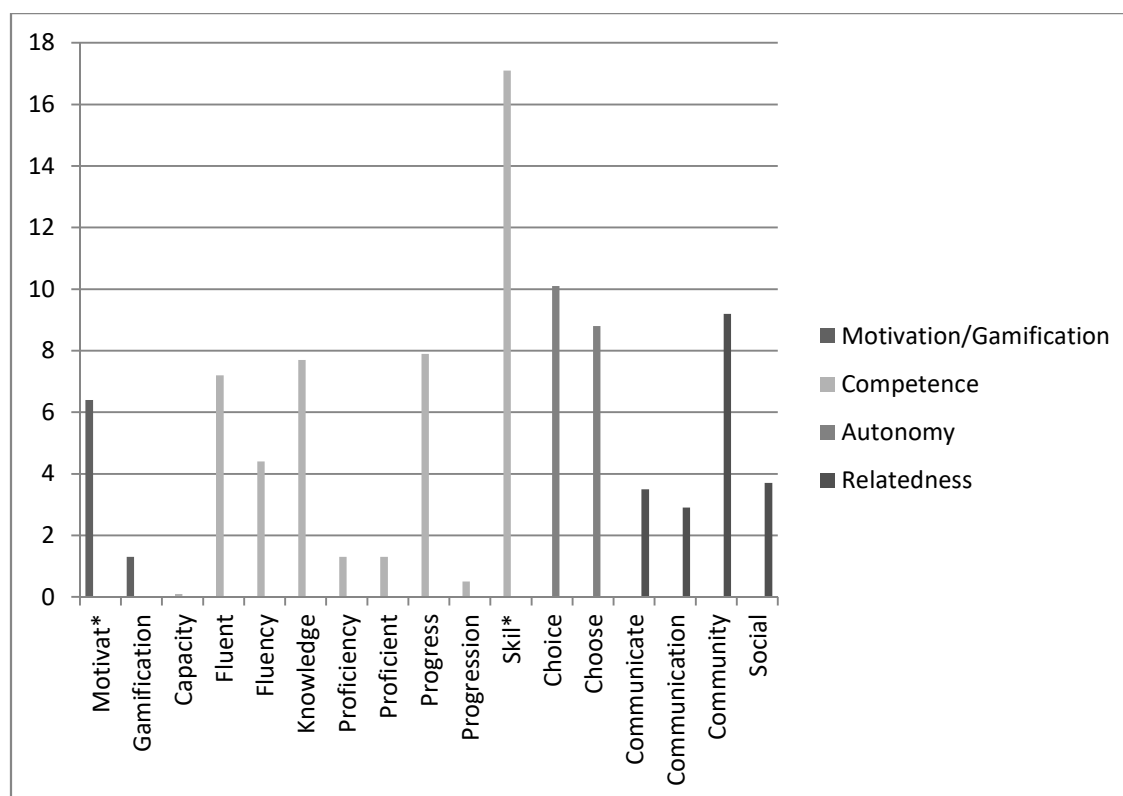


Figure 6.1: Percentages of threads including the terms – Discussion forums

Research Question 2 requires an analysis of how well Duolingo has covered each of the motivational constructs, from the perspective of the users. In Figure 6.2, we see the spread of positive and negative usages for each of the terms found in the message threads as set out above. If usages are largely positive, I posit that users are satisfied with this mix, whereas more negative usages imply that users are unhappy with what Duolingo has to offer.

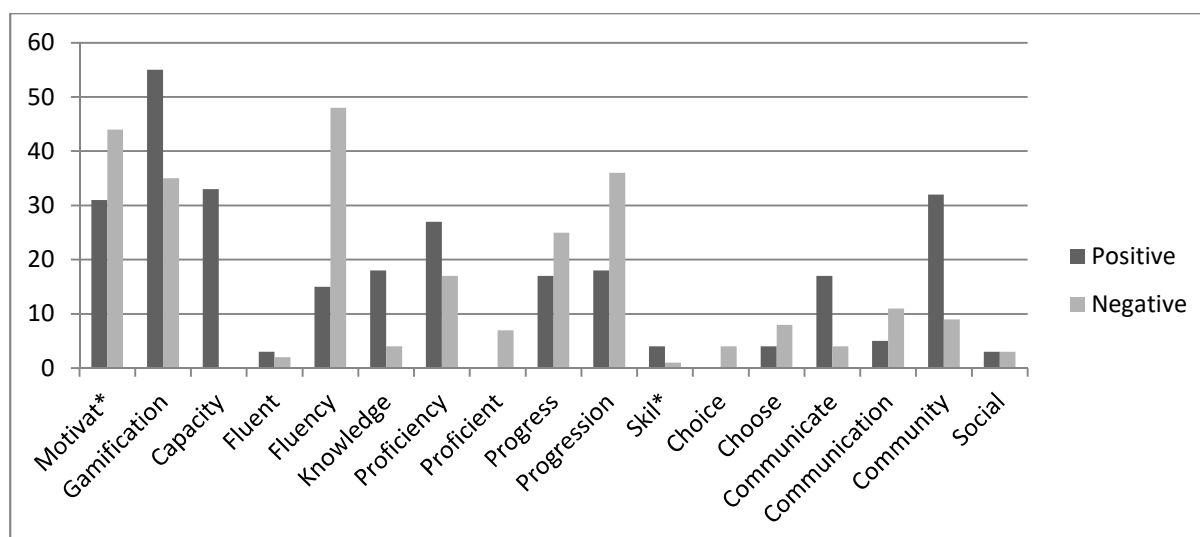


Figure 6.2: Percentages of relevant usages: Positive + Negative – Discussion forums

6.2.1 Motivation/Gamification

“Motivation” (or derivations thereof) are shown in Table 6.1 to have occurred in 6.4% of the message threads isolated for analysis in the Duolingo Discussion forums. A small number of those usages are positive in terms of their relevance to an awareness of motivating learning on the Duolingo website, with over half being negative. “Gamification” is referenced in 1.3% of the message threads, and is mostly positive. Because neither of these terms are directly linked to SDT, discussion of this trend toward more negative associations with the word “motivation” (or its derivatives), and the positive use of the word “gamification” will be in Chapter 7: Conclusion.

Term	Occurrences	% of threads including the term	Positive	% Relevant usages	Negative	% Relevant usages
Motivat*	249	6.4	77	41	110	59
Gamification	31	1.3	17	61	11	39

Table 6.1: Motivation and Gamification summary – Duolingo Discussion forums

6.2.2 Competence/synonyms

In Chapter 3: Methodology, sections 3.4.2.1 and 3.4.2.2 I detailed the process of generating synonyms for the three SDT motivational constructs. Twelve synonyms were ultimately adopted, and of these, nine appear across 47.5% of the Discussion forum threads. As we see in Table 6.2 while the term Competence itself is not referenced in a relevant fashion, the use of synonyms points towards some level of awareness in the users. Two terms in particular (Fluency and Progress) seem to negate the positivity associated with all the other usages. Discussion of this will follow in Chapter 7.

Term	Occurrences	% of threads including the term	Positive	% Relevant usages	Negative	% Relevant usages
Competence	8	0.3	-	-	-	-
Capacity	3	0.1	1	100	-	-
Competency	3	0.1	-	-	-	-
Fluent	196	7.2	5	62.5	3	37.5
Fluency	193	4.4	28	23	93	77
Know-how	-	0	-	-	-	-
Knowledge	138	7.7	25	81	6	19
Proficiency	30	1.3	8	61.5	5	38.5
Proficient	15	1.3	-	-	1	100
Progress	346	7.9	58	40.5	85	59.5
Progression	11	0.5	2	33	4	67
Skil*	713	17.1	29	78	8	22
Skilfulness	-	0	-	-	-	-

Table 6.2: Competence summary – Duolingo Discussion forums

When we see Figure 6.3 the distribution of negative and positive instances of usage of words associated with Competence across the Duolingo Discussion forum message threads looks quite even. In terms of answering **Research Question 2**, there is perhaps a user perception that there is a deficiency of game elements that promote Competence in Duolingo, particularly in relation to Fluency and Progress. This relationship will need to be more deeply explored in Chapter 7, along with the possibility that a greater frequency of Competence-related game elements need to be incorporated into the system.

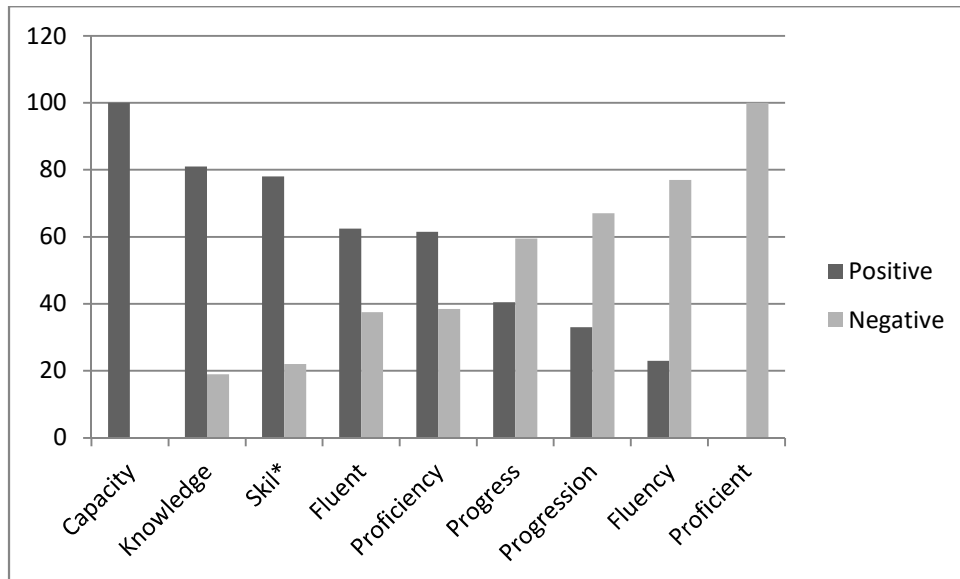


Figure 6.3: Percentages of positive/negative usage in Duolingo message threads: Competence

6.2.3 Autonomy/synonyms

Table 6.3 shows that Autonomy as a term itself is also not mentioned in a way relevant to motivational issues, and the synonyms “choice” and “choose” are used more negatively than positively, as is very

clear from Figure 6.4. In Chapter 7, we will see how these largely negative usages of the terms manifest across the community of users, and investigate to see what this means for Duolingo's facilitating of this motivational component. It does seem that Duolingo could improve with respect to users' perception of Autonomy, and we have seen in Chapter 5 that this is an important consideration for gamers.

Term	Occurrences	% of threads including the term	Positive	% Relevant usages	Negative	% Relevant usages
Autonomy	1	0.1	-	-	-	-
Choice	191	10.1	1	12.5	7	87.5
Choose	146	8.8	6	33	12	67

Table 6.3: Autonomy summary – Duolingo Discussion forums

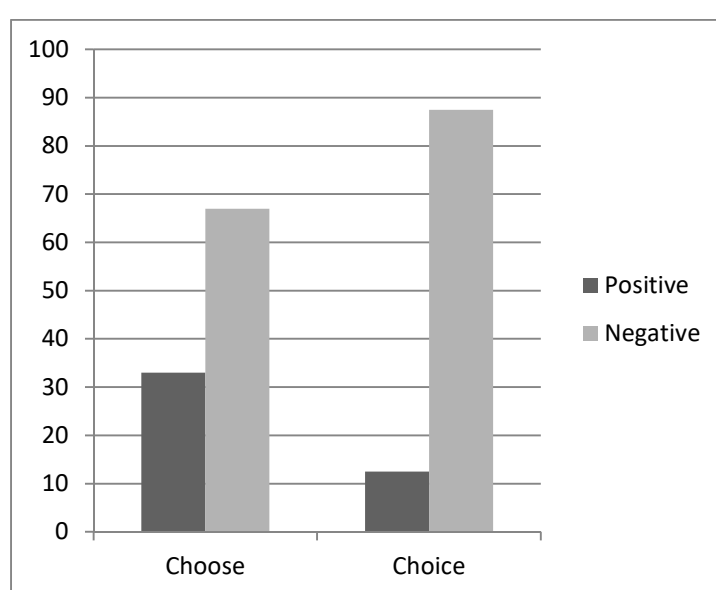


Figure 6.4: Percentages of positive/negative usage in Duolingo message threads: Autonomy

6.2.4 Relatedness/synonyms

Finally, Table 6.4 shows that once again the specific motivational term is not referenced directly in the threads.

Term	Occurrences	% of threads including the term	Positive	% Relevant usages	Negative	% Relevant usages
Relatedness	-	0	-	-	-	-
Access	115	5.1	-	-	-	-
Associated	25	2.3	-	-	-	-
Common	310	14.9	-	-	-	-
Commonality	-	0	-	-	-	-
Communicate	54	3.5	9	82	2	18
Communication	37	2.9	2	33	4	67
Community	195	9.2	63	79	17	21
Social	34	3.7	1	50	1	50

Table 6.4: Relatedness summary – Duolingo Discussion forums

In contrast to the other two motivational constructs, Figure 6.5 indicates a much more positive view of the elements in Duolingo which I suggest are promoting this sense of Relatedness. Particularly in the cases of “communicate,” with 82% of its usages being positive, and “community,” at 79%, we get a glimpse of what is working on the site. This will be fleshed out in my discussions around these results, and in seeking to answer **Research Question 2** in Chapter 7.

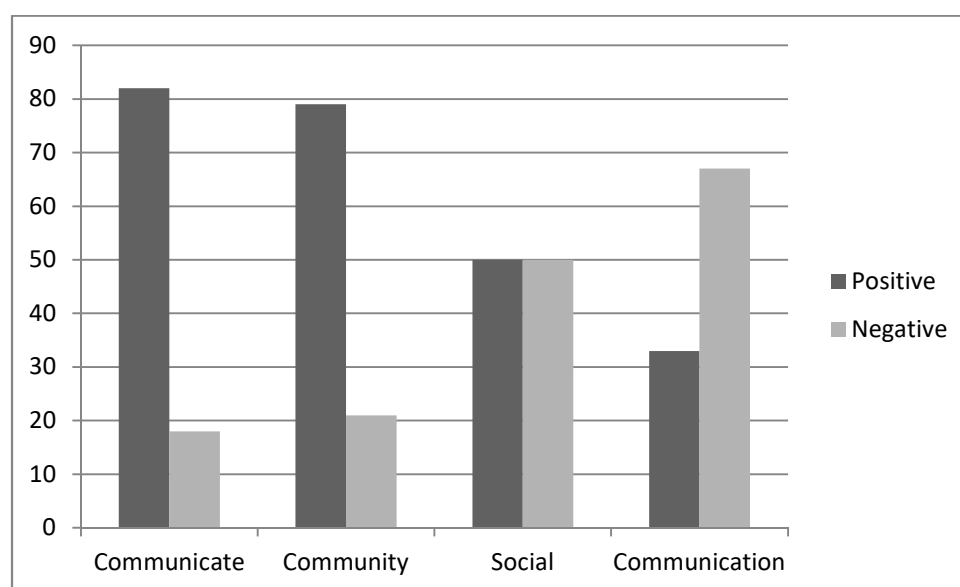


Figure 6.5: Percentages of positive/negative usage in Duolingo message threads: Relatedness

6.2.5 Sentiment scores

From this assessment of the individual terms found in the Content analysis, I can form a measure of the overall attitude from the texts towards each of the main areas under study. This will be useful for the comparison, when I am looking for consistency across the original evaluation, these Discussion forum threads, and the official publications from Duolingo. The measure is formed by adding together the percentages of positive and negative usages of the terms, from across the analysis, and subtracting the larger figure from the smaller. This gives a sentiment score. The sentiment scores for the Discussion forums, giving the results of the equation outlined above, are presented in Figure 6.6, followed by Figure 6.7, which contains the specific sentiment scores for the terms “motivation” and “gamification,” which will be discussed in Chapter 7: Discussion.

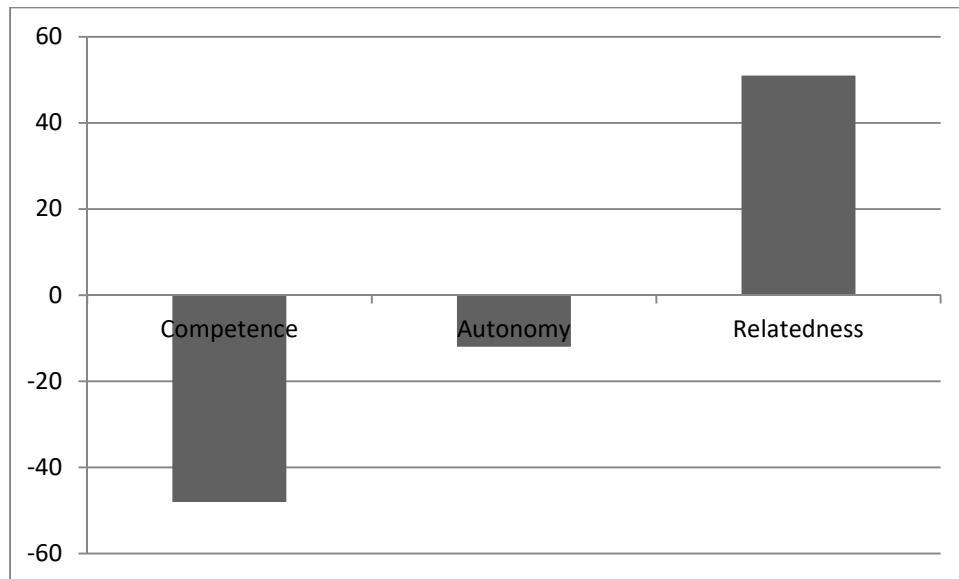


Figure 6.6: Duolingo ranked per component: sentiment score from Discussion forums

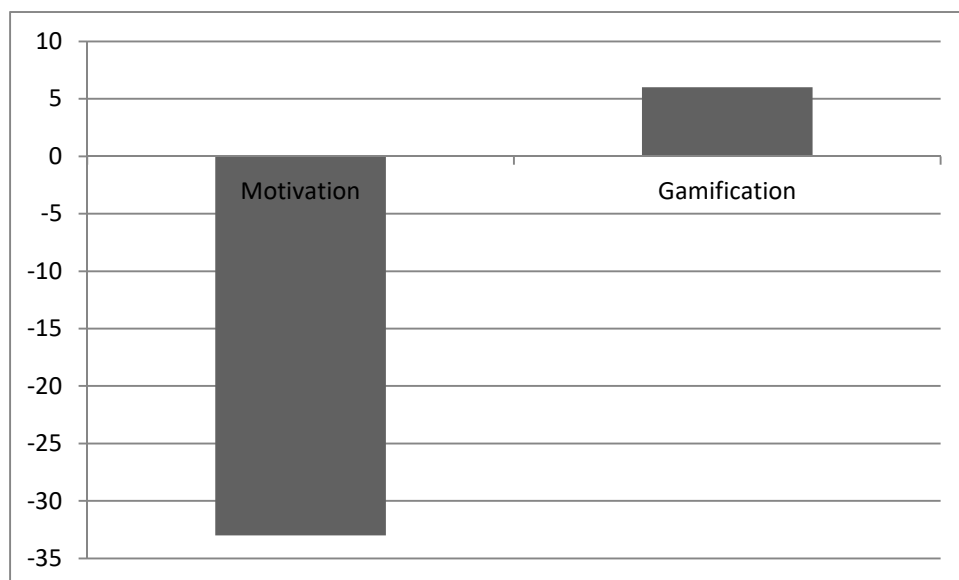


Figure 6.7: Sentiment score for Motivation/Gamification – Discussion forums

6.3 Content analysis results - Duolingo Official Publications

In the previous section, I presented the results of the Content analysis conducted on the Duolingo Discussion forums. **Research Question 3** shifts the focus to the statements issued by the creators of Duolingo, in order to address the design intent with respect to their users' motivational needs. In this section I present the results of the Content analysis conducted on the official publications of Duolingo. The terms for which I searched were the same synonyms as those with which I interrogated the forums, and a comparison of these results will be discussed in the ensuing chapters.

Here, in Figure 6.8, we see the percentage of usages in which the relevant terms occurred across the official publications. The most commonly occurring term across the Duolingo official publications was “motivation” (or its derivatives), which appeared in 57% of the sources under study. These results will be presented in detail below.

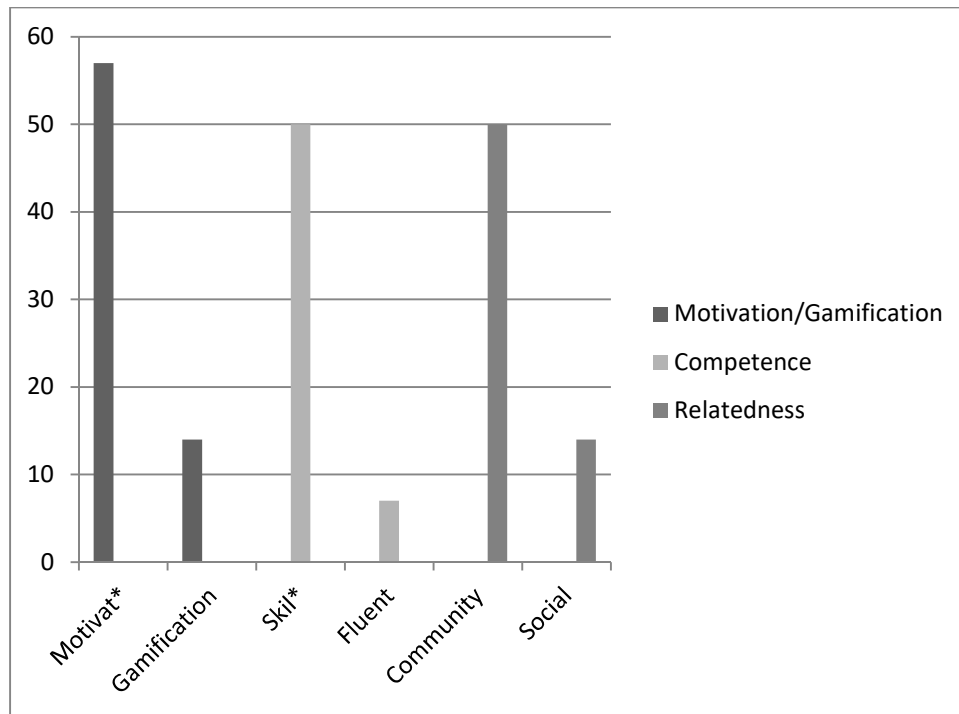


Figure 6.8: Percentage of sources including the terms in the Duolingo official publications

In Figure 6.9, we see that the majority of uses were positive. It is significant that only one of these terms was used negatively, as I shall explore in Chapter 7.

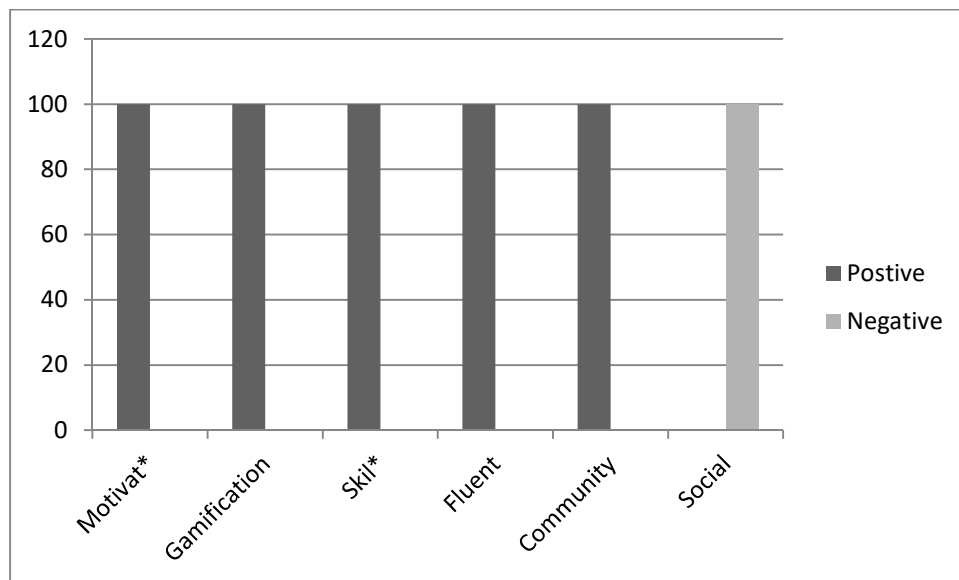


Figure 6.9: Percentage of positive/negative usages of terms across the Duolingo official publications

6.3.1 Motivation/Gamification

The terms “motivat*” (motivation and its derivatives), and “gamification,” although not part of the SDT constructs, were searched for their relevance to this research. “Motivat*” was found in 57% of the documents, and, like “gamification,” each time it was used in a sense relevant to the discussion of

motivational issues on the site, it was used positively. I will return to these results in Chapter 7. “Gamification” occurred in 14% of the documents.

6.3.2 Competence/synonyms

As per the search on the Discussion forums, in Table 6.5, Competence is shown to be referenced only indirectly in the official publications. Only two of the research terms were used in a relevant manner, and in both cases their usage was positive.

Term	Occurrences	% of sources including the term	Positive	% Relevant usages	Negative	% Relevant usages
Capacity	1	7	-	-	-	-
Competence	-	-	-	-	-	-
Competency	-	-	-	-	-	-
Fluent	1	7	1	100	-	-
Fluency	2	14	-	-	-	-
Know-how	-	-	-	-	-	-
Knowledge	2	14	-	-	-	-
Proficiency/ Proficient	1	7	-	-	-	-
Progress/ Progression	1	7	-	-	-	-
Skil*	12	50	1	100	-	-
Skilfulness	-	-	-	-	-	-

Table 6.5: Competence summary – Duolingo official publications

6.3.3 Autonomy/synonyms

As we see in Table 6.6, there are no references, direct or indirect, to Autonomy or its synonyms in these documents. It is curious that the development team do not reference people’s choices in using the Duolingo site, particularly when contrasted with the survey results, which showed gamers feel there are many elements which facilitate choice, and that they value these elements. In the Discussion forums, Autonomy also did not feature as a term, and neither “choice” at 10.1%, nor “choose” at 8.8%, occurred often across the Discussion threads, and even when they did, they were predominantly negative.

Term	Occurrences	% of sources including the term	Positive	% Relevant usages	Negative	% Relevant usages
Autonomy	-	-	-	-	-	-
Choice	1	7	-	-	-	-
Choose	1	7	-	-	-	-

Table 6.6: Autonomy summary – Duolingo official publications

6.3.4 Relatedness/synonyms

Table 6.7 demonstrates that *Relatedness* is only discussed in the official publications through the use of synonyms “community,” and “social.” It is not surprising that the three actual terms from SDT do not

feature directly; this was my hypothesis, and the reason why I identified synonyms, as described in Chapter 3: Methodology.

Term	Occurrences	% of sources including the term	Positive	% Relevant usages	Negative	% Relevant usages
Relatedness	-	-	-	-	-	-
Access	1	50	-	-	-	-
Associated	1	7	-	-	-	-
Common	2	14	-	-	-	-
Commonality	-	-	-	-	-	-
Communicate	2	14	-	-	-	-
Communication	1	7	-	-	-	-
Community	9	50	1	100	-	-
Social	2	14	-	-	1	100

Table 6.7: Relatedness summary – Duolingo official publications

In Chapter 7 I will explore these results. On initial reading, it appears that there is some superficial awareness of motivation among the Duolingo creators, without the depth that SDT provides, suggesting the usefulness of the proposed taxonomy as a way to systematise the design decisions behind a gamified site.

6.3.5 Sentiment scores

We saw in section 6.2.5 that a useful way to compare the different evaluations I have conducted is to create a sentiment score from the results of this analysis. In this case, a sentiment score will allow for ease of comparison for the official publications, leading towards an answer for **Research Question 3**. Figure 6.10 summarises the feeling expressed towards the three SDT constructs in the official publications, while Figure 6.11 shows the overall attitude towards the two specified terms from the same sources.

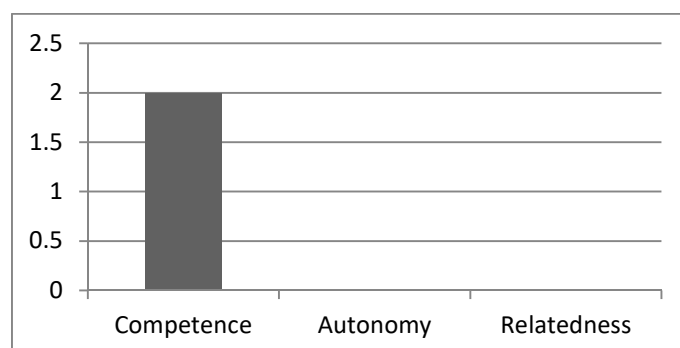


Figure 6.10: Duolingo ranked per component: sentiment scores for official publications

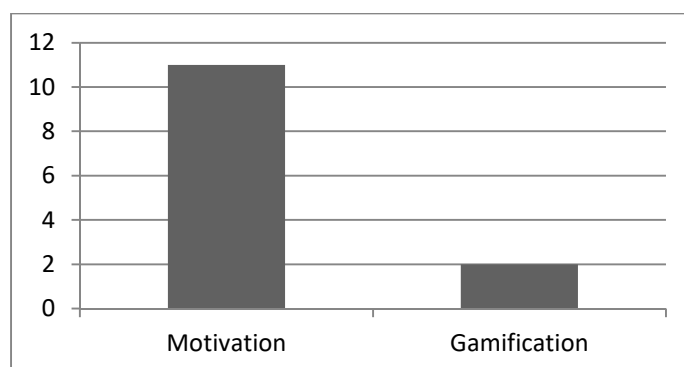


Figure 6.11: Sentiment scores for Motivation/Gamification: official publications

6.4 Conclusion

In this chapter we have seen the results from the Content analysis conducted on texts isolated from the users of Duolingo and the designers of the language-learning platform. The site's Discussion forums were interrogated for examples of user discussions concerning motivation and related issues, using synonyms as set out in section 3.5. Sentiment scores were created, based on the number of instances where said synonyms were used, and, once determined to be relevant, whether or not that usage was positive or negative. As a result, usage of terms derived from the word-part "motivat*" (motivate, motivation, motivating, etc.) returned a negative usage 59% of the time they were used relevantly, while the word "gamification" was referenced positively 61% of the time.

The three terms arising from the SDT approach to understanding motivation, Competence, Autonomy and Relatedness, were searched, along with synonyms. Among the texts derived from the users in the Discussion forums, Competence achieved a sentiment score of -49, Autonomy -12, and Relatedness +51. The term Competence was not used in a relevant manner itself, but the synonyms "knowledge" (81%) and "skil*" (78%) were used in a majority positive way. The overall negative score, however, was brought about because of the use of the synonyms "fluency" (77%) and "progress" (59.5%), which cancelled out the positive usages of the other synonyms.

Like Competence, the term Autonomy was not used directly in the Discussion forums. However, the two synonyms "choice" (87.5%) and "choose" (67%) were overwhelmingly used negatively, thus resulting in the sentiment score of -12. The term Relatedness was the only one of the three to return a positive sentiment score, in spite of its use also not being specific. Although the synonym "communication" was used negatively (67%), the two terms "communicate" (82%) and "community" (79%) held higher sway over the eventual results.

The results from the Content analysis on official publications from the Duolingo team were much less definitive. High scores in relation to percentages of negative and positive uses are misleading, due to the very small number of uses overall. Where usages of "motivat*," "gamification," "fluent," "skil*,"

and “community” were 100% positive, in many cases there was only one use of each word altogether, and the same for the 100% negative use of the word “social.” Sentiment scores were produced, but at +2 for Competence and its synonyms, and zero for both Autonomy and Relatedness, they were not deemed useful. Of more interest is the fact that so few of the words were present in the official publications at all.

In the following chapter, Chapter 7 Discussion, these results will be analysed from the perspective of determining the level of awareness of motivational issues on Duolingo for both the users and the designers of the website.

Chapter 7: Discussion

7.1 Introduction

Chapter 5 showed that the survey of gamers was very useful in sharpening my observations on the proposed taxonomy. By including the interpretations of a group of self-selected gamers (Oates 2006), I have access to an expert group, whose reflections on their own experiences improve the framework greatly. The ensuing graphs denoting the utility of the various elements are extremely beneficial for giving an overview of which elements a gamification designer might wish to choose once they are familiar with the target behaviours required of their system. Thus, **Research Question 1, “How are game elements related to motivational constructs?”** is addressed in the discussion around the results of the survey and the resultant updated taxonomy, in section 7.2.

In Chapter 6, the results of the Content analysis allowed some surprising findings to emerge. The fact that Duolingo is a proprietary website meant that I had limited access to the Discussion forums, so the representativeness of the user sample may not be as robust as I would have hoped. However, from the sample analysed, I am able to draw inferences which point to some interesting observations. One example is that all of the following particularly relevant terms were used in predominantly positive discussions:

- gamification;
- capacity;
- knowledge;
- proficiency;
- communicate;
- community.

On some level, there are game elements being used well in Duolingo in terms of motivating factors, however it is clear from the results that some aspects of the design of Duolingo are leading to dissatisfaction with the game elements as motivational affordances. Section 7.3 contains discussion of these results and their implications for answering **Research Question 2, “Can the framework profile SLA systems consistently with the users’ stated motivational perceptions of the system? ”**

Similarly, the Content analysis which took place on the Duolingo official publications resulted in the following terms emerging as the most commonly occurring words:

- motivation;
- skill;
- access;
- community.

With so few terms present, this would seem to suggest that an awareness of these motivational issues is not important to the development company behind the site. In section 7.4 these results are discussed with the following question in mind: **Research Question 3, “*Can the framework profile SLA systems consistently with the system’s declared motivational intent?*”**

7.2 Survey

In order to strengthen the assertions behind the proposed taxonomy, I accessed the opinions of gamers through the survey concerning game elements’ utility as potential motivators, as outlined in Chapter 3: Methodology (section 3.3). The results of these survey responses are analysed in the following sections.

7.2.1 Demographics

The survey responses (section 5.2.1) suggest a population who is highly engaged in playing games, and therefore well versed in knowledge of the various game elements to which they have been exposed, and more likely to be well able to comment on the types of motivation they feel when playing these games. A total of 97.2% of the respondents self-identified as having played games between 5 years and more than 10 years, with no single respondent answering that they had played games between 0-2 years. This suggests gamers who are predominantly male, highly interested in playing games *regularly*, and have shown a *sustained* interest in gaming for a long period of time, especially as 77.6% of the respondents fall into the 10+ years category. This confirms that the respondents have self-identified as motivated gaming experts and fits with the exact types of target behaviours many designers of gamified systems are looking to engender.

7.2.2 Differences arising out of the survey

After examining the level of agreement regarding the usefulness of the various game elements in affording one or more of the motivational constructs, there are four main differences between the proposed taxonomy and the revised taxonomy, as presented in Table 5.1.

- The framework went from 16 – 18 game elements, with *two new elements added*:
 - Audio effects [seen as fulfilling all three motivational constructs];
 - Realistic graphics [seen as fulfilling Competence and Relatedness].
- The fulfilment of *Competence* is:
 - Confirmed in 12 out of 14 cases:
 - with Avatars and Discussion forums being removed;
 - Added to three elements:
 - Audio effects, Teams and Realistic graphics.

- The fulfilment of *Autonomy* is:
 - Confirmed in five out of six cases:
 - with Discussion forums being removed;
 - Added to seven elements:
 - Achievements, Audio effects, Boss fights, Collections, Combat, Content-unlocking, Points and Teams.

- The fulfilment of *Relatedness* is:
 - Confirmed in ten out of 12 cases:
 - with Badges and Virtual goods being removed;
 - Added to three elements:
 - Audio, Combat and Realistic graphics.

Although there are numerous changes, the high number of confirmations suggests that the initial conjectural analysis was effective, and also that it was conservative. None of the game elements were shown *not* to contribute to one, two or three of the motivational constructs, new game elements were added, and the majority of link changes were additions rather than removals:

- **Competence** 3 added: 2 removed
- **Autonomy** 7 added: 1 removed
- **Relatedness** 3 added: 2 removed.

The additional elements and links serve to refine the initial conjectural analysis, making the framework more holistic in nature. The breadth of elements offered, and the different ways in which they can serve to foster a sense of motivation, suggest that designers may be able to utilise the framework as an effective design tool. Figures 7.1, 7.2 and 7.3 (Figures 5.6, 5.7 and 5.8 from Chapter 5) list the elements found to be useful for Competence, Autonomy and Relatedness respectively, thereby allowing designers to decide what types of elements they might most look for in achieving their specific systems' motivational needs. 15 out of 18 elements were found to be useful in facilitating Competence, 13 for Autonomy, and 13 for Relatedness. Depending what mix of skills and feelings a designer wishes to engender in a system's participants, these elements may be added to facilitate those feelings, bearing in mind their need to be integrated with other elements.

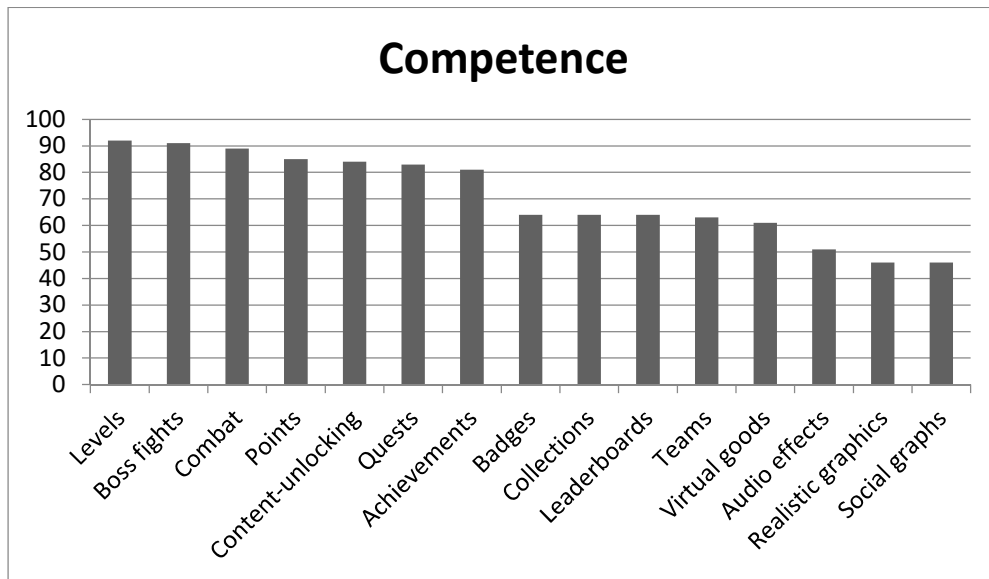


Figure 7.1: Level of agreement on game elements which facilitate Competence

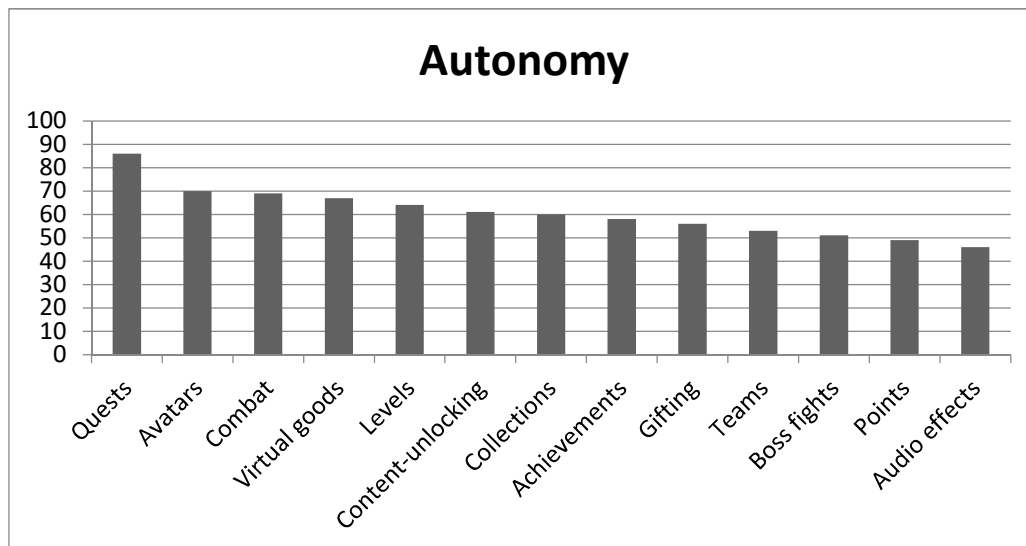


Figure 7.2: Level of agreement on game elements which facilitate Autonomy

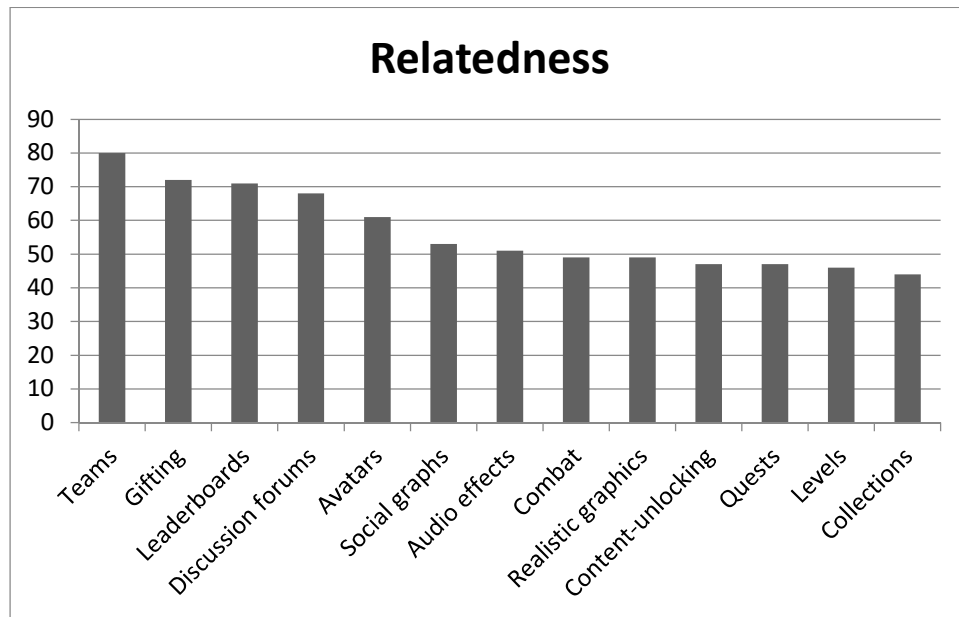


Figure 7.3: Level of agreement on game elements which facilitate Relatedness

7.2.3 Survey: Key findings – Likert scale questions

From this section of the survey, a number of interesting findings emerge, as presented in Table 5.1. The top three elements across the respective motivational constructs are Levels (Competence: 92%), Quests (Autonomy: 86%) and Teams (Relatedness: 80%) (see Figure 5.5). A gamified system that included each of these three elements should, in theory, be successful at fulfilling each of the three motivational needs. I give an illustrative example in section 7.2.3.3.

In addition, four elements were added to the survey following the feedback phase: two as distractors, which I hypothesised would not be useful; and two after discussion with the pilot group, who felt that they would be useful additions. As a result of noting the levels of agreement as to the elements' usefulness, one of the distractors was included: Realistic graphics; while one of the suggested elements, Audio effects, was included. Haptic effects, a suggested element, and Reminders, another distractor, however, were both discarded (see Table 5.1).

Seven elements were found to facilitate all three constructs of Competence, Autonomy, and Relatedness. Table 7.1 takes the results shown in Table 5.1 and presents these elements separately, highlighting their respective percentages of agreement across each of the motivational constructs, followed by an average of the three levels given as an indicator of their usefulness as motivationally salient game elements. This average figure could serve as an initial indicator of the best game elements to set about trying to include in a system, if it fits with the target behaviours for which the designers are aiming.

Element	Competence	Autonomy	Relatedness	Average
Quests	83	86	47	72
Combat	89	69	49	69
Levels	92	64	46	67
Teams	60	53	80	64
Content-unlocking	84	61	47	64
Collections	64	60	44	56
Audio effects	51	46	51	49

Table 7.1: Game elements which fulfil all three constructs, according to the survey

The fact that the gamers felt that these seven elements were useful for all three constructs suggests that, where possible, they could be highly effective elements to implement into a gamified system, in order to afford a sense of satisfaction of the motivational needs of the participants, and should therefore be considered by designers. The usefulness of such multi-functioning elements also comes into play in the example in section 7.2.3.3.

A further 10 elements were judged to be under 50% useful for facilitating a particular motivational component, with Realistic graphics achieving only 46% for Competence and 49% for Relatedness, and not being judged as being useful for Autonomy. With numbers as low as this, once again we see that perhaps this is not a very useful element, which may explain why it was not in the original lists, and in future work, its usefulness could be further probed. Of those 10, six were in the Relatedness component, suggesting that this is the most difficult to support as a motivational construct, that this is an area where designers need to work very hard to support participants. Teams, as the element with the highest level of agreement as regards Relatedness, is an element designers ought to try very hard to work into their designs.

7.2.3.1 Competence, Autonomy and Relatedness

The gamers felt that a wide selection of the game elements in the survey offer the possibility of fulfilling Competence, with 15 out of the 18 gaining a majority of votes in their favour. Of the 15, the average agreement rate was 70.9%, with the highest at 92%, for Levels, and the lowest agreement being 46%, for both Realistic graphics and Social graphs. The high number of game elements which promote a sense of Competence tallies with the findings of Koster (2005) and Deterding (2011c) who suggest that it is in the mastery of skills that games are their most compelling and fulfilling. In addition, both of the two extra elements that were added to the revised framework after the survey, Audio effects and Realistic graphics, were seen by the gamers to be useful for facilitating Competence.

We have seen that Autonomy is “the feeling of volition that can accompany any act” (Ryan & Deci 2000a, p. 74). Autonomy increased from six out of the 16 original elements I identified, to 13 out of the revised 18. For the gamers involved in the survey, it is clear that many more elements are linked to the sense of fulfilling Autonomy than originally envisaged, however, these 13 elements had an average agreement rate of only 60.8%. This suggests that there was not a *strong* link between these elements and Autonomy, implying that they may not be particularly effective in engendering that motivation. Only Quests stood out as being particularly useful, receiving the highest agreement of 86%. The importance of Quests for the other constructs too, reinforces the importance of this game element.

There was a large number of elements that survey respondents felt were useful for facilitating a sense of Relatedness. At 13, this was a similar number to the original assessment, but the average approval rate was only 57.2%, suggesting that no one element in particular seemed to fill the respondents with any strong enthusiasm as being most useful for this purpose.

7.2.3.2 ‘PBL’

The “triad” of Points, Badges and Leaderboards (Werbach & Hunter 2012, p. 69), cautioned against for their overuse in gamification, and shown as the three most commonly cited elements across the literature (Table 2.1), returned some noteworthy results, as we saw in Table 5.1. Only Points came out of the survey with any high degree of value from the gamers, achieving 85% in terms of facilitating Competence. With Autonomy and Relatedness not rated by the respondents as being facilitated by Points, this goes some way toward understanding the wariness surrounding them from some critics (as, e.g., Robertson, 2010).

Badges, used extensively across gamification, achieved a rating in only one of the three constructs, with 64% usefulness for Competence. Other elements: Achievements, Boss fights, Combat, Content-unlocking, Levels, Points and Quests, received a much higher level of support from respondents as to their ability to afford participants the sense of Competence, all receiving 81% or more of the respondents’ votes. It would seem that designers of gamified systems may have to watch for badge fatigue and be sure not to overuse this feature, if they wish to promote a sense of Competence.

Similarly, Leaderboards were not rated as affording a sense of Autonomy, and received 64% for Competence. 71% of the respondents felt that the function of Leaderboards in the affording of a feeling of Relatedness to participants is their most useful feature, perhaps pinpointing where their efficacy lies. In the assessment, I found that Social graphs allow players to compare their performance with others, and are therefore similar to Leaderboards. However, with Social graphs, the groups with whom comparison is possible are restricted, i.e. Teams or communities. The survey results confirmed the assessment of this element, but with lower percentages of agreement than for Leaderboards.

Leaderboards achieved agreement of 64% on Competence, whereas only 46% agreed on Competence for Social graphs. Similarly, on Relatedness, Leaderboards were voted 71% useful, while Social graphs only 53%. My assertion from this is that Leaderboards' utility is largely in their ability to relate a player's position *to other players*, and Social graphs may quash this ability in that the position is only able to be seen by other members of the player's chosen group. This challenges the utility of Social graphs as facilitating Relatedness, which is the opposite to the hypothesis.

7.2.3.3 *Integration of elements*

It is perhaps most useful to view using elements in an integrated way. For example, Boss fights fulfil Competence (91%), but are not rated as fulfilling Relatedness. They can, however, be used to unlock Content, which has a rating of 47% for fulfilling Relatedness. Unlocked Content can allow a player to Level up, and Levels have been rated as having a 46% utility for Relatedness. In all three cases, the rating for Competence is high (Boss fights 91%; Content-unlocking 84%; Levels 92%), and all three fulfil Autonomy to some degree (Boss fights 51%; Content-unlocking 61%; Levels 64%), so the idea of cross-component utility is strong in their use together. If Teams and Quests were designed to work together, all three of the constructs would be very highly supported, with Teams offering 80% on Relatedness, while Quests, at 83% for Competence, and 86% for Autonomy, would address the motivational needs covered by the other two constructs. Comparing elements across the constructs in this way, and in how they can be used together, could be very useful for a designer.

To illustrate this idea further, it is useful to recall the notions of the interrelationships between game elements expressed in Figure 4.1, where some game elements are “*Activities*,” and these lead into “*Rewards*.” If we merge these with an awareness of which of the three constructs are present (*C, A, R*), we are beginning to see the ways in which the framework could be used.

For example:

- in a four player game where everyone has an **Avatar** (*A, R*);
- two **Teams** (*C, A, R*) could work together, against the clock, to solve a language-based **Quest** (*C, A, R*).
- If the **Quest** were to involve the **Teams** crossing a pond, for example, where every stepping stone was an image which needed to be identified by text naming the picture in the image in the target language, and each correct answer gave the **Team** a **Point** (*C, A*), we can see a broad covering of the three *constructs* already occurring, and with **Quests** and **Teams** coming from the “*Activities*” category, and **Points** coming from “*Rewards*,” the *integration* of elements which makes them more satisfying to players is also happening.

- If all **Team** members were to gain enough points by making it across the pond to progress up a **Level** (C, A, R), we are therefore:
 - fulfilling all three constructs;
 - utilising all three of the game elements which accrued the most agreement for each of the respective constructs; and
 - we are choosing elements from the two categories of “*Activities*” and “*Rewards*,” thus introducing progression.
- With **Virtual goods** (C, A) being awarded when three **Levels** have been reached;
- **Gifting** (A, R) could also be introduced;
- or those **Virtual goods** could be used to enhance the **Avatar**, in order to show other members of the game community identification and involvement with the game, and a sense of empowerment with the choices being offered.

Beginning to design game systems in this way, remembering that I am advocating an *iterative* process of design (Hunicke et al 2004), could be seen as a good place to start, when designers are hoping to catch every participant’s interests.

7.2.4 Survey: Key findings - Short answer section

The final section of the survey gave respondents the option of commenting on whether there were other elements I may have overlooked. The question respondents were asked to answer was:

*What game element not already listed would you include as most closely associated with
[component]?*

One of the reasons for this was to find any new elements that experienced gamers felt were associated with any or all of the constructs of SDT. It was possible that the literature had overlooked certain elements which were prevalent in games, and an investigation of the respondents’ ideas could add further to the proposed taxonomy. As an additional side effect, some of these short answer responses contained terms that could be used as synonyms, for element names and/or the constructs they afford, which would be able to help in the Content analysis.

The answers which arose in this section, as originally presented in section 5.2.5, fall into three categories:

1. Terms covered by existing elements;
2. Terminology and labelling;
3. Additional observations.

In each case, terms appeared in this section which had been mentioned already, in spite of the wording of the question. These terms, and similar words such as “rank” for “Levels” were seen as repetitions of these concepts and were thus gathered in category 1. In some cases, the terminology I had chosen, as for example “Quests,” obviously did not meet with the respondents’ needs, so that, in this example, much of the discussion turned to “narrative” or “story,” which I had originally felt was encompassed in the term “Quests.” These responses are thus discussed under category 2. Finally, there were numerous additional answers which referred to concepts and elements that only came up once, and these are discussed under category 3.

In the case of Competence, as we see in Figure 7.4 (originally Figure 5.9), 12 terms were used more than once in these short answers, which were provided by 65% of the respondents.

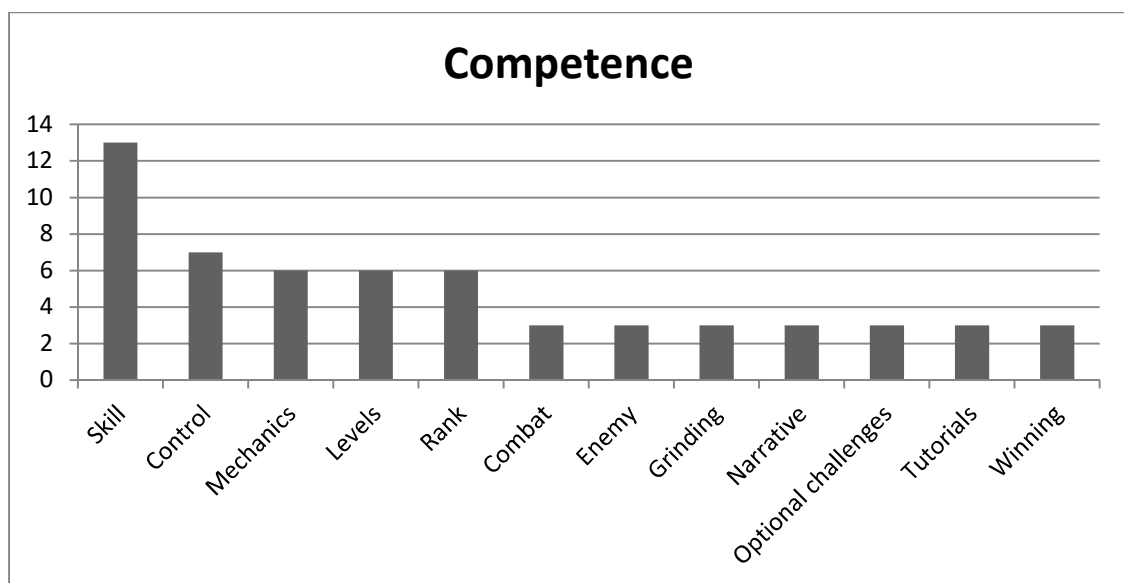


Figure 7.4: Percentage of elements not previously mentioned - Competence

In the case of Autonomy, 67% of the respondents answered, with 10 terms mentioned, as we see in Figure 7.5 (Figure 5.10).

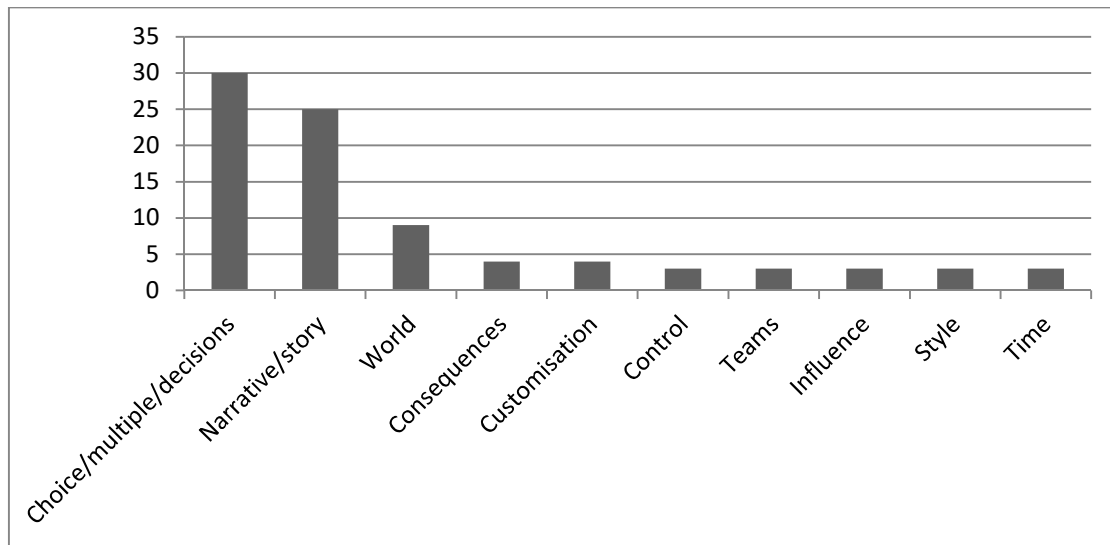


Figure 7.5: Percentage of elements not previously mentioned - Autonomy

As we see in Figure 7.6 (Figure 5.11), seven terms were used more than once in these short answers, which were provided by 60% of the respondents.

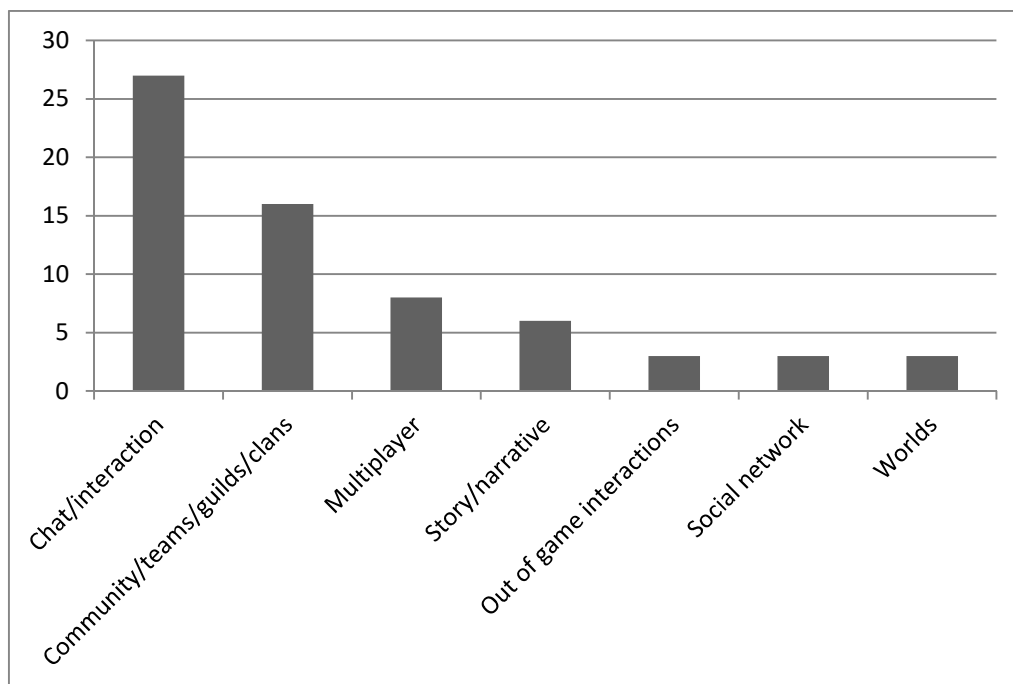


Figure 7.6: Percentage of elements not previously mentioned - Relatedness

7.2.4.1 Terms covered by existing elements

Under the component of Competence, the terms “levels” (6%) and “combat” (3%) came up, in spite of both being present as elements in the survey already. Participants could have been thinking of very specific uses of the terms, which they were unable to articulate in the space they were given for this purpose. In fact, these can be partially explained by the survey not having the list of already assessed game elements up on screen when the question was asked, a design issue that should be rectified in replications of this work. Nevertheless, their inclusion here reinforces their importance as elements,

unsurprising when we recall their inclusion as two of the elements seen to fulfil all three of Competence, Autonomy and Relatedness.

The use of the word “rank,” which occurred in 6% of the Competence responses, refers to features which are covered under the elements of Levels and Leaderboards. Levels actually denote a player’s *rank* in the game, and Leaderboards can be seen as offering a:

ranking ladder system

[Survey short answer response].

In this way I argue that they are covered by the survey already. Similarly, the 3% of Competence answers which referenced an “enemy” are covered by Boss fights and Combat, which require players to engage in some kind of fight with an enemy.

Under Autonomy, 30% of the responses dealt with choice, including mentions of the word “decisions” and “multiple” because of their relationship to choices to be made in a game. One respondent said:

making meaningful choices about how your character, world, civilisation, etc. develop, which impact on the way the game develops

[Survey short answer response].

This directly references the kinds of design decisions found in the literature, and although not giving an actual element to implement, underscores gamers’ desire to see this need for Autonomy being supported. The concept of choice is higher-level than the elements I was aiming for here, although the inclusion of Avatars, Quests and Combat all point to the importance of offering choice to players. It is interesting that so many respondents referred to this idea in this section, as so many of the game elements were selected by the gamers as affording a sense of Autonomy. It is, nevertheless, a very important consideration for designers, as players who feel that they are exercising choice will be afforded the chance to make those “interesting decisions” (Alexander, 2012) that game designers say are so necessary in a good game.

The concept of “customisation,” mentioned under Autonomy in 4% of responses, is also relevant to the choices given to a player when creating or updating their Avatar, because that provides for a player to personalise their gaming experience. Again, the returned wording here refers to a concept above the level of game element, in that customisation can refer to Avatars, Quests, or simply the path taken through a game. Similarly, in spite of Teams being a named element, 3% of the Autonomy comments,

16% of the Relatedness comments, and one response under Competence mentioned terms which are covered by that element.

7.2.4.2 Terminology and Labelling

7.2.4.2.1 Skill

Variations on the word “skill” were mentioned in 13% of the Competence responses. The mastery of skills is very closely related to Competence, and currently the proposed taxonomy does not explicitly include any element which would be an exact fit with the description given by one respondent, of:

skill-based gameplay

[Survey short answer response].

A “skill” is a generic ability that could well be addressed by some of the elements actually present in the survey, and the capability of mastering a skill is implied in elements such as Content-unlocking or Levelling up. However, another limitation of doing an online survey is the inability to explain such connections to respondents to clear up any misconceptions. Integrating the word “skill” into a game element could perhaps be considered more deeply if further studies are conducted in the future, especially as “skill” or its derivatives is also the term found most often in the Content analysis conducted on the Duolingo Discussion forums (see section 7.3). Further work could also determine which game elements afford the opportunity to players to show their skills, and thus be renamed, or reframed, to highlight this aspect of their efficacy. For example, Content-unlocking could be presented as ‘gaining access to restricted resources through demonstration of a skill.’

7.2.4.2.2 Narrative

It has been said that:

a game is a narrative system in which the narrative experience of the player arises out of the functioning of the game as a whole

(Salen & Zimmerman 2004, p. 419).

“Narrative,” or “story,” were mentioned in 3% of Competence responses, 25% of Autonomy comments, and 6% Relatedness. In the sense that a Quest can often be used to progress a narrative thread in a system, I included narrative under Quests. It is, however, understandable that that connection may have been missed, and the fact that narrative is not one of the elements is something which clearly needs revisiting. Although not mentioned by large numbers of respondents, it nevertheless appeared in each of the short answer sections, so it needs further investigation, and could be a key to successful gamification.

Considering the crossover between these terms and some of the usages of “multiple” and “decisions,” in some of the responses, the actual number of comments relevant to the use of narrative could be even higher. Some merely mention the idea of story, where others are specific, talking about:

meaningful variation in a narrative

[Survey short answer response].

Others are looking for a:

non-linear story structure

[Survey short answer response].

Offering choices and bringing a deeper level of meaning to a game by involving the players in its story world are clearly important to gamers, and this term “world” also came up in 9% of the comments on Autonomy, sometimes as an “*in-game world*,” or an “*open world*”. Choices about the following were mentioned:

- the design of the world;
- locations within it;
- places to explore;
- and the impact of a character on the “*game world*.”

None of the game elements I included speak to this idea of a specific, user navigated/explored world. Quests offer choices in terms of places to explore, and reasons to explore, but none of the other elements really reference this concept. It is notable that so many of these answers reference choice, narrative, and indeed choice *in* narrative, and this shows that this concept of a story world is one that is very important to those who play games.

Also referenced under Autonomy were “*multiple storylines; multiple endings;*” and “*multiple paths;*” all of which reference choice, but also feed into the ideas expressed around the use of “narrative” and “story.” Clearly, in its application to “*in-game choices*” and its use to set learned content into the memory of the learner, narrative has an important part to play in games which needs further investigation. It is curious that narrative did not arise as a lower-level feature in the literature; perhaps it does not lend itself to gamification in education, unless it is in the sense of a narrative being introduced as gamification of *content*, rather than structural gamification (Kapp, 2012). Further exploration of this would be beneficial.

7.2.4.2.3 Discussion forums

In the initial assessment, Discussion forums were the element that I see as being particularly useful for facilitating the ability for players to chat or interact with each other. In the survey responses, only 68% agreed that Discussion forums were useful in supporting Relatedness. In this short answer section, 27% of the responses mentioned communication in one form or another, clearly showing that they felt it was missing from the elements, and that Discussion forums do not work to fulfil it. In these responses, gamers mentioned “chat rooms,” “voice comms,” “in-game communication,” and “messages,” and say that communication with another player can affect how you see that player:

great player but incredibly rude on audio

[Survey short answer response].

Additionally, one response suggested the importance of:

creating a community around a single game or genre of games

[Survey short answer response].

In my assessment, that is precisely what Discussion forums are set up to do, so there is a clear discrepancy between my more theoretical view, and the views of the gamers. Some of the other comments mentioned related terms, talking about “teamplay,” “guilds” and “clans,” while one response, coming from a different angle, caught my attention:

not sharing certain information with player, leading to them searching/asking others

[Survey short answer response].

This response was very different from the others in this section. Here, a player is being forced into communicating because they need information to progress in the game. If this information is *not* given, the player *must* find a space to ask for it. Although it is not an element itself, this is a very interesting idea that could be utilised in a game or gamified system, if communicating with others is a target behaviour for that system.

There was one negative comment in this section:

in game chats – are they worth it or are most people just there to spread useless spam and not contribute to the team

[Survey short answer response].

This sentiment, ironically, also comes up in one of the Discussion forum threads under Content analysis, as discussed in section 7.3. The reluctance of gamers to agree to the usefulness of Discussion forums while simultaneously demonstrating a clear interest in what I see as their function raises the question of whether the name I have given the element is correct. It is possible that this element may need to be renamed, maybe to something more generic such as “Chat function,” or “inter-player communication.” This would, however, seem to be a level up from the concrete elements of the original proposed taxonomy, and suggests that perhaps this is another possibility for future work: that there could be two tiers of game elements – the concrete elements, and these higher-level elements.

7.2.4.3 Additional observations

The words “control” (7%) and “mechanics” (6%) came up in a total of 13% of the Competence responses, with “control” referring to a “*single button*” or other physical aspects of gaming, and the “mechanics” mostly concerning high-level design facets, for example, the:

complexity of gameplay mechanics

[Survey short answer response].

“Control,” was also mentioned under Autonomy, and appears there to be about the physical side of playing too, and therefore outside the scope of this work. The example of:

in game settings – how a game allows you change your controls to maximise either comfort, utility or a combination

[Survey short answer response],

suggests an interest in design and physical considerations that are not relevant to this study, as the goal here is to describe concrete elements which can be put into non-game contexts.

“Grinding,” or low-level repetitive tasks, came up in another 3% of cases, as did “optional challenges,” “tutorials” and “winning.” It is true that I did not mention grinding: in fact without looking up a definition it was certainly not immediately clear what the respondents meant. Perhaps the notion of grinding is a high-level concept that could perhaps be a “trigger” (Fogg, 2009) for the awarding of some of the concrete elements already in the survey, such as Points or Achievements. Optional challenges would be covered under any element which offers the *choice* of participation or not, although the idea of a “challenge” is certainly something which could be integrated more into a good design, but would presumably be covered by the same types of elements that would feed feelings of Competence. The aspect of choice, however, comes under “Autonomy” for us, but for the respondents these ideas are naturally linked into the elements they like, and in fact this signposts how specific elements can serve to be useful in the fulfilment of more than one of the motivational constructs.

Tutorials are an interesting addition, as they feel somewhat incidental to a game, in that onboarding and description of game concepts is usually done within the action (see, e.g. Prensky, 2003; Gee, 2014). Again, where respondents are not given the opportunity to offer lengthy explanations of their points, it is not always clear what they mean, a limitation of surveys. Indeed, one comment in the Autonomy section seemed to contradict this idea, as a respondent suggested the importance of:

playing throughout a game without consulting any walkthroughs or guides in general
[Survey short answer response].

This type of contradiction pinpoints the importance (and difficulty) of designing for different types of players at different points in the system (Bartle, 1996; Kim, 2011; Deterding, 2011b; Robinson & Bellotti, 2013).

The one respondent who replied very simply with the single word, “*winning*” could very well have provided us with a way to see the difference between games and gamification. It is not clear that there is always, or indeed ever, a win state in gamified systems. The “win” is assumed to be the activity which has been gamified (e.g. learning a language in Duolingo), but that is very hard to quantify.

Of the further 25% of responses under Competence which mentioned a unique feature, many were directly related to terms already offered in the survey. However, two responses were particularly interesting:

1. Ability to increase difficulty of challenges such that deep strategic choices are required
[Survey short answer response].

This answer:

- references the need for challenges to be *difficult*, in order to engender the sense of mastering a skill;
- mentions the fact that that difficulty needs to be *increased* to keep interest;
- talks also about choice, not just in a meaningful way, but using the term “*deep strategic choices*” implying a level of thought and concentration that speaks to total engagement.

This response shows a high level of analytical thought about games and how they motivate the respondent as a player, clearly mirroring the findings across the literature, and reminding us of the

importance of iterative design decisions which keep revisiting the selection of elements and the ways in which participants will engage with those elements.

2. Time it takes to play a game

[Survey short answer response].

An unusual take on the concept of Competence, in that it was only mentioned by one respondent, but one which stands to reason, as a highly competent player will presumably finish a game more quickly than someone struggling with it. The idea of timing a game, or bringing in timed constructs, could perhaps be examined for its utility in this area. Similar considerations occurred under Autonomy (3%), with the mention of the:

duration of a game

[Survey short answer response].

“The idea of using time as a motivator” (Kapp 2012, p. 49) is used to great effect in games, and choices over whether or not to play a timed game could be one very powerful method for affording players a sense of Autonomy. This is another, high-level consideration, which could be worked into any further work based on the proposed taxonomy.

With “consequences” being mentioned in 4% of Autonomy responses, and “influence” and “style” both coming up in 3% of instances in the same section, none of these terms had widespread occurrences. However, the idea of consequences for actions is an interesting slant on a system giving feedback, and although not an element, it is something which can be held in mind when designing. This is another example of where the language is muddy, as it could be argued that feedback and consequences are interchangeable, and neither can be included as a specific game element, but as the *quality* of what an element delivers to a game system. In addition, feedback and consequences are directly associated with Content-unlocking, Levelling up, and several other of the game elements already identified.

The related ideas of:

personal influence on gameplay

[Survey short answer response];

and:

style of play

[Survey short answer response],

hint at some compelling notions around the ways in which different people play and the effects the different elements have on them. Again, these do not directly name an element, but talk more generally about how Autonomy could be supported in a game or gamified system.

Only 6% of the Autonomy responses contained terms used only a single time. One way Autonomy could be supported, according to one gamer, is by utilising a:

first person point of view

[Survey short answer response],

thus giving the player a graphical representation of that feeling of total choice over their game world. Another gamer suggested the use of “*morals*,” implying that the introduction of moral questions may bring the chance to explore the psychological consequences of major moral decision-making into a game, where these decisions can be thought through in a safe, failure-proof environment. This type of design feature could serve to fulfil a player’s sense of Autonomy, hopefully lead to high levels of engagement, and could offer an absorbing immersiveness that captures the transformative essence of game-playing that so many designers feel is missing from gamification (see, e.g. Salen & Zimmerman, 2004; Bogost, 2011; Ferrara, 2012b).

The opportunity to play with other players, bringing a different, more social kind of experience to a game, is mentioned by the 8% of responses under Relatedness that use the word “*Multiplayer*.” Such an approach would certainly support Relatedness, and could well be integrated into a language-learning gamified platform. The two terms “*Social network*” and “*worlds*” both appear in 3% of cases, talking about how a “*good social network aspect*” can enhance a game, and how “*shared worlds*” can create a sense of “*affinity*” among players.

A further 11% of the total mentioned a unique feature, three of which were covered by Avatars, Audio effects and Reminders. Some other ideas such as customisation have been discussed in other parts of this section, while still more raise some interesting questions, as for example:

sense of connection with character

[Survey short answer response].

This brings in a whole new realm of connectedness, where it is not the *community*, but the *persona being adopted* to which the player feels the affinity.

7.2.5 Recommendations with respect to game elements for gamified system designers

Seven elements emerged out of the survey as highly effective for facilitating Competence:

- Levels (92%);
- Boss fights (91%);
- Combat (89%);
- Points (85%);
- Content-unlocking (84%);
- Quests (83%);
- Achievements (81%).

Four of these seven: Levels; Combat; Content-unlocking and Quests; also fulfil all three constructs, with Levels, Quests and Teams also coming out on top in terms of the level of agreement among survey respondents for the respective motivational constructs.

Two elements, Audio effects and Realistic graphics, were added to the revised framework. Neither featured in the original proposed taxonomy, but the feedback group felt they should be included, and the survey respondents supported this. In both cases, the results were not convincing, however it does seem that the sounds and the aesthetic (Flatla et al, 2011; Kapp, 2012; McGonigal, 2014; Schell, 2014) of a game, important in the literature, are also of some importance to gamers, and therefore must be given detailed thought by designers where appropriate.

Discussion forums were included as game elements due to their usefulness in gamified systems, however, this survey of gamers would suggest that Discussion forums are, indeed, not seen as an integral part of games. We saw in section 4.2.2.8 that Discussion forums are useful in gamified systems as a way in which communities can be formed (Stack Overflow, 2008; Quora, 2010; Duolingo, 2012; Ramirez & Squire, 2014). Section 7.2.4 looked at the short answer questions answered as part of the survey, and discussed how some of these answers might explain why Discussion forums do not feature highly in the gamers' attitudes towards elements, and that perhaps if they were renamed I might have had more success in their being recognised as good motivational affordances, because it is my contention that they are, in fact, extremely useful with respect to fulfilling the aspects of SDT.

Quests came out of the survey with a very high level of agreement with the conjectural analysis, with 83% agreeing that they are of average importance or very important for feeling Competence, and 86% feeling the same towards their affordance of a feeling of Autonomy. Still a majority, but markedly less, 47% felt that Quests facilitated Relatedness. This suggests that Quests should be implemented more in gamification, as they are obviously a useful game element for promoting a sense of motivation. Although I offered the descriptor for Quests as: “specific tasks which act as goals and can further a *narrative* thread in a game,” it would appear that many of the respondents did not necessarily agree with this assessment, and felt that “narrative” was missing from the elements, as we saw in section 7.2.4.3.1.

Narrative emerges as a central aspect of games which I had not considered in the proposed taxonomy. It is clearly of importance to gamers, and exists in the literature (Salen & Zimmerman, 2004; Dickey, 2007; Reeves & Read, 2009; Brathwaite & Schreiber, 2009; Schønau-Fog & Bjørner, 2012; Seaborn & Fels, 2015). In the literature, however, it is quite a dispersed idea not clearly delineated in the lists of elements, and not apparent as such an important item at this concrete level, until highlighted in the survey responses. In future work based on this proposed taxonomy, its inclusion would be highly recommended.

After discovering the importance placed on “narrative” by the gamers in the survey, I searched for the term in the Discussion forums, despite the fact that it is not a term that is referencing motivational issues. It occurred only once, and was used in a linguistic discussion. It is unsurprising that narrative would not arise as a concept in the Duolingo Discussion forums, due to the fact that the gamification elements used in Duolingo are structural, rather than being part of the content (Kapp, 2012). The nature of the language-learning taking place on Duolingo currently does not lend itself to being integrated into a narrative as it is presented in separate skill chunks, not delivered as a story. This highlights the fact that, although narrative is clearly an important part of games, even the most popular of game elements are not always appropriate in different game-types. Perhaps, in order to address this deficiency, the designers of Duolingo may need to consider the introduction of some type of narrative elements across their site.

In the literature, we saw that there are key social actions to be fulfilled in gaming (Kim, 2011), and the importance of such social features in gamification is that they permit “the user to interact with others” (Robinson & Bellotti 2013, p. 3). In addition, they can offer feedback and tangible rewards (Werbach & Hunter, 2012; Fitz-Walter, 2015; Seaborn & Fels, 2015). The element of Teams was seen to be the one with the best chance of helping to build Relatedness, but even this had only an 80% level of agreement on its usefulness. Relatedness is about communication and relationships with others. Elements that create “social contexts (which can) provide experiences that satisfy universal human

needs” (Przybylski et al, 2010, p. 154), are most useful for this sense. Leaderboards (72%) and Gifting (71%) were the only other two elements which received higher than 70%, and both of these were found to fulfil a second construct in addition to Relatedness.

We have seen that the *integration* of elements is important, and if we look at Avatars, for example, they support Autonomy (70%) when there are choices offered to a participant from which to decide how to make the Avatar appear. Content-unlocking has only a 61% agreement level for Autonomy, but if these choices are connected with content that not all participants have access to, they can feed further into this sense because the choices will be imbued as “meaningful” (Salen & Zimmerman, 2004; Ferrara, 2012a). With Content-unlocking having been given a rating of 85% utility in facilitating Competence, this sense may also be fulfilled when Avatars are used in this way, given that the survey respondents did not feel that Avatars fulfil a sense of Competence on their own.

Likewise, Combat (69%) is only useful for fulfilling Autonomy if there is a choice for a player to fight or not to fight. The elements, therefore, are not clear-cut, and are “situated” (Deterding, 2011b) in their particular context and usage, meaning that a list of game elements can only ever function as a starting point in the design process, and this type of comparison is deeply important if the right mix is to be found.

7.2.6 Limitations to survey

A number of issues arose in the running of the survey, some to do with surveys in general, and others, problems that became obvious once I undertook the analysis. It is important that I look at these “potential weaknesses in the study design” (Easterbrook et al 2008, p. 306) in the hope that I have addressed them.

Sometimes, “the validity of a questionnaire can be affected by the wording of the questions it contains. But even if individual questions are valid, a poor sequencing of questions or confusing structure or design of the questionnaire can all threaten its validity” (Gray 2009, p. 375). With this in mind, I tried to achieve “a tight match between (our) questionnaire and what (we) are trying to research (Gray 2009, p. 375).

There were times, however, when the results appeared to show that this balance was not right. As we saw above, there were occasions where respondents did not seem to have fully understood the questions I was asking, with one case in point being the repetition of game elements specifically referenced in the questions when respondents were asked to list elements that had not been previously mentioned. A listing of the game elements on the screen that assessed this question would probably have negated the possibility of this happening, if this study were to be repeated.

Unfortunately, the nature of online questionnaires is such that they are delivered in an impersonal manner, not allowing for any discussion either of the concepts I have listed, nor the concepts the participants are trying to explain. There is, therefore, some room for interpretation error. However, in comparing the results of the survey with the conjectural analysis undertaken to produce the proposed taxonomy, this has been addressed.

Related to this problem is the amount of space I was able to give respondents to answer the longer questions. One respondent mentioned privately after finishing the survey, that he was looking for some way to offer more qualitative answers. The survey did not permit this type of response until the final three questions, but even there, these were still quite controlled questions. The depth of the respondents' answers could perhaps have been complemented by more space for qualitative answers, or qualitative interviews. In a similar vein to this, the question arises whether the respondents were rating how much they *liked* an element, rather than its usefulness, and the only way to control for this would be explicitly to ask respondents to rate elements first, and then to comment on why they think they like them. Perhaps respondents could be asked directly, as in this survey, or it could be left for more open responses, which may overcome some of the inherent difficulties I encountered with this research measure. Unfortunately, this was not foreseen as a risk.

Receiving only 107 responses in total, with four unusable because the participants were under 18, meant that the potential representativeness of the sample is limited. This is a problem for online research in general, "mainly because certain demographic segments of the population may be under-represented or simply not represented at all" (Gray 2009, p. 247).

As I have argued, however, those who did participate form a self-selected group of gamers (Oates, 2006), whose opinions are valued because of their high level of experience, and therefore the responses can be "used to generalize from that sample to the population" (Easterbrook et al 2008, p. 298). There is still the possibility that another cohort of gamers: those who are not inclined to volunteer, are not represented in this survey.

This is also true for women gamers who were severely under-represented in this cohort. The gender question showed that I had a 77.6% response rate from males, with that number possibly rising to 81.3%, if we take into account the "humorous" responses given as short answers. According to Grubb (2014), men make up only 52% of gamers, meaning that the survey results would have been much stronger if we could have attracted more answers from female gamers.

In addition, I did not ask the gamers what genres of games they played. As we found in the literature review, game elements often go by different names across the different genres. In spite of the short descriptors offered per element, it is clear from the results of the short answer section that not all participants understood the naming conventions I was using in this instance. This raises the related problem of keeping surveys short by avoiding information overload. In this instance it was felt that the descriptors were clear enough for the majority of respondents to understand, however, some of the responses would indicate that perhaps this assessment was not right for everyone.

We intuit that, for some genres, certain elements would be highly effective, such as Haptic effects in genres which require movement and activity. These same effects, however, would not necessarily be useful in a language-learning environment, for example, where movement is not important to either the learning or the gameplay. This type of information could be invaluable to gamification designers if we consider they are often not from the world of game design (Robinson & Bellotti, 2013).

It is also possible that the *existence* of an element in a game or gamified system will not necessarily produce the results intuited for it. We have seen that game elements work best when integrated together, and there are other factors which may affect an element's utility as a motivational affordance. These could relate to the frequency of its usage, how prevalent it is as an element, and whether or not the game element is being used as an opportunity for learning (in the case of Competence-related elements) or an opportunity for boasting about one's skill level. These nuanced observations could be teased out in any further studies based on the analysis.

7.3 Duolingo Discussion forums – Content analysis

In using Content analysis, I was looking to find evidence to answer **Research Question 2**, “*Can the framework profile SLA systems consistently with the users' stated motivational perceptions of the system?*” I needed to investigate usages of terms which refer to the three aspects covered by SDT, so I could build up a sense of how much Duolingo users perceive that motivational issues relevant to their use of the site, are present and positive. Once I had this picture, I could use it to compare with the previous evaluation. I analysed Duolingo to see what game elements were present, and in what way they afforded the three constructs of Competence, Autonomy and Relatedness.

The protocol was applied to the identified terms and synonyms in the texts, as set out in Chapter 3: Methodology. Once establishing that the term was in English, its use was not linguistic, and in the case under study the word was being used in relation to motivational issues on the Duolingo site, terms were noted for their positive or negative usage (see Appendix C for the protocol). In this way, I would be able to measure the overall attitude of the users to the various motivational constructs that SDT states

are necessary for experiencing a sense of intrinsic motivation, and look for consistency with the percentages arising out of the evaluation.

If we consider that in my assessment, Competence was well supported in Duolingo, with 60% coverage across the elements, the expectation would be that the results from the Discussion forums would show that Competence was also of importance to the users. In fact, Competence received a sentiment score of -48, with 55% negative comments, including some comments which were overwhelmingly negative, such as “fluency” and “progress.” According to the evaluation, Autonomy is afforded by 61.5% of the elements in Duolingo, and, at -12, its sentiment score suggests the users of site do not feel it is well afforded. Relatedness, with 61.5% support across the elements in the evaluation, achieved the highest sentiment score from this Content analysis, with +51. Five terms were used positively across 78-100% of their relevant usages, including the word “community,” which was used positively 79% of the time.

Figure 7.7 sets out the instances of positive and negative usages across all the relevant comments, and shows a very interesting pattern. Terms that were used positively across the forums were used in almost directly opposite numbers in a negative sense, and vice versa. The results indicate that I am getting a unified picture across the users, and show that an overall sentiment score, taking all positive usages (318) and subtracting them from all negative usages (360) would give a value of -42, thereby suggesting that, from the perspective of the users, motivational constructs are not well supported by Duolingo.

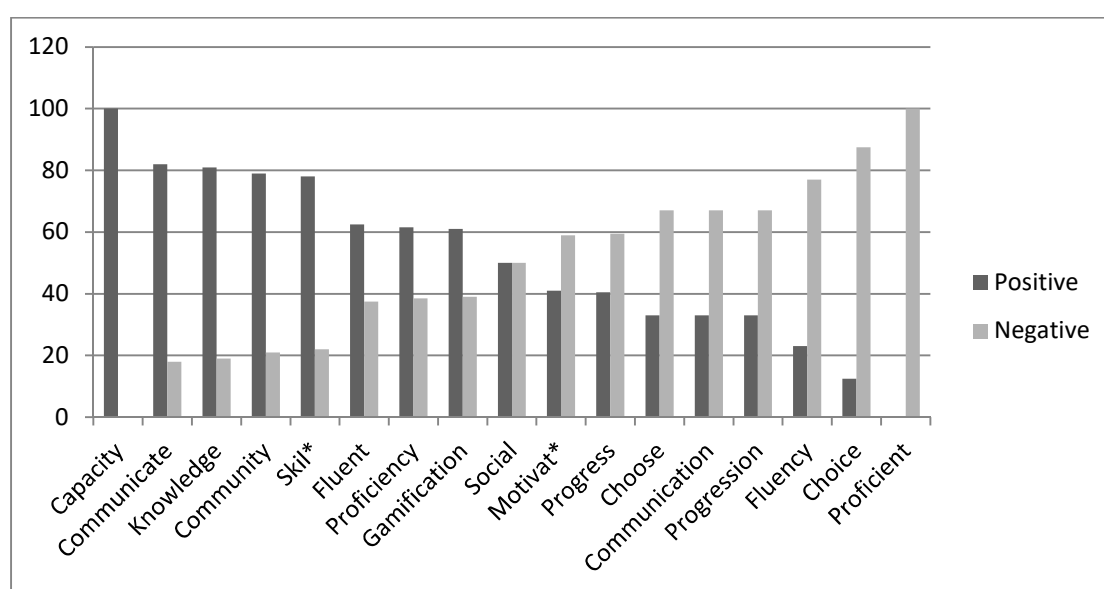


Figure 7.7: Percentages of relevant usages: Positive + Negative – Discussion forums

7.3.1 Content analysis: Key findings – Discussion forums

In looking for a way to create profiles for Duolingo users so as to answer **Research Question 2**, “*Can the framework profile SLA systems consistently with the users’ stated motivational perceptions of the system?*” I accessed the Duolingo Discussion forums. These Discussion forums are open for any user,

regardless of how long they have been on the site, and anyone can start a discussion, about anything at all. I chose to search for the three terms from SDT, along with synonyms for each. Once I had conducted an analysis of the search terms, I summed for a sentiment score for each component.

7.3.1.1 Competence, Autonomy and Relatedness

On Competence, four terms emerge as key. The term which occurred most frequently across the Discussion forum threads, for all three motivational constructs, was “skill” (or its derivatives), at 17.1% of the threads, and this had 78% positive usage. “Skill” was also the most commonly used term in the short answer section of the survey, suggesting that this is a deeply important aspect of games to those who play them. The term with the most positive usages in the Competence category was “knowledge,” at 81%, and both terms sit well with the theories in the literature, discussing the ways in which games reward the mastery of skills and the building of knowledge (see, e.g. Koster, 2005). The overall sentiment score for Competence, however, was -48, and this was influenced by the high number of negative occurrences of the words “fluency” and “progress.”

Autonomy as an idea came up much less often across the Discussion threads. The two synonyms “choice” and “choose” appeared in 18.9% of the threads, with both being used negatively in a majority of cases. This created the sentiment score of -12, suggesting that users do not feel Autonomy is well supported in Duolingo. “Choice” was also the most commonly used term in the short answer section of the survey dealing with Autonomy, and the high number of negative references here suggest that Duolingo does not embody Autonomy well.

The usage of synonyms for Relatedness resulted in the highest sentiment score of the three constructs, coming in at +51. The term “communication” had the highest negative usage, with 67%, but this was balanced by 82% positive usage of the similar word “communicate” and 79% positive usage of the word “community,” which occurred in 9.2% of the threads. “Community” was the second-most used term in the short answer section of the survey on Relatedness, where it was clear that Discussion forums themselves did not seem to satisfy this need among the gamers. Further detail on these key findings will be provided in the following sections before I draw these observations together, so as to provide an answer to **Research Question 2**.

7.3.1.2 Factors influencing the Competence sentiment score

The most commonly used term found under the Competence strand was the word “skill” or its derivatives. 78% of the relevant usages were positive, often being used to talk about the way the different parts of the site work to increase learners’ linguistic skills. Many of the comments offered advice to other users, about how the site can best be used to develop skills (and by extension, competence in a particular language), as per example:

*the most important **skill** is to communicate*

[Duolingo user: 1].

Where the comments were negative, they related to the types of skills that users feel the site does not promote well, such as:

*speaking and listening **skills***

[Duolingo user: 2].

“Capacity” and “proficient” were each used only once, thus giving, respectively, a 100% score in terms of positivity or negativity, which is not a particularly useful indicator of attitudes across the population. However, the next most positive usage came from the word “knowledge” (81%). According to these messages, the act of wanting knowledge is a positive motivator. The following comment sums up the positive usages of the word in these threads:

*What I like about Duolingo: The structure of the language tree is absolutely great. I really does take you through the full range of language grammar and structure, from beginner to advanced level. It gives you the framework and **knowledge** to continue to learn. The game format is great too. Setting goals, maintaining streaks and trying to finish the tree is very motivating, and really helps maintain focus on learning over long periods of time [sic]*

[Duolingo user: 3].

This comment references many aspects of the ideas I am researching here, showing that for at least some users, Duolingo, and by extension gamified language-learning, is definitely getting something right in its mix of motivational strategies.

However, as the numbers show, the majority of comments found under Competence and its synonyms returned a negative score. Two terms stand out particularly: “fluency” (77%) and “progress” (59.5%). Fluency is a particularly pertinent idea when discussing a language learning website, as this is the target for most people in learning a second (or subsequent) language. Presumably, a site promoting the learning of languages would aim for its users to achieve fluency. Fluency appeared in 4.4% of the message threads overall, and the negativity seems to centre on the fact that users want fluency, and achieving that fluency is most definitely a motivator, but not achieving it is affecting that motivation adversely. One user says:

*they are claiming that is real **fluency**, not only Duolingo. We know that is wrong*

[Duolingo user: 4].

Many of the comments are similar to the negative comments found under the word “skill” in that users are suggesting that their learning experiences on the site are not broad enough to gain fluency. This affects a user’s long term motivation, as they do not feel they are progressing in their skill knowledge, and therefore in the real-world use of the language.

That very word, “progress,” also comes up in 7.9% of the message threads. While perhaps not immediately obvious why the word progress would be associated with the idea of Competence, a game cannot be completed unless a player progresses through skills and levels. Points, Levels, Leaderboards, and many of the other game elements which give feedback are there to show a player their progress in the game, and the 40.5% of usages in the threads that are positive show that progressing is a motivator, even if a user plans to progress slowly, as is exemplified in this comment:

*I've been taking a weekly test to help measure my **progress** and it's a big positive for me*

[Duolingo user: 2].

The majority of the usages, however, are negative, with many commenters talking about how discouraging it is, for example, not to see progress:

*something similar happens to me with 100% consistency. whenever I test out a german skill and I still have a couple lessons left, Duolingo does that (skips the last question going back to the main page without any message, reward or **progress** whatsoever). It's as if I've cancelled the test. Right after that though I can do the same test again and it does work [sic]*

[Duolingo user: 5].

*My problem is that my weak words aren't actually strengthening after the practice session. I took a word count and i have 369 words with one bar of strength. After three practice sessions is was still left with 369 words with only one bar of strength. Sometimes i will revise a word several times in a session and then when i look in the word list it still has only one bar of strength. Its really discouraging when you cant see the **progress** being made [sic]*

[Duolingo user: 6].

*I want this!!! I have NO indications of points anywhere. And today I hit my 364 day streak and wanted to share with my friends about points and levels, but I find NO indication of my **progress** anywhere. Kind of makes me wonder why I'm bothering to keep this up at all*

[Duolingo user: 7].

In a site that is promoting the gaining of new skills and the development of proficiency in languages, these types of comments indicate that for some users the way in which certain elements work is detracting from those users' sense of Competence. As the last comment intimates, such dissatisfaction could well lead to participants abandoning the site.

Although neither term, "fluency," nor "progress," came up in the survey, "skill" was the top response in the short answer section. Commentators have signalled that it is in the mastery of skills that games are their most fulfilling, and the survey responses confirm that game elements which promote Competence are important to gamers (Koster, 2005; Deterding, 2011c). While this is true of the Duolingo users as well, there is an indication that this sense is not being fully supported in Duolingo, this is causing concern to some users, and this could be a deficiency in Duolingo's design.

Our own evaluation of Duolingo, based on the proposed taxonomy, suggested that Competence would be supported on the site, with 60% coverage, however the difference of opinion over the potential for external motivators to detract from an individual's intrinsic motivation certainly comes into play with the negativity displayed in the Discussion forums regarding the Fluency shield and the Progress bar. Future work could separate out different *types* of Competence elements:

- ones like the "*tutorials*" mentioned in the short answer section, which allow a player to discover *how to be* competent;
- ones like Achievements, which acknowledge when a player has *become* competent;
- ones like Badges, which allow a player to *show* when they have become competent.

The Fluency shield and Progress bar would fit into the Achievements category: it would seem that to serious gamers, attacking the game feature which marks a person's progress in the game is akin to attacking the person themselves. An observation such as this, particularly aimed at designers who are not familiar with games (Robinson & Bellotti, 2013), would seem to be of invaluable help in designing a gamified system.

7.3.1.3 Factors influencing the Autonomy sentiment score

"Autonomy" as a word was mentioned only once across all the Discussion threads in the analysis, and was not used in a manner relevant to a conversation about motivation. The synonym "choice" came up in 10.1% of the threads, and was thus the most commonly used of the terms in this branch of the analysis. In the literature we saw the great importance of providing "meaningful choices" (Salen & Zimmerman, 2004; Ferrara, 2012a), and the apparent absence of this manifests in the 87.5% negative mentions of "choice" in this analysis. Some comments berate the lack of choice in general:

*your **choices** are limited*

[Duolingo user: 8];

*many people want more **choices**, because the things our money can "buy" are kind of useless*

[Duolingo user: 9].

Others attack the illogical nature of the choices that are provided:

*you have the **choice** to get outfits using lingots (at least if you are learning french)... But I don't understand what's the point of doing that? What do you gain? [sic]*

[Duolingo user: 10].

The attitude displayed in the question “*what’s the point of doing that?*” signifies very clearly the importance of the options being offered to participants being meaningful. Even if elements offering choices are included in a system, the sense of Autonomy will not be supported if the choices to be made are perceived as pointless.

The synonym “choose” also occurred across 8.8% of the message threads. The 67% negative comments show that the inability to choose on an aspect of the site is demotivating, and one commenter even went so far as to say:

*make the word tile mode harder, I'm seeing questions requiring two word answers e.g. 'The manager' and just three tiles to **choose** from, two of which are both 'the', one capitalised, the other not. **That's not teaching anything***

[Duolingo user: 11 (my emphasis)].

This small sample of Duolingo users is mirroring the findings of the survey, and their comments seem to reflect a perception that Duolingo does not support Autonomy well overall. This could also be a deficiency in the design of Duolingo, and I shall return to this point in my discussion to answer **Research Question 2**.

7.3.1.4 Factors influencing the Relatedness sentiment score

The synonyms associated with Relatedness are the only terms which produced an overall positive result in this analysis. The term “community” appeared in 9.2% of the threads in the Discussion forums, and was used positively in 79% of its mentions. As I have argued previously, it is in the emerging community of practice (Lave & Wenger, 1991; Li et al, 2009; Annetta, 2010) that Duolingo works at its most exciting, with the contributions to the Discussion forums constructing a repository of wit,

wisdom and camaraderie around language-learning that is of immense benefit to its users. The majority of the comments paired the word community with the word “great,” or made statements such as:

*I know! Isn't this **community** just lovely! Feeling so welcomed here :)*

[Duolingo user: 12].

The positive attitude towards the community on Duolingo could be summed up in this one comment:

*one of my favorite sayings is "sharing is caring" and that is why I love this **community** and the Duolingo staff so much => [sic]*

[Duolingo user: 13].

The positive usage across the forums suggests that Relatedness is very well supported by the site, especially in relation to the word “community.” After the terms “chat” and “interaction,” “community” was the next highest answer in the short answer section of the survey, so this is clearly an aspect of games and gamification that is of high importance to users, and explains its sentiment score of +51.

7.3.2 Limitations

We have detailed in Chapter 3: Methodology the problems around getting access to the Duolingo forums, and the lack of randomness regarding the messages for analysis. In the comments found on the search for the word “fluency,” I came across a comment from a moderator, which clearly spelt out the problems about gaining access to Duolingo information:

will you share the exact algorithm? The boss says no

[Duolingo user: 14].

However, in following the advice of Oates (2006) and accessing 1000 message threads out of the 1 million+ on the forums, I have accessed the number of threads which should give a representative sample. When dealing with content from a proprietary website who would not reply to my requests for scholarly access, the selection process for identifying those 1000 message threads could, unfortunately, not be more random.

Additionally, I do not know, nor have any way of knowing, what percentage of users post on the Discussion forums. Even in this small sample under study there are some users whose names appear again and again, but without knowing the nature of the algorithm used by the site to select these “random” messages, I do not even know if this is a representative sample of people posting from across the site.

In the short answer section of the survey, one of the gamers suggested:

in game chats – are they worth it or are most people just there to spread useless spam and not contribute to the team

[Survey short answer response].

In a similar vein, it is possible that the most vocal people on internet forums are the ones who wish to complain, going some way towards explaining why so many of these comments appear to be negative.

In searching for the synonyms, I was also inadvertently caught up in two particular conversations which may have skewed the results somewhat. In the search for the term “fluency,” 54% of the occurrences related to a gamification feature introduced by the Duolingo development team called the Fluency shield, meter or score, and about which 85% of those posts were negative. Duolingo developers introduced this feature to measure a learner’s fluency, with no open discussion around how this number was calculated, or how it related to “real-world” fluency. It replaced another, very popular feature, the Progress bar, and there was no choice given to users as to whether or not they kept either the Fluency shield or the Progress bar.

Overall, the huge negativity around the Fluency shield relates back to the literature and the idea of external motivators working against motivation, especially when arbitrarily added to or deleted from a site (see, e.g., Deci et al, 1999; Deci et al, 2011; Ryan & Deci 2000b; Deterding, 2012b). It seems that the sudden introduction of the feature, seen as an imposition, detracted from users’ Autonomy, and the seemingly random nature of the allocation of the score felt like “controlling feedback” (Deci et al 1999, p. 629). Rigby (2014) suggests offering rewards for engagement rather than performance, and in tying the fluency measure to performance, the problems seem to show that the developers have caused “harm” to participants in its rollout (Hecker, 2011).

The fact that 77% of the mentions of the word “fluency,” on a language-learning website, are negative, could lead an observer to understand that the users do not believe they will become fluent by using the site. While this may be a true assessment of these comments, the concentration on the specific Fluency shield feature could be dominating this conversation in a way that makes the results less conclusive.

Similarly, I searched for the word “progress” as a synonym for Competence, and arguments about the removal of the feature called the Progress bar could also have biased the results. 38% of the comments using the word “progress” were directly to do with the removal of the Progress bar, with 73% of those comments being negative. This resulted in 59.5% of the overall comments on “progress” coming out as

negative. Once again, these results are not necessarily wrong, in the sense that the negativity around the removal of a feature *does* affect users' motivation, and also speaks to the fact that the designers may not be sufficiently cognisant of this aspect of feeding into the psychological wellbeing of their users. Indeed, they seem to have taken away a highly competence-associated game element, illustrating designers' need to be informed on motivational constructs. Another commenter made it very clear that players do not like having their choices taken away:

*I'm not clicking on set a goal because I'm **terrified** of getting into something that I won't be able to change (like on memrise where they randomly take away your choice and then you get stuck with your last selection for "number of items to learn per session"...)*

[Duolingo user: 15 (my emphasis)].

This could relate back to Dörnyei's observation that rewards should be a "*lasting* visual representation" (2001, p. 130 [my emphasis]). Once a user has engaged with a feature, it appears to be troubling to them to lose that feature, especially if they feel it happened without any sense of consultation, and as we see here, this can have a detrimental effect on their sense of motivation.

The highest occurrence of any of the terms for which I searched was only 17.1% of the message threads. It may be that perhaps the search terms are too specific, but this is problematic in that I *am* searching for something specific, so it is difficult to know in what manner I could have controlled for this. Another problem could be simply that most users might not be aware of the kinds of motivational issues I am researching. Some users are highly aware; one commenter said explicitly:

we are being treated like laboratory rats to find out what motivates us

[Duolingo user: 16].

7.4 Duolingo official publications – Content analysis

As we saw in the discussion of the first part of the Content analysis, in order to answer **Research Question 3**, "*Can the framework profile SLA systems consistently with the system's declared motivational intent?*" I am looking for consistency in attitudes across the findings. The sentiment scores for the Discussion forums gave some insight into how the beliefs of the users compared with my own evaluation, but a similar analysis of the official publications is not possible from the official publications examined.

Specifically, very few key-word instances were identified, so a profile of Competence, Autonomy and Relatedness from the perspective of the system's designers could not be legitimately developed. One reason for this is the lack of meaningful PR documentation generated about Duolingo by its development team (see section 7.4.1).

The lack of terms related to SDT here suggests a lack of knowledge of one of the mainstream, accepted motivational theories and its constituents, from a set of designers who espouse motivation. This implies a lack of knowledge as to how to achieve motivation according to this theory. Hence the argument for a systemised framework that allows designers to direct themselves towards effectively utilising game elements towards motivation in gamified systems. This work is a first step in this endeavour although it does seem like there are certain attributes such as frequency, centrality, desire, enablers, illustrators and time which may also be useful additions to the framework.

7.4.1 Limitations

The most obvious problem with this analysis is the number of the texts which were available. As a company, Duolingo is obviously private about its information, and although some members of the development team have a high media profile, on analysing their words at this level, there is very little given away. Numerous attempts were made to contact members of the team on their very many public sites and using social media avenues, but in spite of one small series of email exchanges, this contact did not extend very far. Von Ahn is a confident and prolific communicator, giving a TED talk (von Ahn, 2011b) and appearing multiple times on Reddit's AMA series (von Ahn, 2012b; 2013c; 2014b; 2014c; 2017), however, upon deeper reading, there is not much substance to the publications to which I was able to gain access, and very little in the way of the terms for which I was searching.

Anyone in business will promote their projects in a positive light, so it is not surprising that the majority of the comments I did find were positive. These are public comments, advertising a website and attempting to gain a following for it. It is significant that there was some awareness of motivation, as it shows that this is very probably part of the design process, but the results are too limited to show much of any use.

7.5 Additional findings

In undertaking the Content analysis, I searched for two extra terms, in addition to those from the SDT theory of motivation. The first term was "motivation" or derivations thereof, and the second was "gamification." I was curious to see whether or not there was discourse directly discussing motivational issues, and, similarly, the level of awareness of the gamification of the site.

We subjected the two terms to the same protocol as the other terms which made up the Content analysis (see Appendix C for the protocol). In the Discussion forums, "motivat*" occurred in 6.4% of the threads, while "gamification" was present in 1.3%. In the official publications, "motivat*" was present in 57% of the documents, while "gamification" occurred across 14% of the texts. In Figure 7.8 I have compared just the positive mentions. In contrast to the analysis of the SDT words and their synonyms

in the official publications, these results appear to show a totally positive attitude in general towards these issues from the Duolingo team. The results from the Discussion forums are more complex, with “gamification” being used positively in a majority of cases, but “motivat*” proving more problematic. Sentiment scores in this instance are not particularly useful, because, once again, the numbers occurring are so small. However, I present them for reference’s sake:

- “motivat*”: **Discussion forums** +33; **Official publications** +11;
- “gamification”: **Discussion forums** +6; **Official publications** +2.

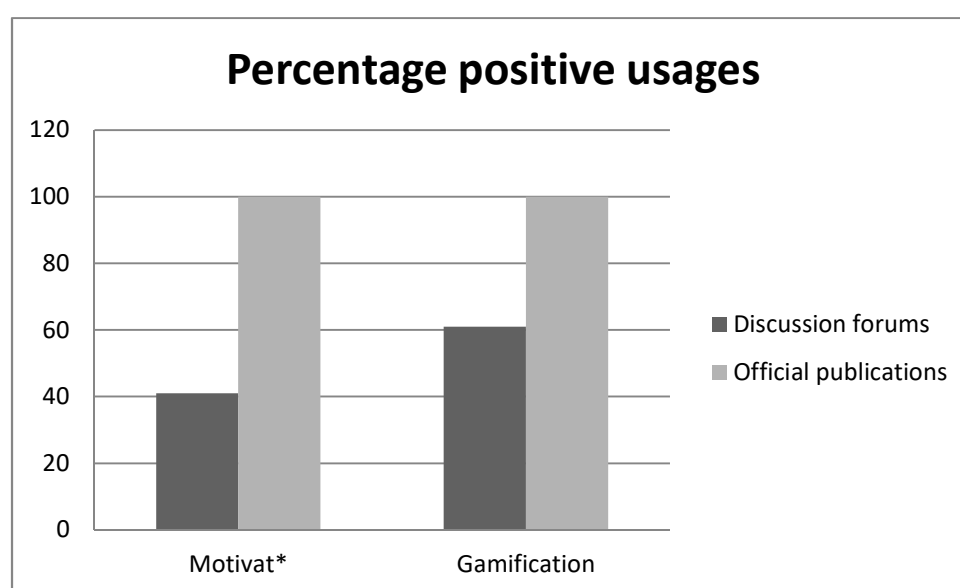


Figure 7.8: Positive usages across the two analyses

7.5.1 Motivation

7.5.1.1 Discussion forums

With 249 units containing the term on the Discussion forums, the overall attitude was bound to be more complex than in official publications. 75% of those usages were relevant, with 59% of these being negative. As with previous findings, much of this negativity related to the removal of particular game features, and is therefore consistent with the literature. In one example we see a user say:

when I first started with duo I was obsessed almost, but the withdrawal of the heart motivator, when i was in sight of finishing, lessened the joy and i fell to just one lesson a day[sic]
[Duolingo user: 17].

Another user discusses the lack of flexibility for users around the way features are administered:

I had a family emergency yesterday and forgot to do my lesson or use the freeze, and didn't realize it till this morning. Subsequently, I lost my ~145 day streak (after doing the same thing last fall and losing a ~90 day streak). Now, if I skip today, who cares? I am less motivated, period

[Duolingo user: 18].

However, nearly half of the comments about motivation were positive. One comment in particular seemed to capture that much of what is done on the site is experimental, and that users ought then to be more patient:

Duolingo is connected to a University's graduate program. But, that's never been a secret. And when you realize that this motivational research is going towards improving how well Duolingo works... we're basically helping ourselves by being part of these experiments, and helping future Duolingoers as well. As someone who has been on Duolingo for (longer than) 388 days, I much prefer today's Duolingo to when I first started. Hundreds of experiments between then and now using my data along with millions of other users contributed to the improvements. And I've been in plenty of the failed test groups as well as a few big successes. So, hopefully you can appreciate that the aspects you most enjoy were in part the fruit of my own frustrations in the past. ^ ~ [sic]

[Duolingo user: 19].

The implication here is that things will go wrong, but that the creators of the site are listening, and attempting to change things for the better. Not all users seem to agree. This is further reconfirmation that the design of such a gamified system is iterative, and the existence of a framework such as the proposed taxonomy would be a useful checklist for this ongoing process.

7.5.1.2 Official Publications

In the official publications, the observations made via the analysis of the SDT terms are turned upside down. Every time the word motivation (or its derivatives) is mentioned in a relevant context, it is used positively, and 45% of the mentions reference a particular game element, making the site “addictive” or “game-like” so as to influence motivation, or are using the word “fun.” In one comment we see that these issues are of high importance to the team:

we spend a lot of effort making Duolingo addictive - - we think the hardest part about learning anything on your own is motivation

[Duolingo official publications].

This suggests a much higher level of awareness of these problems, and interest in solving them, than the Content analysis of the SDT terms in the official publications showed.

Of the particular game elements referenced directly, it is interesting to note that the controversy around the Fluency score has made it to the development team. Where much of the discussion from the users was negative, however, the official word is that:

the fluency meter is extremely motivational

[Duolingo official publications].

Without the opportunity to delve into the decision-making processes behind these features, it is impossible to examine this more closely, but given the disagreement on the forums about this very feature, it seems that there is some disconnect between the team's idea of what is “*motivational*” and what the users experience. It is curious, however, that it is a feature about which there is a direct comment. This suggests a much closer understanding of the various features on the site than the Content analysis appeared to show, regardless of whether the users agree or not, and a recognition that these features have a specific effect upon user behaviour.

7.5.2 Gamification

7.5.2.1 Discussion forums

As gamification is a new concept, not widely known about outside certain environments, it was not clear whether there would be much awareness of the term across the Duolingo users. Duolingo users who commented about gamification appeared to be very conversant with games, game elements, and their contribution to making users feel motivated to play on the site. Some were highly positive:

love this service - the whole gamification angle is brilliant!

[Duolingo user: 20];

some were extremely knowledgeable:

actually the whole premise of the "gamification" is to help make learning language more fun by making it more like a video game, wherein the player is motivated to accomplish goals in the game because the player is playing the game

[Duolingo user: 21];

and still more were philosophical:

gamification is arguably the main reason Duolingo is successful, and that careful balance between gamification and learning is what keeps it that way

[Duolingo user: 22].

For some, however, the ways in which gamification were *not* being used were demotivating:

so, where's the gamification going? Is it something that is being eliminated in favor of a scholastic drill drill drill system? [sic]

[Duolingo user: 23].

In addition to the specific posts bemoaning the loss of loved features, or the imposition of unfathomable new elements, general posts were made looking for further improvements in the use of elements for behaviour change:

personally, I also think there's more that could (eventually) be done to make the points and levels more meaningful and improve the gamification

[Duolingo user: 24].

Here, again, we have the emergence of the word “meaningful,” an idea which is clearly of very high importance to many people using both the site itself, and involved in games in general.

7.5.2.2 Official publications

On Duolingo itself, the claim is made that this is “gamified learning” (2012), and the official publications say that there is:

gamification poured into every lesson

[Duolingo official publications].

Each mention found in the official documents was positive, and on the forums, a majority of 61% of usage was also positive.

7.5.3 Insights

The results from these additional findings show that the users’ observations on motivation were consistent with the literature, particularly in relation to the notion of external motivators being potentially damaging to intrinsic motivation. In that sense, these findings did not show anything markedly different from the synonym-based search. In addition, the users appeared to be aware that Duolingo’s team is experimenting with different ways to motivate its users. The official publications, however, show a higher level of awareness of issues around motivation in the comments around these terms than in our synonym searches. This suggests that, unlike our findings from those synonym searches, there is some recognition of the importance of motivational issues from the design team.

However, there does appear to be some dissonance around some of the elements in use on the site, as is shown, for example, in the relation to the Fluency Meter.

In terms of using the word “gamification,” there is very little direct conversation on the Discussion forums, but the distinction is made, just as in the literature, regarding the need for any such gamification to be “meaningful.” This does not appear to be reflected in the use of the term in the official publications, where although the word “gamification” is alluded to regularly, its use feels somewhat superficial. It is not entirely clear that the design team’s knowledge of the ways in which gamification can work towards improving the motivation of users of the site.

7.6 Conclusion

In this chapter I have examined the results from the different research strands undertaken. The differences between the original proposed taxonomy and the version updated from the observations arising out of the survey are shown to be quite close: where they differ it is in the addition of extra elements and constructs. The initial analysis, therefore, stands as useful, and only improved in its depth via the additional observations.

From the survey, we have seen that the warnings about the overuse of Points, Badges, and Leaderboards (Werbach & Hunter, 2012) seem to be supported, with seven game elements seen by the gamers as facilitating all three of the motivational needs, and none of Points, Badges or Leaderboards featuring in this list. The seven most useful elements according to the survey were:

Audio effects	Collections	Combat	Content-unlocking
Levels	Quests	Teams	

Levels, Quests, and Teams were also the three elements which gained the highest level of agreement for their ability to afford the motivational constructs respectively, across the three.

Twelve elements were found to be present in Duolingo, including three from the list of seven, above. This should have suggested that Duolingo users were afforded many opportunities to experience a sense of satisfaction across the three constructs. However, in the analysis of the Discussion forums, the sentiment scores show -48 for Competence, -12 for Autonomy and +51 for Relatedness. From this we can see there are deficiencies apparent, particularly in relation to the fulfilment of Competence. This could have been unduly influenced by the negativity around the removal of the Progress bar and its subsequent replacement with the Fluency measurement, but it is still a warning to the developers of Duolingo that there are problems in their approach which could be solved by the application of this

proposed taxonomy. The fact that Relatedness is so well supported is another aspect that could be developed further in any future work.

Another finding from the research is that the integration of elements, ensuring that they are able to work together, should foster more facilitation of the three constructs, as well as adding meaning to the choices developers offer participants in their systems. The results from the Duolingo official publications are too small to be conclusive, suggesting that designers do not have the awareness needed in order to develop systems which speak to the motivational concerns of their participants. In this way, a systematised design framework would be of great use.

It is clear that perhaps the framework needs to become more nuanced, in that the mere presence or absence of an element does not totally delimit its utility as a motivational affordance. Further work which connects an element's frequency of use, and the ways in which it is integrated with other elements would serve to improve the observations from this chapter.

Chapter 8: Conclusion

8.1 Introduction

Educators are constantly looking for ways to motivate learning. We have seen that people sometimes experience being “amotivated” to do something (Ryan & Deci 2000b, p. 60), and educators are often tasked with challenging that lack of motivation, and having to encourage students to strive to learn, against their will. Games have been shown to be “captivating” places to learn (Malone 1981, p. 334), because in games, “learning isn’t forced upon” players (Prensky 2003, p. 2).

With the development of gamification, there is potential to use “game design elements in non-game contexts” (Deterding et al 2011b, p. 9). Thus, educators who offer their students “game-like activities” (Dörnyei 2001, p. 93), using “gamification structures, such as achievements, (which) can function to promote learning if used carefully” (Ramirez & Squire 2014, p. 638), can utilise game elements in learning contexts, as “performance improvement mechanisms” (Jung et al 2010, p. 737).

In this thesis I have tried to systematise the use of game elements towards motivation in the design of gamified systems through the linking of game elements with the motivational constructs in SDT: Competence, Autonomy and Relatedness. Initially, I formed a list of game elements that were prevalent across games, and in the literature. the proposed taxonomy linked these elements with specific constructs of the SDT theory of motivation (Ryan & Deci, 2000a), before I then tested these evaluations by presenting a survey of these game elements and their ability to be “motivational affordances” (Zhang, 2008; Jung et al, 2010; Deterding, 2011b) to a group of self-selected gaming experts.

Once I had refined the proposed taxonomy, based on this survey of 104 gamers, I explored the level of awareness of motivational issues in the population of users of the language-learning website, Duolingo (2012). After conducting Content analysis on the Duolingo Discussion forums, I used these results to create a profile of the site from the users’ perspective, in order to compare it to the initial evaluation, searching for consistency across the assessments of the utility of the various elements. Finally, I conducted a second analysis, of documents published by the creators of Duolingo, searching again for the usage of terminology relevant to the discourse around motivation, for further comparison.

This thesis splits into two major sections. The proposed taxonomy is the major contribution, particularly once strengthened with the gamers’ observations. The evaluations of the Duolingo website are present to illustrate the utility of the framework, and to offer an example of gamification to those who may not be familiar with the concept. Similarly, the profiles of the two groups: the users and the creators of Duolingo; are demonstrations of the crossover of the framework to actual examples of gamified learning.

My evaluation of Duolingo suggests that there is a combination of 12 of the game elements I identified from the literature used on the site, nine of which facilitate Competence, and eight apiece for Autonomy and Relatedness. For the users, it appears that Duolingo is actually most successful in facilitating Relatedness, with Competence and Autonomy not well supported. This is slightly different from the game-element based assessment, and therefore allows room for some further modification of the proposed taxonomy. Reasons have been proposed for this, including the need to nuance the ways in which the elements interact with each other.

8.1.1 Why gamification? Why education?

In 1995, as a young English teacher in my first full-time teaching position in the western suburbs of Melbourne, Australia, I was always looking for ways to involve and energise my students. My fiancé, a PhD student teaching programming to undergraduates, talked a lot at the time about this new phenomenon, something called the information superhighway, but I was sceptical. What could that offer me, as an English teacher, that I wasn't already trying with traditional methods? Nevertheless, in the face of his persistence, I eventually signed up for an eight week course entitled "Using Technology in the English Classroom."

Fast forward more than twenty years. The fiancé, long since upgraded to the husband, was proven correct, and had, along the way, become part of a lifelong curiosity about how to merge interests which seem, on first observation, to be unrelated. The field, now massive, of educational technology, opened up before me as I experimented with different ways to engage, involve, and harness students' outside interests into the classrooms where we met.

At first, I was afraid of technology. I wrote essays with pen and paper, I learnt vocab from French books, I watched movies only when the television station programmers decided to show them. But with time, practice, and ever-expanding knowledge, I came to realise the boundless possibilities that technology offers. This has seen me become something of an ambassador. I remember that initial reluctance. I understand it. But I have overcome it. In staff rooms I show new apps to other teachers; in classrooms I use virtual learning environments with my students; over time I have helped them become creators of content that I can go on to collate, correct, and eventually lead them toward publishing, and subsequently showcasing, their own work.

I discovered gamification in the context of researching ways to motivate members of a distributed online community. In the process, I tried out the French skills tree on Duolingo, and quickly became invested in keeping my "streak" going, feeling cross and agitated when, for some reason, I couldn't participate, and had to wear the penalties. When Duolingo announced a beta version of an Irish skills tree I was one of the first in line, eagerly testing my *cúpla focal*, and delighted when I levelled up, or received an

upvote on a comment I had left on the Discussion forums. And so, my curiosity was piqued. What were the ways in which the game elements on the site might be adding to students' motivation to learn? Was there some way of evaluating this? Could I apply any of the theory I had discovered in the literature around gamification, and game design, to a deeper understanding of Duolingo, which might then go on to flesh out the motivational possibilities in gamification design?

The resulting research, as presented in this thesis, is therefore influenced by my own background and experiences. I started teaching as a bit of a traditionalist, but I quickly realised that was not the way forward. In creating the proposed taxonomy I have been thinking about people like myself: teachers who wish to modernise their teaching approach; aware that the students in their care are playing games in their own time, and then looking for the types of visual and sensory stimulation that games can provide when faced with learning; who want to harness these features in a way that is useful for educational purposes. I have been thinking, also, of the game designers like John Ferrara (2012a; 2012b; 2013) and Ian Bogost (2007; 2011; 2012; 2014), who lament the dearth of creativity in the gamification approach, and wish the world to know how transformative good games can be. And it is, really, for these two groups, that I hope my research contribution brings the most benefit: that educators may be able to use this as a framework to analyse whether the gamified systems they wish to use are worthwhile for the students in their care; and that designers may be able to say: here, these are lessons from game design that we can apply to the design of our gamified systems to help make them more effective.

8.2 Addressing the Research Questions

8.2.1 Research Question 1

Three Research Questions underpin the work in this thesis. **Research Question 1** asked:

How are game elements related to motivational constructs?

In isolating an aggregated list of game elements from across the literature, I offer a checklist to designers of gamified systems. This list is presented along with the constructs of the SDT theory of motivation (Ryan & Deci, 2000a), following a conjectural analysis which matched specific game elements to the parts of the motivational theory which that element could engender. A survey of self-identified gamers, rating the utility of each of the game elements in affording these SDT constructs, resulted in heightened observations of the usefulness of those elements, and these results were integrated into a revised version of the framework following the survey. There is a strong case for narrative to be included in the game elements in the taxonomy, and the final revised version is presented in Figure 8.1.

Game Element	Competence	Autonomy	Relatedness
Achievements	•	•	
Audio effects	•	•	•
Avatars		•	•
Badges	•		
Boss fights	•	•	
Collections	•	•	•
Combat	•	•	•
Content-unlocking	•	•	•
Discussion forums			•
Gifting		•	•
Leaderboards	•		•
Levels	•	•	•
Narrative	•	•	•
Points	•	•	
Quests	•	•	•
Realistic graphics	•		•
Social graphs	•		•
Teams	•	•	•
Virtual goods	•	•	
Totals	16/19 Competence	14/19 Autonomy	14/19 Relatedness

Figure 8.1 Final version of the proposed taxonomy

The proposed taxonomy seems quite robust in that new game elements and new links were in the minority in the survey. It offers design guidelines to developers in that it suggests the following elements as having utility across all three motivational constructs:

Element	Average perceived utility
1. Quests	72%
2. Combat	69%
3. Levels	67%
4. Teams	64%
5. Content-unlocking	64%
6. Collections	56%
7. Audio effects	49%

In addition, Levels (92%), Quests (86%) and Teams (80%) emerged as the most useful for each of the respective components of Competence, Autonomy and Relatedness.

Our evaluation of Duolingo, based on this revised framework, uncovered the following results:

- 12 of the identified game elements are present in the site;
- nine fulfil Competence –
 - giving 60% coverage;
 - at 78.5% average agreement on the elements' utility;
- eight fulfil Autonomy –
 - with 61.5% coverage;
 - and 58.9% average agreement;
- eight fulfil Relatedness –
 - thus 61.5% coverage;
 - at 60.3% average agreement.

The complex relationship between game elements and motivational constructs is therefore being simplified into a systematic schema that can be applied in the design of new gamified systems.

8.2.2 Research Question 2

The second Research Question asked:

Can the framework profile SLA systems consistently with the users' stated motivational perceptions of the system?

The subject of this question was the *users* of a gamified SLA system, looking to ascertain the efficiency of that SLA system's design with respect to motivating those users. I conducted Content analysis on the Discussion forum data from the users of Duolingo (2012), searching for terms derived from SDT, which informed the language of the proposed taxonomy. From this, I found that users do not seem to perceive Duolingo as an environment that supports Competence or Autonomy. As per the taxonomy, Competence could be further supported on the site with the introduction of Boss fights, which emerged out of the survey with 91% agreement among the gamers as regards its utility to facilitate a sense of Competence. Similarly, Combat achieved an agreement level of 89% for Competence, and 69% for Autonomy, suggesting it would be very useful as an addition, as it may serve to boost the fulfilment of both motivational constructs. Quests, having received an agreement of 86% for fulfilling Autonomy, would seem to be the best potential element to be added, if this construct were to be more fully supported.

The taxonomy, however, most probably needs a richer application, consisting of not just element presence, but also other attributes like frequency, centrality, and increasing difficulty. the game-element analysis suggested coverage for Competence and Autonomy on the site were good, whereas the Content analysis suggested the opposite. Conversely, the game element analysis did not show Relatedness would be well supported, and yet the Content analysis revealed that it is. Merely being present on the site is not enough to be able to predict the ability to afford a particular motivational construct, so this more nuanced approach is necessary. Similarly, an awareness of how elements can be used together in order to strengthen their ability to afford the different motivational constructs would also be beneficial. This would then lead to further design guidelines whereby not just the presence of the game element would be recommended but its frequency of appearance and other attributes.

8.2.3 Research Question 3

In **Research Question 3** I was looking to compare the evaluations from the framework with the aims from the *creators* of Duolingo itself:

Can the framework profile SLA systems consistently with the system's declared motivational intent?

Once again, I was hoping to ascertain the SLA system's design with respect to motivation, this time from the perspective of those who created the system. Content analysis was conducted on official publications from the creators of Duolingo, searching for the same terms as in the earlier Content analysis.

However, with no stated intent regarding these motivational constructs, it is impossible to answer this question. Instead we have to look past the Research Question to a determination that designers are oblivious to a fairly standard motivational theory, let alone the mechanics that could heighten motivation in line with that theory, suggesting that the theory is required.

The official publications chosen for this analysis did not yield enough of interest to be useful. However, other published work by co-creator von Ahn suggests a high level of awareness of these issues. We know there is some superficial awareness from the official documents, with one comment saying:

it's hard to stay motivated when learning online, so we made Duolingo so fun that people would prefer picking up new skills over playing a game
[Duolingo official publications].

In the literature, von Ahn, alone or with collaborators, has previously written about games, learning and collaboration (von Ahn, 2006; von Ahn, 2011a; von Ahn, 2013a; 2013b). One paper in particular (von Ahn & Dabbish, 2008), provides ample evidence that both he and the full development team behind Duolingo are aware of motivational issues and understand the relationship to games and game elements in that process. This paper talks about “fun” (p. 61) and “gamelike interaction” (p. 61), and says, “many researchers have suggested that incorporating gamelike elements into user interfaces could increase user motivation and the playfulness of work activities” (von Ahn & Dabbish 2008, p. 61). Similarly, the paper talks about “scores” and “levels” as being motivating, along with the idea, from “the literature on motivation in psychology, (that challenge is) a key aspect of any successful game” (von Ahn & Dabbish 2008, p. 63).

One interesting observation to make on these comments, however, is where the definition of a “successful” game is given: “we therefore sidestep any philosophical discussions about ‘fun’ and ‘enjoyable,’ defining a game as ‘successful’ if enough human-hours are spent playing it” (von Ahn & Dabbish 2008, p. 61). This statement could point to where the problems arise for the Duolingo users, and therefore to any potential deficiencies across the site, because this definition only references that one aspect of “success” in a game. Perhaps the reason these are not highly present in the official publication documents is that von Ahn did not envisage them in Duolingo, which supports the rationale for the creation of the framework.

8.2.4 Potential deficiencies in Duolingo

There are some potential deficiencies in the design of Duolingo, as far as the users are concerned. The results of the survey show very clearly that both Competence and Autonomy are of high importance to gamers, whereas the results of the Content analysis of the Discussion forums show that users do not feel either construct is well supported on the site.

For some Duolingo users, while they understand that gamification shouldn’t be the most important aspect of the site, because it is, after all, a language-learning space, they are concerned that the site is not getting the most out of them, or out of its gamification opportunities. This attitude is encapsulated in user posts, with one user in particular calling for a number of new gamified features:

... a bigger bonus to completing skills and checkpoints
 ... complicated lingot bonuses for speed drills ...
 ... probably some form of community tutoring interaction ...
 ... basic gamified economy factors A wall or house for your owl/avatar. ... where you generally
 display items you get through performance, seasonal specials, community support, etc ...
 ... a pride and reputation economy

*... specific avatars for different languages with a lingot cost ...
... very special and useful gamification economy items for duolingo, as it's "community progress"
competitive as well as "self" competitive [sic]*
[Duolingo user: 23].

This same user goes on to say:

*I could go on forever and diagram things, and then show the options for initial control of the
unintended consequences (no manufactured economy can escape them) but I'm probably getting
deeper than anyone at duolingo wants to think about [sic]*
[Duolingo user: 23].

It is in this final line that we are alerted to a belief shared by many of the users of the Discussion forums, that these concerns are not important to Duolingo. Even taking the limitations of the Content analysis into consideration, it would seem that perhaps I have still found something here that explains why the users of Duolingo are not as satisfied with the site as one might expect.

The framework cannot work in isolation. The predictions that arose out of the evaluation of Duolingo using the framework do not work on the basis of the elements alone, but the idea of the design of gamified systems being *iterative*. Constant referral must be made, throughout the lifespan of the system, to the motivational needs of the participants, and care must be taken when adding or taking away a feature.

8.3 Research contributions

8.3.1 Core contributions

The core contribution of this work lies in the proposed taxonomy, where I have made explicit the links between various game elements and the target behaviours they may engender through their satisfaction of the three constructs of the SDT theory of motivation. By making these links explicit people unfamiliar with the number of game elements available are given a way to explore the psychological possibilities inherent in good games in such a way as to improve their own gamified systems.

By enlisting expert gamers, I have refined the framework in the light of experienced gamer feedback, and by applying this framework to an existing example of gamified language learning I have shown its utility both as a tool for analysis, and for design. This research therefore builds on the existing literature in that it takes observations made across the theory and the practice that have gone before, but offers something new in the form of this proposed taxonomy. By seeing if the framework aligns with user

perception, it can offer suggestions as to how a system can address the perceived lack identified in those user perceptions.

Those for whom these contributions could be relevant range from educators to designers, those involved in creating instances of e-learning, and anyone looking to use gamification for any context, in spite of the illustrative example coming from SLA. The framework, if used comprehensively, applies to any instance of gamification under consideration.

8.3.2 Originality of contribution

8.3.2.1 Relationship to SDT Continuum

The framework can be seen as a potential checklist in the design of a gamified system. Specifically, gamification designers can attempt to use game elements that could work to move participants along the SDT Continuum (Ryan & Deci, 2000b). For example, we saw in the Literature Review in Chapter 2 that there are four stages along the continuum under the heading of “extrinsic motivation,” (Ryan & Deci 2000b, p. 62), each of which reference the use of some type of external motivator. Designers of a gamified system who allow a player to feel approval from others in the gamified system may result in that player experiencing “introjection” (p. 62) with the goals of the system, perhaps encouraging that person to return to play again. This type of feeling could be achieved by using game elements which are highly rated as affording participants the chance to feel a sense of Relatedness, such as Teams, or Gifting. We have seen that the elements cannot be added to a system in isolation, but understanding the ways in which the elements could affect the behaviours of participants is a very important place to start in the design of a successful system, and this framework will help in this process.

Similarly, the use of game elements which can function as goals would address the two stages of “extrinsic motivation” known as “identification” and “integration” (Ryan & Deci 2000b, p. 62). A gamified system which uses, for example, Levels as goals for participants to aspire towards, is potentially offering participants the chance to experience all three of the SDT constructs. Someone experiencing “identification” will be interested in Levelling up as they identify with the importance of achieving that goal in the system. Similarly, for some players, the idea of Levelling up is an achievement that the players could internalise, thus leading to the players experiencing a sense of “integration” of the Levelling up goal and their own internal need satisfaction (Ryan & Deci 2000b, p. 62). The continuum represents the “process” of motivational change (Dörnyei, 2001) and has been seen as a “blueprint” (Rigby 2014, p. 128) in the design of good gamification. Therefore, this framework, in being able to be used alongside the continuum, is a useful addition to the gamification designer’s toolbox.

8.3.2.2 Moving away from using the “triad” of PBL

In presenting a comprehensive list of game elements that can be used across gamified systems, this framework encourages the move away from the use of the “triad” of Points, Badges, Leaderboards as

identified by Werbach and Hunter (2012) and echoed across the literature, as seen in Table 2.1. Robertson (2010) demonstrates the objection in the industry to this type of approach by renaming it “pointsification:” the idea that Points are among the least important of game elements, and yet the most used in gamification examples. By using this framework as a suggestion for other elements which may be considered for inclusion in a new gamified system, gamification designers have access to a much wider range of potential elements than would seem to be the case in some of the most derided examples of gamification (see, e.g. Zichermann & Cunningham, 2011).

8.3.2.3 Design considerations

In Chapter 2, we saw that there were a number of central design considerations from the world of game design, which would form useful crossover for gamification designers (section 2.4). The framework can be used alongside these considerations, offering the opportunity to examine them one by one, in the context of choosing which game elements should be included in a new system. The need for users to be at the centre of all design decisions, for example, (2.4.1.1) could be addressed by using the framework to check which of the motivational constructs users would experience if particular elements were employed. Similarly, the framework helps to make clear the type of feedback a specific game element offers players, thus addressing issues around offering players informational, rather than controlling, feedback (2.4.1.2).

Likewise, the need to consider different player types, and the ways in which players’ motivations change from player to player, and, indeed, within the lifetime of a player’s engagement with a game (2.4.2), could be addressed via the use of the framework to ensure the design process is iterative. By building different types of feedback into the gamified system, the experience could be better tailored to players’ changing motivations (Yee et al, 2012).

Similarly, we saw in section 2.5 that the core of a gamified system is behaviour change (Linehan et al, 2011), and good design should start by identifying the main objective of a system (Aparicio et al, 2012). Using the framework, therefore, could help make the core of a gamified system more explicit, in that the choice of elements could be set against the need for all elements to feed into the core of that system, as espoused by numerous designers (see, e.g. Andersen et al, 2011; Ferrara, 2012a). This would also help the designers to differentiate their gamified systems from similar types of game-related systems such as GWAP, which have other aims at their core (von Ahn, 2006; von Ahn & Dabbish, 2008).

The framework could also be a way to remind designers to use achievements carefully, (Hecker, 2011), and to work on building reputation systems into gamified applications, that help to develop communities of practice (Lave & Wenger, 1991) through the inclusion of elements that feed into a sense of Relatedness (De Alfaro et al, 2011). The importance of providing meaningful choices, emphasised in

the literature (Salen & Zimmerman, 2004; Ferrara, 2012a), and echoed both in the survey and the Content analysis of the Duolingo users' Discussion forums, could also be attended to via the framework, as game elements which feed a sense of Autonomy could be identified.

8.3.2.4 Gamification for SLA

Duolingo was used as an illustrative example of gamification in practice, both because of my exposure to the site while researching gamification, and due to the fact that my experiences as a second-language teacher in the past better equipped me with the ability to evaluate the effectiveness of the site for language-learning. The specific attributes which make gamification so applicable to second-language learning can be summarised in the “ten commandments” for the language classroom (Dörnyei & Csizér 1998, p. 215), as discussed in section 2.6. Keeping these “commandments” alongside the framework from this research seems an effective method for both the *design* of SLA gamification, and, as in the case of this research, *evaluation* of an existing instance of gamification in SLA. Table 2.4 showed how each of commandments 2–10 could be addressed using gamification, with, for example, Discussion forums being useful for replicating “a pleasant, relaxed atmosphere in the classroom” (2) and developing “a good relationship with the learners” (4), while specific elements such as Avatars and Achievements can be introduced to “promote learner autonomy” (7) and “personalize the learning process” (8) (Dörnyei & Csizér 1998, p. 215). This linking of the motivational “commandments” and aspects of gamification is another of the original contributions this research offers, and has direct application for those interested in SLA.

8.4 Recommendations and future work

The nature of this research has meant that there was not enough time to address all of the issues which arose throughout its course. Ideas for further research building on this work, along with observations which could improve the existing work if carried out, all occurred in the process of completion. Certain key notions are worth further investigation.

8.4.1 Key findings: what next?

8.4.1.1 Survey

Some future work may arise out of these survey findings.

1. Levels, Quests and Teams are game elements that designers should strive to include, given the strength of association each element had with the respective SDT constructs. Future work could examine the possibility of using these more widely across gamified systems.
2. More generic SDT coverage could be fulfilled in the future by attributes like the seven in Table 8.1, which promote all three constructs.

Element	Competence	Autonomy	Relatedness	Average
Quests	83	86	47	72
Combat	89	69	49	69
Levels	92	64	46	67
Teams	60	53	80	64
Content-unlocking	84	61	47	64
Collections	64	60	44	56
Audio effects	51	46	51	49

Table 8.1: Game elements which fulfil all three constructs, according to the survey

3. The low level of agreement as regards the utility of the “PBL” (Werbach & Hunter, 2012) elements suggests a much more nuanced approach to design is needed. Merely including elements is not enough: their use must be integrated with other elements, and the frequency and centrality of their use needs also to be examined.
4. Two terms arose time and again across the responses, suggesting an issue with the terminology, and signalling their importance to game design; “skill” and “narrative.” While “skill” is a higher-level concept which may not work as an element, it may be able to be worked into the names of Competence-building game elements. “Narrative,” however, does seem to be a useful addition to the framework (see Figure 8.1).

Further to these notions of terminology change, in the responses to the short answer sections of the survey (see section 7.2.4) it became apparent that the terminology I had presented in the naming of the game elements was not as clear cut as it needed to be. “Badges,” for example, may need to be renamed as two separate types of elements:

- “Participatory rewards” to show appreciation for users participating in a site;
- “Skill-based rewards” where it is clear that a Badge or other reward is given to a participant for gaining proficiency in a particular skill or set of skills.

Similarly, the name “Discussion forums” did not sit particularly well with the gamers who responded to the survey. The desire for a chat function, where players interact, in-game or in real-world situations, was very strong among the respondents who chose to reply to the short answer question section of the survey. For this reason, it would seem that alternative names for this function may need to be considered, or a distinction needs to be made between in-game/real-time chat and off-line Discussion forums. Further work could be designed so as to look to the gaming community for a more inclusive name, perhaps something along the lines of “chat function” or “interaction function.”

These findings show that an over-reliance on the most accessible and traditionally used game elements of Points, Badges and Leaderboards will not be likely to lead to a gamified system that is able to satisfy the motivational needs of participants across the spectrum. Instead, designers choosing from among the seven elements that were seen to fulfil all three constructs at once, especially Levels, Quests and Teams, will be more likely to create scenarios where participants are afforded multiple opportunities to satisfy their motivational needs. The framework is therefore likely to be particularly useful for someone working with a gamified system who has perhaps only had experience of the “PBL” approach and needs assistance with developing something with a broader appeal. In addition, however, further work needs to be done to adapt the names of the game elements so that the notions behind the terms “narrative,” “skill,” “chat” and “interaction” are reflected in the framework.

8.4.1.2 Content analysis: Discussion forums

Similarly, from the Discussion forums, I found the use of the term “skill” is repeatedly, demonstrating its importance in a gamified system, as well as for gamers. There was a distribution of attitudes across the forums as to whether or not the development of skills was handled well on the site, but it is definitely of importance to the users, reinforcing the need to work it into the framework. Competence received a sentiment score of -48 on the forums, but this score was negatively influenced by the fact that many of the comment threads concerned the removal of the Progress bar, or the imposition of a Fluency score. The problems around both of these features support the arguments from the literature that the use of external motivators may sometimes be harmful to intrinsic motivation (Deci et al 1999), highlighting the need for a systematic approach to design.

Autonomy received a low sentiment score, of -12, suggesting that the choices on the site are not meaningful enough to engage participants fully. This concept of providing for meaningful options is repeated throughout the literature, and across both of the user research methods. Unsurprisingly, it is in the fulfilment of Relatedness that Duolingo users are most satisfied with the site. With a sentiment score of +51, higher than predicted by the results of the survey, Duolingo users were particularly happy with the way in which the “community” aspects of the site were afforded. Curious, as the gamers did not see Discussion forums as particularly useful for developing community, but here in a real-world example of a forum such as this, “community” was celebrated, and the Relatedness strand was seen to be very well supported. This has implications for the design of future systems, which the framework may support.

8.4.1.3 Content analysis: official publications

The sentiment scores arising out of the Content analysis of the official publications from Duolingo were very low. Very few of the search terms appeared across the publications, however the presence of “skill”

and “community” was interesting, as these were both present in the short answer survey responses and the Discussion forums.

Searching for the term “motivation” yielded much more successful results for profiling the official attitude to Duolingo from its creators. This suggests a more profitable route for any future research, whereby any official statements could be examined to see how much importance is attached to motivation as an overall concept. Luis von Ahn himself, along with moderators, visits the Discussion forums on a semi-regular basis, and these posts could also be subjected to Content analysis in order to see whether these terms arise, and if so, in what manner they are used. Being able to locate them and isolate them from the rest of the noise of the Discussion forums could likely prove to be problematic, however it could be very useful for providing further context about the team’s interest in motivating use of their site. No doubt continued attempts to get in touch with the development team could also be beneficial in the long term.

8.4.2 Integration of elements

We saw earlier that one aspect of game design for which we did not control in our research was the ways in which game elements work *together*. While isolating game elements so as to create a list from which designers could choose when populating a game, the next step: that of putting those game elements back together, was not part of the process. We have seen that the appeal of game elements is often greatly improved with this type of integration (Salen & Zimmerman, 2004).

In section 4.2.2.1.7 I presented a diagram to represent some of the ways in which elements could function more fully together, in connection with each other, in connection with each other, aware of the different types of elements and how in meshing together their use can be more effective. The type of distinction, where game elements are seen as “*Activities*” or “*Rewards*,” able to be awarded for different purposes, is a very important one for designers, if they are to create a gamified application which satisfies a range of psychological needs.

We saw earlier that “*Activity*” elements require the player to perform an action, while “*Rewards*” are the elements that are given to players once those “*Activities*” have been performed. The integration of these different types of elements could lead to much deeper satisfaction of motivational needs, and seeing elements in this interrelated way could be very useful for further refinements to the framework. For example, a deeper sense of Competence could be afforded if the game element of a Boss fight is designed into a game, when the “*Reward*” for that “*Activity*” is a Badge which unlocks further Content that allows a player to compete in a quiz that only “expert” players can contest. This type of interrelated thinking would benefit the design of a gamified system and has the potential to improve the framework immeasurably.

8.4.3 Length of study

We saw that in SLA research, the greatest importance is attached to researching motivational issues surrounding “longer currents of intensive action” (Dörnyei et al 2015a, p. x). Much of the gamification literature conducted so far is short-term in its scope, with one study going only so deep as to look at the effects of “framification” (Lieberoth, 2015c), or the *framing* of an activity to look like a game, and still finding positive effects. In the Content analysis conducted on the Duolingo Discussion forums, many of the negative comments centred on issues to do with features being taken away, creating a difference between the way a user initially felt about the site and their current attitudes. This type of *change* in motivation is of huge significance in this area, and the literature would definitely benefit from long-term studies of this kind.

Even without moving away from analysing Duolingo, it would be useful to study a group of Duolingo users, using a think-aloud protocol, perhaps combined with pre- and post-testing of language abilities, to give extra depth to these findings. A comparison with language-learners who do not have access to Duolingo, or are not motivated by their use of game elements, would deepen an appreciation and understanding of how these game elements work. Asking users directly whether there are features on the site that they find particularly motivating (or un-motivating) could also assist in making these ideas more explicit, and better understood.

8.4.4 Other research instruments

We have seen some of the limitations of the instruments used in this research, particularly surveys. With little room for intense questioning, some respondents were left feeling that they did not have sufficient room to express their true assessments of the game elements under study. Further research targeting gamers of specific genres could drill further down into the issues here, via in-depth interviews, where naming issues can be clarified, so as to find more details to further improve the study. Future studies should also take care to address female gaming populations directly, or groups which have been engineered to have a 52/48% split as suggested by Grubb (2014).

8.4.5 Game designers

One of my original working ideas when developing the framework was to give it to game designers currently in the field, to rate its utility. We have read in the literature that game designers are imploring those working in gamification to learn from them, and in fact this could be one very concrete way in which to ensure that this is happening. A research project inviting game designers to use, and improve, this framework could return some very interesting results which may have far-reaching consequences for gamification design.

8.5 Conclusion

In this work, I have presented a framework informed by the literature, which has been strengthened by the observations made by expert gamers. This framework has been applied to an existing example of gamified language-learning, and I have discussed its strengths and its weaknesses, along with outlining ways I see that it, and the SLA system, could be improved. Gamification is still in its infancy as an academic concern, and there is much still to be learnt. It is clear, however, that there is much potential for gamifying learning across many different disciplines, and that this framework is a first step towards more comprehensive learning, design guidelines for developers of gamified systems, and an analysis tool for existing systems. However, to fulfil its potential, it would need an expansion in terms of attributes, the tiers to which elements can belong, the integration of elements, and the kinds of nuanced observations I have noted such as the frequency of elements being used.

I noted in section 7.2.4.4 that one respondent in the survey seemed perhaps to have found the key to criticisms of gamification, in that one element that is often missing from gamified platforms is “*winning*.” The sense of accomplishment winning brings to any participant in any game-like activity is difficult to replicate, and in gamification the core of the system does not always lend itself to an actual win-state. By utilising this framework as a starting point in the design of a system, incorporating all of the knowledge the gamers brought to their assessment of each of the elements’ ability to afford a sense of the various SDT constructs, designers can work towards a win-state that will leave participants feeling satisfied, motivated, and ready to take on their next learning challenge.

Bibliography

Abramovich, S., Schunn, C., & Higashi, R. M. (2013). Are badges useful in education?: it depends upon the type of badge and expertise of learner. *Educational Technology Research and Development*, 61, 217-232.

Alexander, L., (2012) *GDC 2012: Sid Meier on how to see games as sets of interesting decisions* [online], available: http://www.gamasutra.com/view/news/164869/GDC_2012_Sid_Meier_on_how_to_see_games_as_sets_of_interesting_decisions.php [accessed November 30, 2014]

Alexander, L., (2014) *Romero awarded Fulbright fellowship for Irish industry work* [online], available: http://www.gamasutra.com/view/news/214228/Romero_awarded_Fulbright_fellowship_for_Irish_industry_work.php [accessed November 30, 2014]

Amichai-Hamburger, Y. (2008). Potential and promise of online volunteering. *Computers in Human Behavior*, 24(2), 544-562.

Andersen, E., Liu, Y. E., Snider, R., Szeto, R., Cooper, S., & Popović, Z. (2011). On the harmfulness of secondary game objectives. In *Proceedings of the 6th International Conference on Foundations of Digital Games* (pp. 30-37). ACM.

Andersen, S., Ertac, S., Gneezy, U., List, J. A., & Maximiano, S. (2013). Gender, Competitiveness, and Socialization at a Young Age: Evidence from a Matrilineal and a Patriarchal Society. *Review of Economics and Statistics*, 95(4), 1438-1443.

Anderson, A., Huttenlocher, D., Kleinberg, J., & Leskovec, J. (2012). Discovering value from community activity on focused question answering sites: a case study of stack overflow. In *Proceedings of the 18th ACM SIGKDD international conference on Knowledge discovery and data mining* (pp. 850-858). ACM.

Annetta, L. A. (2010). The “Ts” have it: A framework for serious educational game design. *Review of General Psychology*, 14(2), 105.

Antin, J., & Churchill, E. F. (2011). Badges in social media: A social psychological perspective. In *CHI 2011 Gamification Workshop Proceedings* (pp. 1-4).

Aparicio, A. F., Vela, F. L. G., Sánchez, J. L. G., & Montes, J. L. I. (2012). Analysis and application of gamification. In *Proceedings of the 13th International Conference on Interacción Persona-Ordenador* (p. 17). ACM.

Azadegan, A. (2012). Serious games integration in companies: a research and application framework. In *Advanced Learning Technologies (ICALT), 2012 IEEE 12th International Conference on* (pp. 485-487). IEEE.

Bailey, K.D., (1994). *Typologies and taxonomies: an introduction to classification techniques* (Vol. 102). Sage, London.

Barab, S. A., Scott, B., Siyahhan, S., Goldstone, R., Ingram-Goble, A., Zuiker, S. J., & Warren, S. (2009). Transformational play as a curricular scaffold: Using videogames to support science education. *Journal of Science Education and Technology*, 18(4), 305-320.

Bartle, R., (1996) *Players Who Suit MUDs* [online], available: <http://mud.co.uk/richard/hcds.htm> [accessed March 30, 2014]

- Beckett, C., (2012) *Forget Angry Birds or Draw Something: making gamification work for you* [online], available: <http://www.theguardian.com/voluntary-sector-network/2012/apr/16/make-gamification-work-charity> [accessed April 8, 2014]
- Bedwell, W. L., Pavlas, D., Heyne, K., Lazzara, E. H., & Salas, E. (2012). Toward a taxonomy linking game attributes to learning: an empirical study. *Simulation & Gaming*, 43(6), 729-760.
- Bernhaupt, R., Isbister, K., Buchanan, J., Cook, D., & Warfield, D. (2011). Games and HCI: perspectives on intersections and opportunities. In *CHI'11 Extended Abstracts on Human Factors in Computing Systems* (pp. 351-354). ACM.
- Bethesda.com (2016) *Fallout 4* [online], available: <https://www.fallout4.com/> [accessed September 26, 2016]
- Bista, S. K., Nepal, S., Colineau, N., & Paris, C. (2012). Using gamification in an online community. In *CollaborateCom* (pp. 611-618).
- Blizzard Entertainment (2016) *World of Warcraft* [online], available: <https://worldofwarcraft.com/en-us/> [accessed September 26, 2016]
- Blake, V (2017) *Minecraft has 55 million monthly players, 122 million sales* [online], available: <http://ie.ign.com/articles/2017/02/27/minecraft-has-55-million-monthly-players-122-million-sales> [accessed June 11, 2017]
- Blohm, I., & Leimeister, J. M. (2013). Design of IT-based enhancing services for motivational support and behavioral change. *Business & Information Systems Engineering*, 275-278.
- Bogost, I. (2007). *Persuasive games: The expressive power of videogames*. Mit Press.
- Bogost, I., (2011) *Persuasive Games: Exploitationware* [online], available: http://www.gamasutra.com/view/feature/6366/persuasive_games_exploitationware.php [accessed April 7, 2014]
- Bogost, I., (2012) *Cow Clicker: The Making of Obsession* [online], available: http://bogost.com/writing/blog/cow_clicker_1/ [accessed August 20, 2014]
- Bogost, I., (2014) Why Gamification is Bullshit in Walz, S., & Deterding, S. (eds) *The Gameful World: Approaches, Issues, Applications*. MIT Press.
- Borst, W. A. M. (2010). *Understanding Crowdsourcing: Effects of motivation and rewards on participation and performance in voluntary online activities* (No. EPS-2010-221-LIS). Erasmus Research Institute of Management (ERIM).
- Brathwaite, B., & Schreiber, I. (2008). *Challenges for Game Designers*, Charles River Media. Inc., Rockland, MA.
- Bruckman, A. (1999). Can educational be fun. In *Game developers conference* (Vol. 99).
- Butler, B., Sproull, L., Kiesler, S., & Kraut, R. (2002). Community effort in online groups: Who does the work and why? *Leadership at a distance: Research in technologically supported work*, 171-194.
- Cameron, J. (2001). Negative effects of reward on intrinsic motivation—A limited phenomenon: Comment on Deci, Koestner, and Ryan (2001). *Review of Educational Research*, 71(1), 29-42.

Cavusoglu, H., Li, Z., & Huang, K. W. (2015). Can Gamification Motivate Voluntary Contributions? The Case of StackOverflow Q&A Community. In *Proceedings of the 18th ACM Conference Companion on Computer Supported Cooperative Work & Social Computing* (pp. 171-174). ACM.

Cheong, C., Filippou, J., & Cheong, F. (2014). Towards the gamification of learning: Investigating student perceptions of game elements. *Journal of Information Systems Education*, 25(3), 233.

Clary, E. G., Snyder, M., Ridge, R. D., Copeland, J., Stukas, A. A., Haugen, J., & Miene, P. (1998). Understanding and assessing the motivations of volunteers: a functional approach. *Journal of personality and social psychology*, 74(6), 1516.

Clary, E. G., & Snyder, M. (1999). The motivations to volunteer theoretical and practical considerations. *Current directions in psychological science*, 8(5), 156-159.

Creswell, J. W. (2003). *Research design: Qualitative, quantitative, and mixed methods approaches*. Sage, London.

Csikszentmihalyi, M. (1991). *Flow: The psychology of optimal experience* (Vol. 41). New York: HarperPerennial.

De Alfaro, L., Kulshreshtha, A., Pye, I., & Adler, B. T. (2011). Reputation systems for open collaboration. *Communications of the ACM*, 54(8), 81-87.

Deci, E. L., Eghrari, H., Patrick, B. C., & Leone, D. R. (1994). Facilitating internalization: The self-determination theory perspective. *Journal of personality*, 62(1), 119-142.

Deci, E. L., Koestner, R., & Ryan, R. M. (1999). A meta-analytic review of experiments examining the effects of extrinsic rewards on intrinsic motivation. *Psychological bulletin*, 125(6), 627.

Deci, E. L., Koestner, R., & Ryan, R. M. (2001). Extrinsic rewards and intrinsic motivation in education: Reconsidered once again. *Review of educational research*, 71(1), 1-27.

Deci, E.L. & Ryan, R.M., (2002). Overview of self-determination theory: An organismic dialectical perspective. *Handbook of self-determination research*, pp.3-33.

Deci, E. L., & Ryan, R. M. (2008). Self-determination theory: A macrotheory of human motivation, development, and health. *Canadian Psychology/Psychologie canadienne*, 49(3), 182.

Deci, E.L. and Ryan, R.M., (2011). Self-determination theory. *Handbook of theories of social psychology*, 1, pp.416-433.

Decker, A., & Lawley, E. L. (2013). Life's a game and the game of life: how making a game out of it can change student behavior. In *Proceeding of the 44th ACM technical symposium on Computer science education* (pp. 233-238). ACM.

Denis, G., & Jouvelot, P. (2005). Motivation-driven educational game design: applying best practices to music education. In *Proceedings of the 2005 ACM SIGCHI International Conference on Advances in computer entertainment technology* (pp. 462-465). ACM.

Denny, P. (2013). The effect of virtual achievements on student engagement. In *Proceedings of the SIGCHI conference on human factors in computing systems* (pp. 763-772). ACM.

Deterding, S., (2010) *Just add points?* [online], available: <http://www.slideshare.net/dings/just-add-points-what-ux-can-and-cannot-learn-from-games> [accessed June 13, 2014]

- Deterding, S., (2011a) *Meaningful Play: Getting Gamification Right* [online], available: <https://www.youtube.com/watch?v=7ZGCPap7GkY> [accessed April 29, 2014]
- Deterding, S. (2011b) Situated motivational affordances of game elements: A conceptual model. In *Gamification: Using Game Design Elements in Non-Gaming Contexts, a workshop at CHI*.
- Deterding, S., (2011c) *A Quick Buck by Copy and Paste* [online], available <http://gamification-research.org/2011/09/a-quick-buck-by-copy-and-paste/> [accessed April 29, 2014]
- Deterding, S., (2011d) *Gamification by Design: Response to Zichermann* [online], available: <http://gamification-research.org/2011/09/gamification-by-design-response-to-zichermann/> [accessed April 29, 2014]
- Deterding, S. (2012a). Gamification: designing for motivation. *interactions*, 19(4), 14-17.
- Deterding, S. (2012b). *Coding conduct: Games, Play, and Human Conduct Between Technical Code and Social Framing* [online], available: <http://www.slideshare.net/dings/coding-conduct-games-play-and-human-conduct-between-technical-code-and-social-framing> [accessed June 13, 2014]
- Deterding, S. (2014) The Ambiguity of Games: Histories and Discourses of a Gameful World in Walz, S., & Deterding, S. (eds) *The Gameful World: Approaches, Issues, Applications*. MIT Press.
- Deterding, S., Sicart, M., Nacke, L., O'Hara, K., & Dixon, D. (2011a). Gamification. using game-design elements in non-gaming contexts. In *CHI'11 Extended Abstracts on Human Factors in Computing Systems* (pp. 2425-2428). ACM.
- Deterding, S., Dixon, D., Khaled, R., & Nacke, L. (2011b). From game design elements to gamefulness: defining gamification. In *Proceedings of the 15th International Academic MindTrek Conference: Envisioning Future Media Environments* (pp. 9-15). ACM.
- Deterding, S., Björk, S. L., Nacke, L. E., Dixon, D., & Lawley, E. (2013). Designing gamification: creating gameful and playful experiences. In *CHI'13 Extended Abstracts on Human Factors in Computing Systems* (pp. 3263-3266). ACM.
- Dickey, M. D. (2007). Game design and learning: A conjectural analysis of how massively multiple online role-playing games (MMORPGs) foster intrinsic motivation. *Educational Technology Research and Development*, 55(3), 253-273.
- Dictionary.com, (2016) *Roget's Thesaurus Alphabetical Index* [online], available: <http://www.thesaurus.com/Roget-Alpha-Index.html> [accessed January 17, 2017]
- DiSalvo, B., & Morrison, B. (2011) A Critique of “Gamification” in Khan Academy. in *Proceedings of DiGRA 2011 Conference: Think Design Play*.
- Dixon, D. (2011) *Player Types and Gamification* [online], available: <http://gamification-research.org/wp-content/uploads/2011/04/11-Dixon.pdf> [accessed April 28, 2016]
- Dombek, M. (2014). *A study into the motivations of internet users contributing to translation crowdsourcing: the case of Polish Facebook user-translators* (Doctoral dissertation, Dublin City University), [online], available: http://doras.dcu.ie/19774/1/PhD_Thesis_M_Dombek_Final_Corrected_Version.pdf [accessed April 5, 2015]
- Dörnyei, Z. (1998). Motivation in second and foreign language learning. *Language teaching*, 31(03), 117-135.

Dörnyei, Z. (2001) *Motivational Strategies in the Language Classroom*. Cambridge University Press, Cambridge.

Dörnyei, Z. (2003) *Questionnaires in Second Language Research*. Lawrence Erlbaum, New Jersey.

Dörnyei, Z., (2014). Researching complex dynamic systems: ‘Retrodictive qualitative modelling’ in the language classroom. *Language Teaching*, 47(1), pp.80-91.

Dörnyei, Z., & Csizér, K. (1998). Ten commandments for motivating language learners: Results of an empirical study. *Language teaching research*, 2(3), 203-229.

Dörnyei, Z., Ibrahim, Z., & Muir, C. (2015a). *Motivational currents in language learning: Frameworks for focused interventions*. Routledge.

Dörnyei, Z., Henry, A., & Muir, C. (2015b). ‘Directed Motivational Currents’: Regulating complex dynamic systems through motivational surges. *Motivational dynamics in language learning*, pp.95-105.

Duolingo (2012) *Duolingo: Free Language Education for the World* [online], available: www.duolingo.com [accessed Feb 24, 2014]

Easterbrook, S., Singer, J., Storey, M.A. and Damian, D., (2008). Selecting empirical methods for software engineering research. In *Guide to advanced empirical software engineering* (pp. 285-311). Springer London.

Elliot, A. J. (1999). Approach and avoidance motivation and achievement goals. *Educational psychologist*, 34(3), 169-189.

Ertmer, P.A. & Newby, T.J., (1993). Behaviorism, cognitivism, constructivism: Comparing critical features from an instructional design perspective. *Performance improvement quarterly*, 6(4), pp.50-72.

Exton, C., Wasala, A., Buckley, J., & Schäler, R. (2009). Micro crowdsourcing: a new model for software localisation. *Localisation Focus*, 8(1), 81-89.

Exton, G. and Murray, L., (2013 [2017]) Duolingo: An Evaluation of Gamification for CALL. *Greta Journal for Teachers of English*. Volume 21, Number 1, pages 25-34.

Eyal, N. & Hoover, R. (2013) *Hooked – How to Build Habit-Forming Products* [online], available: http://nireyal.wpengine.netdna-cdn.com/wp-content/uploads/2015/04/Hooked_Workbook_0415.pdf [accessed April 14, 2016]

Failbetter Games (2016) *Sunless Sea* [online], available: <http://www.failbettergames.com/sunless/> [accessed September 26, 2016]

Ferrara, J. (2012a). Playful design. *Rosenfeld Media*.

Ferrara, J., (2012b) *A note to the Gamification Summit: Surviving the backlash* [online], available <http://rosenfeldmedia.com/blogs/playful-design/a-note-to-the-gamification-sum/> [accessed November 23, 2014]

Ferrara, J. (2013). Games for Persuasion Argumentation, Procedurality, and the Lie of Gamification. *Games and Culture*, 8(4), 289-304.

Ferro, L. S., Walz, S. P., & Greuter, S. (2013). Towards personalised, gamified systems: an investigation into game design, personality and player typologies. In *Proceedings of The 9th Australasian Conference on Interactive Entertainment: Matters of Life and Death* (p. 7). ACM.

Fitbit (2016) *Fitbit Find your fit* [online], available: <https://www.fitbit.com/whyfitbit> [accessed February 25, 2016]

FitnessKeeper (2016) *Runkeeper* [online], available: <https://runkeeper.com/> [accessed February 25, 2016]

Fitz-Walter, Z., Tjondronegoro, D., & Wyeth, P. (2011). Orientation passport: using gamification to engage university students. In *Proceedings of the 23rd Australian Computer-Human Interaction Conference* (pp. 122-125). ACM.

Fitz-Walter, Z. (2015) *Achievement unlocked: Investigating the design of effective gamification experiences for mobile applications and devices*. PhD thesis, Queensland University of Technology. [online], available: <http://eprints.qut.edu.au/83675/1/Zac%20Fitz-Walter%20Thesis.pdf> [accessed April 1, 2016]

Flatla, D. R., Gutwin, C., Nacke, L. E., Bateman, S., & Mandryk, R. L. (2011). Calibration games: making calibration tasks enjoyable by adding motivating game elements. In *Proceedings of the 24th annual ACM symposium on User interface software and technology* (pp. 403-412). ACM.

Fogg, B. J. (2009). A behavior model for persuasive design. In *Proceedings of the 4th international Conference on Persuasive Technology* (p. 40). ACM.

Forde, S. F., Mekler, E. D., & Opwis, K. (2015). Informational vs. Controlling Gamification: A Study Design. In *Proceedings of the 2015 Annual Symposium on Computer-Human Interaction in Play* (pp. 517-522). ACM.

Foursquare (2009) *Introducing the all-new Foursquare, which learns what you like and leads you to places you'll love* [online] available: <https://foursquare.com/about> [accessed September 24, 2014]

Freudmann, E. A., & Bakamitsos, Y. (2014). The Role of Gamification in Non-profit Marketing: An Information Processing Account. *Procedia-Social and Behavioral Sciences*, 148, 567-572.

Frith, J. (2013). Turning life into a game: Foursquare, gamification, and personal mobility. *Mobile Media & Communication*, 1(2), 248-262.

Fullerton, T. (2014). *Game design workshop: a playcentric approach to creating innovative games*. CRC Press.

Games Workshop (2016) *Total War* [online] available: <https://www.totalwar.com/> [accessed September 26, 2016]

Garcia, I. (2013). Learning a Language for Free While Translating the Web. Does Duolingo Work?. *International Journal of English Linguistics*, 3(1), p19.

Garrett, J. J. (2010). *The Elements of User Experience: User-Centered Design for the Web and Beyond*. Pearson Education.

Gee, J. P. (2003). What video games have to teach us about learning and literacy. *Computers in Entertainment (CIE)*, 1(1), 20-20.

Gee, J. P. (2014) *What video games have to teach us about learning and literacy*, Macmillan

- Gee, J. P. (2015, May 11) *Video Games and Digital Literacy in Education: The Good, the Bad, and the Ugly* [Webinar] Retrieved from <https://breeze01.uclan.ac.uk/jamespaulgee/>
- Gnauk, B., Dannecker, L., & Hahmann, M. (2012). Leveraging gamification in demand dispatch systems. In *Proceedings of the 2012 Joint EDBT/ICDT Workshops* (pp. 103-110). ACM.
- Gray, D. E. (2009). *Doing research in the real world*. 2nd edition, Sage, London.
- Grubb, J. (2014). *Gaming advocacy group: The average gamer is 31, and most play on a console* [online] available: <https://venturebeat.com/2014/04/29/gaming-advocacy-group-the-average-gamer-is-31-and-most-play-on-a-console/> [accessed May 29, 2017]
- Gubler, T., Larkin, I. & Pierce, L. (2013) The dirty laundry of employee award programs : Evidence from the field. *Harvard Business School NOM Unit Working Paper 13-069*.
- Guilloteaux, M. J., & Dörnyei, Z. (2008). Motivating language learners: A classroom-oriented investigation of the effects of motivational strategies on student motivation. *TESOL quarterly*, 55-77.
- Guy, I., Perer, A., Daniel, T., Greenspan, O., & Turbahn, I. (2011). Guess who?: enriching the social graph through a crowdsourcing game. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems* (pp. 1373-1382). ACM.
- Hamari, J., & Eranti, V. (2011). Framework for designing and evaluating game achievements. *Proc. DiGRA 2011: Think Design Play*, 115, 122-134.
- Hamari, J., Koivisto, J., & Sarsa, H. (2014). Does Gamification Work?--A Literature Review of Empirical Studies on Gamification. In *System Sciences (HICSS), 2014 47th Hawaii International Conference on* (pp. 3025-3034). IEEE.
- Hanus, M. D., & Fox, J. (2015). Assessing the effects of gamification in the classroom: A longitudinal study on intrinsic motivation, social comparison, satisfaction, effort, and academic performance. *Computers & Education*, 80, 152-161.
- Hecker, C., (2011) *Achievements considered harmful?* [online] available: http://chrishecker.com/Achievements_considered_harmful%3F [accessed April 28, 2014]
- Herman, G. L., Trenshaw, K., Goldberg, D. E., Stolk, J., & Somerville, M. (2013). Creating an intrinsic-motivation-driven course design method. In *Frontiers in Education Conference, 2013 IEEE* (pp. 1203-1209). IEEE.
- Herzig, P., Jügel, K., Momm, C., Ameling, M., & Schill, A. (2013). GaML-A Modeling Language for Gamification. In *Proceedings of the 2013 IEEE/ACM 6th International Conference on Utility and Cloud Computing* (pp. 494-499). IEEE Computer Society.
- Hodge, K., (2012) *Kate Hodge: Best Bits – Gamification for charities* [online], available: <http://www.theguardian.com/voluntary-sector-network/2012/mar/23/gamification-charity-advice> [accessed April 8, 2014]
- Horn, M. S. (2014). Beyond video games for social change. *Interactions*, 21(2), 66-68.
- Houle, B. J., Sagarin, B. J., & Kaplan, M. F. (2005). A functional approach to volunteerism: Do volunteer motives predict task preference?. *Basic and applied social psychology*, 27(4), 337-344.

- Howe, J., (2006) *Crowdsourcing - A Definition* [online], available: http://crowdsourcing.typepad.com/cs/2006/06/crowdsourcing_a.html [accessed August 12, 2014]
- Huizinga, J. (1967). *Homo Ludens: A study of the play-element in culture*. Boston, MA: Beacon Press.
- Hunicke, R., LeBlanc, M., & Zubek, R. (2004). MDA: A formal approach to game design and game research. In *Proceedings of the AAAI Workshop on Challenges in Game AI* (pp. 04-04).
- Huotari, K., & Hamari, J. (2011). Gamification from the perspective of service marketing. In *Proc. CHI 2011 Workshop Gamification*.
- Huotari, K., & Hamari, J. (2012). Defining gamification: a service marketing perspective. In *Proceeding of the 16th International Academic MindTrek Conference* (pp. 17-22). ACM.
- Ibanez, M. B., Di-Serio, A., & Delgado-Kloos, C. (2014). Gamification for engaging computer science students in learning activities: A case study. *Learning Technologies, IEEE Transactions on*, 7(3), 291-301.
- Ibrahim, R., (2008). Setting up a research question for determining the research methodology. *ALAM CIPTA, International Journal on Sustainable Tropical Design Research & Practice*, 3(1), pp.99-102.
- Jakobsson, M. (2011). The achievement machine: understanding Xbox 360 achievements in gaming practices. *Game Studies*, 11(1), 1-22.
- Järvinen, A. (2009). Game design for social networks: interaction design for playful dispositions. In *Proceedings of the 2009 ACM SIGGRAPH Symposium on Video Games* (pp. 95-102). ACM.
- Jung, J. H., Schneider, C., & Valacich, J. (2010). Enhancing the motivational affordance of information systems: The effects of real-time performance feedback and goal setting in group collaboration environments. *Management Science*, 56(4), 724-742.
- Kapp, K. M. (2012). *The gamification of learning and instruction: game-based methods and strategies for training and education*. John Wiley & Sons.
- Khan Academy (2006) *A free world-class education for anyone anywhere* [online] available: <https://www.khanacademy.org> [accessed May 26, 2014]
- Khatib, F., Cooper, S., Tyka, M. D., Xu, K., Makedon, I., Popović, Z., Baker, D. & Foldit Players (2011). Algorithm discovery by protein folding game players. *Proceedings of the National Academy of Sciences*, 108(47), 18949-18953.
- Kim, A.J., (2011) *Designing the Player Journey* [online], available: <http://www.slideshare.net/amyjokim/gamification-101-design-the-player-journey> [accessed April 8, 2014]
- Kim, A.J., (2014a) *Entice Me Back: How Core Loops drive Re-Engagement* [online], available: <http://amyjokim.com/blog/2014/05/27/entice-me-back-how-core-loops-drive-re-engagement/> [accessed June 6, 2014]
- Kim, A.J., (2014b) *Triggers and Investment Pull Players Back* [online], available: <http://amyjokim.com/blog/2014/06/06/triggers-and-investment-pull-players-back/> [accessed June 6, 2014]
- Koivisto, J., & Hamari, J. (2014). Demographic differences in perceived benefits from gamification. *Computers in Human Behavior*, 35, 179-188.

- Kollock, P. (1999). The economies of online cooperation. *Communities in cyberspace*, 220.
- Korhonen, H., Montola, M., & Arrasvuori, J. (2009). Understanding playful user experience through digital games. In *International Conference on Designing Pleasurable Products and Interfaces* (pp. 274-285).
- Koster, R. (2005). *A theory of fun for game design*. Scottsdale, AZ: Paraglyph Press, Inc.
- Krashen, S. (1987). *Principles and practice in second language acquisition*. Prentice Hall, London.
- Krippendorff, K. (2004). *Content analysis: An introduction to its methodology*. Sage, London.
- Kuo, M. S., & Chuang, T. Y. (2016). How gamification motivates visits and engagement for online academic dissemination—An empirical study. *Computers in Human Behavior*, 55, 16-27.
- Kvale, S., & Brinkmann, S. (2009). *Interviews: Learning the craft of qualitative research interviewing*. Sage, London.
- Lampe, C. (2014) Gamification and Social Media in Walz, S., & Deterding, S. (eds) *The Gameful World: Approaches, Issues, Applications*. MIT Press.
- Lave, J., & Wenger, E., (1991). *Legitimate Peripheral Participation in Communities of Practice. Situated Learning: Legitimate Peripheral Participation*. Cambridge: Cambridge University Press
- Leacock, M., (2008). *Cooperation and Engagement: What can board games teach us?* [online], available: <https://www.youtube.com/watch?v=cdTVcFo2EQw> [accessed September 10, 2015]
- LeBlanc, M. (1999). Feedback systems and the dramatic structure of competition. In *Game Developers Conference*.
- Lee, J. J. & Hammer, J. (2011). Gamification in Education: What, How, Why Bother? *Academic Exchange Quarterly*, 15(2).
- Li, L. C., Grimshaw, J. M., Nielsen, C., Judd, M., Coyte, P. C., and Graham, I. D. (2009). Evolution of Wenger's concept of community of practice. *Implementation Science*, 4(1), 11.
- Lieberoth, A. (2015a). What really works in gamification?: Short answer: we don't know, so let's start thinking like experimenters. *E-learning Papers*, 43.
- Lieberoth, A. (2015b). Shallow gamification: testing psychological effects of framing an activity as a game. *Games and Culture*, 10(3), 229-248.
- Lieberoth, A., Wellnitz, K. B., & Aagaard, J. (2015). Sex, violence and learning: assessing game effects. In *Game Research Methods* (pp. 175-192). ETC Press.
- Linehan, C., Kirman, B., Lawson, S., & Chan, G. (2011). Practical, appropriate, empirically-validated guidelines for designing educational games. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems* (pp. 1979-1988). ACM.
- Linehan, C., B. Kirman & B. Roche (2014) Gamification as Behavioral Psychology in Walz, S., & Deterding, S. (eds) *The Gameful World: Approaches, Issues, Applications*. MIT Press.

- Ling, K., Beenen, G., Ludford, P., Wang, X., Chang, K., Li, X., Cosley, D., Frankowski, D., Terveen, L., Mamunur Rashid, A., Resnick, P. & Kraut, R. (2005). Using social psychology to motivate contributions to online communities. *Journal of Computer-Mediated Communication*, 10(4), 00-00.
- Littleton, K. Toates, F & Braisby, N., (2002), 'Chapter 3 Three approaches to learning', *Mapping Psychology 1*, Milton Keynes, The Open University, 165-216.
- Llagostera, E. (2012). On gamification and persuasion. *SB Games, Brasilia, Brazil, November 2-4, 2012*, 12-21.
- Lucero, A., Holopainen, J., Ollila, E., Suomela, R., & Karapanos, E. (2013). The playful experiences (PLEX) framework as a guide for expert evaluation. In *Proceedings of the 6th International Conference on Designing Pleasurable Products and Interfaces* (pp. 221-230). ACM.
- Lucero, A., Karapanos, E., Arrasvuori, J., & Korhonen, H. (2014). Playful or Gameful?: creating delightful user experiences. *interactions*, 21(3), 34-39.
- Luckemeyer, G. (2015). Virtual blended learning enriched by gamification and social aspects in programming education. In *Computer Science & Education (ICCSE), 2015 10th International Conference on* (pp. 438-444). IEEE.
- Lyons, T., (2014) *The Game is On – How One Couple Made it Big in a Virtual World* [online], available: <http://www.irishtimes.com/business/technology/the-game-is-on-how-one-couple-made-it-big-in-a-virtual-world-1.1947878> [accessed December 8, 2014]
- Malone, T. W., (1981). Toward a theory of intrinsically motivating instruction. *Cognitive science*, 5(4), 333-369.
- McCambridge, J., Witton, J. & Elbourne, D.R., (2014). Systematic review of the Hawthorne effect: new concepts are needed to study research participation effects. *Journal of clinical epidemiology*, 67(3), pp.267-277.
- McGonigal, J., (2014) I'm not Playful, I'm Gameful in Walz, S., & Deterding, S. (eds) *The Gameful World: Approaches, Issues, Applications*. MIT Press.
- McKenzie, G. (2011). Gamification and location-based services. In *Workshop on Cognitive Engineering for Mobile GIS*.
- McNiff, J., (2002) *Action research for professional development - Concise advice for new action researchers*, [online], available: <http://jeanmcniff.com/ar-booklet.asp> [accessed October 1, 2015]
- McNiff, J., and Whitehead, J. (2010) *You and Your Action Research Project*, Routledge, New York.
- Medeiros, D. B., Neto, P. D. A. D. S., Passos, E. B., & De Souza Araújo, W. (2015). Working and Playing with Scrum. *International Journal of Software Engineering and Knowledge Engineering*, 25(06), 993-1015.
- Mekler, E. D., Brühlmann, F., Opwis, K., & Tuch, A. N. (2013a). Disassembling gamification: the effects of points and meaning on user motivation and performance. In *CHI'13 Extended Abstracts on Human Factors in Computing Systems* (pp. 1137-1142). ACM.
- Mekler, E. D., Brühlmann, F., Opwis, K., & Tuch, A. N. (2013b). Do points, levels and leaderboards harm intrinsic motivation? An empirical analysis of common gamification elements. In *Proceedings of the First International Conference on gameful design, research, and applications* (pp. 66-73). ACM.

- Minecraft (2011) *Minecraft Game* [online], available: <https://minecraft.net/game> [accessed May 26, 2014]
- Mitchell, T. R. (1982). Motivation: New directions for theory, research, and practice. *Academy of management review*, 7(1), 80-88.
- Model, E. D. (2005). *Creation and validation of the dual motivation profile scale* (Doctoral dissertation, University of Florida) [online], available: http://etd.fcla.edu/UF/UFE0010101/model_e.pdf [accessed February 2, 2015].
- Montola, M., Nummenmaa, T., Lucero, A., Boberg, M., & Korhonen, H. (2009). Applying game achievement systems to enhance user experience in a photo sharing service. In *Proceedings of the 13th International MindTrek Conference: Everyday Life in the Ubiquitous Era* (pp. 94-97). ACM.
- Morrison, B. B., & DiSalvo, B. (2014). Khan academy gamifies computer science. In *Proceedings of the 45th ACM technical symposium on Computer science education* (pp. 39-44). ACM.
- Movshovitz-Attias, D., Movshovitz-Attias, Y., Steenkiste, P., & Faloutsos, C. (2013). Analysis of the reputation system and user contributions on a question answering website: StackOverflow. In *Proceedings of the 2013 IEEE/ACM International Conference on Advances in Social Networks Analysis and Mining* (pp. 886-893). ACM.
- Mozilla Open Badges (2014) [available] <http://openbadges.org/about/> [accessed February 12, 2014]
- Nacke, L. E., Kalyn, M., Lough, C., & Mandryk, R. L. (2011). Biofeedback game design: using direct and indirect physiological control to enhance game interaction. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems* (pp. 103-112). ACM
- Neuendorf, K.A., (2016). *The content analysis guidebook*. Sage publications.
- News About Technologies (2012) *Duolingo: Easy and Free Way to Learn A Language* online, [available] <http://dailytechslife.blogspot.de/2012/11/duolingoeasy-and-free-way-to-learn.html> [accessed November 26, 2014]
- Nicholson, S. (2012). A user-centered theoretical framework for meaningful gamification. *Games+ Learning+ Society*, 8, 1; online, [available] <http://scottnicholson.com/pubs/meaningfulframework.pdf> [accessed January 29, 2014]
- Oates, B.J., (2006). *Researching information systems and computing*. Sage, London.
- Oxford University Press, (2017) *Oxford English Thesaurus* [online], available: <https://en.oxforddictionaries.com/english-thesaurus> [accessed January 17, 2017]
- Parnin, C., Treude, C., Grammel, L., & Storey, M. A. (2012). Crowd documentation: Exploring the coverage and the dynamics of API discussions on Stack Overflow. *Georgia Institute of Technology, Tech. Rep.*
- Paul, S. A., Hong, L., & Chi, E. H. (2012). Who is authoritative? understanding reputation mechanisms in quora. *arXiv preprint arXiv:1204.3724*.
- Pedreira, O., García, F., Brisaboa, N., & Piattini, M. (2015). Gamification in software engineering—A systematic mapping. *Information and Software Technology*, 57, 157-168.

- Pelling, N., (2011) *The (short) prehistory of “gamification”* [online] available: <http://nanodome.wordpress.com/2011/08/09/the-short-prehistory-of-gamification/> [accessed January 29, 2014]
- Postma, A. M. (nd) *Motivation in human computation task design* [online], available: http://www.annepostma.nl/portfolio/content/AnneM.Postma_Motivation%20in%20human%20computation%20task%20design.pdf [accessed January 20, 2014]
- Prensky, M. (2003). Digital game-based learning. *Computers in Entertainment (CIE)*, 1(1), 21-21.
- Priebatsch, S., (2010) *The game layer on top of the world* [online], available: http://www.ted.com/talks/seth_priebatsch_the_game_layer_on_top_of_the_world [accessed April 7, 2014]
- Protalinski, E., (2015) *100M users strong, Duolingo raises \$45M led by Google at a \$470M valuation to grow language-learning platform* [online], available: <http://venturebeat.com/2015/06/10/100m-users-strong-duolingo-raises-45m-led-by-google-at-a-470m-valuation-to-grow-language-learning-platform/> [accessed August 25, 2015]
- Przybylski, A. K., Rigby, C. S., & Ryan, R. M. (2010). A motivational model of video game engagement. *Review of General Psychology*, 14(2), 154.
- Quinn, A. J., & Bederson, B. B. (2011). Human computation: a survey and taxonomy of a growing field. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems* (pp. 1403-1412). ACM.
- Quora (2010) *The Best Answer to Any Question* [online] available: <https://www.quora.com/> [accessed September 24, 2014]
- Ramirez, D. & K. Squire (2014) Gamification and Learning in Walz, S., & Deterding, S. (eds) *The Gameful World: Approaches, Issues, Applications*. MIT Press.
- Randall, A. M., & Jašková, B. V. (2014) *Duolingo as a New Language-Learning Website and its Contribution to E-Learning Education*. Unpublished Masters thesis [online], available: http://is.muni.cz/th/342420/pedf_m/Duolingo.pdf [accessed December 5, 2014].
- Recyclebank (2004) *Good Actions. Great Deals.* [online], available: <https://www.recyclebank.com/about-us> [accessed September 24, 2014]
- Reeves, B., & Read, J. L. (2009) *Total Engagement: Using Games and Virtual Worlds to Change the Way People Work and Businesses Compete*. MA: Boston: Harvard Business School Publishing.
- Resnick, P., Kuwabara, K., Zeckhauser, R., & Friedman, E. (2000). Reputation Systems *Communications of the ACM*, 43(12), 45-48.
- Rigby, C. S. & Ryan, R. M. (2011). *Glued to Games: How Video Games Draw Us In and Hold Us Spellbound: How Video Games Draw Us In and Hold Us Spellbound*. ABC-CLIO.
- Rigby, C. S. (2014) Gamification and Motivation in Walz, S., & Deterding, S. (eds) *The Gameful World: Approaches, Issues, Applications*. MIT Press.
- Robertson, M., (2010) *Can't Play Won't Play* [online], available: <http://hideandseek.net/2010/10/06/cant-play-wont-play/> [accessed April 7, 2014]

- Robinson, D., & Bellotti, V. (2013). A preliminary taxonomy of gamification elements for varying anticipated commitment. In *Proc. ACM CHI 2013 Workshop on Designing Gamification: Creating Gameful and Playful Experiences*, [online], available: http://gamification-research.org/wp-content/uploads/2013/03/Robinson_Bellotti.pdf [accessed April 7, 2014]
- Rogstadius, J., Kostakos, V., Kittur, A., Smus, B., Laredo, J., & Vukovic, M. (2011). An Assessment of Intrinsic and Extrinsic Motivation on Task Performance in Crowdsourcing Markets. In *ICWSM*.
- Romero, B. (2011) *Gaming for Understanding* [online], available: https://www.ted.com/talks/brenda_brathwaite_gaming_for_understanding?language=en [accessed September 18, 2014]
- Ryan, R. M., & Connell, J. P. (1989). Perceived locus of causality and internalization: examining reasons for acting in two domains. *Journal of personality and social psychology*, 57(5), 749.
- Ryan, R. M., & Deci, E. L. (2000a). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American psychologist*, 55(1), 68.
- Ryan, R. M., & Deci, E. L. (2000b). Intrinsic and extrinsic motivations: Classic definitions and new directions. *Contemporary educational psychology*, 25(1), 54-67.
- Ryan, R. M., Rigby, C. S., & Przybylski, A. (2006). The motivational pull of video games: A self-determination theory approach. *Motivation and emotion*, 30(4), 344-360.
- Sakamoto, M., Nakajima, T., & Alexandrova, T. (2012). Value-based design for gamifying daily activities. In *Entertainment Computing-ICEC 2012* (pp. 421-424). Springer Berlin Heidelberg.
- Sailer, M., Hense, J., Mandl, H., & Klevers, M. (2013) Psychological Perspectives on Motivation through Gamification, *Interaction Design and Architectures Journal*, IxD&A, N.19, 28–37.
- Salen, K., & Zimmerman, E. (2004). *Rules of play: Game design fundamentals*. MIT press.
- Savage, N. (2012). Gaining wisdom from crowds. *Communications of the ACM*, 55(3), 13-15.
- Schönau-Fog, H., & Bjørner, T. (2012). “Sure, I Would Like to Continue” A Method for Mapping the Experience of Engagement in Video Games. *Bulletin of Science, Technology & Society*, 32(5), 405-412.
- Seaborn, K., & Fels, D. I. (2015). Gamification in theory and action: A survey. *International Journal of Human-Computer Studies*, 74, 14-31.
- Seymour, B. (n.d.) *Maximizing the Usefulness of Data Gathered Through Crowdsourcing Methods Using Gamification*. [online], available: http://130.216.33.163/compsci705slc/assignments/proj_sem/reviews/bsey006.pdf [accessed March 26, 2014]
- Schell, J., (2010), *When games invade real life* [online], available: http://www.ted.com/talks/jesse_schell_when_games_invade_real_life [accessed March 26, 2014]
- Schell, J., (2014). *The Art of Game Design: A book of lenses*. CRC Press.
- Shneiderman, B. (2004). Designing for fun: how can we design user interfaces to be more fun? *Interactions*, 11(5), 48-50.

- Sierra, K., (2011) *Your customer won't take a bullet for you* [online], available: <http://gapingvoid.com/?s=your+customer+won%27t+take+a+bullet+for+you> [accessed March 30, 2014]
- Sims, Z., (2011) *Codecademy* [online], available: <http://www.codecademy.com/about> [accessed April 29, 2015]
- Stack Overflow (2008) *Question and Answer site* [online] available: <http://stackoverflow.com/> [accessed September 24, 2014]
- Standage, M., Duda, J. L., & Ntoumanis, N. (2005). A test of self-determination theory in school physical education. *British Journal of Educational Psychology*, 75(3), 411-433.
- Stephens, T., (2015) Game Designer Brenda Romero honoured with Game Developers Choice Award [online], available <http://news.ucsc.edu/2015/01/romero-award.html> [accessed March 23, 2015]
- Thom, J., Millen, D., & DiMicco, J. (2012). Removing gamification from an enterprise SNS. In *Proceedings of the ACM 2012 conference on Computer Supported Cooperative Work* (pp. 1067-1070). ACM.
- Tsang, M., Fitzmaurice, G., Kurtenbach, G., & Khan, A. (2003). Game-like navigation and responsiveness in non-game applications. *Communications of the ACM*, 46(7), 56-61.
- Vansteenkiste, M., Niemiec, C.P. and Soenens, B., (2010). The development of the five mini-theories of self-determination theory: An historical overview, emerging trends, and future directions. In *The decade ahead: Theoretical perspectives on motivation and achievement* (pp. 105-165). Emerald Group Publishing Limited.
- Vesselinov, R., & Grego, J., (2012) *Duolingo Effectiveness Study* [online], available: http://static.duolingo.com/s3/DuolingoReport_Final.pdf [accessed February 14, 2014]
- von Ahn, L., Ginosar, S., Kedia, M., Liu, R., & Blum, M. (2006). Improving accessibility of the web with a computer game. In *Proceedings of the SIGCHI conference on Human Factors in computing systems* (pp. 79-82). ACM.
- von Ahn, L., & Dabbish, L. (2008). Designing games with a purpose. *Communications of the ACM*, 51(8), 58-67.
- von Ahn, L. (2006) Games with a purpose. *Computer* 39(6), 92-94
- von Ahn, L. (2011a). Three human computation projects. In *Proceedings of the 42nd ACM technical symposium on Computer science education* (pp. 691-692). ACM.
- von Ahn, L. (2011b) Massive-scale online collaboration [online], available: http://www.ted.com/talks/luis_von_ahn_massive_scale_online_collaboration?language=en [accessed February 14, 2014]
- von Ahn, L. (2012a). *Duolingo Language Courses*. [online], available: <https://www.duolingo.com/courses/all> [accessed February 14, 2014]
- von Ahn, L. (2012b) *IAmA scientist and startup CEO named Luis von Ahn*. AMA. [online], available: https://www.reddit.com/r/IAmA/comments/we7tq/iaama_scientist_and_startup_ceo_named_luis_von_ahn/ [accessed May 9, 2017]

- von Ahn, L. (2013a). Duolingo: learn a language for free while helping to translate the web. In *Proceedings of the 2013 international conference on Intelligent user interfaces* (pp. 1-2). ACM.
- von Ahn, L. (2013b). Augmented intelligence: the Web and human intelligence. *Philosophical Transactions of the Royal Society A: Mathematical, Physical and Engineering Sciences*, 371(1987), 20120383.
- von Ahn, L., (2013c) *I am a scientist and entrepreneur named Luis von Ahn* [online], available: https://www.reddit.com/r/IAmA/comments/1fa3nu/iam_a_scientist_and_entrepreneur_named_luis_von_/ [accessed November 4, 2016]
- von Ahn, L., (2014a) Duolingo turns two today [online], available: <https://www.duolingo.com/comment/3412629> [accessed August 19, 2014]
- von Ahn, L., (2014b) I am Luis von Ahn, co-founder and CEO of Duolingo. AMA [online], available: https://www.reddit.com/r/duolingo/comments/230umo/iam_luis_von_ahn_cofounder_and_ceo_of_duolingo_ama/ [accessed November 4, 2016]
- von Ahn, L., (2014c) *I am Luis von Ahn...AMA!* [online], available http://www.reddit.com/r/IAmA/comments/2mwe7w/i_am_luis_von_ahn_the_creator_of_recaptcha_those/ [accessed November 20, 2014]
- von Ahn, L., (2017) *I am Luis von Ahn, CEO and co-founder of Duolingo, AMA!* [online], available: https://www.reddit.com/r/duolingo/comments/5pr3sv/i_am_luis_von_ahn_ceo_and_cofounder_of_duolingo/?limit=500 [accessed May 8, 2017]
- von Ahn, L., (no date) *Luis von Ahn* [online], available: <https://www.cs.cmu.edu/~biglou/> [accessed February 10, 2014]
- Vygotsky, L., (1978), *Mind in Society: The Development of Higher Psychological Processes*, Cambridge and London, Harvard University Press
- Walz, S. & Deterding, S. (2014) An Introduction to the Gameful World in Walz, S., & Deterding, S. (eds) *The Gameful World: Approaches, Issues, Applications*. MIT Press.
- Wang, G., Gill, K., Mohanlal, M., Zheng, H., & Zhao, B. Y. (2013). Wisdom in the social crowd: an analysis of Quora. In *Proceedings of the 22nd international conference on World Wide Web* (pp. 1341-1352). International World Wide Web Conferences Steering Committee.
- Waze (2009) *Get the best route, every day, with real-time help from other drivers* [online], available: www.waze.com [accessed October 17, 2014]
- Weiser, P., Bucher, D., Cellina, F., & De Luca, V. (2015). A taxonomy of motivational affordances for meaningful gamified and persuasive technologies. *ICT for Sustainability (ICT4S)*.
- Wenger, E., McDermott, R. A., & Snyder, W. (2002). *Cultivating communities of practice: A guide to managing knowledge*. Harvard Business Press.
- Wenger, E. (2011). *Communities of practice: A brief introduction* [online], available: <http://hdl.handle.net/1794/11736> [accessed September 20, 2015]
- Werbach, K & Hunter, D, (2012) *For the Win: How Game Thinking Can Revolutionize Your Business*, University of Pennsylvania, Wharton Digital Press.

Werbach, K. & Hunter, D., (2015). *The gamification toolkit: Dynamics, mechanics, and components for the win*, University of Pennsylvania, Wharton Digital Press.

Ye, F. (2014) *Validity, reliability, and concordance of the Duolingo English Test* [online], available <https://s3.amazonaws.com/duolingo-certifications-data/CorrelationStudy.pdf> [accessed November 26, 2014]

Yee, N. (2007). Motivations of play in online games. *Cyber Psychology & behavior*, 9(6), 772-775

Yee, N., Ducheneaut, N., & Nelson, L. (2012). Online gaming motivations scale: development and validation. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems* (pp. 2803-2806). ACM.

Yunus, Muhammad and Weber, Karl (2007). Creating a world without poverty: social business and the future of capitalism. *Public Affairs*, 2007.

Zhang, P. (2007). Toward a positive design theory: principles for designing motivating information and communication technology. *Advances in Appreciative Inquiry*, 2, 45-74.

Zhang, P. (2008). Technical opinion Motivational affordances: reasons for ICT design and use. *Communications of the ACM*, 51(11), 145-147.

Zichermann, G., (2011) *A Teachable Moment* [online] available: <http://www.gamification.co/2011/09/20/a-teachable-moment/> [accessed April 29, 2014]

Zichermann, G., & Cunningham, C. (2011). *Gamification by design: Implementing game mechanics in web and mobile apps*. O'Reilly Media, Inc.

Zimmerman, E. (2012) *Jerked around by the Magic Circle – Clearing the air 10 years later* [online], available: http://www.gamasutra.com/view/feature/135063/jerked_around_by_the_magic_circle_.php [accessed May 27, 2016]

Zimmerman, E. (2014) Manifesto for a Ludic Century in Walz, S., & Deterding, S. (eds) *The Gameful World: Approaches, Issues, Applications*. MIT Press.

Appendices

Appendix A: Publications, Reviews and Presentations

Publications

In press

Exton, G. & Murray, L., (2013 [2017]) Duolingo: An Evaluation of Gamification for CALL. *Greta Journal for Teachers of English*. Volume 21, Number 1, pages 25-34.

February 2015

“Motivation: A Proposed Taxonomy using Gamification” [with Liam Murray] on the *University of Limerick’s Institutional Repository* at: <http://hdl.handle.net/10344/4279>
(Statistics on access to this paper in Figure App.1)

Overall Statistics (for all your items):

Your total abstract views for the past month:	4	Your overall total abstract views:	414
Your total downloads for the past month:	2	Your overall total downloads:	363

Figure App.1: Download statistics for ULIR paper as at June 2017

Reviews

January 2017

Guest reviewer for *Computers in Human Behavior*

Lectures

March 2016

Guest lecture on Gamification: Broadening programme
University of Limerick

November 2015

Guest lecture [with James Patten] on Gamification: MA Digital Media Students, National University of Ireland Galway

November 2015

Guest lecture [with James Patten] on Gamification: 4th year Computer Games Development Students,
University of Limerick

November 2014

Guest lecture [with James Patten] on Gamification: 4th year Computer Games Development Students,
University of Limerick

Conference Presentations

September 2015

“Gamifying Irish-Language Learning,”
CALL for Irish Symposium,
DCU, Dublin

August 2015

“Duolingo: A Case Study in Gamification,”
EuroCALL2015,
Padova, Italy

May 2015

“Gamification for education: rants, retorts, rebuttals and refinements,” [with James Patten and Liam Murray]
ILTA EdTech2015,
UL, Limerick

Appendix B: Gamer survey

The survey was conducted using Google Forms, so in order to include it in this Word document it was converted to pdf. This resulted in a loss of formatting, however the resultant pages are copied and pasted for reference's sake.

03/07/2017 Game Elements and Motivation - Google Forms

QUESTIONS RESPONSES 107

Section 1 of 25

Game Elements and Motivation

Thank you for taking the time to do this survey.

The purpose of this research project is to look for relationships between elements found in games and ways to motivate people.

This is a research project being conducted by Geraldine Exton, Dr Jim Buckley and Dr Liam Murray at the University of Limerick in Ireland. You are invited to participate in this research project because you play computer games.

PROCEDURE
The procedure involves completing an online survey that will take approximately 12 minutes. Your responses will be confidential and we do not collect identifying information such as your name, email address or IP address. The survey questions will be about some commonly occurring game elements and their relationship to components of a motivational theory.

ANONYMITY
As we capture no identifying information, the information provided by the participants cannot be traced back to individuals and so anonymity is guaranteed. All data is stored in a password protected electronic format. To help protect your confidentiality, the surveys will not contain information that will personally identify you. The results of this study will be used for scholarly purposes only and will only be presented in anonymised, summary form.

VOLUNTARY PARTICIPATION
Your participation in this research study is voluntary. You may choose not to participate. If you decide to participate in this research survey, you may withdraw at any time. If you decide not to participate in this study or if you withdraw from participating at any time, there is no penalty.

This research has been reviewed according to University of Limerick Ethics Procedures for research involving human subjects.

FURTHER INFORMATION
If you have any questions about the research study, please contact jim.buckley; liam.murray; or geraldine.exton@ul.ie

If you have concerns about this study and wish to contact someone independent, you may contact: The Chair, Faculty of Science & Engineering Research Ethics Committee, University of Limerick, Limerick. Tel: 061 202802

ELECTRONIC CONSENT
Please select your choice below.

Clicking on the "agree" button below indicates that:

- you have read the above information
- you voluntarily agree to participate
- you are at least 18 years of age

If you do not wish to participate in the research study, please decline participation by clicking on the "disagree" button.

Consent

☐ Agree

Figure App.2: Page One of survey

After section 1 [Continue to next section](#)

Section 2 of 25

Who you are

Please give us some background information on your age and gaming habits. None of this will be identifiable.

Please tell us your age: *

- ☐ under 18
- ☐ 18-24
- ☐ 25-30
- ☐ 31-40
- ☐ 40+

Please tell us your gender: *

Short answer text

How many hours per week do you currently play games? *

- 1. 0-2 hours
- 2. 2-10 hours
- 3. 10+ hours

How many years have you played games? *

- 1. 0-2 years
- 2. 2-5 years

Figure App.3: Page Two of survey

5. Option 5

6. Option 6

7. Option 7

After section 2 Continue to next section

Section 3 of 25



1/20: Achievements - in-game content that is earned by player behaviour, eg. content for avatar customisation

Reminder:

- Competence – mastering skills
- Autonomy – feeling of choice
- Relatedness – social connection

If you think Achievements may make you feel any of those, please choose the relevant component(s).

1/20: Achievements *

Row 1. Competence

Row 2. Autonomy

Row 3. Relatedness

Column 1. Not important at all

Column 2. Of little importance

Column 3. I don't know

Column 4. Of average importance

Column 5. Very important

After section 3 Continue to next section

Figure App.4: Page Three of survey

2/20: Audio - background music or sound effects

Reminder:

- Competence – mastering skills
- Autonomy – feeling of choice
- Relatedness – social connection

If you think Audio may make you feel any of those, please choose the relevant component(s).

2/20: Audio *

Row 1. Competence

Row 2. Autonomy

Row 3. Relatedness

Column 1. Not important at all

Column 2. Of little importance

Column 3. I don't know

Column 4. Of average importance

Column 5. Very important

After section 4 [Continue to next section](#)

3/20: Avatars - visual representation of a player in a game, personalised with chosen elements

Reminder:

- Competence – mastering skills
- Autonomy – feeling of choice

Figure App.5: Page Four of survey

3/20: Avatars *

Row 1. Competence

Row 2. Autonomy

Row 3. Relatedness

Column 1. Not important at all

Column 2. Of little importance

Column 3. I don't know

Column 4. Of average importance

Column 5. Very important

After section 5 Continue to next section

Section 6 of 25

4/20: Badges - visual representations of rewards or achievements

Reminder:

- Competence – mastering skills
- Autonomy – feeling of choice
- Relatedness – social connection

If you think Badges may make you feel any of those, please choose the relevant component(s).

4/20: Badges *

Row 1. Competence

Row 2. Autonomy

Row 3. Relatedness

Column 1. Not important at all

Figure App.6: Page Five of survey

03/07/2017

Game Elements and Motivation - Google Forms

Column 3. I don't know

Column 4. Of average importance

Column 5. Very important

After section 6 Continue to next section

Section 7 of 25



5/20: Boss fights - final challenges in order to level up

Reminder:

- Competence – mastering skills
- Autonomy – feeling of choice
- Relatedness – social connection

If you think Boss fights may make you feel any of those, please choose the relevant component(s).

5/20: Boss fights *

Row 1. Competence

Row 2. Autonomy

Row 3. Relatedness

Column 1. Not important at all

Column 2. Of little importance

Column 3. I don't know

Column 4. Of average importance

Column 5. Very important

After section 7 Continue to next section

Section 8 of 25



Figure App.7: Page Six of survey

6/20: Collections - sets of in-game items that may or may not be useful within the game

Reminder:

- Competence – mastering skills
- Autonomy – feeling of choice
- Relatedness – social connection

If you think Collections may make you feel any of those, please choose the relevant component(s).

6/20: Collections *

Row 1. Competence

Row 2. Autonomy

Row 3. Relatedness

Column 1. Not important at all

Column 2. Of little importance

Column 3. I don't know

Column 4. Of average importance

Column 5. Very important

After section 8 [Continue to next section](#)

Section 9 of 25

7/20 Combat - fights, battles, duels within games

Reminder:

- Competence – mastering skills
- Autonomy – feeling of choice
- Relatedness – social connection

If you think Combat may make you feel any of those, please choose the relevant component(s).

7/20: Combat *

Figure App.8: Page Seven of survey

Row 2. Autonomy

Row 3. Relatedness

Column 1. Not important at all

Column 2. Of little importance

Column 3. I don't know

Column 4. Of average importance

Column 5. Very important

After section 9 Continue to next section

Section 10 of 25



8/20: Content-unlocking - content withheld from players until a certain level of ability is reached

Reminder:

- Competence – mastering skills
- Autonomy – feeling of choice
- Relatedness – social connection

If you think Content-unlocking may make you feel any of those, please choose the relevant component(s).

8/20: Content-unlocking *

Row 1. Competence

Row 2. Autonomy

Row 3. Relatedness

Column 1. Not important at all

Column 2. Of little importance

Column 3. I don't know

Figure App.9: Page Eight of survey

Column 5. Very important

After section 10 Continue to next section

Section 11 of 25

9/20: Discussion forums - forums which give an opportunity to ask and answer questions, rate other users, and communicate with other players

Reminder:

- Competence – mastering skills
- Autonomy – feeling of choice
- Relatedness – social connection

If you think Discussion forums may make you feel any of those, please choose the relevant component(s).

9/20: Discussion forums *

Row 1. Competence

Row 2. Autonomy

Row 3. Relatedness

Column 1. Not important at all

Column 2. Of little importance

Column 3. I don't know

Column 4. Of average importance

Column 5. Very important

After section 11 Continue to next section

Section 12 of 25

Figure App.10: Page Nine of survey

10/20: Gifting - the practice of giving in-game virtual goods to other players, as a reward or as part of a team strategy

Reminder:

- Competence – mastering skills
- Autonomy – feeling of choice
- Relatedness – social connection

If you think Gifting may make you feel any of those, please choose the relevant component(s).

10/20: Gifting *

Row 1. Competence

Row 2. Autonomy

Row 3. Relatedness

Column 1. Not important at all

Column 2. Of little importance

Column 3. I don't know

Column 4. Of average importance

Column 5. Very important

After section 12 Continue to next section

Section 13 of 25

11/20: Haptic effects - physical effects such as a tremor in the mouse when a character moves

Reminder:

- Competence – mastering skills
- Autonomy – feeling of choice
- Relatedness – social connection

If you think Haptic effects may make you feel any of those, please choose the relevant component(s).

Figure App.11: Page Ten of survey

11/20: Haptic effects *

Row 1. Competence

Row 2. Autonomy

Row 3. Relatedness

Column 1. Not important at all

Column 2. Of little importance

Column 3. I don't know

Column 4. Of average importance

Column 5. Very important

After section 13 Continue to next section

Section 14 of 25

12/20: Leaderboards - all players' positions in a system, usually in relation to the number of points they have been awarded

Reminder:

- Competence – mastering skills
- Autonomy – feeling of choice
- Relatedness – social connection

If you think Leaderboards may make you feel any of those, please choose the relevant component(s).

12/20: Leaderboards *

Row 1. Competence

Row 2. Autonomy

Row 3. Relatedness

Column 1. Not important at all

Figure App.12: Page Eleven of survey

Column 3. I don't know

Column 4. Of average importance

Column 5. Very important

After section 14 Continue to next section

Section 15 of 25



13/20: Levels - levels express the number of points a player has, and subsequent levels become more difficult as a player progresses

Reminder:

- Competence – mastering skills
- Autonomy – feeling of choice
- Relatedness – social connection

If you think Levels may make you feel any of those, please choose the relevant component(s).

13/20: Levels *

Row 1. Competence

Row 2. Autonomy

Row 3. Relatedness

Column 1. Not important at all

Column 2. Of little importance

Column 3. I don't know

Column 4. Of average importance

Column 5. Very important

After section 15 Continue to next section

Figure App.13: Page Twelve of survey

14/20: Points - awarded for various deeds in a game

Reminder:

- Competence – mastering skills
- Autonomy – feeling of choice
- Relatedness – social connection

If you think Points may make you feel any of those, please choose the relevant component(s).

14/20: Points *

Row 1. Competence

Row 2. Autonomy

Row 3. Relatedness

Column 1. Not important at all

Column 2. Of little importance

Column 3. I don't know

Column 4. Of average importance

Column 5. Very important

After section 16 Continue to next section

Section 17 of 25

15/20: Quests - specific tasks which act as goals and can further a narrative thread in a game

Reminder:

- Competence – mastering skills
- Autonomy – feeling of choice
- Relatedness – social connection

If you think Quests may make you feel any of those, please choose the relevant component(s).

Figure App.14: Page Thirteen of survey

15/20: Quests *

Row 1. Competence

Row 2. Autonomy

Row 3. Relatedness

Column 1. Not important at all

Column 2. Of little importance

Column 3. I don't know

Column 4. Of average importance

Column 5. Very important

After section 17 Continue to next section

Section 18 of 25

16/20: Realistic graphics - the importance given to good aesthetics in a game

Reminder:

- Competence – mastering skills
- Autonomy – feeling of choice
- Relatedness – social connection

If you think Realistic graphics may make you feel any of those, please choose the relevant component(s).

16/20: Realistic graphics *

Row 1. Competence

Row 2. Autonomy

Row 3. Relatedness

Column 1. Not important at all

Column 2. Of little importance

Figure App.15: Page Fourteen of survey

03/07/2017

Game Elements and Motivation - Google Forms

Column 4. Of average importance

Column 5. Very important

After section 18

Continue to next section

Section 19 of 25

>

<

...

17/20: Reminders - to encourage you to play the game

Reminder:

- Competence – mastering skills
- Autonomy – feeling of choice
- Relatedness – social connection

If you think Reminders may make you feel any of those, please choose the relevant component(s).

17/20: Reminders

Row 1. Competence

Row 2. Autonomy

Row 3. Relatedness

Column 1. Not important at all

Column 2. Of little importance

Column 3. I don't know

Column 4. Of average importance

Column 5. Very important

After section 19

Continue to next section

Section 20 of 25

>

<

...

Figure App.16: Page Fifteen of survey

presented to specific groups or teams of people within a game, eg. to spur one group on to

Reminder:

- Competence – mastering skills
- Autonomy – feeling of choice
- Relatedness – social connection

If you think Social graphs may make you feel any of those, please choose the relevant component(s).

18/20: Social graphs *

Row 1. Competence

Row 2. Autonomy

Row 3. Relatedness

Column 1. Not important at all

Column 2. Of little importance

Column 3. I don't know

Column 4. Of average importance

Column 5. Very important

After section 20 Continue to next section

Section 21 of 25

19/20: Teams - groups of people who may or may not know each other outside the game

Reminder:

- Competence – mastering skills
- Autonomy – feeling of choice
- Relatedness – social connection

If you think Teams may make you feel any of those, please choose the relevant component(s).

Figure App.17: Page Sixteen of survey

Row 1. Competence

Row 2. Autonomy

Row 3. Relatedness

Column 1. Not important at all

Column 2. Of little importance

Column 3. I don't know

Column 4. Of average importance

Column 5. Very important

After section 21 Continue to next section

Section 22 of 25



20/20: Virtual goods - in-game items which may be purchased by performing tasks within a game

Reminder:

- Competence – mastering skills
- Autonomy – feeling of choice
- Relatedness – social connection

If you think Virtual goods may make you feel any of those, please choose the relevant component(s).

20/20: Virtual goods *

Row 1. Competence

Row 2. Autonomy

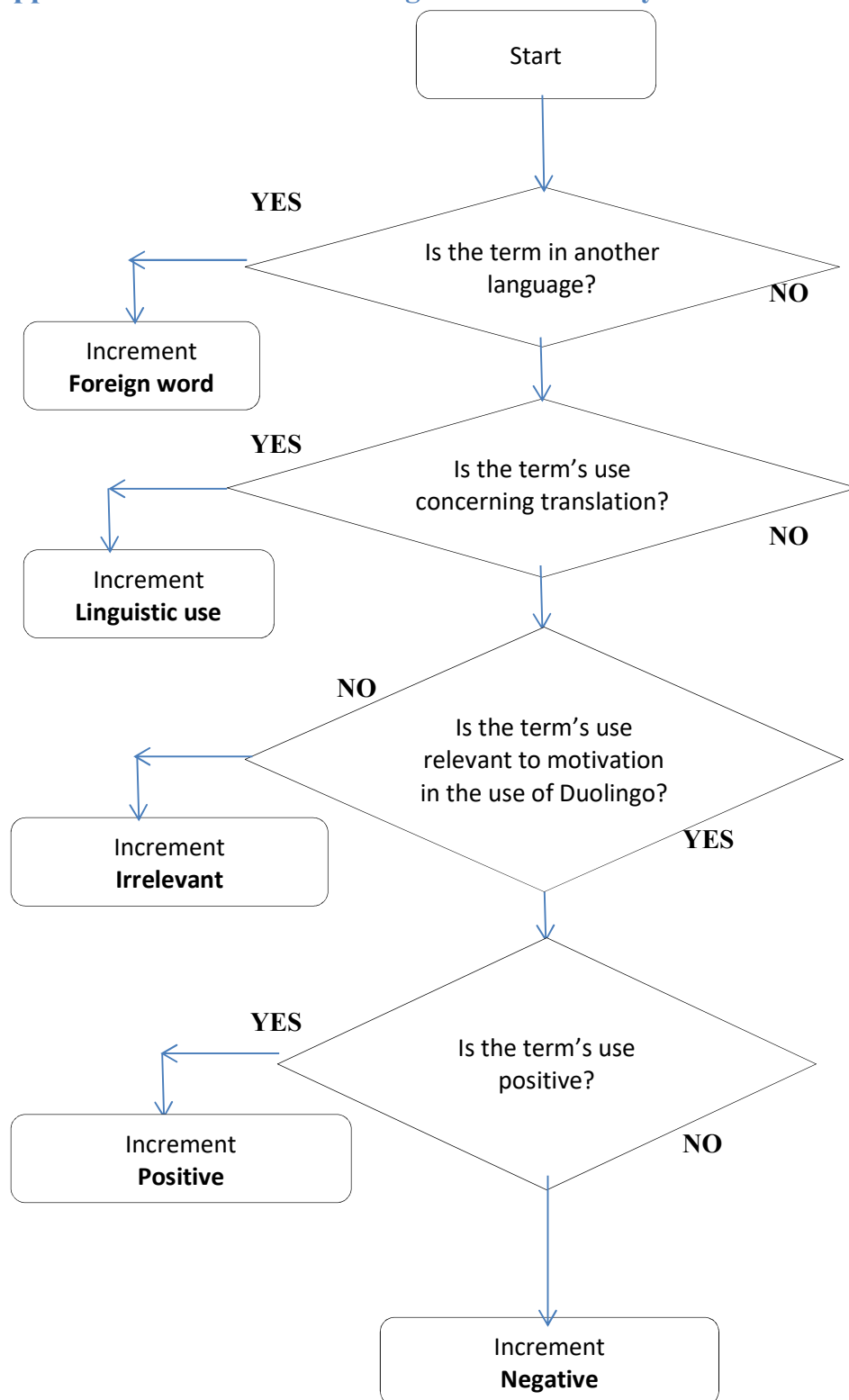
Row 3. Relatedness

Column 1. Not important at all

Column 2. Of little importance

Figure App.18: Page Seventeen of survey

Appendix C: Protocol for coding the content analysis



Appendix D: 1000 message threads derived from Duolingo Discussion forums

As these files are very long, they are presented separately, in hard form as CD and in soft copy as a separate file.

Appendix E: Official Duolingo publications

Duolingo press release on website

Duolingo (2013) *Duolingo To Launch Fully Crowdsourced Language Courses*, [online], available:

<https://www.duolingo.com/press>

http://duolingo-data.s3.amazonaws.com/s3/press-assets/Duolingo_Incubator_Launch.pdf [accessed October 27, 2016]

Pittsburgh, PA (October 9, 2013) –

Duolingo announced today it will launch the Language Incubator, a way for its community of 10 million language learners to create high-level language courses collaboratively. The platform will employ crowdsourcing to launch the first ever instance of completely crowdsourced language courses.

Though Duolingo is already the most popular way to learn languages online, ranking as the #1 education app on both iTunes and Google Play), it has only offered 6 languages over its first 15 months live. This new development will enable the inclusion of every language in the world, including fictional languages such as Dothraki and Elvish. The most awaited languages, based on ongoing requests from the community, include Chinese, Russian, Japanese and Arabic. “There are many exciting aspects about this, including the possibility of helping preserve endangered languages across the globe,” said Duolingo’s co-founder, Luis von Ahn. Native speakers and language enthusiasts of any language in the world will work together to create courses while a patented algorithm will ensure each lesson is up to Duolingo’s well-known standards.

Luis von Ahn has a track record of solving large global problems via crowdsourcing, powering the combined efforts of millions of people across the globe with technology. While language learning is notoriously expensive and, therefore, prohibitive, this new development will allow anyone to obtain a lifetime of language learning for free.

About Duolingo

Created by crowdsourcing pioneer Luis von Ahn, inventor of reCAPTCHA, and Severin Hacker, Duolingo is a free language learning platform in which students translate Web content in order to practice their foreign language skills. As such, the platform provides high quality language education for free while its students give back by translating websites. Duolingo has quickly become the most popular way to learn languages online and its science-based education model has been proven to be more effective than expensive language-learning softwares and university classes.

About Luis von Ahn

Luis von Ahn is the inventor of reCAPTCHA, a crowdsourcing technology used worldwide to digitize millions of books every year. He has sold two companies to Google, given a very popular TED talk watched by over a million people, and is known for changing what can be accomplished via the collaboration of millions of people online. Luis was awarded the MacArthur Genius grant for his accomplishments and has been featured in The Economist, The New York Times, Forbes, The Wall Street Journal and other prominent media worldwide. He received his Ph.D. from Carnegie Mellon University

Duolingo website

<https://www.duolingo.com/info> [October 27, 2016]

About

Personalized education.

Everyone learns in different ways. For the first time in history, we can analyze how millions of people learn at once to create the most effective educational system possible and tailor it to each student. Our ultimate goal is to give everyone access to a private tutor experience through technology.

Making learning fun.

It's hard to stay motivated when learning online, so we made Duolingo so fun that people would prefer picking up new skills over playing a game.

Universally accessible.

There are over 1.2 billion people learning a language and the majority are doing so to gain access to better opportunities. Unfortunately, learning a language is expensive and inaccessible to most.

We created Duolingo so that everyone could have a chance. Free language education – no hidden fees, no premium content, just free.

Duolingo is used by the richest man in the world and many Hollywood stars, and at the same time by public schools students in developing countries. We believe true equality is when spending more can't buy you a better education.

<https://www.duolingo.com/team> [October 27, 2016]

Different jobs, one goal: 53% Engineering; 17% Design; 8% Operations; 5% Community; 3% Marketing; 3% Sales; 3% Leadership; 3% Research; 3% Product

<https://www.duolingo.com/register> [October 27, 2016]

The best new way to learn a language.

Learning with Duolingo is fun and addictive. Earn points for correct answers, race against the clock, and level up. Our bite-sized lessons are effective, and we have proof that it works.

See how we do it [video link embedded into page] – transcription

Everybody agrees. Duolingo is a great way to learn a language. It's addictive, because languages are split into bite-size skills that feel like games. You'll lose a life when you get something wrong, and you earn points when you complete a lesson. Duolingo teaches you to read, write, listen and speak, and it's extremely effective. In fact, an independent study found that 34 hours on Duolingo are equal to a whole university semester. A semester of knowledge that you can fit into your breaks, commutes, and moments spent waiting in line. Duolingo is completely free. No annoying ads, no misleading in-app purchases, no subscription fees. Language, free at last.

Gamification poured into every lesson.

Read, Listen, Speak

Each lesson includes a variety of speaking, listening, translation, and multiple choice challenges.

In-Lesson Grading

Instantly see which answers you get correct. When you miss a challenge, we'll quickly show you how to improve.

Streak Count

Duolingo motivates you to stay on track by recording how many days in a row you spend learning a language.

Hearts

Hearts keep your lessons alive! You lose them when you answer incorrectly. When you're out of hearts, start over and try again.

Learn anytime, anywhere.

Make your breaks and commutes more productive with our iPhone and Android apps. Download them and see why Apple and Google gave us their highest accolades.

Duolingo for Schools

The world's most popular language learning platform is now available for the classroom. Thousands of teachers are already using it to enhance their lessons.

Bring Duolingo to your classroom [link to <https://schools.duolingo.com/>]
You can now track progress on Duolingo!

Many teachers and even entire governments around the world already view Duolingo as the perfect blended learning companion for their classrooms. Duolingo lessons give each student personalized feedback and practice, preparing them to get the most out of classroom instruction.

Now teachers can track all their students in one place through our brand new dashboard.

Over 50 million people around the world use Duolingo to help them learn languages. The fun, game-like lessons keep students motivated and excited about language. Best of all, as studies by the City University of New York and others have shown - it really works! [Vesselinov paper]

<https://www.duolingo.com/guidelines>

Community Guidelines

Duolingo is a global community of language learners

We believe that everyone should have access to free language education. Our guidelines are meant to build a mutual understanding of what being a part of this community is all about. We will take action if any of these guidelines are not upheld, so please read carefully.

Always be Respectful

We come together from across the world at varying language levels with the same goal in mind - to learn. Curiosity, questioning, and cultural understanding are something we celebrate. Be respectful of others and where they're coming from.

Help and support across all skill levels

We are all in this together. Learning a language is hard and takes a lot of courage and dedication. If someone uses incorrect grammar or has a question you think has an obvious answer, kindly and calmly help them out. Heckling and being straight up mean doesn't help anyone learn. Can't say it nicely? Don't weigh in.

Embrace and share regional language differences

A language can have many words, accents and ways to say the same thing. We think that's one of the wonders of languages. Approach these conversations with an open mind and attitude.

Think before you share

We care about your safety. Speaking another language is inherently social, but please beware of swapping or posting any private information that could be misused. That includes your phone number, age, address, what time you'll be at home, school name, email, or other personal information that could put your privacy at risk. Simply put: don't over-share. Sharing and encouraging others to share personal data might get your post, and possibly your account, removed.

Please don't use Duolingo to...

Attack a person or group of people with words and actions

Duolingo is a safe place for learners of all backgrounds. Harassment and hurtful content will not be tolerated. Using symbols, names and text that promote hate—as well as harassing, stalking, impersonating, and making sexual remarks towards someone—are considered abuse. The same goes for nudity and disturbing profile pictures and usernames. As stated in the terms, Duolingo reserves the right to replace images or remove these accounts at its sole discretion. Rule of thumb: if you are making someone feel attacked or hurt, then you shouldn't be doing it. We take these reports seriously and may delete your account without previous notice if such activity is verified by our team.

Spam the forum or people's streams

Leaving a trail of irrelevant entries in forums or on people's streams may get your account deleted. This includes not only creating posts without substance, but also any other type of spamming.

Script or cheat maliciously

Duolingo believes in honest learning. If you are scripting for the purposes of cheating or sharing information and instructions about using Duolingo in a way that may impact the system, community, learning, data or experience in a negative or significant manner, your account and posts may be removed.

Write inflammatory comments

Hateful, obscene and off-topic comments don't contribute to learning. Cursing doesn't either (let people discover those words in the wild). Leave them out of the language discussions.

To Summarize

By following these guidelines we'll all contribute to an interesting and helpful learning community. What happens if you can't follow these guidelines or our terms of service? You risk losing partial or full access to Duolingo without warning.

<https://support.duolingo.com/hc/en-us>

General Questions

<https://support.duolingo.com/hc/en-us/sections/200824750-General-Questions>

What is Duolingo?

Where can I use Duolingo?

How much does Duolingo cost?

Is my information safe?

I think Duolingo is awesome and want to work there! How do I submit my resume?

Do I need the internet to use Duolingo?

Forums & Discussions

Troubleshooting

What are the forum community guidelines?

Who are the forum moderators?

How do I edit or delete a comment?

What are those arrows under the comments?

What are the Moderator Guidelines?

Account

How do I change my username or email?

My account is in a language I do not understand! How do I change it back?

Someone created a Duolingo account with my email. How can I remove it and unsubscribe?

I forgot my password, how do I reset it?

How do I change my profile picture?

I can't access my account or reset my password!

See all 11 articles

Using Duolingo

Parental controls and online maturity

How do I invite and add friends?

How do I block someone?

Why did I lose my streak?

How can I learn multiple languages at the same time?

How can I skip the basics?

See all 16 articles

Technical Problems

My sound is not working. What can I do?

My microphone is not working. How can I fix it?

How do I take a screenshot?

How do I allow Duolingo to use my microphone on Chrome?

How do I make a video attachment for a bug report?

Duolingo for Schools

What is Duolingo for Schools?

Duolingo for Schools FAQ

How do I disable social features and mature vocabulary for my children?

How do I find an assignment?

How do I access Duolingo for Schools?

Incubator

What is the Incubator?

To Beta and beyond. What are the course progress phases?

How can I suggest a new language course?

Immersion

How does the Immersion section work?

Can I upload Immersion documents to be translated?

The Duolingo English Test

What is the Duolingo English Test?

How is the Duolingo English Test different from Duolingo's other tests and quizzes?

About the Duolingo English Test Scores

Duolingo English Test FAQ

Reporting Issues

How do I report a problem with a sentence or translation?

How do I report an issue with the course?

How do I report a bug?

How do I report abuse?

Still unsure about something?

Ask the CommunityorSubmit Bug Report

Luis von Ahn TED talk

von Ahn, L. (2011b) Massive-scale online collaboration [online], available:

http://www.ted.com/talks/luis_von_ahn_massive_scale_online_collaboration?language=en [accessed February 14, 2014]

Subtitles and Transcript

0:11

How many of you had to fill out some sort of web form where you've been asked to read a distorted sequence of characters like this? How many of you found it really, really annoying? Okay, outstanding. So I invented that. (Laughter) Or I was one of the people who did it.

0:24

That thing is called a CAPTCHA. And the reason it is there is to make sure you, the entity filling out the form, are actually a human and not some sort of computer program that was written to submit the form millions and millions of times. The reason it works is because humans, at least non-visually-impaired humans, have no trouble reading these distorted squiggly characters, whereas computer programs simply can't do it as well yet. So for example, in the case of Ticketmaster, the reason you have to type these distorted characters is to prevent scalpers from writing a program that can buy millions of tickets, two at a time.

0:50

CAPTCHAs are used all over the Internet. And since they're used so often, a lot of times the precise sequence of random characters that is shown to the user is not so fortunate. So this is an example from the Yahoo registration page. The random characters that happened to be shown to the user were W, A, I, T, which, of course, spell a word. But the best part is the message that the Yahoo help desk got about 20 minutes later. Text: "Help! I've been waiting for over 20 minutes, and nothing happens." (Laughter) This person thought they needed to wait. This of course, is not as bad as this poor person.

1:24

(Laughter)

1:26

CAPTCHA Project is something that we did here at Carnegie Mellon over 10 years ago, and it's been used everywhere. Let me now tell you about a project that we did a few years later, which is sort of the next evolution of CAPTCHA. This is a project that we call reCAPTCHA, which is something that we started here at Carnegie Mellon, then we turned it into a startup company. And then about a year and a half ago, Google actually acquired this company.

1:46

So let me tell you what this project started. So this project started from the following realization: It turns out that approximately 200 million CAPTCHAs are typed everyday by people around the world. When I first heard this, I was quite proud of myself. I thought, look at the impact that my research has had. But then I started feeling bad. See here's the thing, each time you type a CAPTCHA, essentially you waste 10 seconds of your time. And if you multiply that by 200 million, you get that humanity as a whole is wasting about 500,000 hours every day typing these annoying CAPTCHAs. So then I started feeling bad.

2:16

(Laughter)

2:18

And then I started thinking, well, of course, we can't just get rid of CAPTCHAs, because the security of the Web sort of depends on them. But then I started thinking, is there any way we can use this effort for something that is good for humanity? So see, here's the thing. While you're typing a CAPTCHA, during those 10 seconds, your brain is doing something amazing. Your brain is doing something that computers cannot yet do. So can we get you to do useful work for those 10 seconds? Another way of putting it is, is there some humongous problem that we cannot yet get computers to solve, yet we can split into tiny 10-second chunks such that each time somebody solves a CAPTCHA they solve a little bit of this problem? And the answer to that is "yes," and this is what we're doing now.

2:52

So what you may not know is that nowadays while you're typing a CAPTCHA, not only are you authenticating yourself as a human, but in addition you're actually helping us to digitize books. So let me explain how this works. So there's a lot of projects out there trying to digitize books. Google has one. The Internet Archive has one. Amazon, now with the Kindle, is trying to digitize books. Basically the way this works is you start with an old book. You've seen those things, right? Like a book? (Laughter) So you start with a book, and then you scan it.

3:18

Now scanning a book is like taking a digital photograph of every page of the book. It gives you an image for every page of the book. This is an image with text for every page of the book. The next step in the process is that the computer needs to be able to decipher all of the words in this image. That's using a technology called OCR, for optical character recognition, which takes a picture of text and tries to figure out what text is in there. Now the problem is that OCR is not perfect. Especially for older books where the ink has faded and the pages have turned yellow, OCR cannot recognize a lot of the words. For example, for things that were written more than 50 years ago, the computer cannot recognize about 30 percent of the words. So what we're doing now is we're taking all of the words that the computer cannot recognize and we're getting people to read them for us while they're typing a CAPTCHA on the Internet.

4:01

So the next time you type a CAPTCHA, these words that you're typing are actually words that are coming from books that are being digitized that the computer could not recognize. And now the reason we have two words nowadays instead of one is because, you see, one of the words is a word that the system just got out of a book, it didn't know what it was, and it's going to present it to you. But since it doesn't know the answer for it, it cannot grade it for you. So what we do is we give you another word, one for which the system does know the answer. We don't tell you which one's which, and we say, please type both. And if you type the correct word for the one for which the system already knows the answer, it assumes you are human, and it also gets some confidence that you typed the other word correctly. And if we repeat this process to like 10 different people and all of them agree on what the new word is, then we get one more word digitized accurately.

4:42

So this is how the system works. And basically, since we released it about three or four years ago, a lot of websites have started switching from the old CAPTCHA where people wasted their time to the new CAPTCHA where people are helping to digitize books. So for example, Ticketmaster. So every time you buy tickets on Ticketmaster, you help to digitize a book. Facebook: Every time you add a friend or poke somebody, you help to digitize a book. Twitter and about 350,000 other sites are all using reCAPTCHA. And in fact, the number of sites that are using reCAPTCHA is so high that the number of words that we're digitizing per day is really, really large. It's about 100 million a day, which is the equivalent of about two and a half million books a year. And this is all being done one word at a time by just people typing CAPTCHAs on the Internet.

5:20

(Applause)

5:28

Now of course, since we're doing so many words per day, funny things can happen. And this is especially true because now we're giving people two randomly chosen English words next to each

other. So funny things can happen. For example, we presented this word. It's the word "Christians"; there's nothing wrong with it. But if you present it along with another randomly chosen word, bad things can happen. So we get this. (Text: bad christians) But it's even worse, because the particular website where we showed this actually happened to be called The Embassy of the Kingdom of God. (Laughter) Oops. (Laughter) Here's another really bad one. JohnEdwards.com (Text: Damn liberal) (Laughter) So we keep on insulting people left and right everyday.

6:16

Now, of course, we're not just insulting people. See here's the thing, since we're presenting two randomly chosen words, interesting things can happen. So this actually has given rise to a really big Internet meme that tens of thousands of people have participated in, which is called CAPTCHA art. I'm sure some of you have heard about it. Here's how it works. Imagine you're using the Internet and you see a CAPTCHA that you think is somewhat peculiar, like this CAPTCHA. (Text: invisible toaster) Then what you're supposed to do is you take a screen shot of it. Then of course, you fill out the CAPTCHA because you help us digitize a book. But then, first you take a screen shot, and then you draw something that is related to it. (Laughter) That's how it works. There are tens of thousands of these. Some of them are very cute. (Text: clenched it) (Laughter) Some of them are funnier. (Text: stoned founders) (Laughter) And some of them, like paleontological shvisle, they contain Snoop Dogg.

7:19

(Laughter)

7:22

Okay, so this is my favorite number of reCAPTCHA. So this is the favorite thing that I like about this whole project. This is the number of distinct people that have helped us digitize at least one word out of a book through reCAPTCHA: 750 million, which is a little over 10 percent of the world's population, has helped us digitize human knowledge. And it is numbers like these that motivate my research agenda. So the question that motivates my research is the following: If you look at humanity's large-scale achievements, these really big things that humanity has gotten together and done historically -- like for example, building the pyramids of Egypt or the Panama Canal or putting a man on the Moon -- there is a curious fact about them, and it is that they were all done with about the same number off people. It's weird; they were all done with about 100,000 people. And the reason for that is because, before the Internet, coordinating more than 100,000 people, let alone paying them, was essentially impossible. But now with the Internet, I've just shown you a project where we've gotten 750 million people to help us digitize human knowledge. So the question that motivates my research is, if we can put a man on the Moon with 100,000, what can we do with 100 million?

8:25

So based on this question, we've had a lot of different projects that we've been working on. Let me tell you about one that I'm most excited about. This is something that we've been semi-quietly working on for the last year and a half or so. It hasn't yet been launched. It's called Duolingo. Since it hasn't been launched, shhhhh! (Laughter) Yeah, I can trust you'll do that. So this is the project. Here's how it started. It started with me posing a question to my graduate student, Severin Hacker. Okay, that's Severin Hacker. So I posed the question to my graduate student. By the way, you did hear me correctly; his last name is Hacker. So I posed this question to him: How can we get 100 million people translating the Web into every major language for free?

9:05

Okay, so there's a lot of things to say about this question. First of all, translating the Web. So right now the Web is partitioned into multiple languages. A large fraction of it is in English. If you don't know any English, you can't access it. But there's large fractions in other different languages, and if you don't know those languages, you can't access it. So I would like to translate all of the Web, or at least most of the Web, into every major language. So that's what I would like to do.

9:28

Now some of you may say, why can't we use computers to translate? Why can't we use machine translation? Machine translation nowadays is starting to translate some sentences here and there. Why can't we use it to translate the whole Web? Well the problem with that is that it's not yet good enough and it probably won't be for the next 15 to 20 years. It makes a lot of mistakes. Even when it doesn't make a mistake, since it makes so many mistakes, you don't know whether to trust it or not.

9:48

So let me show you an example of something that was translated with a machine. Actually it was a forum post. It was somebody who was trying to ask a question about JavaScript. It was translated from Japanese into English. So I'll just let you read. This person starts apologizing for the fact that it's translated with a computer. So the next sentence is is going to be the preamble to the question. So he's just explaining something. Remember, it's a question about JavaScript. (Text: At often, the goat-time install a error is vomit.) (Laughter) Then comes the first part of the question. (Text: How many times like the wind, a pole, and the dragon?) (Laughter) Then comes my favorite part of the question. (Text: This insult to father's stones?) (Laughter) And then comes the ending, which is my favorite part of the whole thing. (Text: Please apologize for your stupidity. There are a many thank you.) (Laughter) Okay, so computer translation, not yet good enough. So back to the question.

10:53

So we need people to translate the whole Web. So now the next question you may have is, well why can't we just pay people to do this? We could pay professional language translators to translate the whole Web. We could do that. Unfortunately, it would be extremely expensive. For example, translating a tiny, tiny fraction of the whole Web, Wikipedia, into one other language, Spanish. Wikipedia exists in Spanish, but it's very small compared to the size of English. It's about 20 percent of the size of English. If we wanted to translate the other 80 percent into Spanish, it would cost at least 50 million dollars -- and this is at even the most exploited, outsourcing country out there. So it would be very expensive. So what we want to do is we want to get 100 million people translating the Web into every major language for free.

11:35

Now if this is what you want to do, you pretty quickly realize you're going to run into two pretty big hurdles, two big obstacles. The first one is a lack of bilinguals. So I don't even know if there exists 100 million people out there using the Web who are bilingual enough to help us translate. That's a big problem. The other problem you're going to run into is a lack of motivation. How are we going to motivate people to actually translate the Web for free? Normally, you have to pay people to do this. So how are we going to motivate them to do it for free? Now when we were starting to think about this, we were blocked by these two things. But then we realized, there's actually a way to solve both these problems with the same solution. There's a way to kill two birds with one stone. And that is to transform language translation into something that millions of people want to do, and that also helps with the problem of lack of bilinguals, and that is language education.

12:25

So it turns out that today, there are over 1.2 billion people learning a foreign language. People really, really want to learn a foreign language. And it's not just because they're being forced to do so in school. For example, in the United States alone, there are over five million people who have paid over \$500 for software to learn a new language. So people really, really want to learn a new language. So what we've been working on for the last year and a half is a new website -- it's called Duolingo -- where the basic idea is people learn a new language for free while simultaneously translating the Web. And so basically they're learning by doing.

12:55

So the way this works is whenever you're a just a beginner, we give you very, very simple sentences. There's, of course, a lot of very simple sentences on the Web. We give you very, very simple sentences along with what each word means. And as you translate them, and as you see how other people translate them, you start learning the language. And as you get more and more advanced, we give you more and more complex sentences to translate. But at all times, you're learning by doing.

13:17

Now the crazy thing about this method is that it actually really works. First of all, people are really, really learning a language. We're mostly done building it, and now we're testing it. People really can learn a language with it. And they learn it about as well as the leading language learning software. So people really do learn a language. And not only do they learn it as well, but actually it's way more interesting. Because you see with Duolingo, people are actually learning with real content. As opposed to learning with made-up sentences, people are learning with real content, which is inherently interesting. So people really do learn a language.

13:46

But perhaps more surprisingly, the translations that we get from people using the site, even though they're just beginners, the translations that we get are as accurate as those of professional language translators, which is very surprising. So let me show you one example. This is a sentence that was translated from German into English. The top is the German. The middle is an English translation that was done by somebody who was a professional English translator who we paid 20 cents a word for this translation. And the bottom is a translation by users of Duolingo, none of whom knew any German before they started using the site. You can see, it's pretty much perfect. Now of course, we play a trick here to make the translations as good as professional language translators. We combine the translations of multiple beginners to get the quality of a single professional translator.

14:29

Now even though we're combining the translations, the site actually can translate pretty fast. So let me show you, this is our estimates of how fast we could translate Wikipedia from English into Spanish. Remember, this is 50 million dollars-worth of value. So if we wanted to translate Wikipedia into Spanish, we could do it in five weeks with 100,000 active users. And we could do it in about 80 hours with a million active users. Since all the projects that my group has worked on so far have gotten millions of users, we're hopeful that we'll be able to translate extremely fast with this project.

15:00

Now the thing that I'm most excited about with Duolingo is I think this provides a fair business model for language education. So here's the thing: The current business model for language education is the student pays, and in particular, the student pays Rosetta Stone 500 dollars. (Laughter) That's the current business model. The problem with this business model is that 95 percent of the world's population doesn't have 500 dollars. So it's extremely unfair towards the poor. This is totally biased towards the rich. Now see, in Duolingo, because while you learn you're actually creating value, you're translating stuff -- which for example, we could charge somebody for translations. So this is how we could monetize this. Since people are creating value while they're learning, they don't have to pay their money, they pay with their time. But the magical thing here is that they're paying with their time, but that is time that would have had to have been spent anyways learning the language. So the nice thing about Duolingo is I think it provides a fair business model -- one that doesn't discriminate against poor people.

15:57

So here's the site. Thank you. (Applause) So here's the site. We haven't yet launched, but if you go there, you can sign up to be part of our private beta, which is probably going to start in about three or four weeks. We haven't yet launched this Duolingo.

16:18

By the way, I'm the one talking here, but actually Duolingo is the work of a really awesome team, some of whom are here. So thank you.

von Ahn, L. (2013b). Augmented intelligence: the Web and human intelligence. *Philosophical Transactions of the Royal Society A: Mathematical, Physical and Engineering Sciences*, 371(1987), 20120383.

Duolingo

Seven hundred and fifty million distinct people (about 10% of the world's population) have helped digitize at least one word using reCAPTCHAs. This compares with large-scale projects, including building the pyramids, the Panama Canal, or putting a man on the Moon, all of which used something of the order of 100 000 people. The reason this limit was reached was that coordinating (and paying) more than this number of people was impossible prior to the Web. Von Ahn posed the question of what large-scale project could be solved with a three orders of magnitude increase of potential manpower.

The particular project von Ahn focused on was translating the Web into every major language (for free). Machine translation is wrong too often, and its output is not smooth enough to read. Professional translators would be too expensive; translating Wikipedia from English into Spanish would cost \$50 million at the cheapest possible rates.

However, getting 100 million people to cooperate in translating the Web has two major hurdles. First, there is a shortage of bilingual people; and second, people lack motivation without money. But von Ahn pointed out that both of these problems could be addressed simultaneously by noting that 1.2 billion people are learning a foreign language. These people are certainly motivated; in the USA alone there are five million people who have paid over \$500 for language learning software.

Von Ahn explained how he has transformed the problem of language translation into language learning. He is working on a project called Duolingo, in which people learn a language (for free) while simultaneously translating text (for free). The learning comes about by ensuring that the translations that learners do are not too hard, but still stretching. The project is at the testing phase (at the time of speaking, September 2010), revealing that (i) users learn as well with Duolingo as with highly rated language learning software and (ii) they translate as well as professional translators, if the right sentence is given to the right person. Under such a regime, Wikipedia could be translated into Spanish in five weeks with 100 000 users, and in 80 h with one million users.

Language learning has four components: reading, writing, listening and speaking. Duolingo addresses these as follows.

- — *Reading*. The user is asked to translate from the object language into the native language. The output of this exercise, correct or incorrect, will always make sense.
- — *Writing*. The user is asked to translate from the native language into the object language. The user understands the input, but may produce nonsensical output. But combining these first two exercises over a number of users cooperatively produces output as good as professional translation.
- — *Listening*. Rather than translate, to learn listening the user is asked to subtitle video in the object language. This again produces accurate output, augmented by automated processes such as spellchecking.
- — *Speaking*. The user is asked to speak the object language in order to train a speech recognition algorithm (which currently do not work very well with people with strong accents).

All of these are important computing problems, and Duolingo provides an environment in which people are motivated to help solve them.

Conclusion

Von Ahn concluded that the human brain is an extremely advanced processing unit that can solve problems that computers cannot yet solve. And because of the Web, we can consider humanity as an extremely advanced and large-scale distributed processing unit that can solve large-scale problems that computers cannot yet solve. Currently, we have a very parasitic relationship with computers; von Ahn advocated a more symbiotic relationship, where humans solve some sub-problems, computers others, and the two are combined to address large-scale problems.

Von Ahn Reddit AMA 2012

Von Ahn, L. (2012b) *IAmA scientist and startup CEO named Luis von Ahn. AMA*. [online], available: https://www.reddit.com/r/IAmA/comments/we7tq/iam_a_scientist_and_startup_ceo_named_luis_von_ahn/ [accessed May 9, 2017]

IAmA scientist and startup CEO named Luis von Ahn. I developed CAPTCHA and reCAPTCHA, those squiggly characters you see all over the web (sorry!). I'm now working on Duolingo, a new way to learn languages while helping to translate the Web. AMA.

Hi Reddit! I'm Luis von Ahn. I helped create CAPTCHA and reCAPTCHA. In my defense, most people like reCAPTCHA better once they hear that it's being used to digitize books at a rate of 100 million words per day. I am not Lord Inglip, but for a while I had full control of the words shown in reCAPTCHA.

My new project is Duolingo, where you can learn languages 100% for free and help translate the Web at the same time. It may be crazy, but I really want to crowd-translate the whole Web into every major language, and you should help me! Btw, Duolingo has a pretty rocking subreddit.

I'm also a computer science professor at Carnegie Mellon and I'm from Guatemala.

Twitter proof.

I'll start at 2pm ET, so ask away!

Edit: Severin will kill me if I don't say this: Duolingo is hiring!

How do you convince yourself that an idea is worth pursuing? Also, 251 was painful but the problem-solving skills it gave me are invaluable.

When enough people don't think the idea is really dumb, I start working on it.

Do you think crowdsourcing and gamification of workflows are the future of work ? What implications do you think this has for the job market as such ? This is especially important because machine learning and AI are beginning to perform more and more human tasks of late and seem to be constantly improving ?

I think we'll continue seeing a mix: certain tasks are best done by small teams of experts, others are best done by crowdsourcing, and others by computers. That said, I assume the fraction of crowdsourced and computer tasks will increase over the next 5 years.

If you do end up making it more of a game, will we have the option to stay with the original Duolingo, which I like? I think competitiveness is really all that keeps it a game. If it was linked with social networking, for example, it would seem more like a game because you would want to beat the scores of your friends.

We've been making changes to Duolingo almost daily for the last 6 months. Every change is tested on a small fraction of the users, and we only go with the ones that people like. Not sure where exactly this will end up though :)

I had an idea to fix the text to speech engine. Eliminate it. Then, crowd source for translations. Dict.cc does this for their words. Native speakers say the things, and their peers vote on the best pronunciation. Does this seem feasible? I have gotten so many errors because I couldn't understand the T2S engine.

We may do something like this.

How far away is Chinese on Duolingo? How do you plan to go about teaching a non-Latin based language?

Our internal goal is to have Chinese in 2012. However, things usually take twice as long as you think, even when you take this rule into account.

How do you ever finish things?

I don't think I've ever "finished" something. I stop working on things, but they're never "done."

Are there any big websites, for instance websites of big newspapers, that have shown interest in having their content translated by Duolingo?

Yes.

Can you give us any examples?

Not yet.

[in response to a deleted question]

I guess it takes time to migrate big systems in large companies. Have you seen office space?

First off, thank you so much for Duolingo! It's exactly what I've been looking for in terms of learning a language. I know you guys recently did a poll on it, but what languages should we expect in the future? Have you considered teaching English through it as well? Thanks!

The next language is definitely going to be Portuguese. After that Chinese, and then I think Japanese. Eventually, our goal is to allow the community to add languages themselves.

The thought of the community adding languages sounds extremely interesting. Have you got any idea how it would be implemented?

Not a very clear idea. But the first step will be allowing people to edit the lesson sentences themselves.

What's proven to be the biggest challenge since Duolingo launched the beta last year? Since it launched publicly last month?

The whole thing has been challenging. We've had to overcome a lot of technical hurdles. For example, when you click on word, the top translation that we give is (usually) the best translation for that word in that context. That's hard to do. Almost every aspect of the site, even the ones I take for granted now, has required quite a bit of work. Fortunately, we have an amazing engineering team, and they are working really hard.

How does reCAPTCHA deal with odd characters or chemical symbols that are hard or impossible to input with a typical keyboard?

By pissing off the user!

First, I have to say I LOVE duolingo. I've been trying to learn french and its been going pretty well so far (still at the beginning). It seems though that I couldn't hope to learn all of french from your lessons. Are you planning to expand duolingo to include more lessons? Are you planning on making the microphone component work better? Unfortunately it seems to me it accepts garble that wasn't even an attempt at trying to say the words, but when I do try to say them it often doesn't accept it and makes me say it repeatedly. Weird I know, but it would be neat if that could get fixed, by working with Dragon Naturally Speaking or something lol. Seems more a novelty to get people to attempt speaking more than anything right now. Any new projects for the future we should look out for?

Thank you for the kind words! Yes, we are adding new lessons all the time. At some point we want to have swear words even (for people over 18 only, of course). The microphone...yeah...our internal testing actually shows that it works quite well, but we know of some good ways of improving it, so probably in a few months there will be something better.

I love duolingo so far, thanks for making it. I'm Lv8 in Spanish and just hit Lv9 in the French beta. Question: I'm curious is there any chance of duolingo being extended to captioning videos on YouTube?

I can neither confirm nor deny this ;)

Hey Luis, great to see you on here! I've been loving Duolingo so far, especially the poll that was put up on Facebook asking about languages to tackle next. Since Japanese won (is winning?) that poll, do

you have anything to share about the possibilities of implementing that, and the hardships you'll likely face trying to teach a non-latin alphabet?

We're definitely going to work on Japanese, but we haven't started yet (the poll was just last week). I think non-european languages present a very interesting challenge for us, so I'm very excited about Chinese and Japanese. I hope they work out as well as European ones :)

I have used Rosetta Stone and the Pimsleur program for languages but so far I prefer duolingo's format. You say that you want to be able to translate the Internet. I don't think that my Spanish will be good enough after the ~65 lessons you have provided. Will you be adding any additional lessons? I am through level 10 after a week. do the formats of the lessons change? I would like to see where I am asked a question and then instead of repeating it....I answer it. possible?

Yes, this will happen in a couple of months.

Have you plan to add other base language ? (because for the moment we have only english <=> other language and i hope we will have other language <=> other language).

Yes, as mentioned here, we already have Spanish <=> English. That said, we would like to cover all directions between the languages we cover. The next base language is likely French.

What suggestions would you give researchers who are trying to incorporate gamification techniques in their own work ? Any pitfalls to avoid ? Do you think that there has been an overpromise as many "experts" today cite Open collaboration using techniques such as gamification as a panacea to everything ?

Gamification is very hard, and simply "adding points" doesn't get the job done.

Duolingo has been great to me so far as a writing practice tool, but I have some questions/reservations about using laypeople to crowdsource translations. For example, a few weeks ago when I was starting out with French, the top-rated translations said that Panthera was a "genre," rather than a genus, because it looks closer to the French word for it. Perhaps the masses will eventually eliminate basic mistakes like this, but what about articles that require a greater level of expertise? Do you have any plans to somehow make Duolingo users 'qualify' to translate texts that use not only advanced language, but, say, advanced mathematics, or do think that crowdsourcing alone will make things accurate enough? I feel like the point system is a great incentive to keep learning, but is also an incentive to translate as much as possible instead of as accurately as possible. Also, do you anticipate any problems from people positively rating translations that are humorous rather than accurate? Or is this whole thing an experiment to see if that will happen or not? Anyway, thanks for doing this AMA. I do love Duolingo, and look forward to continuing to use it as more languages are added.

Even though some of the sentences have mistakes while the article is being translated, at the end of the day the results are super accurate -- as accurate as those from professional translators.

Can/Do you sell crowdsourced digitization services to publishers? Do you think you'll eventually run out of books that need digitizing, as the new stuff is natively digital?

That's Google's decision now (they bought reCAPTCHA). Currently it's mostly being used for the Google Books project, but I don't know what their future plans are. Did you see they are also using reCAPTCHA to decipher street addresses from streetview images? I thought that was pretty cool.

You're big on using human computation for various things that are hard for computers to accomplish (image tagging in the ESP game, object recognition in Peekaboom, and digitizing books in Recaptcha). However, these are all things that, conceivably, computers could one day get really good

at. We all know that computers are gonna be really smart some day in the future. And when they do they're gonna be pissed because you've been saying they're bad at stuff. So, here's my question, given that you're likely one of the first people to be targeted in a machine uprising, what's your strategy for staying alive in the coming war between humans and machines?

Good question. Fortunately, I already have some experience from the professional translator uprising Duolingo is causing!

I watched your TED and enjoyed it greatly. I am aware that there is a campaign to essentially subvert the process by which you crowdsource words by properly typing the obscured word and typing a vulgar / racist word for the other one. I was curious if you had heard of this effort, and if so if you had thoughts or a response to it.

Yes, we have been well aware of these efforts (e.g. by 4chan) to do this. To this day, fortunately, they haven't succeeded (it's hard to compete with 100 million legitimate answers per day).

What kind of things have you got planned for the future? Not only for Duolingo but, well, anything.

For now it's all Duolingo. I think translating the Web will take...a bit of time...

I have a serious question. My fiancée is deaf and from Italy. She does not speak english and wants to learn. Obviously this is much harder for her than a regular italian since she is deaf. Will duolingo ever have some kind of alternative that is available for deaf people who want to learn a new language?

You can use Duolingo without any of the audio components.

How would you compare Livemocha to Duolingo? Do you think one is better than the other?

I'd like to think Duolingo is better, but we haven't done a scientific study comparing the two. I can say, however, that Duolingo is "freer" :)

Do you really believe that Duolingo is a tool for fluency? What kind of language/education experts do you have backing that opinion? How does one increase their chances of success with Duolingo? What planned features will increase the effectiveness of Duolingo? Personally I don't see how you could learn a language without being presented with the opportunity to create your own sentences, rather than just answering questions based on generated questions. Also: Why a green owl? Where did the mascot come from?

Yes, I do believe Duolingo can help you become fluent. That's our goal at least. The green owl was better than a broken stone with foreign characters in it.

Do you think Duolingo gives enough grammar info for the user? I have the feeling someone who's completely new to the language can be pretty lost by having to guess the grammar rules mainly from the example sentences. This goes for the German part only, because I haven't tried other languages on the site. The grammar info for German is quite scarce.

A good fraction of our users are complete beginners and it seems to work out well for them.

Could you give us your vision of the kind of tasks that might be better performed by a distributed workforce across the internet as compared to the way it is done traditionally today ?

I don't have a coherent vision. Basically, we try to come up with good ideas for tasks and then work on the ones that seem like they could work.

Considering how fast OCR is improving, what will we do once any computer can read as well as a human? What's the next line of defense against the bots? Addendum: when do you think that will happen?

The next CAPTCHAs will probably be image-based, such as "what is common among all of these pictures" (that was actually the first CAPTCHA we devised).

Couple of questions: 1) Do you think a website like Mechanical Turk will still be around in a few years? Most people realize you can't get rich on Turk; however, a lot of people are still doing HITs on Turk. 2) What is your opinion on Mechanical Turk as a valid crowdsourcing tool? I feel like things like GWAPs are way better because they always seem (at least the ones you create) to be designed to force the user into generating a correct answer, whereas on Turk you pay somebody a few cents to do something and there is not much of a guarantee you will be getting quality work.

MTurk is great for certain tasks, so I think it will stick around for a while. My approach (making custom systems) is great for big problems, such as digitizing all books ever written or translating the whole Web, but it's bad for smaller tasks because it requires a lot of effort.

First, I love the work you're doing on DuoLingo! I'm just starting out with the French beta, and after having used it for a couple of weeks I can definitely see an improvement in my beginner-level skill. My only question is: do you have any plans to add any more languages? Call me nerdy, but I'd love to see Japanese supported!

You and about 25% of the questions in this AMA :) Yes, we're working it.

How does it make you feel to have hackers repeatedly target and break reCAPTCHA?

It's usually easier for us to change reCAPTCHA than for hackers to break it, so it hasn't been a huge problem so far.

So I've been a beta user of Duolingo and LOVE it. My main question is why did you pick German, French and Spanish for starting languages? In my experience, those are the most common languages that a school (i.e. Middle school, high school) will offer as a course for students. Since Duolingo is very big on being a free learn a language service, why pick the languages that most people already have access to?

Those are also the ones that most people want to learn.

First of all great work on Duolingo, I'm using it regularly to study French (beta :D) these days and so does my mom and my grandma. Can you tell us a bit about future plans for Duolingo and other possible projects?

Plans (in this order): mobile app, portuguese, chinese, japanese, go to disney world.

Von Ahn Reddit AMA 2013

von Ahn, L., (2013c) *I am a scientist and entrepreneur named Luis von Ahn* [online], available: https://www.reddit.com/r/IAmA/comments/1fa3nu/iam_a_scientist_and_entrepreneur_named_luis_von_ahn/ [accessed November 4, 2016]

Hi Reddit! It's me again, Luis von Ahn. I'm the co-founder/CEO of Duolingo, which aims to provide the best way to learn languages to everybody for free. I think that education makes people's lives better, and shouldn't be limited only to those who have the money to learn.

Today I'm especially excited because we just launched the Duolingo Android app. You can download it from Google Play here. It offers full language courses that are 100% free, with no ads, hidden charges, or BS "in-app purchases."

You may be interested to know that there's an awesome Duolingo subreddit. I'm also a computer science professor at Carnegie Mellon, and I'm from Guatemala. I developed CAPTCHA and reCAPTCHA (acquired by Google).

Picture proof!

I'll start at 2pm ET, so ask away!

UPDATE [4:45pm]: Still hard at work answering your questions. Getting some help from my top advisor, Coco: <http://imgur.com/fGNi1hy>

UPDATE [7:30pm]: Taking a little break. I'll come back online later tonight to answer a few more questions :)

I'm a big fan of Duolingo, but I'm curious about one thing: do you have any reservations about allowing language students (non-native speakers) to do official translations of online text? I understand that this arrangement keeps Duolingo services free, but do you ever worry that student-translated text will be inaccurate?

We do worry about that, but it turns out it's very accurate. In fact, in all the studies we do, we find that the final translations from Duolingo are as accurate as those from professional translators.

What exactly are the reasons that you find most language learning software deficient, and how does DuoLingo make up for these shortcomings?

Because they don't motivate you to keep going! We spend a lot of effort making Duolingo addictive -- we think the hardest part about learning anything on your own is motivation.

Hi , do you think there is a way to gamify the creation of subtitles for any internet video based on web standards? I ask you this because this can make any content engaging for a large group of people as well as significantly improve the accessibility of web for many people.

We discuss this idea often inside the team. We definitely will do it at some point, but we've been busy working on other stuff, such as our Android app :)

Are there any plans to integrate student to student video calls or to partner with a website that provides this service? I find that I can now read quite well in French, understand spoken French but it falls apart when I try to speak it.

We've thought about this a lot, but there are two problems we can't seem to shake off: (1) People just aren't that good at teaching languages to each other when they don't speak the same language, and (2) It is really hard to create an experience that won't be creepy (the last thing we want is for it to become plagued by penises like Chatroulette...)

What if you made face-to-face learning only available after a certain amount of levels? That way the service isn't open to opportunistic flashers, and the people who it is open to already have an investment that discourages bad behaviour. You could also have a confidence rating for each user who want to use this part of the service, like eBay buyer/seller ratings.

This is not a bad idea.

Duolingo user here. Great software! How long did it take to perfect the user interface? Is there a design or software you used as inspiration?

It's...really damn good

We have amazing and obsessive UI/UX designers who are very critical of their own work. It took about 1 year of work before we were happy enough with something to launch it.

Apart from languages, do you think there are other things that can be taught using the techniques involved in Duolingo?

Yes, we think programming could be taught this way, but we're not actively working on it.

What kind of success stories have you heard from people who have been using Duolingo ?

It always feels good to hear from our users about how they passed a test that lets them save money on college courses, or showing us how much they have improved in their target language. But my all-time favorite was a bit of feedback we got from a user in Syria, who said "Living in a country torn by hideous civil war and daily terrible news can be unbearable, but Duolingo really lifts up my spirit."

First of all, I really enjoy the site, and am glad that someone is taking strides to make language learning more enjoyable and affordable. I'm hoping it will put scams like Rosetta Stone out of business (not likely, but I can dream).

My question is regarding the method of teaching. I understand that the site is dependent on translations for revenue, but many people (including myself) believe that translations can be harmful in language learning after a certain extent. It is important to create your target language as a separate entity in your mind, rather than entangling it with English. Also, how do you plan to incorporate languages that are almost impossible to directly translate? I feel like the current model has limited itself to its current offerings (the romance languages and German. Although Scandinavian languages could work.)

For example, the direct Russian translation of the formal "hello" is "Be healthy!" These kinds of things are all over the language. I imagine it is even worse for east Asian languages like Mandarin and Japanese, which are among the most popular for learners.

Any comment on this method of teaching and its incorporation into languages that aren't necessarily translatable to English?

Keep up the good work!

When we started Duolingo, we didn't know much about how to best teach languages. So we read a bunch of books on how to do it, and we also talked to language acquisition experts, asking them very specific and practical questions. For example, I wanted to know, in Spanish should we teach adjectives before adverbs or adverbs before adjectives. And I was surprised to find out that they actually didn't know the answer! They would say stuff like, "Well, the current philosophy is blah blah", but never really get to the point. Nobody could tell me, for a fact, what was better. At first, I was pretty amazed and thought: "What the hell are these people good for?" But then I realized: I'm a computer science professor, and I can't tell you what the best way to teach computer science is. I know how I do it and what has worked for me in the past, but that's about it. And in fact, that's basically the current status within most of education: we teach based on very little science.

So, we designed an initial curriculum based on everything we learned through reading books and asking experts. But then we realized something. As Duolingo started growing, we had a unique opportunity. We had millions of users and we could actually find out by ourselves everything we wanted to know. Questions nobody had ever answered before! So this is what we do now. We're basically doing very large-scale data-driven education, and improving it every day. For example, if we want to know how early we should teach plurals, we simply test it. We give a group of 50,000 people plurals a little earlier in the course than everybody else, and we measure: do these people learn faster, do they learn better, do they stick around for longer? And if it's better, we start teaching plurals earlier to everybody. This approach improves the experience on Duolingo and also is giving us answers to those language questions we really couldn't find answers to when we were just starting out.

We will likely by adding other ways of learning the language but in all cases we'll be driven by the data we gather.

I am currently using Rosetta Stone to learn Polish. How can you convince me that Duolingo is better? I have tried other stuff before, and always ended up wasting my time. I understand trying it would work, but besides that. In other words, what does Duolingo have that Rosetta Stone doesn't?

First, Duolingo is totally free. No ads, no subscriptions, no 5-easy-payments plan. Rosetta Stone costs hundreds of dollars.

Second, there is scientific evidence that Duolingo can be more effective. An independent study was done by a research team that previously evaluated the effectiveness of Rosetta Stone. They found that it takes students on Duolingo 34 hours to learn the equivalent of a one-semester university course, whereas it takes 55 hours with Rosetta Stone. Here is a link to the study:

http://static.duolingo.com/s3/DuolingoReport_Final.pdf

And of course there are other differences that are harder to quantify: Duolingo has game mechanics, a 5-star mobile app, and since it doesn't come in a CD-ROM, we're able to improve it on a daily basis.

How long before we have more efficient Discussions engine? I'm annoyed to see the same questions and suggestions appear again and again, but at the same time I understand their posters because it is easier to ask right away than to try and find the old threads. I would gladly contribute to an FAQ if there was some place for it.

It is pretty difficult to make sure that we never see the same questions or suggestions being repeated (even Reddit has this problem!). An FAQ is a great idea though, and would be great to be able to direct new users to. We'll work on it!

Have you ever thought of implementing more interactive games? Like a flash game, but that would require Spanish, for example, knowledge. Or even competitions, between friends. It would be a lot of fun to compete with friends on a real-time competition, hangman or other games.

Yes! We'll be testing a few of these in the next month or two :)

Hey Luis! I was at www2013 and loved your talk (and the Q&A afterwards). Your ideas of aligning incentives has kept my mind occupied! There is a lot of opportunities still to exploit latent activities we are already doing.

I have a question that's been on my mind. Duolingo has a very data-driven approach to getting better at people learning languages. Do you worry that you could actually optimizing for a local 'peak' and not the best 'peak'? The reason why I ask. I've used duolingo and it has indeed been an awesome way of learning languages. But it's approach seem to be aligned with people wanting to learn the 'whole language'. There are cases where some people would rather want to learn some basics and then learn phrases to use when travelling so they can get by.

Do you worry that the data-driven approach could actually mean you aren't solving the problem the best way possible?

Yes, we worry about local maxima, but we do try drastically different things every now and then to try to compensate for this.

Glad you liked the talk :)

Many other questions left unanswered

Von Ahn Reddit AMA April 2014

Von Ahn, L., (2014b) *I am Luis von Ahn, co-founder and CEO of Duolingo. AMA* [online], available: https://www.reddit.com/r/duolingo/comments/230umo/iam_luis_von_ahn_cofounder_and_ceo_of_duolingo_ama/ [accessed November 4, 2016]

Hey everybody! I'll be answering any questions you may have starting at 4:00pm Eastern US time.

As opposed to my previous AMAs, this one is exclusive to /r/duolingo.

Ask away!

Edit (6pm EST): Thank you all for the awesome questions. I have to run now, but will try to be back later to answer a few more.

Hello, Luis. I appreciate you taking the time to answer questions.

Can you tell me what criteria you use/how you decide which language courses will be built next (always assuming that there are qualified people to do it)?

Thank you for your time.

We look for a few things:

The number of qualified candidates to build the course.

The number of people who want to learn the language.

How easy it will be to build the course with our current tools.

I want to add all languages, but we're not there yet. I should also say that each language we add still requires quite a bit of effort from our team so we're only adding about one per week. In a few months I'm hoping we'll have a truly scalable system that allows us to add hundreds of languages at once.

Are there any plans to expand the Grammar Lessons? One of my biggest complaints about the site (and one reason I stopped using it as much) is the lack of Grammar explanations. We have an entire section dedicated to "Vocabulary", but all the Vocabulary in the world doesn't help if you can't put it together into a coherent sentence.

There are some basic grammatical explanations at the start of some lessons, but nothing too in-depth. The lack of Grammar help just kills it for me IMO and discourages further learning. Without it, the "Hit and miss" approach only goes so far where you have to guess what is right or wrong sometimes. Duolingo is great if you need to just pick up Vocabulary, but if you genuinely want an emphasis on making it a language learning tool, then we need an equal amount of time invested into learning Grammatical Concepts as well, especially for languages down the road such as say, Japanese for English Speakers, or other such languages.

I understand there are outside resources, but I hate having to bounce between 3 or 4 different sites to supplement Duolingo, when all the potential is there for Duolingo to serve as a "one-stop-shop" for Language Learning.

What I suggest is, at the top of the page, have a section for "Grammar" next to the "Immersion" button, and when you click on it, it takes you to a page with a ToC with an introduction into the grammar for the language you're learning (Something as simple as This "About" site). Such a thing might take a while to implement, and that's ok, but as long as it gets done, it would make Duolingo an even more invaluable tool for learning than it already is.

The very honest answer is that I, personally, don't like vocabulary, grammar or verb conjugation. My dream in life is to be able to teach you a language without you needing to read textbooks about indirect objects. In fact, I consider the use of grammar to be discriminatory against those who unfortunately didn't have a very good education in their own native language (which is the majority of the world's population). I think slapping 30 pages of grammar before every lesson is the easy way out -- instead we should strive for something that everybody can consume.

That said, we ARE working on these issues -- they just move slower because we're more excited about other things.

Good luck learning about German cases and declination classes through osmosis. That approach just doesn't work for complex languages.

Hi Christian :)

I actually agree that we need to teach more grammar in the German course. We're about to open the explanations up in the Incubator and we're hoping that will help.

I'm more wondering about the Spanish flag. Duo teaches Brazilian Portuguese, so a Brazilian flag makes sense. But it teaches a Latin American Spanish (Mexican, I think?), so I'm curious as to why the Spanish flag is used.

Unfortunately, there is no great way to do this. The real problem is our usage of flags to represent languages because there isn't a 1-1 mapping between the two (some countries speak multiple languages, and some languages are spoken in multiple countries).

We chose the US and Brazilian flags because we teach those variants of the languages, because they have the overwhelming majority of the speakers, and because they are the variants that most people want to learn (sorry chaps!).

The Spanish flag is trickier. We teach a Spanish that is closer to Latin American Spanish, but being a continent, Latin America does not have a flag, nor a clearly dominant country. Some have suggested we use the Mexican flag, but we don't specifically teach Mexican Spanish, and unfortunately the Mexican flag looks like the Italian one. We decided to stick with the most recognized flag to signify Spanish (the one from Spain).

Hi Luis!

What plans, if any, are there to improve the ranking experience in immersion? It seems to reflect quantity over quality right now, while I feel it should be an accurate display of a translator's ability as is stated in the description of tiers:

"Each language learner is assigned a tier representing the quality of their translations, as judged by other learners."

We're experimenting with this constantly. So, we have plans, but I'm not sure which of our experiments will pan out.

A late question :)

I try helping to improve DL. In the last couple of weeks I received about 50 emails of suggestions, that have been accepted. These are either alternative translations, correcting typos/mistakes in new courses. I'm glad to help improving the courses a little, and I really just play a minor role.

Yet, are there any plans to reward such contributions? Currently it is rather discouraged to try out different translations in a language that you already master, because every error report means a lost heart, which means either 1EXP less, or to restart the exercise. Such rewards might be lingots, EXP points, or unlimited golden trees at a certain level ...

Of course, the main contributors should be rewarded even more :)

We should give a lingot for every accepted answer. putting it on the list

What as-yet-unreleased Duolingo feature are you most excited about?

Three of them: (1) The new iPhone release (out on April 24) will have a multi-player feature that is a lot of fun; (2) A new verified certification test whose goal is to bust the monopoly that tests like the TOEFL and IELTS have (which charge hundreds of dollars to people for the mere privilege of applying to jobs or a universities); (3) A new way to practice conversation (this will come out mid to late summer).

What are the parts of Duolingo that you like least? Even if you don't have a proposed solution yet.

The whole "social" component is tacked on (e.g. followers and leaderboard).

I really like to compete with my facebook friends, but none of them are learning my language combination -

Are we going to be able to be in the same team, when the new feature will be introduced? Or are teams restricted to the same language combination?

Right now it's looking like teams won't be language specific, so yes :)

Judging from the immersion section it appears as if Duolingo currently does not translate a lot of content. I would estimate it around 500 sentences / day.

How many sentences are actually translated per day?

How do you plan to generate revenues of \$ 500.000 a month (source: Forbes) within this year already? Do you plan to utilize the course to do actual translations?

Or are you planning to earn money primarily through certification tests as opposed to translations?

We translate way more than 500 sentences per day, but not enough for \$500k/month. Right now we're concentrating mostly on improving our teaching experience, so reaching profitability is not a priority.

Hey Luis, quick question: What languages do you think are the most important to learn, and why?

I don't think there is an easy answer to this. It depends on where you live, whether you have relatives that speak another language, what your job is, etc. All else being equal, I'd say that in the US learning Spanish makes a lot of sense because there are lots of speakers nearby and it's relatively easy to learn. If you want more of a challenge, Chinese is probably a good idea.

Many other questions left unanswered

Von Ahn Reddit AMA November 2014

von Ahn, L., (2014c) *I am Luis von Ahn...AMA!* [online], available

http://www.reddit.com/r/IAmA/comments/2mwe7w/i_am_luis_von_ahn_the_creator_of_recaptcha_those_squiggly_characters_all_over_the_web_and_the_co-founder_and_CEO_of_DUOLINGO! [accessed November 20, 2014]

I am Luis von Ahn, the creator of reCAPTCHA, those squiggly characters all over the web, and the co-founder and CEO of DUOLINGO! Duolingo has become the most popular way to learn languages online, for free, and has overtaken expensive and gimmicky alternatives like Rosetta Stone. AMA!

Hello Reddit! I'm the co-founder/CEO of [DUOLINGO](#), which is now the most popular way to learn languages in the world. :)

Today I'm especially excited because we can finally say that Duolingo is available on the 3 biggest smartphone platforms (see below for links!), giving everyone access to completely free language education with no ads or BS hidden fees.

Education can make people's lives better. Unfortunately, those who don't have a lot of money, or live in poor countries and neighborhoods end up getting shafted with bad education. I believe everyone should have an equal right to learn.

We also recently launched the [Duolingo Test Center](#), a new app created to replace expensive standardized English tests that take advantage of students and job-seekers with absurd prices, like the TOEFL and IELTS.

More about me: I'm a computer science professor at Carnegie Mellon, and I'm from Guatemala. I developed CAPTCHA and reCAPTCHA (acquired by Google).

[Twitter proof!](#)

Check out the Duolingo apps:

- [Duolingo for Android](#)
- [Duolingo for iOS](#)
- [Duolingo for Windows Phone](#)
- [Duolingo Test Center for iOS](#)
- [Duolingo Test Center for Android](#)

I'll start at 2pm ET, so ask away!

Edit: Severin would kill me if I didn't mention [we're hiring!](#)

In answer to this question:

I want to know whether we can use Duolingo to teach English?

Yes! Absolutely. We are proud to say that the ministry of education in Guatemala has reached out to us to use Duolingo to teach English and to use the Duolingo Test Center to measure English skills, and it's an honor to collaborate with them.

Everyone can use Duolingo - the idea is that it is free and available to all.

What language do you personally most want to have in Duolingo?

Of the ones we don't have? Japanese. The question is when that's coming out... It won't be quick, unfortunately. It's impossible to be great at everything, and we're moving at a pace that allows us to only offer high quality courses.

(Question deleted)

Mo Lingots, mo problems! Just kidding. :) Yes, we do want to add more bonus skills and cool items.

What is the most important aspect of keeping projects like Duolingo free for all to use?

The whole point of having created Duolingo was to give everyone free, equal access to language education and removing barriers from the lives of people trying to better themselves. But we're not a non-profit, and believe in making this self-sustainable so it doesn't have to rely on donations to function.

Here's how we make money.

(closed captioning from this video: <https://www.youtube.com/watch?v=WyzJ2Qq9Abs>)
dated Nov 29, 2011

It's a big world out there. Billions of us trying to live, love, prosper, and make sense of our brief time on this planet. Since the dawn of humanity, we've been passing information from one person to another through a common language. Unfortunately, you can't communicate with others without knowing or learning their language first. A similar issue is manifested on the web, where text can be penned in dozens of languages, each of which demands a reader's fluency. We've developed an elegant solution to both problems – a way for you to learn a language for free, while at the same time helping to translate text from the web, enabling a wealth of language-shackled information to be liberated for all of humanity. It's called "Duolingo." Here's how it works: let's say you're a native English speaker who wants to learn Spanish. We start by giving you a sentence from a Spanish website and asking you to translate it. Wait. Back up. How can you translate a language you don't know? First, Duolingo only gives you sentences that fit your language level. Beginners get the really simple sentences from the web, and advanced users get the more complex ones. This way, everybody becomes a valuable translator. And second, if you're really lost, you can always

see possible translations for words you don't know. Afterwards, Duolingo helps you understand and memorise the words you hovered over through educational examples. You can also vote on the quality of other students' translations, which helps you learn by seeing how others translated the same sentence. And because you create valuable translations while you learn, we return the favour by offering Duolingo completely free of charge, no ads, no hidden fees, no subscriptions, just free. To put the potential benefit of Duolingo into perspective, think about this: if one million would use Duolingo to learn, the entirety of English Wikipedia could be translated to Spanish in just 80 hours. Duolingo: learn a language while translating the web.

This doesn't seem to explain how you make money - it's an explanation of how Duolingo works.

Oops, I can explain more!. There are two parts to our revenue model. First, we make money by selling some of these translations to companies like CNN and BuzzFeed. So, for example, they write their news in English, and send it to us. We then give it to our students, who in order to practice their English skills, help translate this news to their native language. Then we give the translations back to e.g. CNN and they pay us for having translated them.

The second and most important part is our new app, the Duolingo Test Center. We're now giving everyone the chance to prove that they have language skills without having to pay the \$250 normally charged by the existing proficiency tests. Our tests will cost \$20 (it's free now, in Beta), and will help our educational app stay afloat.

How close are you guys to being profitable? Is the volume of content being translated big enough to cover a large chunk of your operating costs?

We're not yet profitable, but that's not our goal for now. We want to reach as many people as possible. I'm happy because there are now more people learning languages on Duolingo in the US than in the entire US public school system. There are also some countries where close to 4% of the Internet population is an active user of Duolingo!

I've always wondered: how do you ensure the quality of these translations? Presumably you have multiple students translate the same article and use the consensus translation, but what about for sentences that are too difficult/variable and have no consensus?

Students vote on each others' translations. This works pretty well even for complex sentences. So far, CNN has been our client for more than a year and hasn't fired us :)

Would you be interested in creating "Teacher accounts", where teachers can get reports with useful data about their students learning activity and progress? Presuming that students voluntarily appoint someone with such a teacher account as actually their teacher with whom they want to share their progress data. Such a functionality is lacking now.

Teacher accounts could be paid by schools. This would provide Duolingo with new funding without violating the promise that learning languages on Duolingo is free and will remain free forever.

Yes. We are working on this.

So far we have stayed away from developing specifically for schools, because we think that companies that develop primarily for institutions have really crappy products -- it's almost an unstoppable effect: the institutions pay, and since they are not the end users they don't care too much about the user experience, so it makes more sense to hire really good sales people to sell them a shitty product. This explains Blackboard.

We will always develop for the student.

That said, we'll have some notion of a teacher account soon :)

I just wanted to say that the UI and UX designers you have are THE best! My question is why didn't you go with universal app for Windows?

Keep up the good work!

Thanks! Our designers are awesome.

For Windows, we decided to concentrate on phones and really nail that experience first. This is how we try to do everything: start with something small and make it good first.

"Duolingo test center" is a brilliant and innovative idea (like Duolingo) ! Are there other fields that you would like to disrupt with your service ?

All of education! It's really quite a broken system. It's inefficient, unfair, and ineffective.

Hey Luis, I am a big fan of everything you've made...You come from a Country that has many brilliant minds but great inequality and very little support for education overall. How can technology aid in improving the situation for underdeveloped countries like yours?

This has been the motivation for my work - to help improve the education for people in developing and underdeveloped countries like mine.

The costs associated with education in many countries around the world make it so that instead of it being an equalizer, education allows the rich to continue growing but stifles the poor, who rarely make it to college. It is also extremely ineffective: people spend 12 years learning math and most can barely add fractions somehow! Technology now allows us to make education measurably more effective and find ways to heavily reduce costs so that everyone can have equal access. Also, it turns out that more people have access to mobiles phones in the world than to public toilets! So mobile technology helps us bring education to the hands and pockets of those who would otherwise not have access.

Are there any plans to offer advanced trees for the languages, allowing users who have already completed a tree to do some more advanced work? Thanks, by the way, for starting Duolingo. I use it everyday, and I'm learning nine languages on it concurrently, and I love the heck out of it. Thanks!

Yes, we will expand on the course content we have. And not just with longer trees -- also with new teaching features.

Do you do much advertising or draw users from Latin America? (Actually, do you do any advertising or is it all word of mouth?) When I read the DuoLingo discussions or here on reddit, most users seem to hail from the U.S. and Europe. I'm curious how many users come from other areas of the world. Is there a specific market that you think could benefit most from knowledge of/access to Duo? I'm thinking specifically of my in-laws in Mexico City who are all taking (poor quality and expensive) English classes in high school and are becoming very connected online through internet cafes and personal devices, but I'm just curious about any thoughts you have on the matter.

¡Hola! We don't do any advertising at all because we believe all our funding should go toward making the best possible product. As such, we rely on word of mouth and interested journalists. :) Here on Reddit most people do seem to come from the US or Europe, but there is a huge Latin American community on Duolingo - in fact it is bigger than our US community. Mexico is our 3rd largest country, and the idea behind Duolingo was originally to help people in countries like mine who could really benefit from learning English but just couldn't afford it. Right now we're in touch with the governments of Costa Rica, Guatemala and Colombia to help spread English education with Duolingo, and we are very interested in continuing our growth in Mexico.

Why doesn't duolinguo do adaptive retesting of problem material (for example if someone has trouble with future tense, future tense questions show up more often)? has your research shown it doesn't work?

Oh we do fo sho! Duolingo has a model of everything that you know, and how well you know it, and it uses that model to choose the next exercise to give you. That said, we're working on making this way more personalized and adaptive. Our goal is to be as good as a 1:1 tutor!

You mentioned in a TED talk that Duo would seek revenue by marketing crowdsourced translations to companies. How have companies responded to this idea so far, and is it as viable (or more viable) than you expected? Have you had to adjust your business plan accordingly?

Yes it is viable, and CNN and BuzzFeed are currently our clients. We translate their content into Spanish, French and Portuguese! However, we don't want to become a translations company - education is our core. As such, we're now also focusing on the Test Center which allows people to prove their language skills without shelling out US \$250, from home, on a mobile device or computer. Each certified test will cost \$US 20 and the idea is that we can make revenue while removing a huge barrier from the lives of students and job seekers.

Hi, Luis! How would you describe the core teaching philosophy at Duolingo? There's a lot of debate in the discussions about whether Duo tries to teach through immersion and whether or not it's designed to teach you in the way a child would learn. (I know where I stand on this, but I'd love to hear your authoritative viewpoint.)

Hi! There are many different philosophies on how to teach, but most of them have little to no data backing them. When we started working on Duolingo we read some books on how to best teach a language, and we pretty quickly realized they contradicted each other! (It felt a lot like books on diets).

Now, with Duolingo, we actually have access to a data pool of, say, 100,000 users to compare with another 100,000 users whenever we wonder if teaching X before Y, or Y before X is better. Everything on Duolingo is measured this way, including the number of tears that our mascot Owl, Duo, cries when you fail a lesson.

So we're not based on philosophies as much as in data.

The other point to consider is that people learn best when they're interested and engaged. Making Duolingo like a game, and teaching in a way that allows it to feel like a game, was crucial to keeping everyone coming back on a regular basis, which is essential for learning a language.

Hi Luis! I was wondering where you'd like Duolingo to be, in say, 2 years?

Our mission is to develop the best education and make it available to all. Hard to say what this means in 2 years because we're a startup, which means we probably created and destroyed 5 different plans while you were typing up this question.

Roughly, I'd like us to have reached 100 million active users, to have substituted existing English certification tests like the TOEFL, and to have created an educational model for teaching languages that is much more effective than a classroom. Maybe we'll have ventured out into teaching other things... we'll see!

Question deleted

Hi yourself! Thank you so much, I'll share the message. :) Yes, this is certainly an ambition of our team's: there are currently 1 billion adults in the world who can't read or write. The current educational system is failing the majority of people and I want to help fix this. With our new mission to develop the best possible education (of any kind) and make it universally available, we do think that we'll expand out of languages. However, for now we really want to nail what we're doing and that requires focusing completely on teaching languages. Soooo, we don't have a concrete date in terms of when we may be expanding.

how do you think you can make Duolingo even better?

Hi Jesse. We a/b test everything on Duolingo, so that every day it gets better and better. Last year, a study conducted by the City University of New York (CUNY) showed that 34 hours of Duolingo are equivalent to a whole university semester of language learning. Now, we want to offer education that is as effective as a personal tutor. To do that, we're using what we call "machine learning" to make the experience more adaptive, meaning each lesson will be more tailored to each user depending on their needs, as identified by Duolingo through their progress.

What made you focus on language learning after CAPTCHA?

After selling my second company to Google, I was at a very fortunate situation. Therefore, I wanted to dedicate my time and efforts towards something that could help a large number of people. I've always been interested in education - I'm a professor at Carnegie Mellon - and wanted to do something that would allow everyone to learn in an effective way regardless of their financial background. In particular, it was my country that motivated me to do this, since most of the population does not have access to good education.

What are the next projects after the current ones for you, Luis?

I don't know! I try to focus 100% on what I'm doing, and right now my entire focus is on Duolingo. There's still a lot to be done here - originally we wanted to offer free language education to everyone, but now our mission is to develop the best possible education of any kind and make it universally available. We may start teaching basic literacy soon. There are a billion adults in the world that don't know how to read and write, and I think that's crazy!

What's Duolingo's revenue model?

As I'm typing this I'm in the middle of a Duolingo lesson, and I'm hoping you guys can afford to continue to teach me for free. Also, if you charged me for the Duolingo for Windows Phone app, I'd have gladly bought it.

Hi Ryan! We never want to charge our users - on any platform. And yes, we plan on staying afloat so everyone can continue learning for free. We currently have two models. The first is that on the website, our users have the opportunity to translate texts (in the "immersion" section) to practice their language skills, and these come from real sites like CNN that pay us for translations! This sounds crazy but works because people collaborate on translations until they look good. The second and most important part is our new app, the Duolingo Test Center. We're now giving everyone the chance to prove that they have language skills without having to pay the \$250 normally charged by the existing proficiency tests. Our tests will cost \$20 (it's free now, in Beta), and will help our educational app stay afloat.

Where (geographically) do you think Duolingo will be most successful? Are you planning on targeting certain regions or countries?

The countries where we're most popular include the US, Mexico, Colombia, Guatemala, Costa Rica, Hungary, the UK, China and Italy. So it really varies! Our core goal is to reach people whose lives can really be improved by learning a language, but might not have been able to afford it. Often this means developing countries, but where people are able to get online.

Many other questions left unanswered

Von Ahn Reddit AMA 2017

von Ahn, L., (2017) *I am Luis von Ahn, CEO and co-founder of Duolingo, AMA!* [online], available: https://www.reddit.com/r/duolingo/comments/5pr3sv/i_am_luis_von_ahn_ceo_and_cofounder_of_duolingo/?limit=500 [accessed May 8, 2017]

Hi Everybody,

I'm here to answer any questions you may have about Duolingo, our future plans, or pretty much anything that's on your mind! I'll start answering at 5pm EST, but you're welcome to start asking beforehand.

Update: Wow, thanks for all your questions! I tried to answer as many as I could (even if it was with short answers), but I must go now to continue working on Duolingo.

Going forward, are there plans to make the feature set more similar between Duolingo's different platforms?

Yes, we want to standardize. Working on it slowly.

hi luis is Japanese going to be a course for English speakers?

Yes! This year, hopefully. I can confirm we're working on it, along with a way to teach different scripts.

Does this mean we could see Mandarin?

Yes

Any plans to bring the grammar lessons to the mobile app?

Working on that FO SHO.

Are you referring to "Grammar lessons" as in "Tips & Notes", Luis?

If yes, will there be restrictions on volunteers side(), making that contributors will have to rewrite entirely the existing ones?*

() like the limitation the apps' design imposed on hints-length.*

Yes, we may need to rewrite the tips and notes to make them shorter.

Hi, Luis. Is Duolingo on the verge of implementing something big? It seems with the removal of Immersion and other features that Duolingo may be in the process of an overhaul. Can we expect something exciting soon?

We're working on hundreds of features, some of which you may never see because they won't increase our usage metrics when we test them on a small fraction of the users. But you'll see the ones that increase usage metrics, and hopefully you'll like them :)

Speaking of an overhaul, the website is undergoing a full rewrite from the ground up, which will make it, literally, ten times faster. However, other than speed, you shouldn't notice any difference.

This new implementation of the website is currently being tested on about 10% of our users.

I should add that the website rewrite contributed to my decision to turn Immersion off: porting it to the new architecture would have taken months, and since Immersion was only used by 0.05% of our users, I didn't think this was an intelligent use of our time.

I get that "usage metrics" are vitally important, but to my mind, the features that help people to better learn and retain their language skills should be equally, if not more important than "usage metrics". This is a language-learning site, after all.

Sorry, I should have been more clear: we definitely look at learning outcomes as well.

When using the browser version of Duolingo (which I use because of the increased difficulty when compared to the mobile app) you are primarily translating from the foreign language into the language you are already familiar with, and less often are you translating into the foreign language. This means your reading ability in your foreign language is far higher than your ability to write with it. Will we have the ability in the future to change that ratio? So users of Duolingo can focus more on writing in their foreign language than reading it. This would also work both ways so that those less comfortable in reading can also target that side.

Thank you!

Yes yes yes. I REALLY want this. It's not easy to change because every time we try, people give up more easily. But we're working hard on slowly increasing the number of such writing exercises.

Currently even the best courses on Duolingo only teach to a very basic level. Are there any plans to improve the Duolingo system in such a way that it would be able to teach more advanced topics?

We have a pretty good idea of how well each Duolingo course teaches. Of course it varies per person, and also per skill (reading versus writing, etc.). That said, on average, we get people to an A2 level on the CEFR scale (though for some skills and some languages we sometimes see users reach B1). We're always working on improving this, and one of the company's goals for 2017 is to allow complete beginner users to reach level B1 for most language skills. To do this, we're working on new exercise types to teach more advanced listening and reading comprehension. You'll start seeing them in the next couple of months.

How are you measuring user level? Is it an estimate or did some of them take the cefr?

Some of them take standardized tests.

Hey Luis! Thank you for all you've done for the language learning community. I've seen some comments of users who applied to build a new language tree, like Latin and Icelandic, and never got any response, so I was wondering: what is the full process behind making a new course, from getting volunteers to releasing it to the public? Hope this doesn't sound rude.

It's not rude! Thanks for asking! We have more than 50,000 people who have applied to create new courses, and unfortunately we haven't done the best of jobs keeping this process well organized. We can't add every language at once (mainly because each one requires some resources on our end), so we have to prioritize in some way.

You guys seem so hesitant to add some pay version. I wouldn't mind paying some sum each month at all, and if that made you able to add more languages then i'd be very happy.

We ARE hesitant because we believe that education should be free.

Will you ever bring back immersion? Or add a new better feature to replace it?

Unfortunately, we have no plans to bring back Immersion. We understand that some people loved this feature (I was one of them), but it was used by only 0.05% of our users. A few years ago, we tried very hard to increase the number of people using it (for example, we would recommend it at the end of every lesson, etc.), but we were never able to get even 1% of our active user base to interact with it. Our job is to put our eggs in the places where we can make the most impact, and I'm afraid Immersion was not such a place.

We definitely have plans to add exercises that teach reading and listening comprehension a lot more in depth.

Was that 0.05% of all users period, or 0.05% of all users on an OS with immersion available?

It's 0.05% of all users. If you count people just on the website that had Immersion available, that number is higher, but still much lower than 1%.

Is there any plans to change the robotic voice used on courses to a real spoken voice, this is one of my biggest issues with Duolingo.

We've tried doing this and it reduces usage metrics :(That is, people stick with Duolingo for less time when we present real human voices rather than our synthesized speech. Not sure why this happened, but given that it hurt and that having real human voices requires quite a bit of effort, we stopped working on it.

Can something be done about all the noise in the forums? They seem to be overly clogged with "Can I has some linguts plzzzz?", "Hi everyone from Ms X's Class!", "I will teach you my own new conlang here one post an hour for a year", competitions, lotteries and all sorts of wastes of space. There is also the problem with the users who post these threads creating multiple accounts either to boost their own threads or to downvote legitimate threads into oblivion. I know there is a limit to what the mods can do, but the forums are fast becoming unusable. I mainly browse looking for announcements, such as the one that sent me here, but I'd happily just subscribe to a staff-only forum as things stand.

Later this year we will overhaul the forums. Stay tuned!

Cool. Hopefully an improved search function will be included?

Yes!

I've seen you write before that Chinese or Japanese for English speakers doesn't have a worthwhile cost/benefit ratio for Duolingo to work on teaching these languages. That said, not offering those languages makes Duolingo stand out from other learning tools. Does this worry you at all? I've been able to study Japanese elsewhere, but I would have preferred to study on Duolingo.

See my comment to another question. Japanese is hopefully coming this year.

Thanks! Yet what about Chinese?

That too, eventually.

Hey Luis, are there any plans for more African languages? Swahili is releasing soon!

Yes, Swahili is coming in a month or so! I don't know of any plans for other African languages.

(this is just a silly question)

In the app versions of Duolingo, you can spend lingots to get different "costumes" for Duo. I believe for a limited time in the last year or two, there was a Chinese New Year costume available.

Have you guys considered re-using the other holiday-themed Duo art from Duolingo's social media pages for additional costumes in the store? Although I usually use the mobile site instead of the app, I would want to rock the Owlween costume every day of the year

I'm just going to leave this screenshot here from my beta version of the app:
<http://imgur.com/a/IhBQ0>

With immersion now firmly out of the picture, what can you tell us about Duolingo's future plans for learning new languages? Are there any new updates on the horizon to bots, the store, or the lessons in general? Thanks for all your time and hard work, James.

Yes, we are working on a number of initiatives, including exercises that teach listening and reading comprehension of longer passages.

Thank you for this wonderful tool. That's all I have for now.

Thank you!!!

How is the ad monetization going? Are you taking donations yet?

It's going very well. I'm not sure if this is what you're asking, but the Android app will soon have a way to pay to remove the ads.

Just some feedback on the ads themselves. The way they are currently implemented is great. Completely unintrusive, easy to close out, do not disrupt or break formatting of your content, and they emerge in expected ways, which makes them not jarring. I actually have found myself examining many of the ads, something I never do on those found typically on the web. They also have good resolution images that aren't a complete eye sore. I never thought I'd speak such praises about ads, and tbh the way you have implemented them will have an impact how other ads are displayed.

Awww thanks! We try hard for the ads not to be annoying!

Can you provide an update about Duolingo's efforts or plans for supporting small and endangered languages? Are there specific challenges in launching endangered languages on Duolingo that external revitalization projects could assist with (e.g. development of TTS engines)?

Audio is one of the big problems for small and endangered languages (scripts is the other one). Usually we cannot find a TTS engine for them (i.e. computer audio), so we have to manually record the voices, which requires quite a lot of effort.

We'll be working on 4-5 smaller languages this year, but there are over 6,000 languages in the world, so we won't have the resources to make a big dent any time soon.

Are there plans to add Latin for English speakers?

Just adding on to this to note that I and numerous other M.A.-level or higher credentialed Latin teachers have applied to add the course and heard nothing from DuoLingo. I know he said it would be added in a previous AMA, so I'd love to see this question answered.

Also, in the hopes /u/vonahn sees this, I'd just like to give the plug here: based on ACTFL stats, Latin is the 3rd or 4th most studied foreign language in the US. In spite of this, the free online resources for self-guided learning for Latin are pretty terrible. On /r/Latin, and on some Latin Facebook groups, I constantly see requests for Latin-learning apps or sites, but there's nothing good to recommend as a standalone learning tool. There's a niche that DuoLingo definitely would fill if it offered Latin.

Noted!

Hi Luis!

I'm a massive Duolingo fan and promote it any chance I get.

However, as a fan I obviously want to see Duolingo succeed, so I'd love to hear more about how you guys plan to become revenue positive if you haven't already. In lieu of the original crowd-sourced translations business model, are there any promising models that are consistent with your mission and values?

Thanks for asking about this! We're not yet revenue positive, but we've made huge advances over the last few months. We should be breaking even by the end of the year.

Are there any plans to be better able to compete with friends? I'd like to see the ability to 'challenge' or compete directly, such as who can get the most xp in a week/time period, even between different languages. Thanks

Edit: also what happened to the Android wear app? It was simple but effective, and even if it wasn't popular there is surely no reason to take it away rather than just not develop it further?

Yes, we'll add more competition to the Clubs feature. Stay tuned!

Unfortunately the Wear app increased the size of our Android app by several megabytes. Since it was used by less than 1,000 people per day, we thought it as better to remove it (and save the other N million people money on their data bills).

Hi Luis! Thank you so much for bringing Duolingo to the world! Do you have an ETA on the updated Spanish for English tree?

Unfortunately, I don't have an ETA for that. I know it's being worked on, but I can't say much more than that.

Hey Luis, love what you and the duolingo team are doing. As a man with many responsibilities and things to do, what sandwich do you eat most frequently and how does it suit your needs?

I like grilled ham and cheese. It's delicious.

Multiple questions, if you only want to answer some of them, fine by me :)

How many languages do you speak yourself? If multiple, which one is your favourite foreign one?

Why no love for Android? Chatting with bots is still only on iOS I think, and are the tiny cards. Or simply having these features in the online app would make it accesible for everyone, but I understand limiting it first to the most popular platforms

I assume you have access to a lot of statistical information. Which language is the hardest to learn starting from English, and which one is the easiest one?

I speak 2.75 languages (English, Spanish and 0.75 of Portuguese).

We have more iOS developers than we have Android ones. If you know of any good Android devs, have them apply here: <https://duolingo.com/jobs>

Easiest starting from English are Spanish and Esperanto.

Have you used duolingo yourself to help learn a language?

Yes. That's the 0.75.

Can we expect more indigenous languages or other "revival" projects to be added to Duolingo in the near future?

See my other answer to a similar question. Basically this is not super easy. We will be adding 4-5 smaller languages this year, but this is only a small dent (there are more than 6,000 languages in the world).

Is there any chance of removing the fluency meter? I mean, it doesn't correspond to the CEFR levels like A1, A2, etc.

It is very misleading to people thinking that they are becoming native fluent. Unless this is the whole point?

Motivation is the single biggest problem people have when learning a language. The fluency meter is extremely motivational.

Hi Luis! Are the "Sentences" tab (in courses' forums) on the hot seat? All services that had be temporarily disabled (to alleviate servers) came back except for this forum view: does it indicate it may disappear (forever)?

This is coming back, hopefully in the next couple of days.
Aaand, it's back now.

Hi, just finished French and I would love to start learning Arabic in Duolingo. Any chance for Arabic in DL?

At some point, yes.

Hi Luis. I am contributing to one of the DL courses and during the last few days I feel like the role of us contributors is being reduced to processes which actually don't require neither proficient language skills nor passion for teaching. Since the sentence discussions were closed there is hardly a possibility to contact our students. Generally, the great communication tool like DL forum is being neglected completely in the Android app, though it would provide an excellent perspective of communicative learning and mentoring. Are there any plans to strengthen this communicative aspect, like bringing Tipps and Notes to the app (there were requests from diverse users), restoring of sentence discussions, testing new forum tools? I am also greatly interested in the way the languages are being chosen for the Incubator, especially concerning "Project Finnish". The language seems to be fashionable among modern youth, so why does it not deserve a place in the Incubator? Building of agglutinative language courses has turned out to be a success, since we have Turkish and Esperanto, so what's the problem with Finnish then?

Sentence discussions are coming back in the next couple of days.
We will have Tips and Notes in the app at some point this year.
I'm not sure when Finnish will be added. I understand people are asking for it, but as you can tell from this thread there are hundreds of other requests.

Sentences will hopefully be back online soon:
https://www.reddit.com/r/duolingo/comments/5pr3sv/i_am_luis_von_ahn_ceo_and_cofounder_of_duolingo/dct5j5w/

I still would love to be ensured that they won't share the destiny of Immersion during the next Big Glitch...

We don't have any plans to remove them.

when are you planning on bringing tinycards to android?

It will first come to Web (with a mobile version of the site). This should happen in February or March.

*First of all, thank you Duolingo and for your time to answer questions directly.
Now my actual question: Why the focus on IOS? It seems a bit counter-intuitive that your goal is provide free language education to the world, yet the most interesting innovations (tinycards & bots) get released only in the most elitist platform available.*

It's for a very practical reason: we have more iOS developers than Android developers. If you know any great Android programmers, have them apply at <https://duolingo.com/jobs>

Hi Luis, thanks for Duolingo. I'm getting fairly proficient with a few languages thanks to it and I honestly never thought I had the aptitude for them.

Are there any plans to bring a bots like feature to something like the Google home or the Amazon echo?

Thanks! We'll bring the features there as soon as those platforms have enough users (hundreds of millions). We once made the mistake of making an app for Android Wear (the watches): it took away precious resources and was used by a few hundred people every day (because not that many people had Android watches).

Dydh da (Hello) Luis- I've been using Duolingo for nearly three years, which has enabled me to learn Spanish and revived my enthusiasm for language learning in general. I made it my language mission last year to learn my ancestral language of Cornish, but have found it so frustrating that I made contact with the moderator from the Welsh Duolingo team to find out from them how they achieved getting their course on Duolingo. The TTS from the Welsh course could probably be used or adapted for a Cornish course, as they are both from the Brythonic language group, and words are pronounced in a similar way.

I'm gradually reaching out to the Cornish language community and think we could put together a solid, experienced team to develop a Cornish course, based on the Welsh course, with a couple of people who are already contributing to other Duolingo courses being enthusiastic and willing to contribute to a Cornish course too. In light of Duolingo's need to prioritise resources, I wondered how that is likely to impact on its previously stated support for endangered and revitalised languages, with Cornish in mind. The Cornish worldwide diaspora is 4-6 million strong, and a recent video of a song in the Cornish language went viral, with well over 1 million views. Meur ras (Thank you)

Thank you for this comment! I don't know when Cornish will be added, but I assume we'll eventually get to it. As you can hopefully understand there are over 6,000 languages in the world, and we have very limited resources.

Would you consider allowing subscriptions for a small monthly fee that removed ads and multiple choice/word selection in favor of being able to type out sentences? Right now I no longer use the service as the word rearranging doesn't allow me to retain the information. I'd gladly pay if I could start learning again!

A subscription to remove ads is coming very soon.

Great news. I hope it comes with more helpful question types too!

Sentence discussions are coming back in the next day or two.

*Do you plan to keep fixing bugs volunteers are reporting to your teams on UV?
[Asked on behalf of several course contributors]*

Yes

*Hello Luis, and thank you for doing this AMA (and for Duolingo!). My question is a fairly silly one, but you've already answered other questions I've had. How do I pronounce "von Ahn"? Is it /fon.a:n/ or /van.ahn/, or something else?
Thanks again!*

/fon.a:n/

Any news on Mandarin, Luis? Thank you

No ETA yet, but we should have it this year.

Why do y'all focus on adding features most people don't like or get anything from (like Clubs), while ignoring or removing features users actually enjoy/desire? (Like Immersion, Tips & Notes, now comment links on the Android version). It seems like y'all are actively trying to drive people away from the site.

Our metrics indicate otherwise :) Already Clubs are used by over 100x as many users as Immersion ever was.

Sentence comments on Android are coming back in the next couple of days. Those were turned off because they required quite a bit of server capacity, and we've been under very heavy traffic the last few weeks.

Tips and Notes are coming to the apps this year (in some form or another).

Uh-huh. Sure. You sign up. Then how do you use 'em? You don't, there's nothing to use. There is literally no way that "100x" as many users could be using Clubs, because there are no functions of Clubs to use. They are literally not useable. You join one (as most people have done, out of curiosity, or an expectation that Clubs would actually have features) and then there's nothing to do. There's no discussion forum for the Club. There's no way of holding mini-contests or making buddies.

Many more features are coming to Clubs soon. But just to clarify: on a given day, 100x as many people did something in a Club (such as react to somebody else's activity) than the number of people who did something in Immersion. I really have no incentive to read the metrics wrong: I want what's best for Duolingo :)

When will the Spanish for English tree get updated? Especially when the English for Spanish speakers has more useful vocabulary than the Spanish for English speakers. If it does, can we get Castilian Spanish tree?

Sorry to be blunt, but there won't be a Castilian tree as long as I'm in charge. I'm a native Spanish speaker and I think the Spanish we teach allows you to communicate in every Spanish-speaking country. Yes, there are some words that are different and some tenses are used more in some places than others, but this is not what you should be worrying about when learning on Duolingo. To me, this is like somebody asking for a British English tree. Duolingo teaches enough of the language to get you to intermediate level. During that stage of learning the most important things are for you to know the basic words, to learn how to form sentences together and to understand what people are saying to you. Knowing regional variants of the language should come later.