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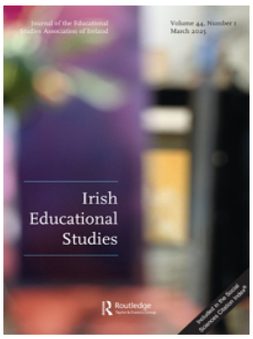

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Critically reflecting on the human and environmental costs of digital technology use in education: considering the role of leadership and school culture

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ABSTRACT

While there has been an ever-increasing drive to digitally transform educational institutions over the past decade, concerns related to the environmental and human impact of digital technology consumption appear absent from policy in this area. Such concerns about resource depletion, environmental degradation, and human exploitation are likely to be downplayed and met with resistance from advocates of the digital transformation agenda. For schools to seriously consider the damaging effects of the ever-increasing digital technology consumption, effective leadership is needed. Traditionally the idea of digital leadership in schools was seen as a specified role often undertaken and attributed to singular change agents or individuals. This paper argues that more democratic and inclusive leadership is needed to enable teachers to take ownership of this change agenda, thereby enabling schools to proactively respond to this sustainability crisis in an ethical and empathetic manner. This alone is not sufficient, however, as a shift from the dominant techno-positive mindset is also needed to allow teachers to critically reflect on this digital transformation agenda. The paper argues that if such conditions are established, more ethically driven responses to digital technology practices are likely to emerge.

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Introduction

The increasing predominance of digital technology use in schools has been met with an array of different responses. Advocates contend that this increase is an inevitable and necessary response to a more digitally literate student body (Gronow 2007; Sheninger 2019). Some argue that the integration of technology into schools can enhance the learning environment, increase engagement and motivation as well as address issues related to inequality (Carstens et al. 2021; Haleem et al. 2022; Tawfik, Reeves, and Stich 2016). Others argue that digital technologies can also contribute to the fulfilment of the United Nations Sustainable Development Goals (SDGs) (Zhang et al. 2022). For instance, there are a number of claims that educational technologies can reduce carbon footprints

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(Haleem et al. 2022; Versteijlen et al. 2017) and energy consumption demands (Doulos et al. 2019; Yin et al. 2022) across different educational sector institutions. There are also concerns regarding students' digital competence for a technology-driven world which seem to underpin this technological expansion (Bejaković and Mrnjavac 2020; Mukherjee 2023; Skues and Cunningham 2013).

Conversely, there are those who question this techno-optimism. Facer and Selwyn (2021) argue that 'hoping that technology alone will address education's fundamental challenges is as unrealistic as it is inefficient' (9) and that due to enticing claims and promises, many overlook the challenges associated with increased technology use. For example, how digital distraction can detract from students' learning experiences (Kates, Wu, and Coryn 2018) and the risks of digital addiction and its impact on student well-being are often overlooked (Selwyn and Aagaard 2021). Moreover, concerns associated with exposing education to the ever-growing corporate influence of the digital technology industry do not seem to feature in public debate, despite the threats to education as a public good (Moeller 2020; Riep 2023; Williamson 2022; Williamson and Hogan 2020).

Finally, in line with the scope of this paper, it is also paramount to acknowledge the pervasive neglect of sustainability concerns within the broader discourse surrounding education (Selwyn 2021; UNESCO 2023). When exploring the potential effects of this lack of discourse, Selwyn (2021) notes that technologically reliant schools might soon be impeded by the continually accelerating depletion of natural resources and the ever-growing energy demands resulting from increased production and consumption of digital resources. Moreover, the extraction and production endeavours necessary to facilitate technological expansion have been linked to significant human rights concerns (Emejulu and McGregor 2019). Therefore, while digital technologies could be beneficial in addressing emerging sustainability issues (as will be further discussed below), it is likely more appropriate to perceive digital technologies as a double-edged sword rather than a panacea when evaluating the impact they have on SDGs (Zhang et al. 2022). As such, in this era of rapid technological expansion, it is imperative to consider if, and how, schools respond to this critical challenge.

Educational technology integration is, therefore, a multifaceted and complex phenomenon posing significant opportunities as well as challenges for school leaders as they navigate the various intricacies of the transformation agenda. The task of aligning action to the needs and interests of others can be particularly challenging, as failing to adequately respond to various expectations carries a risk of being seen as not fulfilling one's duties (Balikçi and Aypay 2018; Ball 2016). In addition, raising environmental and human rights concerns related to digital technology expansion in education is likely to be met with resistance from advocates of the digital transformation agenda. Yet if schools are to seriously consider the issue of sustainability and climate change, then critically informed action and, by extension, leadership at school level is crucial, particularly concerning digital technologies where leadership has been deemed a vital factor for its successful integration or lack thereof (Gronow 2007; Karakose, Polat, and Papadakis 2021; McDonagh and McGarr 2015; Singh and Muniandi 2012; Tondeur, Cooper, and Newhouse 2010).

As such, this paper is concerned with how school leaders could potentially respond to the issues of digital technology use in education and their perceived sustainability. To date, little attention has been given to this issue, but its importance is likely to increase

in the future and therefore work of this nature is timely (UNESCO 2023). Importantly, this paper does not focus on individual school leaders, an approach commonly employed when dealing with the integration of digital technology within the literature (Gronow 2007; McGarr and McDonagh 2013; Tondeur, Cooper, and Newhouse 2010). Instead, it situates the role of the school leader within the wider school culture in which decisions are made and through reviewing relevant literature, this paper explores how different manifestations of these cultures are likely to influence a school's response to issues of digital technology and sustainability.

The issue of sustainability and educational technology

In the ever-evolving landscape of digital technology use in education, it appears that pressing concerns related to the environment and broader sustainability issues have been largely ignored (Selwyn 2021). For the purposes of this paper, the concept of sustainability is not limited to environmental considerations; it also encompasses the human costs associated with widespread technology production. These costs include the human repercussions of resource depletion, manufacturing, and e-waste disposal, as well as the labour conditions of those involved. As such, this section aims to briefly explore these issues within the realm of digital technologies and education, before considering how school leaders could respond to this multifaceted challenge.

Prior to exploring potential sustainability issues associated with the use of digital technologies in education, however, it must be noted that digital technologies could in fact contribute to the fulfilment of all 17 SGDs (ITU 2018). Technology's role towards the fulfilment of SDG 13 (take urgent action to combat climate change and its impacts) in particular is significant for the context of this paper. Literature around achieving environmental sustainability through the use of technology in education is numerous and aligns directly with SDG 13. For instance, in addition to reducing the amount of vehicular carbon emissions (Haleem et al. 2022; Versteijlen et al. 2017), online teaching modes in higher education have shown to reduce the energy requirements of physical infrastructure, heating, and lighting (Caird et al. 2015; Yin et al. 2022), and while literature on online education and energy efficiency of public schools is sparse, other technologies such as, more reliable and efficient lighting, improved heating, and more sustainable energy systems like solar, have proven to help schools reduce their energy consumption demands (Doulos et al. 2019; Morck, Thomsen, and Jorgensen 2015; Rospi et al. 2017). Furthermore, digital technologies can reduce physical resource requirements (Otto and Becker 2019), such as paper handouts, workbooks, textbooks, notebooks, as well as other material resources, such as pencils or pens (UNESCO 2023), thus reducing the overall carbon footprint of educational institutions. In fact, this positive association of digital technologies with addressing environmental sustainability concerns is not limited to more recent publications; such a position is also evident in Berkhout and Hertin's (2001) exploration of 'second order effects of ICTs' (9–17) in which the authors highlight how newer technologies tend to be more efficient, achieving the same outcomes with less resource investment while also producing less waste in the process.

However, a recent United Nations Educational, Scientific and Cultural Organization (UNESCO 2023) report states that assumptions that educational technologies 'would

transform the education sector into an engine and model of sustainability were simplistic at best' (248). The report states that potentially blinded by the supposed benefits, many overlooked the wider implications that our increasing reliance on digital technologies in education may have; namely that due to the significant (and ever-increasing) global demand for hardware and connectivity, subsequent resource extraction is likely to significantly damage the environment. Looking at the human element, this demand impacts the lives of countless individuals (Emejulu and McGregor 2019). Human exploitation and suffering can occur at any point along the life cycle of a digital product: This begins with the initial phase of resource extraction, where hazardous mining conditions take a toll on the lives of many around the world, continuing during the manufacturing of products where the conditions faced by many workers would not meet the acceptable standards of more developed nations, and extending to the disposal and recycling of products where toxicity levels create more hazardous environments (Chen 2016; Emmanuel, Jerry, and Dzigbodi 2018; Githiria and Onifade 2020). Therefore, it must be noted that digital devices are not weightless or neutral; they are products of a long and complex process where environmental degradation and human exploitation readily occur.

Commenting on the instability of the ever-increasing expansion of digital technologies in education, Facer and Selwyn (2021) argue that this large-scale adoption of technologies is unlikely to stop as various pressures are imposed upon policymakers and educational leaders, many of whom are fearful of the consequences potentially associated with resisting this digital transformation agenda. As such, it is worrying that issues of sustainability have not received due attention in the wider debate around digital technology use in schools. Its absence indicates limited criticality regarding technology integration; rather it is suggestive of the prevalence of a techno-solutionist mindset within the wider educational community. This mindset seems to assume that technology can readily solve complex societal, political, and environmental issues without due consideration of the broader context and potential negative consequences (Selwyn 2023). As this paper will later argue, the wider school culture can play a pivotal role in addressing these challenges and creating the conditions required for more critical questions surrounding digital technologies to be raised.

Digital leadership in schools

The importance of leadership in relation to digital technologies in schools has been recognised for many years. As a result, different terms have been employed, often used interchangeably to capture this concept. These terms include 'Technology leadership' (Anderson and Dexter 2005; Flanagan and Jacobsen 2003), 'e-leadership' (Avolio, Kahai, and Dodge 2000; Gurr 2004; Zaccaro and Bader 2003), and 'digital leadership' (Sheninger 2019; Tigre, Curado, and Henriques 2023; Yusof, Yaakob, and Ibrahim 2019), all of which are commonly used in literature. While these terms are related and often overlap in their meanings, they appear to have different core characteristics presented in the literature. It could be argued that these leadership terms reflect evolving understandings and priorities in relation to leadership and technology. It is therefore important to differentiate between these terms to remove ambiguity and determine what constitutes school leadership in the context of technology today.

Technology leadership was a term commonly used in the past to describe the leadership required to facilitate the integration of digital technology in schools. Anderson and Dexter's (2005) model provides three outcomes which best represent the aims of school technology leadership: (1) Net use – The frequency of teacher and student use of email and the world wide web; (2) Technological integration – The extent of technological integration into curriculum and classroom practices; (3) Student tool use – The extent in which students utilise technology to complete various academic tasks. These three outcomes may be reflective of the dominant concerns at that time: the acquisition and use of digital technologies. Early indicators of effective technological leadership, therefore, tend to focus predominantly on resource and infrastructure acquisition, facilitation of consistent professional development, and the establishment of a supportive environment encouraging the use of technologies within the school (Anderson and Dexter 2005; Flanagan and Jacobsen 2003; Yee 2000). This priority was inevitable in these early stages where issues of technology acquisition and use were core concerns in a system with limited technology use.

E-leadership tends to refer to leading virtual teams and utilising digital tools for remote collaboration, but it also came to be used as a term to describe leaders who perform a large portion of their leadership duties through various electronic channels (Zaccaro and Bader 2003). One of the earliest and most influential accounts of e-leadership is that of Avolio, Kahai, and Dodge (2000), in which e-leadership is defined as a social influence process mediated by technology that facilitates communication, coordination, and engagement 'to produce a change in attitudes, feelings, thinking, behaviour, and/or performance within individuals, groups, and/or organizations' (617). This definition later evolved to include context as a fundamental contributor in shaping practice of e-leadership (Avolio et al. 2014). It is important to note that e-leadership only emerged as digital technology use increased, and a particular level of technological infrastructure had been achieved. Tigre, Curado, and Henriques (2023) contended that prior to 2016, the term 'e-leadership' was among the most used keywords in technological leadership literature. However, their analysis also showed that the term 'digital leadership' was becoming more prevalent.

Tigre, Curado, and Henriques (2023) define digital leadership as, 'an ethical and agile mindset that quickly responds to changes and learns from them, fostering a trust-based culture that values people and its diversity, coaching them to collaborate and thrive in a digital scenario' (58). Sheninger (2019), focusing on the educational context, defines it as 'establishing direction, influencing others, initiating sustainable change through access to information, and establishing relationships in order to anticipate changes pivotal to school success in the future' (21). In their definition, Yusof, Yaakob, and Ibrahim (2019) draw particular attention to the importance of sustainable technological integration and its involvement in the leadership practices of school leaders. Integration in the context of schools, however, seems to be often limited to technological acquisition rather than actual use, suggesting a clear neglect of a sufficient cultural shift and thus, the sustainability required for effective school-wide integration (Gura 2022; McDonagh and McGarr 2015).

Technology leadership, e-leadership, and digital leadership are all terms that have been used to describe the leadership of digital technologies in educational settings. These terms each possess unique characteristics and as indicated above, could be

interpreted as representing different stages in the evolution of leadership in the context of technology in schools. The term 'digital leadership' is the most recent term used and seems to go beyond the use of various technologies to facilitate collaboration of team members and support technical integration into existing structures, as was the case with technology leadership and e-leadership, respectively. Rather, it is a more nuanced and holistic phenomenon that involves the ethical use and evaluation of various digital tools, and any issues associated with them to transform the entire culture of the organisation. Due to this and its ever-increasing prevalence in recent literature, this paper will use the term 'digital leadership' as opposed to technology leadership or e-leadership, while acknowledging the overlap between these concepts and that existing literature may use these terms interchangeably.

The individual nature of digital leadership in schools

Turning attention to the practical aspect of digital leadership in schools, it is crucial to identify the key players who act as digital leaders within schools. This section will examine empirical research to compare and contrast the expectations of digital leadership with what is achieved by digital leaders in reality. However, it is important to note that the roles and responsibilities of these leaders can vary depending on the context in which they operate and as such, may not always fully align with the theoretical expectations of digital leadership.

Traditionally, school principals have been the leading authority within their schools (Harris 2013; O'Donovan 2015). As such, they have often been identified as digital leaders, responsible for overseeing school-wide technological integration and the wider digital transformation agenda (Karakose, Polat, and Papadakis 2021; Lai and Pratt 2004; Yee 2000). It is worth noting that while some principals demonstrate strong technological competence and actively drive technological integration within their schools (Yee 2000), others may face limitations due to their lack of familiarity with technology. For instance, Hillman (2022) questions assumptions regarding principals' digital competence, indicating that principals are limited in their understanding of technology, often neglecting thorough product evaluation practices during the procurement of technological resources. Similarly, Letuma (2023) found that given the context of rapid technological expansion, school leaders need to see a significant improvement in their knowledge and training around digital technology use. Others suggest that principals should rely on other staff to assist them with their digital leadership duties as they might lack the required technological competence (Department of Education 2022; Gronow 2007; Håkansson Lindqvist and Pettersson 2019). In other words, the responsibility for school-wide technological integration should not lie with one individual but instead, be attributed to many who possess the necessary knowledge and skills to aid the decision-making process (Lai and Pratt 2004; McDonagh and McGarr 2015; McGarr and McDonagh 2013; Woo 2023). This would mean a shift from the historic style of leadership where the school principal acts as the main authority, to a more democratic one in which leadership is distributed amongst other members of the school staff.

Coordinators are another group frequently involved in schools' digital leadership efforts, often assisting principals with their responsibilities in this area (Anderson and Dexter 2005; Devolder et al. 2010; McGarr and McDonagh 2013; Woo 2023; Woo and

Law 2020). While traditionally they were referred to as Information and Communication Technology (ICT), technology, or computer coordinators, this study adopts the term 'school digital coordinator' to align with the newly evolved terminology of leadership as discussed above. The roles and responsibilities of the digital coordinator are vast and varied (Devolder et al. 2010; McGarr and McDonagh 2013; Woo and Law 2020). They often include providing pedagogical and technical support to colleagues, facilitating professional development, acquiring digital resources, and assisting in planning, developing, facilitating, and monitoring the school's digital vision (Devolder et al. 2010). Interestingly, however, while both pedagogical and technical support might be provided, their distribution of efforts is often imbalanced. Various studies have identified that technical support duties, such as hardware maintenance and troubleshooting accounted for a significant majority of digital coordinators time, negatively affecting the fulfilment of other duties (McGarr and McDonagh 2013; Moreira, Rivero, and Sosa Alonso 2019; Rodríguez-Miranda, Pozuelos-Estrada, and León-Jariego 2014; Tondeur, Cooper, and Newhouse 2010; Woo 2023). Consequently, digital coordinators might perceive their leadership potential as limited and feel they lack adequate recognition from their peers (Lai and Pratt 2004; McDonagh and McGarr 2015; McGarr and McDonagh 2013; Woo 2023).

Having reviewed the relevant literature regarding school digital leaders' roles and responsibilities, it would seem sustainability considerations remain largely neglected. Furthermore, digital leadership appears to be most often attributed to individuals, neglecting to consider school culture and its influence on how schools respond to expectations. As aforementioned, principals are generally regarded as the leading authority within their schools and hence, by extension were attributed the digital leader position. Others associate digital leadership in schools with individuals referred to as digital coordinators. However, given reported concerns around principals' seemingly limited understanding of technology, and coordinators overemphasis on technical support, many have argued in favour of a collective decision-making approach instead of relying on individuals and their responsibility towards school-wide technological integration (Lai and Pratt 2004; McDonagh and McGarr 2015; McGarr and McDonagh 2013; Woo 2023). Still, although indicating a need towards a shift in the decision-making culture of schools, discourse is limited. It revolves primarily around distributing digital leadership to more individuals that can effectively aid with schools' digital transformation as opposed to exploring the potential impact of the wider school culture. What is particularly absent from the literature is due consideration of school culture and how it can hinder or advance considerations regarding responsible and ethical integration of digital technologies.

School cultures

It is widely acknowledged that educational institutions are often bureaucratic in nature, with their own hierarchy, rules, and regulations (Balikçi and Aypay 2018; Trinidad 2019). While bureaucracy might provide order, stability, and unity through imposed rules and regulations, it can stifle opportunities for critical reflection as any deviation from the norm is seen as a deficiency in duties and responsibilities (Balikçi and Aypay 2018; Ball 2016; Trinidad 2019). In bureaucratic environments, responses to national and

regional policies can often be typified by compliance. For instance, digital coordinators possible and actual tasks appear to be influenced by national and regional policies with McDonagh and McGarr (2015) revealing that digital coordinators draw heavily on prevailing policy discourse, and Avidov-Ungar and Shamir-Inbal (2017) noting that the role of the digital coordinator is defined according to the criteria specified in local governmental policies.

However, while many policies outline the 'what' is to be done, they neglect the 'how', leaving many coordinators wondering which actions to take, resulting in differing policy interpretations and thus variability across schools (Trinidad 2019; Vanbuel 2022). In this sense, it might be argued that the way in which digital leaders respond to policies is dependent on their own style of leadership and beliefs. This paper argues that for appropriate responses to the digital transformation agenda to occur, the focus must shift from individual leadership approaches to collective organisational culture and action. According to Serpa (2016), organisational culture may be considered as a 'shared way of being, thinking and acting in a collective of coordinated people with reciprocal expectations; it is shaped, disseminated, learned and changed over time, proving predictability in every organisation' (51). While it must be noted that the relationship between culture and leadership can be reciprocal, with each influencing and shaping the other in a dynamic way (Schein 2010), it would appear that the capacity of leaders to influence culture is limited to the early stages of organisational development, with culture beginning to shape leadership characteristics as an organisation matures (Kargas and Varoutas 2015). Moreover, organisational culture has been shown to have a profound impact on the emergence of specific leadership styles (Ogbonna and Harris 2000) as well as mediate the impact of leadership on the performance of any given organisation (Pillai and Meindl 1998). Most significantly for the context of this paper, it is important to note that while the concept of organisational culture initially found its roots in the realm of corporate leadership, management, and administration, it has since evolved into an interdisciplinary notion, especially within the domain of education and school cultures (Serpa 2016). This paper will focus on exploring autocratic and democratic leadership-based school cultures, as these models are most frequently discussed in the literature.

Autocratic cultures identify the leader as one of absolute authority, yielding complete power and control over a group (Bass and Stogdill 1990; Lewin and Lippitt 1938). This view, alongside the prospect of rewards for compliance, and punishments otherwise, motivates followers to partake in the tasks assigned to them (Bass and Stogdill 1990; Jogulu and Wood 2006). This type of culture is extremely strict and involves a rigid set of regulatory policies under constant leader supervision (Jogulu and Wood 2006). Autocratic leaders determine all the decisions in an organisation and neglect team consultation, collaboration, and feedback (Omolayo 2007). Research indicates that such a lack of collegiality results in an overall decrease in decision-making creativity (Jogulu and Wood 2006; Maloş 2012). Followers of autocratic leadership exhibit a relative dislike for their leader and describe them as bossy, controlling, and dictatorial (Lewin, Lippitt, and White 1939; Maloş 2012). The Transactional theory of leadership aligns well with the principles of an autocratic culture. It is driven by self-interest, aiming to maintain the existing organisational structures, seemingly uninterested in the betterment of the future (Odumeru and Ogbonna 2013). The theory focuses on the supervision and management of organisational performance utilising a punishment/reward system as a

means of instilling motivation (Amanchukwu, Stanley, and Ololube 2015; Khan, Nawaz, and Khan 2016; Odumeru and Ogbonna 2013). Thus, it is grounded in a strict system of rules and regulations akin to the relationship between the government, inspectorate, and public schooling.

Democratic cultures, on the other hand, encourage individual agents within an organisation to partake in collaborative decision-making (Amanchukwu, Stanley, and Ololube 2015; Bass and Stogdill 1990; Woods 2021; Woods and Gronn 2009), building trust and follower-orientated relationships (Jogulu and Wood 2006). In pursuit of this collaborative environment, democratic leaders de-emphasise hierarchy and show themselves as just another member of the team (Bass and Stogdill 1990). Lewin, Lippitt, and White (1939) interviewed subordinates describing their democratic leaders and found that comments, such as 'walked alongside with us', 'thinks of things just as we do' and 'never did try to be the boss' were reoccurring descriptors. Furthermore, according to Bass and Stogdill (1990), democratic leaders are described as responsible, considerate, caring, and willing to compromise. Distributed leadership theory aligns well with the principles of a democratic culture as it states that cooperation is a staple of effective leadership and hence, believes in the distribution of tasks, roles, and responsibilities (Amanchukwu, Stanley, and Ololube 2015; Woo 2023). The theory acknowledges the expertise, intellect and competence of followers and involves them in the decision-making process through consultation or alike. It creates a community of individuals who are encouraged to learn from one another (O'Donovan 2015), fostering 'greater initiative and responsibility' (Gronow 2007). Distribution of power, control, and autonomy, amongst others (see Bennett et al. 2003), are seen as major variables differentiating organisations utilising distributed leadership theory (O'Donovan 2015).

Regardless of the culture, how a school responds to the digital transformation agenda is also determined by how the challenge is conceptualised (Selwyn 2023). As previously noted, there are many ways in which the current drive to integrate digital technologies into schools can be seen. At one level, it could be seen as an externally mandated policy priority to which schools need to respond in an efficient and effective manner, resulting in compliant adoption of policy priorities without any major critical exploration of their merits and assumptions (Hirschman and Wood 2018; Phillips 2015). On the other hand, given the complexities and nuances of this digital transformation agenda and the many questions it raises, schools could respond in a more critical manner using the current policy agenda as an opportunity to critically question the assumptions that underpin these policy reforms and as such, reassert the educational values and principles that the school holds closely (Selwyn 2023). In this way, the school does not necessarily adopt policies in an uncritical manner but instead refracts policy agendas to fit with its own values, representing a more proactive, bottom-up approach to digital technology adoption. A critically reflective stance also has the capacity to facilitate consideration of ethical issues related to digital technology consumption and their human and environmental impact (Facer and Selwyn 2021).

Discussion

It is not that simple to categorise school cultures as either democratic or autocratic in nature as in practice they are likely to vary in the extent to which they employ forms

of distributed leadership as opposed to being either autocratic or democratic (O'Sullivan and Mac Ruairc 2023). Moreover, while acknowledging this, the absence or presence of a critical stance is likely to have a significant influence on how schools might respond regarding digital technology. For example, a more democratic school culture that does not critically reflect on the ethical considerations concerning the rhetoric surrounding digital technology is likely to result in quite a different school response than a democratic culture that encourages critical reflection and thereby considers associated ethical issues. Conceptualising this problem in this way, it can be argued that school responses to the digital transformation agenda can be classified according to the extent to which they reflect four different types of school culture. Figure 1 illustrates a potential framework for categorising school responses according to these cultures. It emerged from a review of the literature and as such, while empirical studies would need to be undertaken to explore this issue further, given the extent of the body of literature from which it emerged, it is highly likely that such cultures are evident and exist within schools.

As a potential limitation of this framework, it could be argued that the use of autocratic leadership is uncommon in today's educational context and as such, its use as a main pillar of the framework is questionable. This is warranted as many school leaders appear to have shifted towards a more democratic and distributed mindset. It is important to note, however, that while autocratic leadership may in fact be rarer than its democratic counterpart, certain hierarchical and directive leadership styles can still be present in various forms, even if they are not labelled explicitly as 'autocratic'. In other words, principles of autocratic leadership and cultures still exist within schools today. For instance, Brinia and Papantoniou (2016) showed that while a democratically orientated style was more frequently adopted by Greek school principals (56.85%), a large number of principals remained autocratic in nature (43.15%). Similarly, Aldhaheri (2023) found that while UAE school leaders were more likely to practice democratic principles, they

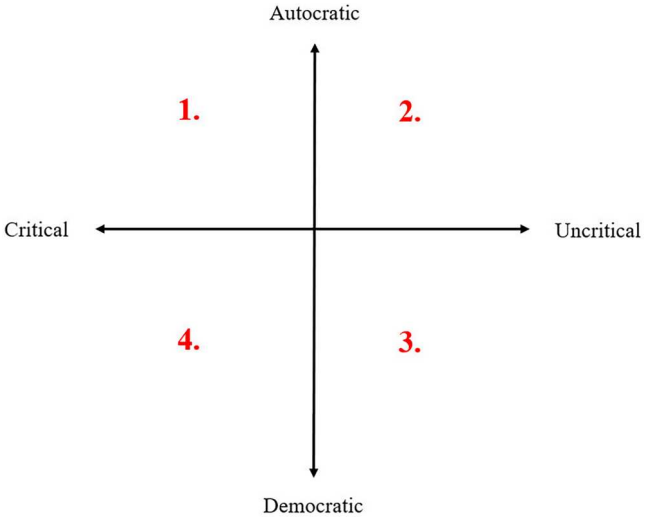

Figure 1. Framework for mapping potential responses according to a school's position within the spectrum of four distinct cultures: (1) Autocratic-Critical, (2) Autocratic-Uncritical, (3) Democratic-Uncritical, and (4) Democratic-Critical.

still frequently practice principles associated with autocratic cultures. Aldhaheri goes on and states, however, that there are differences between private and public school leaders and that contrary to data found for public school leaders, private school leaders are significantly more likely to adopt autocratic and transactional leadership practices. In line with these findings, research of school leadership styles in developing countries found that the most prevalent type of leadership within school leaders was autocratic leadership (Parveen et al. 2022; Saleem et al. 2020). There can also be occasions when autocratic decision-making occurs in traditionally democratic contexts (Hargreaves and Dawe 1990). This is particularly relevant in relation to the digital transformation agenda where a shift towards a more autocratic decision-making style of management can be seen (McGarr and Engen 2022).

Having justified the inclusion of autocratic leadership as a pillar of the framework due to its continued use in schools around the world, it is important to note that while the framework considers the fact that school leaders could adopt a blended leadership approach (Bass and Stogdill 1990; Vann, Coleman, and Simpson 2014) and express democratic as well as autocratic behaviours to various extents, the following discussion will focus on the four cultural extremities and how they could affect a school's responses to emerging challenges associated with the digital transformation agenda. The purpose of this framework is to act as a helpful conceptualisation to advance thinking in this area.

The first response, autocratic-critical (AC), is a result of an autocratic school culture where an individual(s) possesses substantial power and acts as the main decision-making authority within their school in relation to digital technology. In other words, any significant changes or ideas must pass through them before being considered for implementation. This type of centralised decision-making allows for a swift response to initiatives; however, the nature of the response is dependent on the AC leader's views of technology in education. This category is characterised by the leader's critical stance in relation to digital technology. They do not consume the techno-positive discourse in an uncritical manner and instead may be quite sceptical and resistant towards continued implementation. As a result, they may respond in a limited, partial, or disruptive manner (rarely compliant) that may mediate, and even distort, policy intentions to various degrees in an effort to align with their own values, regardless of the beliefs of the wider teaching body in the school. For that reason, this autocratic culture may not always have the full support or buy-in from the staff and broader school community. Centralisation of decision-making can sometimes lead to resistance or discontent among stakeholders who may not share the leader's values or beliefs or may not understand the rationale for the stance they are taking regardless of the merits of it (Peker, İnandı, and Gılıç 2018; Shohamy 2010; Wynn 2019).

The second response, autocratic-uncritical (AU), is characterised by a centralised top-down leadership approach coupled with a strong commitment to following established procedures and policies with little room for deviation or critical examination. Due to the uncritical nature of such a response, AU leaders are likely to embrace the techno-positive discourse and as such, comply with associated extant and emerging initiatives. It is important to note that leadership decisions are influenced by a complex interplay of factors, and each leader's motivations and priorities can vary significantly. As was the case with AC response, AU responses can suffer if the leader's actions deviate from the already established culture of the school, potentially resulting in limited

school-wide buy-in and support as a top-down decision-making approach often fails to adequately consider the perspectives, values, or beliefs of others.

The third response, democratic-uncritical (DU), can be characterised by its uncritical, bottom-up response to the digital transformation agenda and by extension, any associated challenges. As was the case with DC, the democratic element of a DU response encompasses a strong emphasis on collaboration and inclusion which tends to generate a sense of buy-in among school community members as they feel that their input is valued and having a role in shaping initiatives. The democratic element of this response however is limited by its uncritical approach to policy adoption, often failing to gather a diverse set of perspectives as the majority of its members would favour adhering to imposed rules and regulations instead of challenging existing or newly emerging policies. Critical questioning of these policies is not entirely ignored but is likely to be minimal in nature and as such, would rarely be acted on. Moreover, members of DU culture may express hesitancy in voicing their opposing views as they value the stability that adherence to existing policies offers. This can affect the level of buy-in among those who feel that their perspectives are not fully considered or that policies are not adapting to new technology-centric challenges. While this approach emphasises participation and shared ownership, it lacks appropriate critical reflection necessary to ensure that policies remain adaptable and responsive to the evolving landscape of digital technology in education.

The fourth and final response, democratic-critical (DC), is characterised by its focus on the distribution of leadership duties and collaborative decision-making, fostering inclusivity in shaping their school's future direction. This emphasis on school-wide engagement can significantly affect the way in which these cultures might respond to existing policies. For instance, stakeholders can collectively voice their concerns and create a new *de facto* initiative of their own, resisting or manipulating extant or existing policies in the process (Shohamy 2010). In this culture, critical feedback is not only welcomed but encouraged. Because stakeholders are actively engaged in the decision-making process and their critical feedback is valued, they are more likely to support and fully embrace the resulting initiatives, resulting in a high degree of school-wide buy-in. However, while the culture's emphasis on inclusivity can lead to breakthroughs in tackling various concerns, democratic processes are quite time consuming and as such, this culture might struggle when faced with urgent challenges requiring swift action (Amanchukwu, Stanley, and Ololube 2015; Engler et al. 2021; Woods and Gronn 2009). This can be particularly problematic due to the extent and ever-increasing demands placed on schools and their leaders (Balikçi and Aypay 2018; Tintoré et al. 2022). Despite this potential drawback, this type of leadership ensures that policy decisions are rooted in a diverse range of perspectives, holding the promise of more comprehensive and sustainable solutions in the long run. As such, DC cultures are likely to challenge and resist the digital transformation agenda; however, whilst this may be the case, it must be noted that DC cultures might in fact respond in a compliant manner if critically informed resistance of the agenda would negatively affect the school's core organisational goals.

Returning to the issue of sustainability around digital technology use in education, it could be strongly argued that a democratic-critical (DC) response would be most effective in tackling associated concerns. In looking at the democratic element, responses to the unsustainable consumption of digital technologies need to be tackled in a collective manner (Amel et al. 2017), as individually led changes, regardless of the sincerity and

merits of their intention, are likely to have limited impact as they fail to gain buy-in from the wider collective (Hubbart 2023). Further supporting the need for a democratic element, Thomson et al. (1999) found a strong link between effective communication and buy-in, stating that increasing the effectiveness of communication can significantly increase levels of buy-in. Apart from being tackled as a collective, responses to the sustainability crisis also need to be critically informed so that individuals and groups can question prevailing ideologies and assumptions and respond in a manner that reflects their values (Knutsson 2018; McGarr 2023). This lack of critical questioning can be attributed to societal norms of a techno-positive, techno-solutionist mindset as identified by various scholars (Facer and Selwyn 2021; Knutsson 2018; Kuntsman 2020). A significant increase in the frequency of concerns around 'greenwashing' further highlights the importance of critical questioning around technology use (De Freitas Netto et al. 2020; Pimonenko et al. 2020). In other words, if schools are to be effective in tackling the critical issue of unsustainability, their responses must be collectively embraced and include a level of scepticism and critical questioning regarding the merits of this digital transformation agenda. Emejulu and McGregor's (2019) call for 'radical digital citizenship' combines these two conditions, arguing that positive change will only occur if 'individuals and groups: (1) critically analyse the social, political, economic and environmental consequences of technologies in everyday life; (2) collectively deliberate and take action to build alternative and emancipatory technologies and technological practices' (131). Similarly, William Misiaszek (2021) states that while eco-pedagogical literacy for understanding the interconnectedness of social and environmental injustices is important, without democratic dialogue on these deeper socio-environmental issues, positive change is unlikely to occur.

Conclusion

School digital leaders must navigate the multifaceted and complex challenges associated with the digital transformation agenda. However, as various observers have noted, digital leadership has been largely influenced and limited by a techno-positive, techno-solutionist mindset (Facer and Selwyn 2021; Knutsson 2018; Kuntsman 2020; McGarr 2023). As such, digital leaders' ability to critically analyse emerging digital-centric policy discourse is hindered and limited. An issue of particular importance associated with the digital transformation agenda is one of sustainability, an issue which remains largely ignored by digital leaders.

As such, this paper argues that now, more than ever, there is a significant need for critically informed leadership in schools as emerging challenges relating to digital technology remain largely overlooked. Moreover, many would traditionally associate the responsibility for this leadership with individuals (Anderson and Dexter 2005; Devolder et al. 2010; Karakose, Polat, and Papadakis 2021; Lai and Pratt 2004; McGarr and McDonagh 2013; Woo 2023; Woo and Law 2020; Yee 2000), yet this paper argues that for real change to occur a collective school-wide buy-in is required. In other words, it is important to situate the role of the school leader within the wider school culture in which decisions are made and look at the issue of digital leadership through a collective lens instead of individual leadership styles. Through discussions of responses presented in Figure 1, it would therefore appear that a democratic-critical school culture nurtures more favourable conditions for appropriate responses to the digital transformation agenda to emerge. Opening this critical space is

also likely to raise more fundamental questions around digital technology consumption. For example, it could be argued that the present consumption of educational technology is unsustainable and that given the rapid global expansion of the educational technology market, all consumption is unsustainable (Selwyn 2021). Acknowledging the unsustainable nature of digital technology expansion, perhaps all educators can consider how their practices can become less damaging and more sustainable in nature. In this space, ethical considerations are critical, which points to the necessity to ensure the ethical dimension of digital leadership as espoused in the literature (Tigre, Curado, and Henriques 2023) to be reflected in leadership practice itself.

Looking at the Irish context, the recent commitments and introduction of voluntary guidelines aimed at restricting, limiting, or even banning the use of mobile phones in schools is a response to the challenges and issues associated with digital technologies in the lives of young people (Department of Education 2023; Foley 2024). This democratically prompted initiative appears to be critically challenging the goals of the current agendas around the digital transformation of schools in Ireland and could be seen as a form of 'pushback' beginning to emerge globally (UNESCO 2023). In time, a similar concern around sustainability may emerge. The current emphasis on further digital technology integration and limited focus on issues of sustainability regarding same in teacher professional development will likely change, however, the extent to which it does is largely dependent on whether an environment exists that enables more critical questions to emerge, as such, sectoral-wide critical discourse is therefore required. Consistent with this, it is suggested that the abovementioned framework for categorising different school cultures with reference to democratic versus autocratic and critical versus uncritical aspects is one that can be used to evaluate and inform school cultures regarding the extent to which they take due account of sustainability issues with respect to digital technology use in education.

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References

Aldhaheri, A. 2023. "Do School Leaders in the Emirate of Abu Dhabi Predominantly Practice a Transformational, Transactional, or Laissez-Faire Style of Leadership?" *International Journal of Organizational Analysis* 31 (5): 1826–1840. https://doi.org/10.1108/IJOA-06-2021-2824

Amanchukwu, R. N., G. J. Stanley, and N. P. Ololube. 2015. "A Review of Leadership Theories, Principles and Styles and Their Relevance to Educational Management." *Management* 5 (1): 6–14.

Amel, E., C. Manning, B. Scott, and S. Koger. 2017. "Beyond the Roots of Human Inaction: Fostering Collective Effort Toward Ecosystem Conservation." *Science* 356 (6335): 275–279. https://doi.org/10.1126/science.aal1931

Anderson, R. E., and S. Dexter. 2005. "School Technology Leadership: An Empirical Investigation of Prevalence and Effect." *Educational Administration Quarterly* 41 (1): 49–82. https://doi.org/10.1177/0013161X04269517

Avidov-Ungar, O., and T. Shamir-Inbal. 2017. "ICT Coordinators' TPACK-Based Leadership Knowledge in Their Roles as Agents of Change." *Journal of Information Technology Education: Research* 16 (1): 169–188.

Avolio, B. J., S. Kahai, and G. E. Dodge. 2000. "E-Leadership: Implications for Theory, Research, and Practice." *The Leadership Quarterly* 11 (4): 615–668. https://doi.org/10.1016/S1048-9843(00)00062-X

Avolio, B. J., J. J. Sosik, S. S. Kahai, and B. Baker. 2014. "E-leadership: Re-Examining Transformations in Leadership Source and Transmission." *The Leadership Quarterly* 25 (1): 105–131. https://doi.org/10.1016/j.leaqua.2013.11.003

Balikçi, A., and A. Aypay. 2018. "An Investigation of School Principalship in the Context of Bureaucracy." *Electronic Turkish Studies* 13 (11): 1535–1560.

Ball, S. J. 2016. "Neoliberal Education? Confronting the Slouching Beast." *Policy Futures in Education* 14 (8): 1046–1059. https://doi.org/10.1177/1478210316664259

Bass, B. M., and R. M. Stogdill. 1990. *Bass & Stogdill's Handbook of Leadership: Theory, Research, and Managerial Applications*. New York: Simon and Schuster.

Bejaković, P., and Ž. Mrnjavac. 2020. "The Importance of Digital Literacy on the Labour Market." *Employee Relations: The International Journal* 42 (4): 921–932. https://doi.org/10.1108/ER-07-2019-0274

Bennett, N., C. Wise, P. A. Woods, and J. A. Harvey. 2003. "Distributed Leadership: A Review of Literature."

Berkhout, F., and J. Hertin. 2001. "Impacts of Information and Communication Technologies on Environmental Sustainability: Speculations and Evidence." Report to the OECD, Brighton, 21.

Brinia, V., and E. Papantoniou. 2016. "High School Principals as Leaders: Styles and Sources of Power." *International Journal of Educational Management* 30 (4): 520–535.

Caird, S., A. Lane, E. Swithenby, R. Roy, and S. Potter. 2015. "Design of Higher Education Teaching Models and Carbon Impacts." *International Journal of Sustainability in Higher Education* 16 (1): 96–111. https://doi.org/10.1108/IJSHE-06-2013-0065

Carstens, K. J., J. M. Mallon, M. Bataineh, and A. Al-Bataineh. 2021. "Effects of Technology on Student Learning." *Turkish Online Journal of Educational Technology* 20 (1): 105–113.

Chen, S. 2016. "The Materialist Circuits and the Quest for Environmental Justice in ICT's Global Expansion. TripleC: Communication, Capitalism & Critique." *Open Access Journal for a Global Sustainable Information Society* 14 (1): 121–131.

De Freitas Netto, S. V., M. F. F. Sobral, A. R. B. Ribeiro, and G. R. D. L. Soares. 2020. "Concepts and Forms of Greenwashing: A Systematic Review." *Environmental Sciences Europe* 32 (1): 1–12. https://doi.org/10.1186/s12302-020-0300-3

Department of Education. 2022. "Digital Strategy for Schools to 2027." Accessed October 8, 2023. https://www.gov.ie/en/.

Department of Education. 2023. "Minister Foley Launches New Plan to Encourage Parents to Avoid Buying Smartphones for Their Children in Primary Schools." Press Release, November 7. Accessed May 6, 2024. https://www.gov.ie/en/press-release/4509f-minister-

foley-launches-new-plan-to-encourage-parents-to-avoid-buying-smartphones-for-their-children-in-primary-schools/.
Devolder, A., R. Vanderlinde, J. Van Braak, and J. Tondeur. 2010. "Identifying Multiple Roles of ICT Coordinators." *Computers & Education* 55 (4): 1651–1655. https://doi.org/10.1016/j.compedu.2010.07.007
Doulos, L. T., A. Kontadakis, E. N. Madias, M. Sinou, and A. Tsangrassoulis. 2019. "Minimizing Energy Consumption for Artificial Lighting in a Typical Classroom of a Hellenic Public School Aiming for Near Zero Energy Building Using LED DC Luminaires and Daylight Harvesting Systems." *Energy and Buildings* 194:201–217. https://doi.org/10.1016/j.enbuild.2019.04.033
Emejulu, A., and C. McGregor. 2019. "Towards a Radical Digital Citizenship in Digital Education." *Critical Studies in Education* 60 (1): 131–147. https://doi.org/10.1080/17508487.2016.1234494
Emmanuel, A. Y., C. S. Jerry, and D. A. Dzigbodi. 2018. "Review of Environmental and Health Impacts of Mining in Ghana." *Journal of Health and Pollution* 8 (17): 43–52. https://doi.org/10.5696/2156-9614-8.17.43
Engler, S., P. Brunner, R. Loviat, T. Abou-Chadi, L. Leemann, A. Glaser, and D. Kübler. 2021. "Democracy in Times of the Pandemic: Explaining the Variation of COVID-19 Policies Across European Democracies." *West European Politics* 44 (5-6): 1077–1102. https://doi.org/10.1080/01402382.2021.1900669
Facer, K., and N. Selwyn. 2021. "Digital Technology and the Futures of Education – Towards 'Non-Stupid' Optimism." Paper Commissioned for the UNESCO Futures of Education Report.
Flanagan, L., and M. Jacobsen. 2003. "Technology Leadership for the Twenty-First Century Principal." *Journal of Educational Administration* 41 (2): 124–142.
Foley, N. 2024. "There Should Be No Access to Mobile Phones Until the School Day Is over." *The Journal*, August 22. Accessed January 3, 2025. https://www.thejournal.ie/readme/norma-foley-ban-on-phones-secondary-schools-6468608-Aug2024/.
Githiria, J. M., and M. Onifade. 2020. "The Impact of Mining on Sustainable Practices and the Traditional Culture of Developing Countries." *Journal of Environmental Studies and Sciences* 10 (4): 394–410. https://doi.org/10.1007/s13412-020-00613-w
Gronow, M. 2007. *ICT Leadership in School Education*. Sydney: Australian Catholic University.
Gura, M. 2022. *The Edtech Advocate's Guide to Leading Change in Schools*. Arlington, VA: International Society for Technology in Education.
Gurr, D. 2004. "ICT, Leadership in Education and E-Leadership." *Discourse: Studies in the Cultural Politics of Education* 25 (1): 113–124. https://doi.org/10.1080/0159630042000178518
Håkansson Lindqvist, M., and F. Pettersson. 2019. "Digitalization and School Leadership: On the Complexity of Leading for Digitalization in School." *The International Journal of Information and Learning Technology* 36 (3): 218–230. https://doi.org/10.1108/IJILT-11-2018-0126
Haleem, A., M. Javaid, M. A. Qadri, and R. Suman. 2022. "Understanding the Role of Digital Technologies in Education: A Review." *Sustainable Operations and Computers* 3:275–285. https://doi.org/10.1016/j.susoc.2022.05.004
Hargreaves, A., and R. Dawe. 1990. "Paths of Professional Development: Contrived Collegiality, Collaborative Culture, and the Case of Peer Coaching." *Teaching and Teacher Education* 6 (3): 227–241. https://doi.org/10.1016/0742-051X(90)90015-W
Harris, A. 2013. "Distributed Leadership: Friend or Foe?" *Educational Management Administration & Leadership* 41 (5): 545–554. https://doi.org/10.1177/1741143213497635
Hillman, V. 2022. "Edtech Procurement Matters."
Hirschman, K., and B. Wood. 2018. "21st Century Learners: Changing Conceptions of Knowledge, Learning and the Child." *The New Zealand Annual Review of Education* 23 (1): 20. https://doi.org/10.26686/nzaroe.v23.5308
Hubbart, J. A. 2023. "Organizational Change: Considering Truth and Buy-in." *Administrative Sciences* 13 (1): 3. https://doi.org/10.3390/admsci13010003
ITU. 2018. "ITU's Approach to Using ICTs to Achieve the United Nations Sustainable Development Goals." Accessed May 7, 2024. https://news.itu.int/icts-united-nations-sustainable-development-goals/.

Jogulu, U. D., and G. J. Wood. 2006. "The Role of Leadership Theory in Raising the Profile of Women in Management." *Equal Opportunities International* 25 (4): 236–250. https://doi.org/10.1108/02610150610706230

Karakose, T., H. Polat, and S. Papadakis. 2021. "Examining Teachers' Perspectives on School Principals' Digital Leadership Roles and Technology Capabilities During the COVID-19 Pandemic." *Sustainability* 13 (23): 13448. https://doi.org/10.3390/su132313448

Kargas, A. D., and D. Varoutas. 2015. "On the Relation Between Organizational Culture and Leadership: An Empirical Analysis." *Cogent Business & Management* 2 (1): 1055953. https://doi.org/10.1080/23311975.2015.1055953

Kates, A. W., H. Wu, and C. L. Coryn. 2018. "The Effects of Mobile Phone Use on Academic Performance: A Meta-Analysis." *Computers & Education* 127:107–112. https://doi.org/10.1016/j.compedu.2018.08.012

Khan, Z. A., A. Nawaz, and I. Khan. 2016. "Leadership Theories and Styles: A Literature Review." *Journal of Resources Development and Management* 16:1–7.

Knutsson, B. 2018. "Green Machines? Destabilizing Discourse in Technology Education for Sustainable Development." *Critical Education* 9 (3): 1–18.

Kuntsman, A. 2020. "From Digital Solutionism to Materialist Accountability: The Urgency of New Interventions." *Journal of Environmental Media* 1 (1): 15–19. https://doi.org/10.1386/jem_00002_1

Lai, K. W., and K. Pratt. 2004. "Information and Communication Technology (ICT) in Secondary Schools: The Role of the Computer Coordinator." *British Journal of Educational Technology* 35 (4): 461–475. https://doi.org/10.1111/j.0007-1013.2004.00404.x

Letuma, N. R. 2023. "School Leaders' Professional Development Needs for the Fourth Industrial Revolution." Doctoral diss., University of Johannesburg.

Lewin, K., and R. Lippitt. 1938. "An Experimental Approach to the Study of Autocracy and Democracy: A Preliminary Note." *Sociometry* 1 (3/4): 292–300. https://doi.org/10.2307/2785585

Lewin, K., R. Lippitt, and R. K. White. 1939. "Patterns of Aggressive Behavior in Experimentally Created 'Social Climates'." *The Journal of Social Psychology* 10 (2): 269–299. https://doi.org/10.1080/00224545.1939.9713366

Maloş, R. 2012. "Leadership Styles." Annals of Eftimie Murgu University Resita, Fascicle II, Economic Studies.

McDonagh, A., and O. McGarr. 2015. "Technology Leadership or Technology Somnambulism? Exploring the Discourse of Integration Amongst Information and Communication Technology Coordinators." *Irish Educational Studies* 34 (1): 55–68. https://doi.org/10.1080/03323315.2015.1010292

McGarr, O. 2023. "Investigating Student Teachers' Responses to Including Sustainable Development as Part of Their Professional Digital Competence Development." *Technology, Pedagogy and Education* 32 (5): 653–665.

McGarr, O., and B. K. Engen. 2022. "By-Passing Teachers in the Marketing of Digital Technologies: The Synergy of Educational Technology Discourse and New Public Management Practices." *Learning, Media and Technology* 47 (4): 440–455. https://doi.org/10.1080/17439884.2021.2010092

McGarr, O., and A. McDonagh. 2013. "Examining the Role of the ICT Coordinator in Irish Post-Primary Schools." *Technology, Pedagogy and Education* 22 (2): 267–282. https://doi.org/10.1080/1475939X.2012.755132

Moeller, K. 2020. "Accounting for the Corporate: An Analytic Framework for Understanding Corporations in Education." *Educational Researcher* 49 (4): 232–240. https://doi.org/10.3102/0013189X20909831

Morck, O., K. E. Thomsen, and B. E. Jorgensen. 2015. "School of the Future: Deep Energy Renovation of the Hedegaards School in Denmark." *Energy Procedia* 78:3324–3329. https://doi.org/10.1016/j.egypro.2015.11.745

Moreira, M. A., V. M. H. Rivero, and J. J. Sosa Alonso. 2019. "Leadership and School Integration of ICT. Teachers Perceptions in Spain." *Education and Information Technologies* 24 (1): 549–565. https://doi.org/10.1007/s10639-018-9789-0

Mukherjee, T. 2023. "Youth Transition in the Digital Age: Balancing Digital Competency Demands and Preparing for the Future." In *Handbook of Youth Development: Policies and Perspectives from India and Beyond*, edited by S. Deb and S. Deb, 359–372. Singapore: Springer Nature Singapore.

O'Donovan, M. 2015. "The Challenges of Distributing Leadership in Irish Post-Primary Schools." *International Electronic Journal of Elementary Education* 8 (2): 243–266.

Odumeru, J. A., and I. G. Ogbonna. 2013. "Transformational vs. Transactional Leadership Theories: Evidence in Literature." *International Review of Management and Business Research* 2 (2): 355.

Ogbonna, E., and L. C. Harris. 2000. "Leadership Style, Organizational Culture and Performance: Empirical Evidence from UK Companies." *international Journal of Human Resource Management* 11 (4): 766–788. https://doi.org/10.1080/09585190050075114

Omolayo, B. 2007. "Effect of Leadership Style on Job-Related Tension and Psychological Sense of Community in Work Organizations: A Case Study of Four Organizations in Lagos State, Nigeria." *Bangladesh e-Journal of Sociology* 4 (2): 30–37.

O'Sullivan, J., and G. Mac Ruairc. 2023. "The Promotion of Distributed Leadership in Education at National Level: Discursive Change to Maintain the Old Order – Lessons from Ireland." *Educational Management Administration & Leadership*, 17411432231206617. https://doi.org/10.1177/17411432231206617.

Otto, D., and S. Becker. 2019. "E-Learning and Sustainable Development." *Encyclopedia of Sustainability in Higher Education*: 475–482. https://doi.org/10.1007/978-3-030-11352-0_211

Parveen, K., P. Quang Bao Tran, T. Kumar, and A. H. Shah. 2022. "Impact of Principal Leadership Styles on Teacher Job Performance: An Empirical Investigation." *Frontiers in Education* 7: 814159. https://doi.org/10.3389/feduc.2022.814159

Peker, S., Y. İnandı, and F. Gılıç. 2018. "The Relationship Between Leadership Styles (Autocratic and Democratic) of School Administrators and the Mobbing Teachers Suffer." *European Journal of Contemporary Education* 7 (1): 150–164.

Phillips, M. 2015. "Digital Technology Integration." In *Teaching and Digital Technologies: Big Issues and Critical Questions*, edited by M. Henderson and G. Romeo, 318–331. Port Melbourne, Australia: Cambridge University Press.

Pillai, R., and J. R. Meindl. 1998. "Context and Charisma: A 'Meso' Level Examination of the Relationship of Organic Structure, Collectivism, and Crisis to Charismatic Leadership." *Journal of Management* 24 (5): 643–671.

Pimonenko, T., Y. Bilan, J. Horák, L. Starchenko, and W. Gajda. 2020. "Green Brand of Companies and Greenwashing Under Sustainable Development Goals." *Sustainability* 12 (4): 1679. https://doi.org/10.3390/su12041679

Riep, C. B. 2023. "Fixing Contradictions of Education Commercialisation: Pearson Plc and the Construction of Its Efficacy Brand." In *Neoliberalism and Education*, edited by B. Jones and S. Ball, 99–117. London: Routledge.

Rodríguez-Miranda, F. P., F. J. Pozuelos-Estrada, and J. C. León-Jariego. 2014. "The Role of ICT Coordinator. Priority and Time Dedicated to Professional Functions." *Computers & Education* 72:262–270. https://doi.org/10.1016/j.compedu.2013.11.009

Rospi, G., N. Cardinale, F. Intini, and E. Negro. 2017. "Analysis of the Energy Performance Strategies of School Buildings Site in the Mediterranean Climate: A Case Study the Schools of Matera City." *Energy and Buildings* 152:52–60. https://doi.org/10.1016/j.enbuild.2017.07.018

Saleem, A., S. Aslam, H. B. Yin, and C. Rao. 2020. "Principal Leadership Styles and Teacher Job Performance: Viewpoint of Middle Management." *Sustainability* 12 (8): 3390. https://doi.org/10.3390/su12083390

Schein, E. H. 2010. *Organizational Culture and Leadership*. 4th ed. San Francisco, CA: Jossey-Bass.

Selwyn, N. 2021. "Ed-Tech Within Limits: Anticipating Educational Technology in Times of Environmental Crisis." *E-Learning and Digital Media* 18 (5): 496–510.

Selwyn, N.. 2023. "Lessons to Be Learnt? Education, Techno-Solutionism, and Sustainable Development." In *Technology and Sustainable Development*, edited by H. Skaug Sætra, 71–83. New York: Routledge.

Selwyn, N., and J. Aagaard. 2021. "Banning Mobile Phones from Classrooms—An Opportunity to Advance Understandings of Technology Addiction, Distraction and Cyberbullying." *British Journal of Educational Technology* 52 (1): 8–19. https://doi.org/10.1111/bjet.12943

Serpa, S. 2016. "An Overview of the Concept of Organisational Culture." *International Business Management* 10 (1): 51–61.

Sheninger, E. 2019. *Digital Leadership: Changing Paradigms for Changing Times*. London: Corwin Press.

Shohamy, E. 2010. "Cases of Language Policy Resistance in Israel's Centralized Educational System." In *Negotiating Language Policies in Schools*, edited by K. Menken and O. Garcia, 196–211. New York: Routledge.

Singh, T. K. R., and K. Muniandi. 2012. "Factors Affecting School Administrators' Choices in Adopting ICT Tools in Schools – The Case of Malaysian Schools." *International Education Studies* 5 (4): 21–30.

Skues, J. L., and E. G. Cunningham. 2013. "The Role of E-Learning Coaches in Australian Secondary Schools." *Journal of Computer Assisted Learning* 29 (2): 179–187. https://doi.org/10.1111/j.1365-2729.2012.00488.x

Tawfik, A. A., T. D. Reeves, and A. Stich. 2016. "Intended and Unintended Consequences of Educational Technology on Social Inequality." *TechTrends* 60 (6): 598–605. https://doi.org/10.1007/s11528-016-0109-5

Thomson, K., L. De Chernatony, L. Arganbright, and S. Khan. 1999. "The Buy-in Benchmark: How Staff Understanding and Commitment Impact Brand and Business Performance." *Journal of Marketing Management* 15 (8): 819–835. https://doi.org/10.1362/026725799784772684

Tigre, F. B., C. Curado, and P. L. Henriques. 2023. "Digital Leadership: A Bibliometric Analysis." *Journal of Leadership & Organizational Studies* 30 (1): 40–70. https://doi.org/10.1177/15480518221123132

Tintoré, M., R. S. Cunha, I. Cabral, and J. J. M. Alves. 2022. "A Scoping Review of Problems and Challenges Faced by School Leaders (2003–2019)." *Educational Management Administration & Leadership* 50 (4): 536–573. https://doi.org/10.1177/1741143220942527

Tondeur, J., M. Cooper, and C. P. Newhouse. 2010. "From ICT Coordination to ICT Integration: A Longitudinal Case Study." *Journal of Computer Assisted Learning* 26 (4): 296–306. https://doi.org/10.1111/j.1365-2729.2010.00351.x

Trinidad, J. E. 2019. "Teacher Response Process to Bureaucratic Control: Individual and Group Dynamics Influencing Teacher Responses." *Leadership and Policy in Schools* 18 (4): 533–543. https://doi.org/10.1080/15700763.2018.1475573

UNESCO. 2023. "An Ed-Tech Tragedy? Educational Technologies and School Closures in the Time of COVID-19." Accessed October 9, 2023. https://www.unesco.org/en.

Vanbuel, M. 2022. "How Stakeholders See the Implementation of Language Education Policy: A Q-Study." *Current Issues in Language Planning* 23 (1): 57–76. https://doi.org/10.1080/14664208.2021.1928427

Vann, B. A., A. N. Coleman, and J. A. Simpson. 2014. "Development of the Vannsimpco Leadership Survey: A Delineation of Hybrid Leadership Styles." *Swiss Business School Journal of Applied Business Research* 3 (1): 28–38.

Versteijlen, M., F. P. Salgado, M. J. Groesbeek, and A. Counotte. 2017. "Pros and Cons of Online Education as a Measure to Reduce Carbon Emissions in Higher Education in the Netherlands." *Current Opinion in Environmental Sustainability* 28:80–89. https://doi.org/10.1016/j.cosust.2017.09.004

William Misiaszek, G. 2021. "Ecopedagogical Literacy of a Pandemic: Teaching to Critically Read the Politics of COVID-19 with Environmental Issues." *The Journal of Environmental Education* 52 (5): 358–369. https://doi.org/10.1080/00958964.2021.1981206

Williamson, B. 2022. "Big EdTech." *Learning, Media and Technology* 47 (2): 157–162. https://doi.org/10.1080/17439884.2022.2063888

Williamson, B., and A. Hogan. 2020. "Commercialisation and Privatisation in/of Education in the Context of Covid-19."

Woo, D. 2023. "The Leadership of ICT Coordinators: A Distributed Perspective." *Educational Management Administration & Leadership* 51 (2): 308–323. https://doi.org/10.1177/1741143220979714

Woo, D. J., and N. Law. 2020. "Information and Communication Technology Coordinators: Their Intended Roles and Architectures for Learning." *Journal of Computer Assisted Learning* 36 (4): 423–438. https://doi.org/10.1111/jcal.12407

Woods, P. 2021. *Democratic Leadership*. Oxford: Oxford Encyclopedia of Educational Administration.

Woods, P. A., and P. Gronn. 2009. "Nurturing Democracy: The Contribution of Distributed Leadership to a Democratic Organizational Landscape." *Educational Management Administration & Leadership* 37 (4): 430–451. https://doi.org/10.1177/1741143209334597

Wynn, S. C. 2019. "What Research Says About Leadership Styles and Their Implications for School Climate and Teacher Job Satisfaction."

Yee, D. L. 2000. "Images of School Principals' Information and Communications Technology Leadership." *Journal of Information Technology for Teacher Education* 9 (3): 287–302. https://doi.org/10.1080/14759390000200097

Yin, Z., X. Jiang, S. Lin, and J. Liu. 2022. "The Impact of Online Education on Carbon Emissions in the Context of the COVID-19 Pandemic – Taking Chinese Universities as Examples." *Applied Energy* 314:118875. https://doi.org/10.1016/j.apenergy.2022.118875

Yusof, M. R., M. F. M. Yaakob, and M. Y. Ibrahim. 2019. "Digital Leadership among School Leaders in Malaysia." *International Journal of Innovative Technology and Exploring Engineering* 8 (9): 1481–1485.https://doi.org/10.35940/ijitee.I8221.078919.

Zaccaro, S. J., and P. Bader. 2003. "E-leadership and the Challenges of Leading E-Teams: Minimizing the Bad and Maximizing the Good." *Organizational Dynamics* 31 (4): 377–387.

Zhang, C., I. Khan, V. Dagar, A. Saeed, and M. W. Zafar. 2022. "Environmental Impact of Information and Communication Technology: Unveiling the Role of Education in Developing Countries." *Technological Forecasting and Social Change* 178:121570. https://doi.org/10.1016/j.techfore.2022.121570