INTEGRATION OF INSTRUCTIONAL DESIGN AND TECHNOLOGY Volume 3

EDITED BY ROB POWER, EdD

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Integration of Instructional Design and Technology: Volume 3

INTEGRATION OF INSTRUCTIONAL DESIGN AND TECHNOLOGY: VOLUME 3

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INTRODUCTION

Welcome to the *Integration of Instructional Design and Technology: Volume 3*! Our focus in this eBook is on providing practical, evidence-based resources and strategies for educators who want to leverage technology to enhance the instructional design of their lessons and instructional units.

This is the third volume of chapters contributed by participants in EDUC5103: Integration of Instructional Design and Technology, a graduate-level course at Cape Breton University. The idea for the first volume came about in March 2020, in response to the COVID-19 pandemic. Like the first and second volumes, this open-access eBook includes chapters with a focus on providing evidence-informed practical advice for educators on how to use instructional design principles to effectively leverage technology to create engaging teaching and learning environments. Contributors opted to submit one of their major course assignments — a literature review of a current or emerging instructional design and technology issue — in the hopes that their work will provide benefits to their colleagues in the teaching profession. Each chapter includes a review of the current literature on their chosen topic, along with a discussion of how those theoretical and instructional design concepts could be practically applied by their colleagues, complete with recommendations for technology-based tools that they could use.

Using eBooks like this can be an excellent tool as an alternative form of assessment — especially in higher

education contexts. It gives course participants an opportunity to write for a larger audience, to create something meaningful that shares their growing expertise with the world at large, and to gain a publication credit for the CVs. In this instance, the authors of these chapters are giving something to their teaching colleagues that directly relates to the overall focus of EDUC5103 — and the immediate needs of educators and students in their own communities.

We hope you find the resources and strategies presented in this compilation useful!

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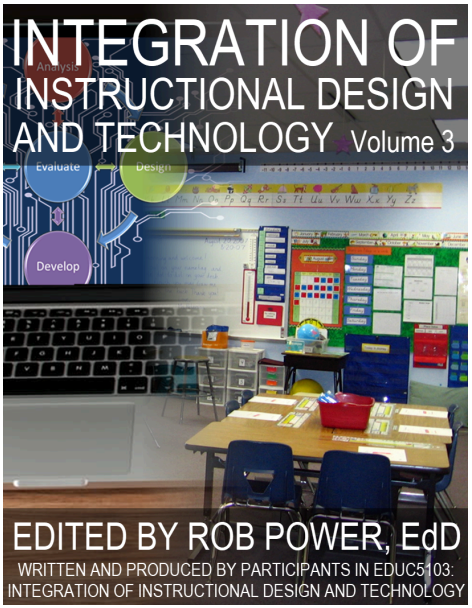

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THE EVOLUTION OF EDUCATIONAL TECHNOLOGY IN INCLUSIVE LEARNING SPACES FROM PRE TO POST PANDEMIC

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Abstract

Educational technology has had a significant impact on both learning and teaching since its existence. This is particularly relevant for students across grade level with learning, cognitive and physical disabilities. The adoption of assistive technology tools to aid students has, according to literature, had a profound impact on the quality of life for students with disabilities and their families. However as designers continue to aid the implementation of accessibility tools and platforms, there has been notable obstacles for students with disabilities and their families. This has included the lack of resources, staff training and concrete digital equity policies (Botelho, 2021, p. 88-93). Assistive technology (AT) has undergone a transformation since its conception in both communities and schools. As designers become increasingly cognizant of the needs of students with disabilities, assistive technology continues to evolve. The impact of COVID-19 and the resultant transition to elearning was particularly challenging, literature has shown, for this population of students and their families (Barrett, 2021, p.114). Digital equity, parental involvement and socio-emotional issues influenced learning experiences for many students worldwide. As stakeholders examine the lessons learned post pandemic, educational technology for all learners continues to evolve within schools. Literature suggests that a shift to the Universal Design for Learning (UDL) model has promise when addressing digital equity issues specifically for students with special needs (Bialka, 2022, p. 1). Future research focusing on local demographics (provincial and national) including concrete accessibility plans for

communities and schools, learning theories specifically on students with special needs and technology integration, and next steps for instructional designers when solving the lack of digital socio-emotional connection would be beneficial in order to facilitate inclusivity in public schools.

Keywords

Educational technology, special needs, disabilities, Assistive Technology (AT), elearning, instructional designers, pandemic, equity, inclusion, Universal Design for Learning (UDL), COVID-19

Introduction

The presence of educational technology, including assistive technology, in primary to grade twelve schools has escalated worldwide. In Canadian schools, even at the lower elementary level, it is common place for students to engage with Chrome books, iPads, spheros and raspberry pis throughout the regular school day (ICTC, 2020, p. 10-16). Innovative digital devices, tools and platforms can facilitate student engagement across grade level and curriculum. In order to do so, teacher and staff training, communication between educators and designers and access to funding must be given priority. As schools continue to transform due to influential world events, assistive technology (AT) also evolves within inclusive learning settings. Assistive technology (AT) are devices, platforms and tools specifically designed and implemented to "increase, maintain or improve functional capabilities of individuals with disabilities"

(Ohashi & Zallio, 2022, p. 85). Assistive technology (AT) has undergone a significant evolution over the last three decades. As schools have shifted to inclusive learning models, assistive technology (AT) has enabled learners to particulate more fully using accessibility features and platforms that support individualized instruction (Bowser & DeCoste, 2020, p.95). Even with the growing infusion of technology for students with special needs into learning environments, the impact of elearning and resultant challenges for students with disabilities have been documented repeatedly in literature. According to the reports authored by The Information and Communication Technology Council (2021), "Early in the switch to online learning research identified that students with disabilities were most vulnerable to feeling disconnected from their peers and insufficiently supported" (p.29). The demands of remote learning due to COVID-19 has had notable ramifications on the role of technology and students with learning, cognitive and physical disabilities. Synthesizing the literature pre, amid and post pandemic has unveiled the constant technological evolution within inclusive school models in an effort to move towards greater digital equity. In order to maintain this digital evolution to meet the needs of all learners, stakeholders must address the challenges documented in literature including the growing role of instructional designers.

Literature Review

Educational Technology Pre Pandemic

Technology tools and equipment have been designed and

modified for hundreds of years to assist individuals with disabilities. Literature has documented evidence centuries back to the development of assistive devices including eyeglasses and wheelchairs in both Italy and China (Ohashi & Zallio, 2022, p.86). Since this time, the evolution of technology has continued within communities, schools, and work spaces. The infusion of technological tools, devices and software in the United States has been heavily influenced by the 1988 Tech Act, the 1997 Individuals with Disabilities Act and the 2019 No Child Left Behind initiative (Gatchalian, 2019, p.3). The demand for assistive devices within schools to support children with disabilities was felt beyond the United States and across the globe. The 1989 Convention on the Rights of the Child and the 2007 Convention on the Rights of Persons with Disabilities, for example, advocated internationally the need for policies to mandate digital inclusion especially for individuals with special needs. Assistive technology (AT) has been specifically designed for those with disabilities and has been deemed essential for school and community inclusion at both international human rights conventions (Botelho, 2021, p. 87).

As the awareness of the potential benefits of technology in the classroom has increased, so has the presence of assistive devices and software. In an effort to accommodate all learners, designers at this time began to work with both education and technology professionals to design, develop, implement and evaluate accessibility tools. These included closed captioning for those that have hearing considerations and speech recognition software for those that have physical limitations (Ohashi & Zallio, 2022, p. 86-87). Magnification, text-to-speech,

word prediction and speech-to-text, research literature has proven, has had a positive impact on learning especially when made available in classrooms (Bowser & DeCoste, 2020, p. 96).

Although literature has revealed that pre pandemic educational technology was evolving in attempts to meet the needs of students, notable obstacles have been documented. According to Botelho (2021), "Assistive technology is instrumental for the development is instrumental for the developmental and participation of children with disabilities by enabling their communication, mobility, and self-care" (p. 87). The same literature reveals the lack of general awareness of technology aids, lack of services and limited training of school staff and the absence of affordable assistive technology devices.

Upon evaluation of relevant literature, gaps in research and documentation are apparent. First, there is a noticeable lack of literature focusing on local (Nova Scotia) and national (Canada) demographics. Without local and national perspective, a technology needs assessment or analysis within communities is nearly impossible. Further, without applying a concrete method to gather information on needs, such as Dick and Carey's Systematic Model, crucial information cannot be gathered, analyzed and used to create an action plan. Examining available literature unveiled a second area with a significant shortfall. Current literature does not appear to investigate the link between technology, learning theory and specifically students with special needs. Without extensive research in this domain, it is unlikely that solutions to promote digital inclusion can be properly made. And, finally, although literature

appeared to consistently report the lack of staff training, concrete solutions to this deficit are also seemingly absent. Multiple publications present the need to make available professional learning opportunities for educators specifically in the area of assistive devices and platforms. Literature on this topic consistently revealed that teachers felt ill equipped to implement technology aids to assist students with special needs but further research and recommendations are needed. Future research, for example, on how technology specialists and designers could utilize Vygotsky's More Knowledgeable Other and Zone of Proximal Development theories to address this competency gap would be beneficial to both teachers and students. Vygotsky's theory explains that individuals learn when instructed, guided and have collaborated with others who have superior knowledge and skills in a particular area (Abtahi, 2007, p.35). Vygotsky's approach to learning may bridge the competencies between technology specialists/designers and educators leading to more inclusive learning environments. The synthesis of literature pre pandemic demonstrates the shortage of research on learning theory and students with special needs, the lack of communication between educators and instructional designers and the absence of professional development opportunities for teachers and staff.

Educational Technology Amid Pandemic

COVID-19 had an unprecedented impact across the world on communities, families and individuals. This disruption continues to have long-lasting influences on business, recreation, healthcare and, of course, education.

The aftermath in educational settings, literature indicates, has included the evolving role of educational technology in both online and blended learning settings (Rice, 2022, p. 311-312). Students with disabilities, according to The Information and Community Technology Council (ICTC), have encountered more severe obstacles related to elearning as compared to classmates deemed less at risk. Ivus et al (2021), state "Early in the switch to online learning, research identified that students with disabilities were most vulnerable to feeling disconnected from their peers and insufficiently supported" (p.29). Although educational technology continued to have a key role in learning throughout remote learning, students with special needs and their families experienced significant challenges with its integration. Supplementary parent/family responsibilities, lack of teacher skill/training on inclusive digital tools and the challenge of creating online communities that fosters engagement all impacted students with special needs and have been documented in recent literature.

Tools and platforms such as Zoom, Brightspace and Read-and-Write Extension that designers and technology specialists developed were increasingly utilized in virtual learning environments internationally. However, literature has indicated that the burden to support these platforms were placed on parents and families (Ivus et al, 2021, p.30). At a distance, educators were unable to offer the direct assistance needed to navigate many technological sites and programs. Therefore, according to the 2020 OECD report, "Parents not only struggled with the learning platform and tools, but they also were anxious about not having access to

good measures of their child's learning" (p. 93). Similarly, literature indicates that educators across the globe were struggling with the sudden shift to virtual teaching and learning. In multiple self-reporting studies, teachers indicate they wanted to provide appropriate instruction but were not familiar with tools and platforms to support students with disabilities. Navigating innovative technology specifically for students with learning, cognitive and physical challenges had a notable impact on the "learning loss" for many students (Rice, 2022, p. 312). And, finally, using online platforms such as live video conferencing, Zoom and Google Meets did not lead to collaborative learning experiences for many students with challenges. According to Barrett (2021), teachers are particularly skilled at creating community with in-person instruction but lacked these skills in virtual classrooms (p. 103). To create a community of learning a sense of belonging, trust, shared interest and purposeful interactions are needed. For some students this connection was feasible but it was nearly impossible for many students with special needs. Barrett (2021) summarizes the social inequity many students felt by stating "No amount of success on the part of mainstream, more well-resourced students justifies allowing such inequity to continue. If community is what is required to make online learning successful for all, the infrastructure and resources need to be provided to make that community available for all" (p. 114).

When synthesizing and evaluating the literature focusing on the evolution of educational technology amid the pandemic, a definite theme emerged. Even with the aid of technology, a lack of connection among educators, parents, families and students with special

needs have been documented. Teachers felt isolated from colleagues and felt ill-equipped to make decisions regarding digital tools and platforms. Parents and families felt overwhelmed with the demands of learning and supporting their child with unfamiliar online platforms. And students, unfortunately, lacked the authentic connection to peers that could not be replicated using video conferencing. Both cooperative and collaborative learning theorists agree that solving problems in a group as a common goal facilitates both academic and social well-being (Education Corner, 2012). Unfortunately, this relationship was a challenge to recreate virtually for educators, parents, families and students. Upon further evaluation of literature, absent from the research is how instructional designers can improve online experiences keeping this socio-emotional consideration in mind. There is limited evidence in literature containing examples of how elearning can be redesigned to be more personalized and authentic for users beyond current video conferencing platforms. As classrooms become more inclusive and infused with technology and online learning resources, it would be beneficial for designers to focus their attention in this domain.

Post Pandemic Applications

The evolution of educational technology in inclusive learning spaces from pre to post pandemic have significant applications in today's schools. Literature published by Dickerson et al (2022) highlight the advances in inclusive platforms such at Kahoo! Mentimer, Padlet, Jamboard and Poll Everywhere in the

post pandemic era (p. 1). Further, they suggest that assistive technology (AT) such as screen readers (VoiceOver, TalkBack, NVDA and JAWS) may be beneficial to students beyond those requiring learning accommodations (p. 3). The theory that assistive technology (AT) could and should be accessible to all learners opens a door for instructional designers. Research literature documented by Hasselbring et al (2005) suggests that the interaction between Assistive Technology (AT) and Universal Design for Learning (UDL) frameworks benefits students with and without challenges in school settings (p. 510). Hasselbring et al outline in their research the difference between the two seemingly distinct theories. Assistive technology (AT) models focus on the individual's needs and seek to solve challenges by utilizing technology. A common problem could be accommodating a student's lack of reading skills. Whereas, the Universal for Design Learning (UDL) framework addresses the same need in a broader perspective. A student's inability to read may be seen as an environmental issue whereby printed material is the barrier. Hasselbring et al suggest that assistive devices and tools such as speak aloud software, video conferencing, closed captions and adapted keyboards are educational supports for many learners based on a specific need at a specific time. Hasselbring et al, however, warn that a purely Universal for Design Learning (UDL) perspective may not address the more unique needs of those students with special needs. Built-in accessibility features for universal use need to be critiqued to ensure students with considerations are supported as needed. Therefore, the interaction between Assistive Technology (AT) and Universal for Design

Learning (UDL) is crucial to create inclusive learning environments (p. 511).

As schools worldwide navigate inclusive learning practices post pandemic, literature reveals some contradictory views on the role of educational technology in schools. The supplementary parent/family responsibilities, lack of teacher skill/training on inclusive digital tools and the challenge of creating online communities that fosters engagement all impacted students with special needs. According to the research and literature by Joshi & Yassen (2021), remote learning provided many novel opportunities to students including the development of digital literacy skills, increased engagement, and equal learning opportunities. Additionally, teachers were able to adopt new technology competencies that can be used in the post pandemic classroom (p.183). Conversely, literature has also suggested that the pandemic has not lead to a positive evolution of technology in the classroom. Classrooms, some literature suggests, across the glove have reverted to pre pandemic states without the addition of innovative technological tools. Vegas (2022) explains this theory by stating, "What is perhaps the most troubling is that as countries are reopening schools, they are going back to how education was delivered before the pandemic, instead of seizing the opportunity of the disruption to transform education" (p. 1). Although some literature exists on post pandemic plans in both the business and healthcare worlds, limited exists in terms of education. The consistent application of the ADDIE framework used by instructional designers consisting of analysis, design, develop, implement and evaluate would undoubtedly be both relevant and beneficial in the

education sector. As educational experiences become increasingly digital, the evaluation phase of this process is crucial. Further, the partnership and communication between educators and instructional designers is ideal in order to appropriately reflect on technology integration and plan next steps.

Conclusions

COVID-19 has had an unprecedented impact across the world on communities, families and individuals. This disruption continues to have long-lasting influences on business, healthcare and, of course, education. The demands of remote learning due to COVID-19 has had notable ramifications on the role of technology and students with learning, cognitive and physical disabilities. In Canada, as many as one million children have diagnosed disabilities that impacts learning. This may include Attention Deficit Hyperactivity Disorder (ADHD), intellectual disability, learning disabilities (dyslexia, dyscalculia), brain injury, etc. (Beauchamp et al, 2021, p. 1696). The evolution of assistive technology (AT) from pre to post pandemic has, according to literature, impacted inclusive learning opportunities for many students worldwide. Literature has documented that the supplementary parent/family responsibilities, lack of teacher skill/training on inclusive digital tools and the challenge of creating online communities that fosters engagement have been barriers to digital equity for many students with special needs. Literature focusing on post pandemic technology advancements vary but an acknowledgement of the value of inclusive digital access appears consistent. In Nova Scotia, a Digital Inclusion

Policy was developed in 2017 to address the availability of assistive technology for individuals with disabilities in communities (p.1). However, this does not appear to directly address the challenges schools face with the lack of digital tools and training. Further, advocates for inclusion suggest a national strategy to address the need for assistive technology. Wang and Wilson (2022) state, "Beyond economic benefits for individuals, society benefits from individuals' use of AT through improved health, well-being, and quality of life outcomes, and enhanced productivity, decreased direct/indirect health and social services costs, and a strengthened labour force" (p. 356). Again, there appears to be a lack of research literature that details the future plans and frameworks in provincial and national public schools to meet the needs of students with special needs. As schools continue to evolve due to both local and global events, inevitably educational technology will also continue to transform. In order to include all students, fusing Assistive Technology (AT) and Universal Design for Learning (UDL) frameworks could improve educational and digital equity. Pilbeam (2020) suggests the role of instructional designers are paramount in the ever-changing digital landscape (p.1). Examining equality vs. equity practices, reviewing course materials, knowing/building community and investing in resources are all critical in the post pandemic world (p. 1-3). When stakeholders take the essential steps of creating digital policies and programs with proper funding and training, students of all abilities will meet their potential in post pandemic classrooms. Perhaps it will take the valuable work of modern instructional designers to lead the

charge in the ever changing landscape of assistive technology within inclusive school settings.

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DESIGNING EFFECTIVE SECOND LANGUAGE INSTRUCTION: DIGITAL TECHNOLOGIES TO SUPPORT LEARNING

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Abstract

Digital technologies can be used as effective pedagogical tools in second language instructional design to support meaningful instruction and augment student learning. Digital technologies can be used to promote collaborative, authentic, engaging, and creative second language learning environments. The integration of digital technologies into second language teaching and learning can help support a variety of instructional purposes while providing students with authentic learning environments that are supportive of their learning needs. Second language learning, the principles of the neurolinguistic approach, and the affordances of digital technologies align with prominent learning theories such as Vygotsky's social development theory and Lave and Wenger's situated learning theory. This literature review will examine digital technologies such as digital games, augmented reality, and multimedia tools for their affordances to second language learning. Digital educational games are pedagogical tools that can be used to supplement and strengthen the meaning of new second language structures. Augmented reality second language learning experiences can create engaging interactions with target language words and sentence structures to support students' meaning making of the target language. Digital multimedia integration into learning design is often used and recommended for minimizing barriers to learning by providing multiple means of engaging learners and representing instructional content. The results of this literature review will provide second language instructional designers

with valuable knowledge to consider in their own instructional design practices.

Keywords

instructional design, second language education, authentic learning, multimedia, technology, digital games, augmented reality, interaction, effective instruction, multimodality, engagement, instructional strategies, learning theories

Introduction

Effective technology-enhanced instructional design and the neurolinguistic approach (NLA) are important pillars of modern-day second language education. The NLA is a pedagogical method used in second language education developed by Netten and Germain (2012). The NLA uses interactive teaching strategies to motivate students by providing authentic scenarios for communicating. Netten and Germain (2012) stated that the contexts of learning should be similar to authentic contexts where the learned material will be used. The NLA and second language instruction is well-aligned with situated learning theory. Lave and Wenger (1991) declared that a central principle of situated learning theory is that knowledge needs to be presented in an authentic context. The creation of learning environments that are engaging and rooted in authentic learning contexts enable students to apply second language skills in real world scenarios. Developing second language skills based on authentic learning scenarios and drawing on students' individual experiences help students connect second language

communication to the real world around them. The NLA also aligns with Vygotsky's social development theory. According to Vygotsky (1987), the sense of a word or new language structure evolves with the thinking/language system of which it is a part through activity in the social situation of development. Prominent levels of collaboration through student-teacher and student-student social interactions are necessary in second language development. Netten and Germain (2012) posited that a less formal and more social classroom atmosphere must be created to encourage target language use; high interaction between the students and the teacher and between the students themselves must be fostered. A variety of digital technologies can be effective at increasing student-student and student-teacher interaction in second language classrooms, thus increasing usage of the target language. Following the principles of the NLA, second language educators explicitly model new language structures using a variety of verbal and technology-enhanced visual methods. Educators then model the new language structures between themselves and their students. As students use new language structures by verbally interacting with their teacher and each other, they internalize the new knowledge and construct meaning of the new language structure. Digital technologies can be valuable tools to help students reinforce the meaning of newly learned second language structures. The learning of a second language must be based upon the use of interesting cognitive tasks that present an intellectual challenge to students (Netten & Germain, 2012), and digital technologies can help provide such tasks. Instructional designers in second language education should keep

emerging digital technologies in mind when designing effective learning experiences. Digital technologies should be used to support collaboration in classrooms, promote active learning, and strengthen new concepts. Providing meaningful integration of modern technologies through the careful choice of quality tools aligning to best instructional practices can alter how learners and instructors engage with concepts and with each other to achieve powerful learning (Holland & Holland, 2014). To create effective second language instruction, it is important for instructional designers to select well-evaluated digital technologies that reinforce new knowledge, support learning outcomes, and increase interaction with the target language. This review of the literature will examine three types of digital technologies for potential integration into meaningful and effective second language instructional design.

Literature Review

Digital Games

In second language education, digital game-based learning is a tool with which student learning is supported with the use of digital educational games. According to Bawa (2019), digital games are technology-based systems within which players engage in game-generated competition that are guided by rules and have quantifiable outcomes. Such games seek to promote learning in an entertaining way by fusing educational content with gameplay and stories while giving learners the opportunity to strategize with higher-order thinking (Bawa, 2019). In second language education, digital

games can be a valuable pedagogical tool. According to researchers van der Westhuizen and Hannaway (2021), a large segment of children today is immersed in a digital world and digital games have the potential to strongly enhance both second language education and second language instruction. Student engagement refers to the degree of attention, curiosity, interest, optimism, and passion that students show when they are learning or being taught, which extends to the level of motivation they have to learn and progress in their education (The Glossary of Education Reform, 2016). van der Westhuizen and Hannaway (2021) described teachers' beliefs that children would feel detached and disconnected without the use of digital games in their second language learning because using digital play as a pedagogical tool is a reality of the modern world. Bawa (2019) suggested that digital game-based learning is becoming increasingly possible due to the rise in variety and availability of digital educational games.

The integration of digital game-based learning into second language education is becoming increasingly popular in today's ever-expanding digital society. There is a wide and continually growing amount of research that supports the integration of digital game-based learning to support second language acquisition. Sabirli and Coklar (2020) noted that digital educational games provide valuable reinforcement of second language learning done in the classroom. Reinders and Wattana (2015) posited that digital games are motivating to students and lower affective barriers in learning, such as anxiety and self-confidence, which in turn promotes and encourages second language interaction. In addition to promoting second language vocabulary acquisition,

digital games are useful for increasing second language reading comprehension and game players experience higher levels of motivation, engagement, and are more often involved in active participation during class (Di Zou & Haoran, 2021).

Chen and Hsu (2020) observed that digital games offer high intrinsic motivation for learners, encourage positive learning attitudes, have rich textual inputs that require learners to engage in meaningful language use to complete in-game activities and tasks, and the interactive and immersive experiences that games supply can reduce learning anxiety, which increases interaction in the target language. Digital games can be an effective pedagogical tool to supplement instruction and increase student engagement. However, digital games should not be considered a stand-alone instructional practice in second language education. Becker and Sturm (2017) stressed upon the important supporting role that digital games can play in second language learning, saying that interactive audiovisual materials on their own cannot be effective unless they are incorporated into well-structured, pedagogically sound activities.

Augmented Reality

Augmented reality (AR) is defined as a technology where computer-generated objects are augmented into the real-world environment to produce a new layer to the environment that users can interact with (Liu et al., 2007). In second language education, AR learning experiences can provide meaningful and engaging interactions with target language words and sentence structures to support students' meaning making of the

target language. AR, through applications and games, affords real-world annotation to display text and images on real-world objects and affords contextual visualization to display virtual content in a specific context (Santos et al., 2014). Santos et al. (2014) posited that aside from possibly improving student performance, AR learning experiences can be used to increase the motivation of students in educational settings and AR design strategies such as enabling exploration, promoting collaboration, and ensuring immersion can create compelling learning experiences. Punar Özçelik et al. (2022) expressed that through the medium of AR, second language learners have a chance to engage in meaningful learning tasks and learners can practice their second language skills within these learning tasks to learn more effectively. AR-based language materials can support second language learners to acquire, internalize, and construct meaning in the target language. AR activities can be integrated into existing instructional practices that follow the NLA to support effective second language instruction.

In their review, Fan et al. (2020) discovered that AR technologies can support language learning outcomes and increase motivation by leveraging the use of well-integrated augmented visuals and oral and aural clues that serve as learning guidance for students. Fan et al. (2020) noted that location-based AR applications usually require learners to explore a specific real-world context and construct the relation between the knowledge of words and sentences to the real world. The contextual visualization emphasizes learners' active construction of meaning during the learning process when leveraging the use of the physical environment as ubiquitous

informational cues (Santos et al., 2014). Fan et al. (2020) named five unique AR affordances in supporting language learning compared to other computational approaches:

- – Transforming abstract language symbols on physical learning materials (e.g., letters, flashcards, objects) to concrete and vivid 2D/3D augmented visual representations and auditory sounds.
- – Presenting language knowledge relating to everyday objects or real-world locations in an authentic learning environment.
- – Enabling a variety of hands-on interactions on virtual objects or physical learning materials with physical affordances (e.g., cubes with physical notches) while viewing real-time augmented feedback on actions through displays (e.g., seeing the word animation when certain cubes are placed in a sequential order).
- – Drawing learners' attention to important phonological knowledge using augmented overlay.
- – Supporting word spelling or proposition word learning in both physical and digital space.

AR applications can be effective digital tools to supplement second language instruction. Fan et al. (2020) stressed that instructional designers should consider how to integrate AR instruction into traditional instructional practices and contexts to provide effective blended learning opportunities for students. The use of AR in second language instructional design is supported by the NLA as it encourages positive collaboration amongst

students by promoting in-depth discussions and effective physical interaction to positively influence learning goals (Fan et al., 2020).

Multimedia Tools

Multimedia integration into learning design is often used and recommended for minimizing barriers to learning by providing multiple means of engaging learners and representing instructional content, along with allowing students multiple means of expressing what they have learned (Davis & Frederick, 2020). The integration of multimedia tools such as audio, video, and animations can address the learning needs of all students. Davis and Frederick (2020) proposed that the strength of multimedia in instructional design lies in its ability to reduce cognitive load and facilitate learner engagement. Cognitive load can be mitigated by the way instructional materials are designed and delivered (i.e., using multimodal input) by reducing working memory resources devoted to extraneous issues, thus increasing the capacity of students' working memory (Rahimi & Allahyari, 2019).

Multimedia tools can be used by instructional designers to create engaging digital stories in the target second language. Cunningham and Redmond (2008) reported that digital storytelling with visuals is an effective way to develop listening comprehension for students who are emergent readers in a second language. According to Cunningham and Redmond (2008), the use of digital visual-contextual cues aids with comprehension and creates a more meaningful and enjoyable language experience. Al-Amri (2020)

discovered that digital storytelling activities provided students with meaningful opportunities to use the target language. Digital storytelling supported students' oral communicative abilities in the target language, such as pronunciation, rhythm, and intonation (Al-Amri, 2020). Following the principles of the NLA, instructional designers in second language instruction can use digital storytelling as an effective method to engage students in authentic learning contexts that are connected to students' individual experiences.

Multimedia software enable instructional designers to create meaningful and engaging instructional activities such as slideshows, interactive game boards, and online games to support second language learning. Hung (2011) advocated that effective learning activities should be focused on learners' exposure and participation in multimedia-rich contexts where multimedia is embedded to provide inherent scaffolding for learning. Hung (2011) further asserted that effective learning activities should require students to actively participate through social interaction with others and technology must be employed to support interactivity among learners (interpersonal interactivity), between learners and learning materials (informational interactivity), or between learners and computers (human–computer interactivity).

Multimedia creation platforms can allow students to create their own multimedia presentations in the target language. For example, second language learners can use multimedia creation platforms to record videos of themselves presenting self-created written texts in the target language. Hung (2011) discovered that students strongly endorsed the use of video recordings of their

oral presentations as a meaningful way to reflect on their learning processes. From the students' perspectives, the video recordings allowed them to observe the strengths and weaknesses of their own oral skills in the target language, which they might have otherwise overlooked (Hung, 2011). Students reported that this reflective practice focused their attention on specific aspects of their presentations and motivated them to better refine future communication (Hung, 2011).

Conclusions

The integration of digital technologies into second language teaching and learning can help support a variety of instructional purposes while providing students with authentic learning experiences that are supportive of their learning needs. Second language learning, the principles of the NLA, and the affordances of digital technologies align with learning theories such as Vygotsky's social development theory and Lave and Wenger's situated learning theory. Digital technologies can be used to create authentic opportunities for learners to collaborate and interact with the target language (Cunningham & Redmond, 2008). Digital technologies can be used as pedagogical tools in second language instructional design to support meaningful instruction and augment student learning. According to Burset et al. (2016), instructional digital materials have more potential to promote learning and second language acquisition than traditional materials may provide due to their high interactivity, which captures the attention of learners and motivates them to learn.

Digital technologies help to promote collaborative,

authentic, engaging, and creative second language learning environments. Instructional designers can use digital technologies to develop instructional materials, support instruction, and reinforce new knowledge in a variety of engaging ways. Fan et al. (2020) found that multimedia and game design strategies combined with effective presentation strategies may support students' learning gains. Khadimally (2020) stressed that all technologies that support students' meaning making during the second language learning process should be included in the design in such a way that the development of each skill is supported with a particular technology and that content is delivered in highly authentic and engaging ways. In this literature review, digital technologies such as digital games, augmented reality, and multimedia tools have been evaluated for their affordances to second language learning. The results of this literature review will provide second language instructional designers with valuable knowledge to consider in their own instructional design practices.

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DIGITAL CITIZENSHIP RESOURCES TO SUPPORT EDUCATORS

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Abstract

This paper will explore resources to support educators in teaching digital citizenship in the K-12 classroom. The COVID-19 pandemic and the various shifts to virtual learning meant an increase in technology use for children across the world. With this rapid increase in technology use, it has become more critical than ever to teach

children how to navigate the digital world in a safe and responsible way. While many educators incorporate technology into their classrooms, there continues to be a limited understanding as to the importance of teaching digital citizenship skills to young learners. This paper analyzes what digital citizenship is in a K-12 context. It will discuss the educator's role in digital citizenship education and provide useful resources to support educators in the teaching of digital citizenship skills.

Keywords

digital citizenship, digital literacy, educator, technology, k-12 classroom, online learning

Introduction

Since the beginning of the COVID-19 pandemic and the various school closures, children are using digital tools and the internet more than ever before (Ranchordas, 2020). Children today have access to the internet through computers, laptops, smartphones, tablets, and video game consoles. This interconnectivity has allowed individuals all over the world to communicate with one another regardless of time or space. This was especially beneficial during the COVID-19 pandemic as the internet allowed for learners to continue their education online, connecting with both their teachers and peers. There is substantial evidence linking the pandemic to an increased use of technology for children and teens. In one study by Hartshorne (2021), it was discovered that children's time interacting with digital technologies increased from an average of 2.6 hours a day to 5.9 hours

per day following the start of the pandemic. With the rapid use of technology and the internet by younger populations, it is crucial that education focuses not only on how to operate these digital technologies, but more importantly how to use these technologies in a safe, responsible and cooperative way. This paper will examine digital citizenship education specifically within the K-12 context. It will explore what is meant by the term digital citizenship, the educator's role in digital citizenship education and provide resources to support educator's in their approach to digital citizenship.

Literature Review

What is digital citizenship?

There is a common misconception that digital citizenship means a focus on online safety. While internet safety is an important component of digital citizenship, it is but the beginning in building skills which make a good digital citizen. According to Ribble, digital citizenship is defined as *"the norms of appropriate, responsible behaviour with regard to technology use."* (2008, p. 15). In his book *The Rise of the Network Society* (2000), Manuel Castells similarly discusses the concept of digital citizenship. Castells states that a good digital citizen is capable of using technology ethically, or in a way that will not cause harm to themselves or others. Ribble et al. (2004) highlight nine key topics that make up their definition of digital citizenship. These areas include; etiquette, communication, education, access, commerce, responsibility, rights, safety and security.

Importance of Digital Citizenship Education for Students

For students, being a digital citizen ultimately means not only learning how to utilize technology, but to do so in a responsible and safe manner. Recent research points to children using technology and the internet more in the past two years than in the four years preceding the pandemic (Common Sense Media, 2021). Studies have shown that the increase in internet use by students has also led to a rapid increase in its misuse. Since the beginning of the pandemic, parents and educators have become increasingly concerned about the effect that technology access has had upon children. Gleason and Gillern (2018) describe that a lack of digital citizenship skills often increases the likelihood of young people falling into dangerous habits online which makes them increasingly vulnerable to victimization. Recent media reports have pointed to growing instances of young people's irresponsible and often reckless use of technology. Some of this behaviour includes using the internet for intimidation or threats, the posting or sharing of inappropriate or private content online, and downloading pirated material from the internet (Ribble & Miller, 2013). Cyberbullying has been a hot topic in the past few years as individuals have witnessed victimization at increasingly younger ages. Statistics Canada (2023) reports that one in four teens aged 12 – 17 have experienced cyberbullying. These young peoples' experiences range from being insulted online, to being excluded from an online community, to having hurtful information posted about them online.

The dangers of the internet are many and children especially are susceptible to these dangers for a number

of reasons. Children's lack of awareness as to what the risks of the internet are means they are more likely to engage in behaviours online that are risky. Likewise, children and adolescent's brains are still developing a complete understanding of critical thinking, impulse control and the ability to foresee the consequences of their actions. Children are growing in their knowledge of how to interact with others in both real world and virtual settings. The internet however is no longer recognized as an entity separate from our face-to-face society and the consequences for actions in the digital realm follow young people offline. Orth and Chen (2013) draw attention to the fact that young people's lives now exist in both the physical and digital world and that each of these worlds has a great deal of influence over the other. Similarly, studies demonstrate that students misuse of technology outside of school hours often has an impact on educators and students in the school environment. In their report *Teens, Kindness, and Cruelty on Social Network Sites* (2011), the Pew Research Center noted that students' negative online interactions often negatively impacted face-to-face interactions with peers at school. In this study, participants indicated in-person arguments, loss of friendships at school, and discomfort in social interactions in school following interactions that had occurred online (Ribble & Miller, 2013). The digital world is now so entrenched in children's lives that the online reality has become equally as significant in their lives as their in-person reality. Education must therefore adapt to equip students with the skills they will need to be productive members of society now and throughout their lifetimes.

Whose responsibility is digital citizenship education?

Drader (2022) investigated perceptions surrounding digital citizenship and found varying understandings about who should be responsible for teaching students how to responsibly use technology. While it is generally thought that this responsibility should mainly fall on parents and families of children, Orth and Chen (2013) found that many parents investigated parents' feelings surrounding digital citizenship. In this study they found that while most parents recognized digital citizenship as a pressing skill set for individuals to have, they did not feel adequately prepared to teach it to their children. There exists a broad consensus that schools have an equal responsibility to prepare students to become good democratic citizens. Fullan (2001), further emphasized the responsibility of schools by stating that they have a *moral obligation* to prepare students to be responsible, contributing members of society. Therefore collaboration between schools and parents is crucial to incorporate digital citizenship as an element of school curricula and an extension of learning that takes place at home.

An Educator's Role

Teachers have long been tasked with guiding their students in learning that is not strictly curriculum related but encompassing the building of positive values and behaviours. The Canadian Teachers' Federation notes that 75% of educators support the notion that part of an educator's role is to provide children with the necessary life skills they will need to be good, contributing citizens of society throughout their lifetime (Sears, 2004).

Educators of all grade levels regularly incorporate lessons on topics such as etiquette, sportsmanship, bullying, conflict resolution, and safety in order to build their student's ability to act in a way that makes them a good citizen. While these subjects are not necessarily curriculum dictated, the importance of character education incorporating these themes has been widely recognized. Traditionally these lessons have often focused on behaviours occurring in the face-to-face environment and have been limited in their application to the digital space. With an increasing number of students having access to technology and the internet, the necessity for digital citizenship education has become glaring. Teachers play an important role in helping their students act responsibly online.

Challenges for Educators

Despite the acknowledgement of educators that digital citizenship is important for students, they face many challenges in incorporating it into their teaching. One study examining teacher's perceptions of digital citizenship (Pusey & Sadera, 2012) found that teachers also feel ill prepared to teach their students about digital citizenship. The same study concluded that lowered teacher confidence in teaching these skills was often due to their lack of understanding of what digital citizenship is. Mattson and Curran (2017) similarly echoed these findings by asking how educators can be expected to teach a digital citizen when they do not understand what a digital citizen is by definition. If teachers are expected to address these issues within their classroom, they must first have an understanding of digital citizenship

themselves. While the responsibility for learning about digital citizenship is part of an educator's role, provincial governments and school boards also need to support educators in this skill development.

Hollandsworth et al. (2011) found teachers also face a significant challenge in that the majority of programs aimed at teaching digital citizenship skills are designed for students in middle school and high school. Unfortunately, as these researchers note, by upper grade levels students have already been entrenched in technology for many years and their online behaviours are now second nature to them. In fact, the Canadian Pediatric Society Digital Health Task Force (2022), notes that the majority of Canadian children have already been exposed to technology by the time they are two years of age. This finding reinforces Ribble's (2014) recommendation that digital citizenship skills be introduced as early as kindergarten. For educators this means a pressing need to incorporate digital citizenship education at earlier stages. However, given the scarcity of age-appropriate resources, teachers have limited materials available to them.

While technology access has increased exponentially since the COVID-19 pandemic, virtual learning also highlighted the lack of technological access still experienced by some Canadians. During the pandemic, many learners sought digital devices from their schools in order to access online learning. Similarly, many students in rural, remote and Indigenous communities did not have the internet access required for synchronous learning. According to The Canadian Radio-Television Commission of Canada, 45.6% of people in rural communities have internet connections that allowed

them to connect to online learning during the COVID-19 pandemic (Freeman et al, 2022). For many educators this digital divide has meant their learners have a wide range of digital literacy skills. While some students have had extensive previous experience with multiple technologies, others have had limited opportunity to engage in online activities to build their digital literacy. The gaps presented by the various digital literacy levels of students presents an ongoing challenge for educators without a comprehensive digital citizenship framework to work from.

Application

While there is agreement that children should be taught digital citizenship skills in school, there is often little guidance for educators on how to implement these concepts in their classrooms. Fortunately, there are numerous engaging resources to support educators in their approach to digital citizenship. Resources in this section have been categorized for educators as 'Curriculums and Frameworks' and 'Specific Content Resources'. In the 'Curriculum and Frameworks' section, is a collection of complete curriculums and lesson plans, while the 'Specific Content' section contains various technology-based applications and websites designed to enhance digital citizenship lessons. Each of these resources is intended to support teachers in both the in-person and online classroom.

Curriculums and Frameworks

Digital Citizenship Curriculum

(Common Sense Education)

Kindergarten – Grade 12

Common Sense Education (2020) has created a free digital citizenship curriculum to support educators in their teaching of students in the K-12 classroom. The curriculum was designed in partnership with Project Zero at the Harvard Graduate School of Education and offers lessons specifically catered to children at different ages and stages of development. The curriculum covers a wide range of digital citizenship topics including; media balance and wellbeing, privacy and security, digital footprint and identity, cyberbullying and hate speech, and news and media literacy. This is an ideal starting point for teachers looking to incorporate some digital citizenship learning in their classroom.

Faux Paw's Cybersecurity Superstars Curriculum

(iKeepSafe, 2023)

Grades 1- 4

This curriculum consists of four lesson plans focussed on teaching students about internet safety. Through the website, students have access to a number of picture books and videos that feature a cat exploring the online environment. Lesson plan topics include; privacy, cyberbullying, balancing screen time, and making good decisions online.

Be Internet Awesome with Google

(Google, n.d.)

Grades 2 – 6

Google has created a complete digital citizenship curriculum- Be Internet Awesome (Google, n.d.). Here educators can explore engaging lesson plans to teach the basics of digital citizenship for grades 2-6. What sets Google's curriculum apart from others is that it is designed to be used alongside their interactive game platform. This series of online adventure games reinforces lessons taught within the curriculum, and allows students to practice what they have learned about being safe and responsible online. There are various games available based on different topics of digital citizenship including sharing information online, cyberbullying, and fake news. Educators are also encouraged to examine the resources Google has compiled to share with parents for further exploration at home.

Specific Content Resources

Information Literacy

The internet has provided us with endless knowledge at the click of a button. The concern is no longer that young people do not have access to this information, but that they require the skills to navigate the vast amount of information available to them. For this reason it is crucial that digital citizenship education includes teaching students how to critically assess information. By teaching these skills we empower our students to be critical

thinkers and enable them to make informed decisions in the digital world.

Real or Photoshop

(Online activity by Adobe (Mearig, 2013))

Grades 2 – 12

This activity can be adapted for use with learners in elementary and high school. Here students will use their observational skills to determine whether photos are real or photoshopped. This activity provides the opportunity for educators to share the impact of Photoshop (Adobe, 2023) on the photographs we see online.

Fake It to Make It

(Online game by Werner (n.d.))

Grades 9 – 12

In this game, users attempt to make money by creating fake news! Students will have the opportunity to see firsthand how internet stories can be exaggerated in an attempt to gain more followers and make more money. This game reinforces important concepts surrounding conducting proper research, considering credible sources of information and online manipulation.

Reality Check

(Online game by MediaSmarts (n.d., *b*))

Grades 9 – 12

In this game, students will examine various social media posts and determine whether they appear to be 'real' or 'fake'. The game walks students through a lesson on how to critically examine and fact check information

they find on the internet. Activities are fun and engaging and teach young people different techniques for authenticating information they find online.

Health & Emotional Wellness in the Digital World

Teaching children about the risks of technology would be remiss if it did not incorporate the negative impact of technology on our personal wellness. Students should understand that when used in excess technology can have poor effects on both their physical and mental health.

Once Upon Online

(Online game by Digital Matters (n.d.))

Grades 5 – 12

Digital Matters has created a series of lessons related to digital citizenship. While there are several different lessons available, of particular interest is one which supports upper-elementary and high school students in their understanding of healthy digital limits. Educators are able to download lesson plans that focus on digital wellness and teaching students how to effectively balance screen time. Within the website, students have free access to an interactive role play game where they choose to make decisions related to screen time and witness the impacts of such decisions on the wellbeing of their character.

Online Safety

Online safety is arguably one of the most important digital citizenship topics for children. Children must learn to navigate the online space in a way that keeps

them safe. This involves educating children about the potential dangers that exist in the online environment. By teaching children the risks of sharing personal information, cyberbullying, and communicating with strangers online, we better equip them to protect themselves.

Zoe and Molly Online

(Online game and comic books by Canadian Centre for Child Protection (2023))

Grades 3 and 4

Zoe and Molly Online is a website that provides a fun way for students to learn about the risks of sharing information and photos online. The materials on the website include lesson plans and accompanying comic books aimed at grades three and four. Educators also have access to lesson plans, Powerpoint and SmartBoard presentations to go along with the corresponding grade level comic.

Cyber Choices

(Online game by MediaSmarts (n.d., *a*))

Grades 3 – 5

Cyber Choices is an interactive story game created to provide children with the opportunity to practice making responsible and safe choices online. The game allows children to make choices about sharing information, cyberbullying and conflict resolution online. As students navigate these decisions, they recognize the impact their choices have upon the outcome of the storyline. *Cyber Choice* is available to schools by purchasing a license. When purchased, teachers have access to the game, a

teacher's guide and programming to track learner progress.

Jessie and Friends

(Interactive Games and Activities by The National Crime Agency of the United Kingdom (n.d., *b*))

Grades K-2

Jessie and Friends is part of the United Kingdom's National Crime Agency online safety education program. It is an interactive game intended for children aged 4-7. This game allows children to understand the importance of reporting things they see on the internet that may make them feel worried or uncomfortable. The game covers topics children typically interact with online (e.g., watching videos, sharing pictures, online gaming and online chatting). Children can work through the levels and make decisions about when they should TAG (tell a grownup) about something they have seen online.

Band Runner

(Interactive Games and Activities by The National Crime Agency of the United Kingdom (n.d., *a*))

Grades 3 – 5

Band Runner is an engaging game that incorporates arcade style gaming and online safety. Learners work their way through levels by running and jumping to collect stars. Their course in the game is dictated by how they make decisions related to online safety. Topics cover accepting friend requests from strangers, sharing locations online, and reporting cyberbullying.

Conclusions

Digital technology is, and will continue to be, a constant in our society. Understanding how to use technology responsibly and protect oneself online is a crucial component of preparing students for life in modern day society. Educators have an essential role to play in introducing these concepts to students. By educating learners on these topics, educators can help young people develop a strong understanding of the risks and benefits of using digital technology and demonstrate how to responsibly navigate these technologies so that they may ultimately become good, contributing digital citizens. With the right support and resources, educators can effectively integrate digital citizenship teaching into their practice and help their students prepare for success in an increasingly digital world.

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ONLINE LEARNING IN AND AFTER THE COVID-19 PANDEMIC

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Abstract

Based on a literature review on some key issues regarding the effectiveness of online education during the COVID-19 pandemic, such as online education platforms, challenges and difficulties of online education, students' and teachers' perceptions of online learning, and post-pandemic online education, this article discusses about the development of online learning in

the post-pandemic period and gives some suggestions on how to combine online learning with traditional learning to improve the quality of education in the future.

Keywords

COVID-19 pandemic, effectiveness, online learning,

Introduction

The COVID-19 virus was first identified in Wuhan, China, in late 2019. Since then, it has spread rapidly across the globe and caused a large number of infections and deaths. In January 2020, WHO declared COVID-19 as a health emergency worldwide for the first time (Spencer, 2023). To break the spread of COVID-19, countries around the world took various measures such as banning gatherings, social distancing, wearing masks, hand washing, vaccinating citizens, and even locking down cities with high infection rates and closing borders (Laili & Nashir, 2021). As a result of these effective public health measures, the number of people infected and dying from COVID-19 around the world has decreased significantly. As more than 90% of the world's population has already acquired some level of immunity to COVID-19 through vaccination or infection over the past three years, The chief of the World Health Organization, Dr Tedros Adhanom Ghebreyesus, declared at the end of 2022 that the end of the COVID-19 pandemic is not far away (Spencer, 2023). This vision is becoming increasingly realistic as more and more countries gradually return to normal after the initial

declaration of a COVID-19 pandemic (Zeke & Amanda, 2023).

However, the impacts of the COVID-19 pandemic on all aspects of life in the past three years has been tremendous, and they will not disappear immediately in the near future. During the COVID-19 pandemic, the education system was one of the most severely affected areas, along with the financial and healthcare systems. More than 94% of students in over 190 countries on all continents were affected by the disruption of education systems due to the pandemic (United Nations, 2020). Although online education has proven to be the best alternative to traditional education in maintaining student education during a pandemic (Xhelili et al., 2021), some issues related to the effectiveness of online education during the pandemic have emerged.

This paper explores some of the major issues regarding the effectiveness of online education during the COVID-19 pandemic and discussES the trend of online education in the post-pandemic period. Suggestions are provided for achieving the integration of online education with tradition education to improve the effectiveness and quality of future education.

Literature Review

Since the outbreak of the pandemic, there has been a proliferation of research on the impact of the COVID-19 pandemic on education. A focus of the research is on the shift to online education from traditional education due to the disruption of the education system during the pandemic. Kerres and Buchner (2022) conducted a literature review of published papers related to online

learning during the pandemic. They (2022) divided these papers into three categories based on the research methods used, which are "prescriptive papers that aggregate existing knowledge about educational technologies for emergency distance learning,… theoretical analyses that reflect and frame the debate,…[and] empirical studies on the educational impact of pandemics" (p.1). Kerres and Buchner (2022) conclude that most of these papers are empirical research papers that provide a heterogeneous view of the positive and negative effects of pandemics on education. The majority of the research papers examined in this literature review are empirical research papers.

Shift to Online Education from Tradition Education

One of the biggest impacts of the COVID-19 pandemic on education worldwide was the closure of educational institutions, which led to a sudden shift from traditional classroom learning to online learning at many institutions around the world. Although online learning has proven to be an effective way to protect teachers and students from the COVID-19 virus, there is still debate about its efficacy when deployed in places of classroom education during the pandemic.

Tradition Classroom Education

Traditional classroom education/learning has long been dominant in the modern educational system. According to Sobirova and Karimova (2021), traditional education is based on a set of organizational and methodological principles dating back four hundred years, which include the principles of citizenship, scientific character, and

education, as well as the principles of fundamental and practical education. They point out several distinct advantages and disadvantages of traditional education, which are listed below. According to Sobirova and Karimova (2021), in classrooms where traditional teaching methods are used, students are passive learners; the teacher has complete control over the classroom, which inhibits not only student motivation and creative initiation, but also direct student-teacher communication; the level of mastery is low due to differences in student memory; and "there are no conditions for independent study and independent decision-making" (p.235). Based on the results of their study, Sobirova and Karimova (2021) suggest that it is necessary to apply non-traditional educational methods in the learning process to improve learning outcomes.

Figure 1

Advantages and disadvantages of traditional classroom education.

Advantages of traditional education	**Disadvantages of traditional education**
§ Allows students to be introduced to the basics of science and examples of activities in a concentrated form in a short period of time.	§ Direct control of the process of acquiring knowledge and skills prevents the emergence of gaps in knowledge.
§ Ensures the robustness of the acquisition of knowledge and the rapid formation of practical skills and abilities.	§ Individual features of information perception are not sufficiently taken into account.
§ The collective nature of assimilation allows the identification of common errors and directions for their elimination.	§ The subject-object approach to teacher-student relationships predominates.

The outbreak of the COVID-19 pandemic exposed one of the Achilles' heels of traditional education, namely that it had to be delivered in a real-life context or physical classroom. In traditional education, learners must attend in-person classes that usually take place at schools. What learners learn and how they learn depends heavily on what they do in the classroom and how teachers organize and implement their lesson plans. Traditional education cannot be achieved without an authentic learning platform. This particular requirement has become the biggest obstacle to the proper functioning of traditional education during the COVID-19 pandemic, forcing a large number of educational institutions around the world to turn to online education to ensure the continuity and quality of education during the COVID-19 pandemic.

Online Education

Online learning/education, also known as distance learning/education, or e-learning, is not a newly emerged form of education that was customized to address educational issues during the COVID-19 pandemic. The concept of distance education first appeared in an article published in 1849 in a North American professional journal of education called *The Journal*, which introduced the idea of Sir Isaac Pitman to create a professional shorthand writing course by correspondence (De Oliveira et al., 2018). The University of Chicago in the United States established the world's first education department by correspondence in 1900, and in 1971, the first institution engaged in distance education appeared at Empire State College in New York. The purpose of this institution was to improve access to higher education for

students who were unable to attend classes on a college campus. In recent decades, the advent of the Internet and advances in educational technology have greatly accelerated the growth of online education. Online education plays an important role in the revolution of the modern education system in the 21st century (Hussain et al., 2020). As stated by Silaban et al. (2020), "the world of education has begun to shift the paradigm of 21st century learning from the traditional Era towards IT- based learning and the internet, so learning can be done anywhere and anytime, and also information can be obtained from anywhere" (p. 88).

Online learning uses information communication technologies (ICTs) through the Internet to provide flexible learning modes in virtual classrooms (Hussain et al., 2020), which is its greatest advantage over traditional learning during the pandemic. In virtual classrooms, learners have greater learning independence than in traditional classrooms because of the use of innovative, efficient, informative, and effective online learning tools (Hussain et al., 2020). In a qualitative study on online learning, De Oliveira et al. (2018) concluded that the benefits of online learning for learners are flexibility, content availability, low cost (compared to traditional courses) and learning at home anytime, while for educational institutions, its benefits include low cost, no need for physical space, and a single class (video) serving to several classes. According to Mirholikovna (2020), availability is the key advantage of online learning, which allows learners to access knowledge from anywhere in the world. Other advantages he found for online learning are flexibility, relative economy of money and time, giving a specific set of knowledge and skills, relevance

of lessons and improved technical skills. Based on the fact that nearly 3 million students enrolled in full-line programs and 6 million students took at least one online course as part of their higher education in 2020, he believes that online learning has become one of the most popular and effective alternatives to traditional education in higher education.

Effectiveness of Online Education During the Pandemic

A number of articles have been published on the effectiveness of online learning during the COVID-19 pandemic, reflecting the great concern of scholars about the quality of education during the pandemic. Some of the lively discussions under this theme are:

- platforms for online education,
- challenges and difficulties of online education,
- student and teachers' perceptions of online learning, and
- online education in the post-pandemic period.

Most of these studies have been conducted in higher education contexts, with a small number in elementary and high school contexts.

Online Education Platforms

During the COVID-19 pandemic, online learning platforms played a key role in making the transition from traditional to online education. Due to the continuous development of educational technology, there are now many online learning platforms available for online learning such as MOOC (Massive Open Online Courses),

Zoom Cloud (Zoom, 2022) and WeChat Work (WeChat, 2022), which were among the most popular online learning platforms during the pandemic. The sudden shift of online learning from a supplementary form of learning prior to the pandemic to the only alternative form of learning to traditional learning during the pandemic has created some difficulties and challenges in the use of online education platforms (Chen et al., 2020), which has generated interest among some researchers to study this situation.

In a study of users' use of online education platforms before and after the COVID-19 pandemic, Chen et al. (2020) compared eight popular online education platforms used in China based on users' experiences with the platforms. They found that users' experiences of using online platforms differed significantly before and after the COVID-19 pandemic. Before the pandemic, "users concerned about the access speed, reliability, and timeliness of video information transmission of the platform" (p.28). After the pandemic outbreak, "users mainly focused on course management, communication and interaction, learning and technical support services of the platform" (p.28). Before the outbreak, users had the best experience with the Zoom Cloud platform, and after the outbreak, users had the best experience with DingTalk (2021). They provide a number of suggestions to improve the user experience of the online education platform during the pandemic. These suggestions were to improve support services by providing users with comprehensive, timely, convenient and fast support, improve the convenience of interactive communication, such as adding a split-screen function to the platform, optimize ease of use, and enrich platform resources.

In another study conducted by Chen et al. (2020) on user satisfaction of online education platforms in China, they concluded after analyzing the emotion data from online user reviews that "Ding Ding and Tencent Class provided high quality service, while Chaoxing Learning and MOOC encountered several problems, such as the inability to submit the learning time, lags, and a significant video delay" (p. 22), and they found that "users personal factors did not have a direct impact on their satisfaction, while platform availability had the greatest impact on user satisfaction" (p.22). Based on their findings, they suggest that "platform technology issues cannot be ignored" because "there are still many problems in the platform technology" (p. 23) and that "two-way interaction of teaching must be improved " (p. 23) because "an increase in interaction can improve students' learning enthusiasm and concentration" (p. 23). Pandey et al. (2021) concluded in their study that learning model or attitudes towards delivering of online class significantly affects students' satisfaction with online learning.

Challenges and Difficulties of Online Education

The shift to online learning during the COVID-19 pandemic posed a number of challenges and difficulties not only for governments and educational institutions, but also for teachers and students. In their study, Pandey et al. (2021) found that challenges to implementing online learning during in underdeveloped countries during the COVID-19 pandemic included lack of internet (most developing countries), security (cyber attacks), infrastructures like computers and ICT gadgets (regions with poverty), power supply (many underdeveloped

regions in Africa), political will due to corruption (Africa), and scalable policies by government. They suggested that governments should take the following steps to overcome these challenges and improve the quality of online education. First, provide a reliable Internet network. Second, ensure sufficient power supply at subsidized rates. Third, establish strong institutions to combat corruption. Fourth, develop flexible government policies that are beneficial to citizens. Finally, raise ICT awareness by providing training to students and teachers to follow the ICT trend.

In their study of online education during the COVID-19 pandemic in Nepal, Khati and Bhatta (2020) found that the country also faced many challenges in adopting online education during the pandemic, such as poor networking, Internet security, and possible Internet addiction. They argue that physical and human resource development is important for the sustainability of online education, and that improving infrastructure, training teachers and motivating students are exactly the things local stakeholders should focus on to improve the effectiveness of online education. They argue that online education in Nepal should be seen as a complement to traditional education, not a substitute for the traditional classroom, and be given an equal role in the future development of education.

In examining the challenges of online learning experienced by EFL teachers during the COVID-19 pandemic, Mahyoob (2020) found that technical, academic, and communication challenges were the main factors affecting the effectiveness of EFL online learning during the pandemic, and that EFL teachers' failure to accomplish the expected progress in language learning

in the online classroom was the main reason for their dissatisfaction with online learning.

Simamora (2020) argues that governments, especially education authorities, should play a key role in addressing the challenges that learners face in online learning during a pandemic. They emphasize that simply providing students with online learning opportunities is not enough. It is important to develop independent learning skills and readiness to learn and to encourage independent learners with critical thinking skills through online learning.

Students' and Teachers' Perceptions of Online Learning

Many scholars have explored the effectiveness of online learning during the COVID-19 pandemic based on empirical studies of students' perceptions of online learning and teachers' perceptions of online learning. Although the results of these studies are inconsistent due to various factors, such as the geographic and academic backgrounds of the subjects involved, the specific timing of the studies, and the concerns of the researchers, they do reflect the reality of online education during pandemics in some countries around the world, particularly developing countries where online learning is underdeveloped.

Syofyan et al. (2020) conducted an online survey of 545 students and 36 faculty members at the University of Andalas, Indonesia during the COVID-19 pandemic. The results showed that most teachers used Zoom to organize their online learning, with 47.3% of them using Zoom along with other media, most teachers and students felt that online learning could not achieve their attitude learning outcomes and skill learning outcomes, although

they agreed that they could achieve knowledge learning outcomes, and more than half of the teachers and students said that online learning was not as effective as traditional learning. They conclude that careful selection of learning activities and media for online learning is key to achieving all aspects of learning outcomes.

Tuma et al. (2021) surveyed 636 students and 81 instructors at Wasit University School of Medicine in Iraq to explore the outcomes of distance medical education during the pandemic, and the researchers found that more than half of the instructors (51%) believed that online education was equal to or better than traditional face-to-face learning, while a smaller percentage of students, about 33%, held the same view. In addition, 51% of instructors and nearly 69% of students experienced more difficulties with online learning, largely due to the availability of technology, the reliability of their Internet connections and their fatigue in learning online. Based on the findings, the researchers acknowledge the important role online learning played in education during the pandemic and suggest that "adequate preparation, good quality audio-visuals and Internet, and student engagement activities" are key factors in improving the quality of education.

Meccawy et al. (2021) explored students' and faculty members' perceptions of online learning at King Abdulaziz University in Saudi Arabia during the pandemic. The results showed that students participating in the study had more positive perceptions of online learning than faculty members, who held slightly negative perceptions, and that gender had little effect on the difference between faculty and student perceptions of online learning. They conclude that:

improvements and modifications in both technical and non-technical aspects are necessary to achieve a higher level of satisfaction for both students and faculty and to make online distance learning a viable option worthy of further investments in the near future (p. 21).

Nambiar (2020) conducted an online survey on faculty and student perceptions and experiences of online courses among 70 faculty members and 407 college students in Bangalore, India. His findings indicate that "quality and timely interaction between student and professor, technical support availability, structured online class modules, and modifications to accommodate conduction of practical classes" (p. 783) were important factors influencing faculty and students' satisfaction with online learning. He argues that "establishing a structured and user-friendly environment for online mode of learning" should be the main criterion for facilitating online learning, while "providing adequate technological training to teachers about method of conducting online classes" (p. 792) is a prerequisite for successful implementation of online learning. He argues that the improvement of the quality of online learning in higher education requires the efforts of various service providers, including the support of different colleges and universities.

Post-Pandemic Online Education

After three years of fighting the COVID-19 pandemic, the end of many pandemic restrictions is in sight (Spencer, 2023). Life is gradually returning to the normalcy that existed before the pandemic broke out. Most of the world's educational institutions have opened

their doors and moved back to traditional education from online learning. However, this does not mean that online education will be useless and replaced by traditional education. There are many good reasons for online education to stay in modern education. For example, it proved to be the only and best alternative to traditional education during the pandemic, providing students with not only a continuous education but also protection from the COVID-19 virus while studying online. More and more scholars are focusing on the implementation and development of online education in the post-pandemic period.

Lockee (2021) argues that the COVID-19 pandemic "could permanently change how education is delivered." However, Kerres and Buchner (2022) are neutral to this statement. They argue that educational technology is an important tool for the implementation and advancement of online learning. In their study on the impact of the pandemic on education, they present two contradictory views on the role that educational technology will play in in post-pandemic education: a pre-digital view and a post-digital view. The former implies a return to normalcy, while the latter attempts to use the experience of the pandemic for corresponding educational reforms. They agree that the experience of online education during the pandemic provides an opportunity to "rethink education" after the pandemic (Zhao, 2020), but that the future of education depends heavily on how open the education system is to seize this opportunity.

Zhu and Liu (2020) note that the outbreak of the COVID-19 pandemic has greatly accelerated the development of online learning in higher education in China, and its impact on the education system can

provide potential development opportunities. They argue that infrastructures, such as the Internet, big data, artificial intelligence, 5G, cloud-based platforms, and other technologies are critical to the development of a new education paradigm that "could represent a shift from traditional, teacher-centered, and lecture-based activities towards more student-centered activities including group activities, discussions, hands-on learning activities, and limited use of traditional lectures" (p. 697). However, achieving such a new paradigm requires "conceptual and philosophical rethinking of the nature of teaching and learning, and the roles and connections of teachers, learners, and materials in post-digital learning communities" (p. 697), in addition to infrastructure readiness.

Xie and Siau (2020) argue that online learning played a key role in education during the pandemic, but that it will not be the only form of education after the pandemic, but rather an integral part of the future of education. This argument echoes Bellini et al.'s (2021) view that the COVID-19 pandemic provides an opportunity for the education system to develop a changed educational model in which new and traditional forms of education will work side by side. Paudel (2021) found in his study that online learning can not function effectively in Nepal, although it could be used during the COVID-19 pandemic as an alternative to traditional education. He argues that blended learning would be a more effective and successful form of education in a setting like Nepal. Keshavarz (2020) proposes a "modified version of blended learning in the form of a hybrid campus" (p. 9) that can overcome the shortcomings of both online and traditional learning. This modified blended learning

is "flexible, versatile, and adaptable, particularly at times of calamities and disasters" (p. 7) and environmentally friendly. It allows learners to take practical courses in person while taking theoretical courses online. However, the limitation of his model is that it is only applicable in the post-pandemic period.

Conclusion

This literature review paper explores some of the most common issues related to the effectiveness of online learning during the COVID-19 pandemic. Several conclusions can be drawn from the results of the literature review. First, the development of online education has varied from country to country around the world. Most of the published articles on the effectiveness of online education during the COVID-19 pandemic, including the articles studied in this paper, come from developing countries. Inadequate accessibility of infrastructure such as computers, ICT gadgets, and Internet networks (Pandey et al.,2021) was one of the most prominent challenges affecting the success of online education in these countries during the pandemic, which increased the difficulties of online education for instructors and learners in these countries (Tuma et al.,2021).

Second, educational technologies, such as online learning platforms, information and communication technologies (ICT), and various online learning tools, are key components of online learning, without which online education would not have been possible during the COVID-19 pandemic. The availability of educational technologies affects not only the implementation and

effectiveness of online learning, but also the satisfaction of learners and teachers with the online learning experience during the pandemic (Tuma et al., 2020). Educational technology also plays a key role in the future reform and revolution of education (Hussain et al., 2020; Kerres & Buchner, 2022). Third, teachers' knowledge, skills and experience in using educational technology for online education is another factor that has a significant impact on the effectiveness of online learning. Even with sound infrastructures and educational technologies, such as online learning platforms and course resources, quality online learning will never be achieved without the proper guidance and assistance from teachers in the online classroom. Providing teachers with adequate technical training on how to conduct online classes with various online learning methods is a top priority to achieve successful online education (Nambiar, 2020). Finally, blended learning can be an ideal complementary education form to traditional learning as well as online learning in the post-pandemic period because it has most of the advantages of both traditional and online learning. The modified blended learning model proposed by Keshavarz (2020) is a good example of this. It can provide students with the most appropriate and effective learning platform to achieve their academic needs through either traditional or online courses. Regardless of the many advantages of blended learning, it cannot replace traditional learning in normal times and online learning in pandemic times.

Online learning has some unique advantages over traditional and blended learning, such as a high degree of flexibility and accessibility, which makes it an irreplaceable form of learning that can keep education

systems running during emergencies like the COVID-19 pandemic. It is therefore quite necessary to maintain the rapid development momentum of online learning during the pandemic and improve its compatibility with traditional learning after the pandemic. It is foreseeable that the future of education will take a more open form, with traditional learning, blended learning and online learning coexisting and complementing each other harmoniously, with the former two dominating general education in peacetime, and the latter standing out in abnormal times, when traditional classroom learning and blended learning do not work well.

In the post-pandemic period, it is significant to introduce online learning into traditional classroom, which is an important way to improve the efficiency and quality of education, and enhance the resilience and sustainability of education in the future. To achieve a successful combination of online learning and traditional learning, all parties involved have a role to play and should work together. First and foremost, governments should ensure that educational institutions, students and teachers have ready access to the infrastructure and resources needed for online learning. There is a strong need for governments to invest more in the development of educational technologies, online learning resources and learning tools, as they are essential components for achieving effective online learning. For educational institutions, they should be responsible for providing training opportunities for teachers to equip them with the knowledge and skills to implement effective online education. It is recommended that educational institutions should offer free courses on online learning to students to prepare them for online learning that may

occur at abnormal times. These online learning experiences and knowledge from the online learning courses will help improve students' learning outcomes and satisfaction with online learning, while reducing the difficulties and pressure they may experience in online classes. For teachers, they should take the initiative to improve their ability to design online learning instruction, as well as their knowledge and skills in using educational technologies for online teaching, such as online learning platforms, online learning tools and multi-media, which not only helps improve their professional skills, but also reduce the difficulties and challenges in their teaching. For students, they should strive to overcome the challenges and difficulties they may encounter in online courses, such as lack of self-discipline, learning autonomy and motivation, procrastination, online learning fatigue, etc. Since most online learning takes place in the home environment, it is quite important for parents to create a comfortable and distraction-free online learning environment for their children and provide them with the equipment and tools required for online learning, such as an Internet connection, headphones, and microphones.

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CONCEPTUALIZING INSTRUCTIONAL DESIGN PRACTICES AND EDUCATOR TECHNOLOGICAL COMPETENCIES FOR POST-PANDEMIC LEARNING ENVIRONMENTS

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Abstract

At the height of the COVID-19 pandemic, mandated government lockdowns and emergency remote teaching measures required teachers and students to re-orient themselves to environments that were entirely online. In the months to follow, new approaches to teaching and learning were facilitated through learning management systems, collaborative applications and communication platforms. While there were reports of success with this mode of teaching, other educators reported challenges relating to issues of competency. This literature review examines a range of studies that addressed educator technological competencies and instructional design practices. Key themes that emerged were the need to develop a deeper understanding of citizenship and authentic interaction in a digital context, and a call for instructional design practices that take advantage of technological affordances to integrate constructivist pedagogy.

Keywords

Instructional design, technological competencies, emergency remote teaching, COVID-19, digital transformation

Introduction

In 2020, K-12 students around the world experienced a rapid shift in learning that was brought about as a result of government-mandated lockdowns and a transition to emergency remote teaching. The change in learning environment precipitated issues in learning (Iivari et al., 2020) and academic behaviours (Klosky et al., 2022) as educators were required to quickly develop strategies for teaching in a solely digital context. While schools have almost entirely resumed in-person classes, the extended period of online learning highlighted the need for heightened technological competencies and improved approaches to instructional design practices (Montiel & Gomez-Zermeno, 2022). Al-Hunaiyyan et al. (2021) maintained that the events of the past three years offer "an ideal window for assessing all aspects of the online learning experience and refining them for future generations" (p.59). Using Moore's (1997) theory of transactional distance as a theoretical lens, this literature review will thus focus on emerging themes from recent research that should inform the development of instructional design considerations and technological competencies for educators.

Literature Review

Moore's Theory of Transactional Distance

Moore (1997) defines transactional distance as "a psychological and communications space to be crossed, a space of potential misunderstanding between the inputs of the instructor and those of the learner" (p.22).

The concept of transactional distance can be seen in research that examines the effects of the switch to emergency remote learning. Montiel and Gomez-Zermeño (2022, p.8) and Iivari et al. (2020, p.4) note the different dimensions of instructor competency that had a significant impact on quality of instruction in a distance-learning context, namely technological understanding and communication.

Educator Technological Competencies

This review will utilize the definition of technological competency put forth by Ogodo et al. (2021) which describes it as "the instructional technology skills teachers should possess to implement classroom instruction effectively" (p.18). As schools transitioned to emergency remote learning, educators were challenged by the lack of preparation that preceded it. A systematic review by Johnson et al. (2022) revealed that 16% of the 251 articles selected for the study "alluded to educators' limited knowledge and experiences regarding online delivery of K-12 schooling" (p.12).

Facilitating Active Learning in a Digital Context

Kingsbury's (2021) comparison between physical schools versus online learning found that active learning was a missing component of the online learning experience during the 2019-2020 academic year, with educators taking a largely transmissionist approach that lacked an active component (p.6572). Ogodo et al. (2021) corroborate this finding in their study, with teacher respondents noting lower levels of student engagement despite a reduced workload and instructional time.

Engagement correlates with the ability to use assessment and evaluation practices that are appropriate for a digital context. The transition to fully online teaching highlighted the lack of this skill in educators whose practices revolved around proximate teaching (Singh et al., 2021). Digital tools were used primarily for delivering information, followed by assessment and active engagement (Myyry et al., 2022). While this practice is indicative of content knowledge, it is also indicative of a need for educators to approach technology as a tool for modification or redefinition of a task as opposed to a medium solely for content transmission (Puentedura, 2014). Ogodo et al. (2021) reflect this finding, noting that engagement in online learning is lost in situations where teachers "lack online mastery of the complex and distinctive combinations of technical, pedagogical, and interpersonal skills" (p.15).

Enabling and Facilitating Meaningful Communication

Communication during the period of emergency remote teaching presented a challenge for educators due to the variety of methods used, which included real-time video, recordings, and feedback through learning management systems (Gross and Opalka, 2020). Effective communication results from timely teacher-student and student-student responses, enabling educators to "overcome transactional distance and practical limitations imposed by the absence of face-to-face interaction" (Kingsbury, 2021, p.6576). In the context of a digital environment, communication as an effective domain of teaching practice also extends to communicating with parents, as seen in Johnson et al.'s (2022) systemic review: while parents play a critical role

for students in a remote learning context, direct support from teachers is generally not received.

Understanding of Technological Affordances

Understanding how to effectively utilize the affordances provided by technology is key to ensuring engagement from students. The spectrum of effective use thus lies in the ability to create an active teacher presence with the available tools (Singh et al, 2021). While teachers were aware of how to use technology from pre-service training, a great number of them had to prepare for virtual learning on their own (Ogodo et al., 2021). Thus, effective use in a technology-assisted classroom or fully online environment is contingent on consistent and ongoing professional development to realize the full potential of technology as a transformative teaching and learning tool (Rozitis, 2017).

Citizenship

The period of fully online learning during the pandemic underscored the need for citizenship as an educator competency. Specifically, Buchholz et al. (2020) note that "educators must be prepared to play a central role in helping nurture digital citizens who can engage ethically" (p.16). In the same vein, Falloon's (2020) framework calls for a deeper understanding of technology that goes beyond "didactic application and technically oriented digital literacy-building before entering the classroom," (p.2458) alluding to the need for digital citizenship in positioning educators and technology as change agents. While citizenship is not regarded as a "primary" competence area, the direct and seamless use of

technology is bolstered by "supportive (but by no means less important)" competencies that are described as "awareness of legal and ethical aspects, as well as privacy and security issues and the ability to act prudently in these matters […], and an understanding of the role of ICT in society" (Janssen et al., 2021, p.478).

Instructional Design Practices

Constructivism

Moore (1993) maintains that a highly structured programme with a lack of dialog will result in a higher transactional distance. While studies of teaching in an online context describe several practical considerations for structuring content (Rozitis et al., 2017; Mayer et al., 2021), instructional designers should ensure that attention is paid to materials and course structures that enable communities of inquiry and authentic interactions between learners to facilitate construction of knowledge (Johnson et al., 2022). This is corroborated in Charbonneau-Gowdy et al.'s (2021) study which found that students in an online environment preferred authentic resources that gave them "things to read [and discuss] that were happening in the real world at the time" as opposed to pre-set textbook content (p.650).

The constructivist focus on formative assessment (Arghode et al., 2017) can be supported in a digital context by taking advantage of built-in functions (e.g. annotation tools) on learning platforms that allow students and educators to share synchronous and asynchronous feedback that informs meaning-making (Moorhouse & Wong, 2022).

Personalized Approaches to Teaching

A curated and individualized learning experience in a digital environment is an affordance that predicates meaningful learning and, in the absence of proximate teaching, develops learner autonomy (Chen & Almarode, 2022; Torun, 2019; Yan et al., 2021).

Instructional design practices that facilitate self-paced and individualized learning allows students to engage more deeply with content. Morrison and Anglin (2012) highlight three basic approaches to individualization that include editable study guides that can be customized by instructors or students; self-paced video recordings; and discussion forums where students can further develop their understanding through conversation (p.247). Personalized instructional design approaches also support scaffolding methods that can be used to deliver assessments that account for learner differences, thus enabling greater focus on constructivist pedagogy (Merrill, 2002).

Application

Implications for Teacher Competency Frameworks

There currently exists a range of competency frameworks for educators, however, Falloon (2020) explains that despite focus on skill development, "only TPACK, the UNESCO framework, and to a lesser extent the ISTE standards, explicitly linked these to associated changes in pedagogy and curriculum" (p.2452). Extant frameworks remain relevant, but the period of emergency remote teaching resulting from the lockdowns highlighted the need to account for new

challenges and affordances associated with teaching and learning in a digital context.

In addition to delivering teaching content, soft skills such as confidence and adaptability to new roles (Blundell et al., 2020) are also domains that should be considered as integral to theoretical instructional design frameworks.

Implications for Instructional Design

In a post-pandemic classroom, instructional design should be learner-centric and allow learners to shape their learning experience (Torun, 2019) in blended contexts. Given the shift to constructivist approaches, this implies moving beyond behaviourist instructional design methods and focusing more on formative development by implementing authentic, collaborative tasks and activities that develop independent learning skills (Massey et al., 2021; Rice & Ortiz, 2021; Charbonneau-Gowdy et al., 2021).

In terms of assessment, instructional design should provide for the opportunity to consolidate knowledge, including appropriate activation and review activities that inform formative assessment (Mazzucato et al., 2021).

Conclusions

In this literature review, several overarching themes emerged:

- – For pre-service teachers, teacher education must go beyond teaching isolated use of technology and applications and professional

development with technology must be prioritized for in-service teachers.
- – Effective instructional design is based on constructivist approaches that foster autonomy and collaboration through student-teacher and student-student interactions.
- – In the absence of proximate learning, educators must possess a deep understanding of the affordances of technology for meaningful learning to take place in a blended or online environment.

The broad proliferation of technology in the classroom has enabled a multitude of affordances for teaching and learning, but the COVID-19 pandemic highlighted emerging domains of practice and gaps in competency that must be addressed. The break from proximate instruction, followed by the period of blended learning as schools slowly re-oriented to physical environments, has necessitated the need to go beyond understanding functions of learning management systems and applications. As new approaches to teaching and learning have been realized with technology, a reconceptualization of what competencies and practices are considered essential is needed to ensure that transformation is lasting and meaningful.

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GUIDED DISCOVERY LEARNING MODEL: SOCIAL CONSTRUCTIVISM AND ONLINE E-LEARNING STUDENTS

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Abstract

The COVID-19 pandemic has enormously impacted

people's social interaction and has changed the education environment. All aspects of our lives have been affected and changed, a natural occurrence when we have time to rethink, reassess, and re-evaluate perspectives, especially on how we perceive education. Distance, digital, and e-learning have reshaped education in many ways. With many technological advancements in education and the transitions to and from online learning, a perspective became an advantage for specific individuals in the education sector. Currently, those with a high interest in technology move more quickly in the distance education and e-learning processes. In this context, individuals want to express their skills in the digital age by taking full advantage of what e-learning offers. More learners are finding that they can work at their own pace, in the best way for them, focusing on learner autonomy that is of great interest to all. This review looks at guided self-directed learning, how it is affected by cognitive theory, and its effect on those that may not thrive in a traditional learning model. The reviewed research also looks at social constructivism and how guided learning and free expression help students meet learner expectations, but in a way that embraces creativity, actively search for information to discover new facts, and produces truths and a pace that works for them and learners. There is also a review of the critical elements of a strong guided learning program. In addition, it looks at this model's negative aspects and shortcomings and the effect it can have on a student's e-learning process. However, the review shows that guided discovery learning can work for those motivated to work alone and in online groups.

Keywords

constructivism, cognitive load theory, e-learning, social constructivism, guided discovery learning, zone of proximal development,

Guided Discovery Learning Model: Social Constructivism and e-Learning Students

The COVID-19 pandemic has profoundly impacted every aspect of our lives, including education. With schools and universities closed to prevent the spread of the virus, students worldwide have been forced to adapt to a new way of learning. As a result, many have turned to online learning to continue their education, online health care for visits, and connection through social media (Noviyanti et al., 2019). With the demand for online connectivity and the exponential growth of information and communication technologies and online programming, we were thrown into a technological cybernetic revolution (Grinin et al., 2022). According to Noviyanti et al. (2019), this rapid growth has encouraged citizens to have intellectual capabilities in the 21st century (p. 7) that they would not have even considered before the pandemic. The creation of the unprecedented revolution also affected enrolment in distance education, as specific individuals enjoyed the comfort and convenience of learning online.

E-learning is using digital media to accommodate the learning process in class. (Koohang & Harman, 2005). Before the pandemic, e-learning was considered a complementary social medium that only served as a supplement to the learning process periodically in the

classroom or at home. However, in the past few years, e-learning has become necessary for some to continue providing the educational process. E-learning can be found on mobile devices, tablets, and computers in the form of apps, allowing people to perform numerous activities online without the need to leave their homes, which then leads to changes in existing traditional learning (Mouratidis & Papagiannakis, 2021) and education. This paper is a review of the literature that looked at e-learning and the individuals that we content with learning online with a guided discovery model.

My Teaching Philosophy

Early in my teaching career, my philosophy around technology in education had been based on the idea that powerful technology enhances the learning experience for all students. I was constantly looking for new and innovative ways to incorporate technology into my science classes and culinary arts program at school to demonstrate, more to myself, that these new tactile technologies had me at the forefront of the technological movement as an educator and contributor to my school community. My teaching practice had slowly become a technological solutionism (Morozov, 2013) with a propensity to jump to a solution with technology before adequately and thoroughly understanding the nature of a problem (McKenney & Reeves, 2020). This philosophy, however fun it may have been for me, became muddled and insignificant due to the COVID pandemic and the transition to online learning. I had assumed that the experience of the technology itself was the linking factor to better understanding the world and the content that

helps students shape their understanding of the world. I learned that technology was more of a means of opening the door to greater understanding if used to enrich the learning experience (Simplilearn, 2023). Therefore, my philosophical perspective of technology in education moved from the flash and experience to a much more intentional integration to meet the learner's needs.

Regarding instructional design, technology is a valuable tool for creating engaging and interactive learning environments (Pappas, 2021). Teaching online during the COVID pandemic taught me that, as educators, we can create immersive experiences that capture the imagination and inspire a love of learning from our students. Of course, it is essential to remember that technology is just one piece of the puzzle for effective instructional design in education. It also requires a deeper understanding of the learner's needs, environment, digital access, preferences, and a thoughtful approach to content development and appropriate delivery to all students.

My revamped philosophy on educational technology is now focused on finding the right balance between technology integration and human interaction. The theories of Constructivism and Connectivism are approaches to technology-enhanced learning environments and instructional design combining the best of both worlds; educators can create unique learning environments and learning opportunities that are both highly effective and enjoyable while meeting the needs of the individual learner and inspiring a lifelong love of learning.

Constructivism emphasizes the importance of active learning and the role of the learner in constructing their

knowledge and how it shapes their world. In a technology-enhanced learning environment, the educator creates opportunities for students to engage with the desired materials in a hands-on, interactive way (Voon et al., 2020). By providing learners with the tools and resources they need to explore and experiment, we can help them build a deeper understanding of the subject matter. I best equate this to the culinary arts program I have taught for many years. Teaching students how to make soup is a fulfilling accomplishment, but introducing an immersion blender into the process opens a whole new world to the students' experience and realm of possibilities.

Connectivism, on the other hand, emphasizes the importance of networks and connections in the learning process. In a technology-enhanced learning environment, the facilitator or educator creates opportunities for learners to connect with experts in the field. Again, in the culinary arts world, this is the equivalent of creating a shared file of famous chefs' YouTube videos or TikTok that demonstrates their unique skills so the students can emulate and acquire them. By leveraging the power of social media, online communities, and other digital tools, we can create a rich and diverse learning ecosystem that supports collaboration, sharing, and lifelong learning (Downes, 2020).

Learning Theories and Models

At the heart of my teaching philosophy, up to this point in my career, I was a true believer in Cognitivism. Teaching in an industrial kitchen with twenty students meant that

I had very little time for student discovery, as more times than not, it would lead to student trips to the infirmary. Cognitivism theory in a kitchen made sense; by following the ADDIE framework for designing in my class, I knew where the students needed to start and had all my courses and recipes parameterized into online modules based on the programs of studies provided by the Alberta Government. Progression was easy as we moved through the semester, and I ate well (Kurt, 2018), not always, but usually. Everything had to be organized to prevent injury, and the sequencing was monotonous (Power, 2023). It was effective, and kids mostly left with all their fingers.

Secretly, I was a closet believer in Constructivism. What I wanted my students to do was find a love for cooking as I did, trial and error. My chef father taught me how to use a knife and left me to my own devices in the kitchen. Practicing the principles of Constructivism at a young age, constructed knowledge, active process, socially constructed with and know chef for a father (Power, 2023). I have often pondered, emotionally cutting onions, whether Cognitivism is more effective than Constructivism. If I had followed a Guided Discovery Learning model (GDL), maybe I would have the next top chef walking out of my kitchen because I allowed them to discover their talent by trial and error, scaffolding their learning, free to express themselves (Noviyanti et al., 2019)

They are grounded in the idea that learning is a dynamic and ongoing process (Svinicki, 1998) requiring active engagement and participation. As an instructional designer for my students, my job is to create learning environments that support this process and empower learners to take ownership of their learning journey.

Which is better, Constructivism or Connectivism? With the latest advancements in technology, I don't believe there is a right or wrong answer. We as educators can create learning environments that are engaging, interactive, and practical and that inspire a love of learning that lasts a lifetime, no matter the theory we follow.

Literature Review: Guided Discovery Learning

Guided Discovery Learning for Online e-Learners

The guided GDL was a concept introduced by psychologist Jerome Bruner as a method of Inquiry-Based Instruction (Svinicki, 1998). This learning theory encourages students to take incomplete information (Noviyanti et al., 2019), and construct understanding by building from past experiences and knowledge, embracing the creativity of their imagination, and actively searching for information to discover new facts, correlations, and truths (Pappas, 2021). In practice for the 21st century, students are introduced to a complex problem or set of problems by an educator, which they work to solve through student-centered self-discovery by being actively engaged, creative, and inventive (Prilliza et al., 2020) by exploring knowledge and insights from various sources of technology that they are familiar with in their daily lives (Saptarini et al., 2022). GDL in an online e-learning environment presumes that the educator helps students by constructing real-world conditions by elaborating and providing real-time feedback on the student's ideas, perceptions, concepts, and skills they observe/learn how to define their new

knowledge (Karuniawati et al., 2022) and form to their own understanding in the 21st century.

Koohang and Harman (2005) described e-learning is the delivery of education (all activities relevant to instructing, teaching, and learning) through various electronic media (p.77). Online e-learning allows teaching materials to be accessible at all times and any place convenient to the students (Azhari et al., 2020) as long as they have access to the internet. Due to this flexibility, online e-learning allows students to practice GDL model at their own pace allowing for more learner control, better time management, and convenience for self-directed Discovery.

The GDL modle is rooted in the Social Constructivism learning theory, where new knowledge replaces existing knowledge or creates new subgroups related to prior knowledge after an experience provided with parameters (Stapleton & Stefaniak, 2018). Constructivism learning was conceived purely as a theory by Piaget (Hobbiss, 2018) and was not designed with any specific pedagogical approach. A theory of learning centered around individual choice, pure discovery, and minimal teacher guidance, according to Myers (2004), may fail to promote the first cognitive process, namely, selecting the relevant incoming information. Students with too much freedom may need help to come into contact with the to-be-learned material (Myers, 2004, p. 14). Suppose a student has the freedom of unlimited access to information online, but the material has little relevance to the learner or is too abstract (Saptarini et al., 2022). In that case, that student fails to discover the to-be-learned material, and no amount of self-discovery, active engagement, or

creativity (Prilliza et al., 2020) will help the learner understand what is desired to be learned.

The theory of Social Constructivism responds to Myers's (2004) cynicism by focusing on the collaborative nature of learning (Azhari et al., 2020). Knowledge for students develops from interacting with others. Online students rely upon educators, technology, peer groups, and social media to help them construct their knowledge and reality threw interaction, guidance, and Discovery (Stapleton & Stefaniak, 2018).

Optimal GDL online e-learning occurs when students learn to handle complex incomplete problems that are still within the cognitive reach or those tasks that fall within the Zone of Proximal Development (ZPD) (Wilson et al., 1993), a form of Social Constructivism. Vygotsky (1981) stated that: ZPD is between the actual level of development determined through independent problem-solving and the level of potential development determined through problem-solving under the guidance of adults or working with more capable peers (p. 86). Vygotsky (1981) taught that when a student is in the ZPD with a particular learning task, if provided with the appropriate assistance, an optimal environment is created for the student to achieve the task (Mcleod, 2023) by actively seeking answers and solutions through self-discovery in creative ways (Pappas, 2021).

Guided Discovery Learning Instructional Design

Instructional Design (ID) aims to create efficient and authentic learning experiences that are engaging, interactive, and effective in achieving the desired learning outcomes (Pappas, 2021). Cognitive Load

Theory (Sweller, 2016) suggests that learners can absorb and retain information efficiently provided so that it does not "overload" the learners' mental capacity. In other words, a learner's short-term working memory can only retain a certain amount of information simultaneously, and working memory is extremely limited in capacity and stores information for a short duration (de Jong, 2009). The more information delivered to a student at a given time increases the possibility that the student will not retain what is needed, nor will they be able to access that information from their long-term memory later (Sweller, 2016). To reduce the Cognitive Load in learners, primarily when engaged in online e-learning, educators can apply a framework from an instructional design model to focus on what is most important to the learner and achieve desired outcomes.

Guided Discovery Learning Model for Online e-Learners

GDL, in an online e-learning environment, is an instructional model that encourages learners to explore and construct new knowledge through problem-solving and inquiry-based activities (Noviyanti et al., 2019) while engaged with various electronic media devices (Koohang & Harman, 2005). Unlike other ID models, such as ADDIE, which approaches ID as a stage-oriented, instructor-driven design with a clearly defined implementation plan for effective learning (Kurt, 2018). The GDL approach places the responsibility of learning and discovering the concepts and principles on their own. GDL online e-learning promotes deep understanding, through critical thinking, and the ability to transfer knowledge to new situations for the student

(Noviyanti et al., 2019). Students become more cooperative problem-solvers as they develop skills to collaborate and work with others, with the freedom to work at their own pace and convenience (Azhari et al., 2020).

GDL model integrates five critical elements to help e-learners in their online learning, which include (Pappas, 2014): 1) Problem or Challenges, 2) Learning Management, 3) Scaffolding / Inquiry-based activities, 4) Collaboration, and 5) Assessment and Feedback. This model makes e-learning powerful by emphasizing problem-solving and developing metacognitive ability (Rahayu & Suparwoto, 2019), positively affecting learning achievement.

Problem or Challenge

Chen and Chen (2010) found that the GDL model effectively promoted problem-solving skills in computer science education courses. GDL is effective because it allows learners to engage in authentic problem-solving activities, further developing critical thinking skills and working at a pace tailored to each individual.

Learning Management

The GDL model allows participants to work alone or with others and learn at their own pace. This flexibility (Khan, 2011) makes learning more than a sequence of lessons and activities; e-learning technologies can improve performance and reduce unnecessary stress by empowering the learner makes them feel in control of their learning.

Scaffolding / Inquiry-Based Learning

The GDL model uses ZPD, which consists of two components (Kurt, 2020). First is a student's potential development as a learner, and second is student interactions with peers and the teacher. The potential development with ZPD is simply what the e-learning student could learn but not independently. Students participate in online chats, message boards, and other activities that require them to ask questions, investigate, and explore new concepts and ideas (Simamora et al., 2018). These activities may include simulations, case studies, or group projects. The teacher then facilitates by scaffolding information to the student and provides guidance, support, and feedback to help learners progress through the learning process.

Collaboration

The GDL model encourages discovery learning, often involving group work and collaboration, as learners can benefit from sharing ideas. Suyatno (2020) shared that many teachers struggled to hold regular online classes during the COVID pandemic and reported poor attendance (p. 1884) Yet also reported remarkably high group participation and completion for assignments when offered through social media applications and open-to-group collaboration.

Assessment and Feedback

Formative assessment and feedback are essential components of GDL, as they help students monitor progress, identify areas for improvement, and adjust

their learning strategies accordingly. Learning does not only occur when we find the correct answers. It also occurs through failure (Nicol & Macfarlane-Dick, 2006). Discovery learning focuses not on finding the correct result but on the new things we discover. Moreover, it is the instructor's responsibility to provide feedback since, without it, learning is incomplete. Some strategies for assessing and providing feedback to e-learning students in GDL are (Nicol & Macfarlane-Dick, 2006):

Rubrics: Rubrics can assess student performance on specific tasks or assignments.

***Self-assessment*:** Self-assessment can be a powerful tool for promoting metacognitive skills and self-regulated learning.

Peer assessment: Peer assessment can be an effective way to provide feedback to students and to promote collaboration and teamwork.

Formative assessment: Formative assessment can be used throughout the learning process to provide students feedback and guide their learning.

To optimize the effectiveness of the DGL model for online e-learners, instructors need to design educational sessions that are engaging, interactive, and observable. These mediums could involve YouTube videos, online games, visual aids, and other digital attention-grabbing methods that stimulate curiosity and foster interest (Pappas, 2014). Encouraging students to explore and manipulate situations, grapple with difficult questions, and conduct experiments makes them more likely to retain and apply newly acquired knowledge. The ultimate goal of discovery learning is to empower learners to arrive at their own conclusions and solutions (Karuniawati et al., 2022; Mcleod, 2023; Prilliza et al.,

2020), which can enhance their critical thinking and problem-solving skills.

However, as with all models, the GDL model also has a few drawbacks that can make it difficult for ID to rely on this model consistently. Again, returning to Myers (2004) exposes the models' blatant weakness by pointing out that a theory of learning centered around individual choice, pure Discovery, and minimal teacher guidance may fail to select the relevant incoming information. Chen and Chen (2010) expressed that the GDL model should not be used as a primary instruction method as it has limitations in practice and might produce inadequate education for a self-directed learner. Finally, many authors indicated that this model's secondary weakness is the teachers (Chen & Chen, 2010; Myers, 2004; Nicol & Macfarlane-Dick, 2006). Instructors in the GDL model must be well prepared, anticipate the questions they may receive, and know the correct answers or guidelines to continue the learning process.

Conclusion and Recommendations

Guided discovery learning is a highly effective approach for self-motivated online e-learning students. By designing and providing a structured framework for exploration and discovery, students can engage with many materials in a more meaningful self-directed way, leading to a more significant potential for deeper understanding, knowledge retention, and greater critical thinking. The flexibility of the GDL model for online e-learners provides more opportunities for personalized instruction and feedback, and more time for collaborating and participating in in-depth conversations

with teachers and peers, further enhancing the benefits of this learning model.

However, there is still much to explore in the GDL model as we are still limited by factors such as our digital divide, connectivity, and the lure of the unknown. More time must be spent looking into mixed learning theory models, which combine elements of traditional classroom instructional models like ADDIE can combine with e-learning approaches like GDL. There has to be a medium where all types of student learners and instructional designing educators can find a model that works for all learners. Hopefully, it is in a kitchen around a freshly baked apple pie prepared in an industrial combination oven. As technology evolves and new pedagogical approaches emerge, the possibilities for enhancing the e-learning experience for each individual are fascinating.

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INSTRUCTIONAL DESIGN CONSIDERATIONS FOR EXECUTING AN INTEGRATED IMPLEMENTATION APPROACH OF ASSISTIVE TECHNOLOGY AT THE ELEMENTARY LEVEL

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Abstract

Assistive technology (AT) has revolutionized our educational system and my own teaching practice and from early years to post-graduate studies and beyond. As a 25-year veteran educator teaching in 2023, I reflect on my career and can attest my core philosophies have remained consistent, while the tools I employ are fortunately extremely enhanced. I approach teaching using practices that are student-centered; I aim to create accessible and inclusive learning spaces which are responsive and cater to the needs of *all* my learners, regardless of their ability or learning style. Fundamental tools I incorporate that influence and support achieving successes include a broad range of assistive technologies. Earlier in my career, these technologies did not yet exist, were not available, and comparable tools were absent, and as such, my learners were unable to achieve in the ways they are now able.

This paper details my teaching philosophies with regard to how I integrate technology, as well as highlights the shifts, design considerations, and proposed recommendations that I deem as significant in supporting student achievement and success. An assistive technological adaptation can be a device, item,

equipment, or product system that increases, maintain, or improve the functional capabilities of individuals with disabilities (Individuals with Disabilities Education Act Amendments, 1997). As much as my values have remained consistent, my methods and practices have evolved and been largely shaped by advances within the field of assistive technology.

I now leverage and balance my practice by combining available technologies, responsive support, and explicit instructional theories oriented in connectivism and constructivism models. Without maximizing and utilizing the available assistive technologies, my learners would not be as supported nor as successful due to not having such appropriate accommodations to excel and demonstrate their true knowledge. Recent studies demonstrate encouraging results, pointing to increased access to, and use of, AT devices among teachers working with students with disabilities (Cullen et al., 2003). This paper will examine research that maintains that assistive technology has enhanced and enabled student achievements unlike ever before and the importance of instructional iterations being implemented accordingly.

Keywords

accommodations, assistive technology, critical thinking, differentiation, exceptionalities, integrated approach, instructional design, learning disability, neurodivergent, program planning,

Introduction

I have been an educator in Nova Scotia for almost a

quarter of a century; over the course of this time, many changes have evolved and enriched my practice. If I were to compare my practice now to what I was delivering and striving for in 2000, there are stark differences in many ways, one being the fusion of assistive technologies.

For the bulk of my teaching career, I have held numerous positions within Student Services supporting a wide array of exceptionalities involving behavioral, communicative, intellectual, and an array of physical types. My career has been vast and complex; however, through these professional opportunities, it has solidified my stance in ensuring *all* learners have the supports they need to do and demonstrate their personal best. I care about seeing and supporting student progress and celebrating their gains. I want my learners to become independent with the skills needed for 21st-century learning, working, and beyond. I do my best to teach them to think critically and apply problem-solving skills. I would not be able to successfully work to achieve these objectives without the reliance on and application of AT. Teachers have a primary role in promoting the use of ATs; therefore, in order to achieve the inclusion of students with disabilities, teachers need to acquire the necessary skills and competencies (Fernández-Batanero et al., 2022).

Some of the issues I encounter with regard to assistive technology implementation include dependency, issues of access, misunderstandings, and differentiation. This paper will probe and emphasize recent findings which contribute to this discussion through an integrated pedagogical approach, specifically noting themes of intent, equity, application, advocacy, independence, and achievement. In my experience, the most significant

learning has been a result of employing a social connectivism approach whereby all students know they are valued, encouraged to share, feel confident, and equipped to risk take and solution seek both independently and collaboratively. These objectives are practiced and engaged in day-to-day throughout my classes and modeled for my learners so that their experiences are authentic, appreciated, and collectively communicated. Employing AT as a tool allows *all* my students an ability to contribute and engage and is a purposeful instructional design feature that facilitates learning through access.

Teaching Philosophy Statement

My teaching philosophy has consistently been to teach, support, and empower my students, regardless of their strengths or challenges, in ways that promote independent and confident thinkers. My approach is student-centered, responsive, and inclusive. The bulk of my career has been supporting a wide variety of complex learners, Grades Primary to Eight, who are neurodivergent, have exceptionalities, and require a variety of specifically individualized adaptations to support their growth and achievement. I attribute much of my growth as an educator to my ability to embrace and integrate specific assistive technologies into my practice to effectively support my students.

The learning theories my pedagogy particularly incorporates are those of social connectivism, zone of proximal development (ZPD) theory, and constructivism. The role of social networking and the incorporation of technology builds connection and supports achievement.

In my practice, what promotes learning is offering a space where students' individual strengths can be challenged while their needs met with scaffolded instruction, support, and opportunities for collaboration. My role as an intervention teacher necessitates me to differentiate and ensure instruction is appropriate, adapted, and accessible for all my students. My learners use tools and apply their knowledge to demonstrate what they know while also building new understandings in social, active ways. My classroom often pushes learners out of their comfort zones but in such a way that is safe, supported, and celebrated. Learners apply their own experiences, knowledge, and interests to what they are learning and enhance others' understandings through collaboration. When learners are offered opportunities to learn from, lean on, and cooperatively problem solve, this creates an environment where critical thinkers, solution finders, and innovative thought are generated. George Siemens' statement aptly and succinctly articulates what I value in my practice, "The connections that enable us to learn more are more important than our current state of knowing."

Learning is active, exciting, engaging, and organic in the sense that learners are empowered to make decisions and contribute to their own understandings, and natural connections become bridged. Scaffolded learning, whereby students themselves speak and contribute, drawing from their own experiences and bases of knowledge, allows for natural frameworks of understanding/knowledge to be created and co-created. The inclusion of AT promotes, enables, and provides accessibility for my students in means which have advanced tremendously over the course of my career.

As an intervention teacher, to not embrace what I have available with AT would be not to utilize a colossal tool kit and ultimately sacrifice my student's potential.

AT and instructional design promote individual achievement and independence; specifically, the design considerations this paper will highlight include; the need for *established intentional objectives, accessibility, differentiation, engagement, and collaborative planning*. Being tasked to prepare students with evolving 21st-century skills is a daunting undertaking in education while balancing existing curriculums; however, a priority must be to ensure our students with exceptionalities are included in this objective, too; assistive technologies and instructional design help to allow such overwhelming expectations become achieved and accomplished.

Literature Review

AT can be used to design, modify and differentiate instruction or customize instructional delivery to augment the needs of students with special needs across their lifespan (Akpan & Beard, 2013). Many academic articles have been published specific to assistive technology; its role, functions, and place within the system of education, the practice of teaching, and correspondingly the instructional considerations which need to be applied. This paper will reveal findings specific to the instructional design aspects required for efficient and impactful implementation to enhance student achievement. The following sub-sections have been methodically incorporated to exemplify how AT can and does transform learning, however, reveals the

design matters which need deliberate attention in the program planning process.

Intentional Objectives

Assistive technologies and intentional program planning allow me to perform my job while enabling my learners to also do their personal best. Utilizing AT should be *intentional.* The functions of the AT should allow the individual learner to have increased ability and enhanced supports to achieve the desired output, whether this be through writing, oral, computation, or other modes of interdisciplinary production. Several professionals have emphasized the importance of using compensatory approaches with students with LD; thus, AT adaptations can be effective supplements or adjunctive approaches to remediation (Bryant et al., 1998).

The following excerpts are from numerous articles referencing the enormity of impact AT can have when intentionally designed and implemented appropriately. The design of instruction using assistive technology should focus on the unique needs of the students, the requirements of the curriculum, and the technological resources to be used for teaching (Blackhurst, 2005).

In a time whereby AT is available, as educators, we would be negligent to elect not to incorporate tech to improve our practice and ultimately aid our students in achieving their personal best. Assistive technology can aid students with disabilities in overcoming or bypassing their learning challenges (Ahmed, 2018).

Effective instructional techniques that integrate technology must be developed wherein the principles of effective instruction are combined with technology's

potential (MacArthur, 1996). Through researching the significance of instructional design and the implementation of assistive technologies, establishing intentional objectives is a substantial piece in ensuring successful application.

Accessibility

In order to promote the classroom acceptance of students with disabilities, many techniques have to be considered, one of which is assistive technology (Ahmed, 2018). The technological transformations, which are now understood as standards in education, are indisputably changing and revolutionizing *how* students learn, *what* they are able to achieve, as well as *who* is able to participate in the learning. More than ever before, our classrooms are progressively more inclusive, equitable, and accessible, enabling all students access to the curriculum in ways unlike experienced before, in part due to the implementation and advances of assistive technologies. This shift cannot occur without *both* an educator who appreciates and acknowledges the significance of assistive technology and also the technology itself. Former U.S. Secretary of Education Arne Duncan maintained this certainty when saying, "Technology alone isn't going to improve student achievement. The best combination is great teachers working with technology to engage students in the pursuit of the learning they need."

Assistive technology is a tool to make learning more accessible and to increase individual motivation and productivity. Second, assistive technology empowers students to learn reading, writing, and mathematical

skills fluently, accurately, and independently instead of relying constantly on the assistance of others (Blackhurst, 2005).

Teachers may not be familiar with how to select the appropriate assistive technology to meet their students' individual needs. Today teachers are faced with an overwhelming number of assistive technologies. According to Edyburn (2005), there were an estimated 25,000 assistive technology products available in 2003. Therefore, it is essential to help teachers become proficient with technology integration into instruction.

Another issue pertinent to access is when schools have to apply for use and or if formal diagnoses are required prior to use due to site license requirements, these can create issues of access and be problematic. Within our centre of education, memorandums of understanding (MOUs) with companies have progressed, and fortunately, as such, our access and availability of assistive supports have become more easily available for *all* learners. Collectively our perceptions of assistive technology to support achievement has contributed as a significant piece of this pedagogical shift in our practice. There is also an appreciation that 21st-century skills not only require the fusion of technologies but they also necessitate them. Current skills sought in the workforce are those which entail technological proficiencies and aptitudes. Thus to best prepare all our learners, the application of technology is a requirement. Providing all students with AT programs may be their best chance for success both inside and outside the classroom. Denying them these options may exacerbate their special needs effects (Akpan & Beard, 2013).

Differentiation

AT can benefit children with increased opportunities for socialization, communication attempts, and interaction, increased self-esteem and confidence, as well as developing language and communication skills (Erickson & Koppenhaver, 1995). Through the program planning process, educators can determine which tools and AT functions are required specific to their learners' strengths and needs. AT has become widely incorporated and encouraged for all learners P-8 and beyond to employ to become more efficient, successful and independent students. For some, AT is a necessity and a specific adaptation, for others, it has become an accepted mode of mainstream learning. AT, both high and light provide enormous potential for students with special needs to capitalize on their strengths and, by bypassing, or compensating for loss of function, make the most out of their educational experiences (Akpan & Beard, 2013).

Providing all students with AT programs may be their best chance for success both inside and outside the classroom. Denying them these options may exacerbate their special needs effects (Akpan & Beard, 2013). However, having available technologies is not enough; it cannot be a 'one size fits all' approach or answer. As educators, a professional determination regarding the effectiveness of the best practices in technological innovation must be made (Parette et al., 2009).

Engagement

My teaching philosophy is an integrated approach whereby my learners are always at the center of my planning. My students are active participants who learn

by doing and participating often with voice and choice to allow for integration of their interests, ideas, and queries. I strive to ensure my teaching is purposeful, and engaging and my learners see themselves in what we are doing; they contribute to the making of meaning by adding their personal experiences and knowledge to contexts, as well as have options for ways to demonstrate their understandings and acquisition of information.

With the integration of assistive technologies, it is paramount that design considerations are given to pair tools that promote engagement and interaction and are appropriate for each learners' specific needs and abilities. Often through the use of AT, a learner is increasingly motivated as they are able to contribute, participate and share in the act of learning. Using technology can help students with disabilities enhance and improve their independence in academic and employment tasks and their participation in classroom discussions, along with helping them to accomplish some difficult academic tasks (Burgstahler, 2003).

AT is viewed as an essential part of instruction to help students with special needs develop basic and critical thinking. It makes it easier for students with disabilities to overcome their disability and succeed academically (Akpan & Beard, 2013).

Collaborative Planning

Technologies and innovations continue to advance, and the pace at which requires our teachers and systems to adapt and adjust the tools they are utilizing, this shift requires collaborative efforts and ongoing communication. Shifts need to continue to ensue in

order for appropriate technologies to become mainstream, available, and used in our system of education. The need for instructional designers to continuously manipulate and promote such tools and support our students is ever-present.

When teachers are determining appropriate AT, a collaborative instructional team should do a needs assessment examining the students' needs, where they will utilize the AT tool, what objectives can be done/supported with the use of the AT, and if it is learner appropriate. As much as educators continually need to reexamine, learn, implement, trial, and train themselves on new technologies, they, too, need to ensure what they are constructing and proposing for their students is applicable, functional, and valuable as an educational tool. The use of assistive technology adaptations by students with learning disabilities requires continued research and consideration by technology team members (Behrmann, 1994). As instructional designers, this ongoing determination would need to be done on a case-by-case basis to ensure accuracy, suitability, and employability.

Observing the technological changes in our education system, one can highlight the alterations, improvements, and challenges and also should acknowledge the progressions and transformations which arguably have contributed to enhancing the practice of teaching and student success. Current inclusive norms, which are commonplace, expected, and celebrated in classrooms, ultimately have allowed for more engaged, successful, and empowered learners in part due to designs that employ AT.

Conclusions and Recommendations

The field of education, not unlike other systems, is one of continual change and flux. We know more when we do more, and when we know better, we tend to do better. My career to date has certainly taught me much about how students learn, how systems and routines can enhance my practice, and how when my philosophical beliefs of learners continue to be at the forefront of planning, my impact is optimal. What my experiences in education have taught me, too, though, is there is *always* room for improvement, and staying stagnant is not something to be celebrated or proud of. When we are open, we grow, as do our students.

With regard to assistive technologies, as intimidating as they may initially seem, given time, patience, and again openness, the rewards one can reap from implementing and evolving our practice are worth the energy and effort to become familiar and proficient. Technologies, like our system of education, are continually emerging, and I would argue with the continued potential to strengthen our practices in transformational ways. The importance of intentional instructional design is paramount and a necessary governing practice for such growth and continued improvement and advances.

Thinking ahead to what to amend from reflection brings me back to the significance of conducting a needs assessment. Whatever it is we intend to implement, the value of the application needs to be known. This intention is achieved by reflecting are our students improved learning experiences, whether they are gaining skills, abilities, and or interests as a result, they are achieving more/better. Incorporating assistive

technology can be a very valuable and transformational accommodation for many students; ensuring the tools complement and correspond with what is needed and appropriate are instructional considerations that require judicious design and attention.

Educators, institutions, instructional designers, curriculum designers, and government agencies must consider meeting the need of special needs students in their various fields by providing accommodations for all students to succeed academically (Akpan & Beard, 2013). Throughout my readings, the issue of knowledge and current availability and readiness of our classrooms was a predominant theme that demands future consideration and attention. As indicated by Cullen et al. (2008), the findings raise concerns about the lack of awareness among professionals of what AT services are. While efforts have been made to educate professionals about the nature of AT devices, successful implementation of technology depends on the provision of services. This requires adequate training and increased awareness of AT services among teachers and other professionals who work with students with disabilities.

An educational design area requiring further attention, which is emphasized throughout my readings, is the demand for ongoing, current professional development (PD) opportunities to ensure teachers are equipped, aware, and informed of current AT tools and best practices. With any technologies, such PD cannot be offered as a 'one and done' approach; rather, it necessitates a continual basis review and update approach to recurrently troubleshoot and offer insights to suit the current advancements of tech and their implications.

Servicing and ensuring pre-service teachers also are equipped and involved in methodologies that incorporate assistive technologies within their education programs should be a recommendation of our Bachelor of Education programs. Learning doesn't end once one AT is implemented or introduced; rather, its functions too are on a continuum that is constantly developing. Researchers should explore the use of AT in relation to the type and degree of disability of learners. In this sense, it is also necessary to investigate effective teaching and learning strategies for these learners. In order to do so, it is necessary for teachers to have an adequate level of training so that they can apply these tools in the classroom (Fernández-Batanero, et al., 2022).

Future research into what available professional development (PD) and or supports are available for families, as well as educators alike, would be a valuable avenue to investigate. The worst situation is having the technology yet underutilizing it or not knowing how to locate, operate, troubleshoot, and or implement it. As famously expressed by Bill Gates, "Technology is just a tool. In terms of getting the kids working together and motivating them, the teacher is the most important." Not to soften the impact of a teacher, however, what is worth knowing is a need and strategic plan for teacher preparation programs to prepare pre-service teachers with the tools and knowledge to select, implement, and evaluate assistive technology for their future students. As impactful and as beneficial as AT is and can be, it cannot replace place strong, effective teaching. Technology is a tool whose implementation, like other devices, requires intentional planning, design, implementation, and review. This paper has indicated some of the

instructional design features which need to be considered and adhered to for the successful implementation of assistive technologies at the elementary level.

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DESIGNING THE INSTRUCTION OF PROJECT-BASED LEARNING THROUGH TRADITIONAL AND CONTEMPORARY

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Abstract

Recent trends in education have shown an increase in attempts to create more engaging and meaningful educational experiences. This paper will examine how the theory of communities of practice can be implemented in technology-enhanced learning environments and how it can be used in instructional design practices. This paper will also relate to how traditional learning theories such as behaviorism, social constructivism, and connectivism set the foundation for the implementation of communities of practice in an instructional design framework. Project-based learning amongst elementary school students serves as an example of how this combination of traditional and contemporary learning theories can complement the instructional design process and enhance the effectiveness of educational technology. The communities of practice theory, together with project-based learning can further be organized into the ADDIE instructional design model.

Key Words

Behaviorism, Communities of Practice, Connectivism, Instructional Design, Social Constructivism, Project Based Learning, Self Efficacy, Social Constructivism

Introduction

Advances in technology over the last two decades have allowed like-minded people to collaborate and share ideas across the globe. This paper examines how

technology and instructional design can foster a high level of collaboration in an elementary school classroom. The communities of practice theory, supported by traditional learning theories, can offer an opportunity to create engaging educational experiences for students and enhance their learning.

Project-based learning will be explored as an example in which a collaborative approach on topics of high interest can potentially increase student success. The implementation of technology to achieve these goals will also be considered. Finally, the self-efficacy demonstrated by students when engaging in collaborative, high-interest activities will be considered.

Teaching Philosophy Statement

The role of a teacher is always evolving, as is the world of education and technology. Ever since starting my journey as a teacher, I have prioritized giving students the chance to work together and create new and meaningful experiences. My philosophy is rooted in showing students how to interact with kindness, respect, and wonder. Interacting with kindness and respect provides an expectation amongst students that everyone's voice is valued and listened to. Creating a sense of wonder allows students to ask questions and provide feedback. Teaching collaboration skills is important to me because it creates a more realistic space for students to build an understanding of not only the curriculum but the world around them. Educational technology within this approach can create spaces where students can quickly and easily collaborate in an efficient and organized

manner. Both traditional and contemporary learning theories align with my approach to teaching.

While Behaviorism is not a theory that I ground my teaching in, it does relate to how I set expectations for how students should act when engaging in learning activities. "Behaviorism is key for educators because it impacts how students react and behave in the classroom" (Western Governors University, 2023). Earlier in my career, I would put a large emphasis on higher-level learning goals without addressing basic expectations. Offering a small reward or positive reinforcement for interacting respectfully without prompting or temporarily restricting access to technology when misused as both ways I have set classroom expectations.

Social constructivism "regards the social practices people engage in as the focus of enquiry." (Andrews, 2012). My teaching heavily relies on students' collaborative nature with each other and the tools they use to explore concepts. Working in groups, having discussions, involving the community, and relating learning to current events are all ways my teaching aligns with elements of this theory. Students create their understanding through interactions with each other and the world around them.

Connectivism relates to how technology is leveraged in my teaching. A major aspect of this theory is "the ability to see connections between fields, ideas, and concepts is a core skill" (Siemens, 2005, as cited in Power, 2023). Technology is essential in making these connections in various cross-curricular projects. Diverse groups of students can take on a project and connect it to various parts of the curriculum and their personal experiences. Using technology to further explore and organize their

ideas is a way in which students can all be included and work together to create artifacts proving their understanding.

The three traditional learning theories discussed all set the foundation for how I align my teaching with the theory of communities of practice (CoP). "Communities of practice are groups of people who share a concern or a passion for something they do and learn how to do it better as they interact regularly" (Wenger-Trayner, 2012). In my classroom, I always build relationships first and get to know the students. I strive to understand their passions and interests and design my instruction to make the curriculum more meaningful to them. Working with other students who share the same interests on projects gives them an opportunity to push each other to take risks and explore. There is increased self-efficacy when students are invested and motivated by their interests. They want to do well and master their skills because they are motivated by their own desire to learn and support their peers. Collaborative use of technology to create projects that students are passionate about is a key aspect of creating this type of learning environment. Learning goals are set so students can easily identify and work towards them. Students work together, with assistance from the teacher on how to solve problems as a collective group.

Literature Review

Communities of Practice and Traditional Learning Theories

Before students can engage in CoP, traditional learning

theories must be pulled to set the stage for higher-level thinking. "CoP development requires establishing a stronger link between the lived experience of what it means to learn socially with other people" (Pyrko, 2017 p. 405). To learn socially, students must exhibit a certain mindset toward learning that can be explained by the traditional theories discussed previously. This includes knowing how to interact in a productive manner, respecting others' opinions or prior knowledge, and having strategies to connect ideas to new learning.

Managing behavior is essential to have students engage in meaningful learning experiences and increase the efficient use of instructional time. There are opportunities to use this behaviorist approach in a collaborative way that leverages the effectiveness of technology in the classroom. One such example is "tootling" in elementary classrooms using the "Class Dojo" educational technology program. Unlike tattling, tootling "describes a procedure in which children report their peers' appropriate behaviors." (Dillon et al., 2019 p. 19). Students help maintain favorable conditions for learning by offering positive reinforcement to each other. Technology is used here as a means to efficiently record and present these positive interactions. Rewards can then be offered to the whole class if they achieve a certain number of these positive interactions. It was shown that there were decreases in disruptive behavior and increases in academically engaged behavior in classrooms who consistently used this method. (Dillon et al., 2019 p. 26).

Connectivism can contribute to how students effectively use technology in the classroom to link their current knowledge to the vast amounts of information found in the digital world. When working together

students must know how to navigate content and create connections, rather than memorize information. In order to facilitate a learning environment using CoP students need first to understand how to use technology effectively and efficiently. This includes becoming familiar with how to ask questions and research information effectively. The practical use of this strand in the classroom is project-based learning objectives. Homanova et al. (2018) describe an example where students gained an understanding of a local dialect that was disappearing. The project was based on practical experiences they already had, and then those experiences were connected to the new content they were being taught. Students used school-owned and personal technology to connect, record and organize their ideas to create a project that achieved their learning objectives. An important takeaway from this project was that "This situation prepares pupils for a professional environment" (Homanova et al., 2018, p. 183). The CoP framework also draws from creating working groups where students, colleagues or community members work together to solve common problems.

Social constructivism also relates to the CoP theory as it relies on the sharing of knowledge from peers and outside sources. The cultural and social backgrounds of students offer valuable perspectives into how we construct a classroom community of learners. The skill of being able to be confident in sharing one's own knowledge but remaining open-minded to different views from peers is critical to effective group work. Examples of this can be found in cross-curricular projects in science and art. Gross and Gross (2016) show an example of social constructivist ideas combined with

various forms of technology when creating art projects using coding combined with traditional materials. During the project "Students learned from and with their classmates, but also differentiated projects to meet individual vision." (p. 42) CoP also encourages students to share their different ideas with confidence, but while also combining common understandings to help each other achieve common goals.

Aligning Instructional Design with Communities of Practice

Organizing instructional time, access to information, technology, and managing assessment are all important aspects of using the CoL theory in a project-based setting. The many moving parts that make up this educational experience must be organized to make all aspects work together to their full potential. Project-based learning may seem unconventional and appear to have limited planning on the surface, but the underlying design must be carefully planned. Students will still need to have clear goals and objectives. Assessment will still need to take place to identify if the desired learning has occurred. Project-based learning builds students' capacity to work through problems that often mirror the real world, making it a valuable educational approach. (English and Kitsantas, 2013, p. 130)

When considering the open-ended nature of problem-based learning, a proven and well-structured approach to instructional design must be taken. Instructional system design (ISD) is a proven way instructional designers can take their ideas on how they plan to teach learners new concepts and skills. The ISD known as ADDIE will be

used to explain how both the traditional and contemporary learning theories discussed in this paper can be used to support project-based learning. ADDIE is an acronym for the five phases within the design system. They are: analyze, design, development, implementation, and evaluation. (Clark, 2015)

Analyze

Instructional goals must be listed. What students should know and what steps they need to take to get there should be recorded in this step. What learning objectives will the students achieve and participate in as part of their project? The learners will also need to undergo an analysis to discover what they may already know or what prerequisite skills they should have before beginning.

Design

Assessment needs to be considered early on in the process. There needs to be a plan for assessing the learning objectives from the previous step. In the example of a group project of the students' choice, the process they take will be evaluated here, not necessarily the content in the project. The format of the project will also be included here. If it is a multimedia presentation, what software will students use?

Development

In this step, a project-based learning experience sample should be created and shared with other colleagues for feedback. This will identify early issues and problems before further work goes into instruction planning.

Materials lists will be finalized in the development stage as well. In this step, it is important to put yourself in the student's mindset, to make sure it is clear and well-prepared from their perspective.

Implementation

Deciding how to present the project to learners will occur once the project framework has been developed and the learners have been introduced. Student grouping based on an earlier analysis will be finalized in this step. To align with the CoP theory learners should have a common interest. This step will also see the physical (or virtual) space organized to meet the project's needs.

Evaluation

Both formative and summative assessments will provide important feedback on the effectiveness of the project. Early on in the project, it will be important to check in with students on the clarity of instructions. Observations of student engagement are also an important aspect to monitoring the project's performance. As the project progresses, questionnaires on the attitudes of students should be considered.

The organization the ADDIE model presents brings the project's design into a more systematic and deliverable framework. A project that appeared to be unorganized and without clear goals now has identifiable goals, procedures, and assessments. It should be noted that these steps should be read linearly, as the feedback obtained from the evaluation period can be linked back to any stage and changed as needed, to meet the instructional goals listed in the analysis stage.

While the ADDIE model fits my ideas of CoP and project-based learning, it does have some warranted criticism. It may be overly complex for small courses or for teachers in a more traditional classroom setting. (Bates, 2015) As an elementary school teacher with a large class and a high workload due to individual needs, engaging in the ADDIE model for a unit that will only take a few weeks to complete may be burdensome. I would perhaps be best suited to someone developing a curriculum for a district, over a classroom teacher planning a passion project for their class. That being said, I believe as an organization tool in the instructional design process, it can be used by anyone successfully.

Conclusions and Recommendations

As the needs of learners evolve and educational technology advances, it is important to consider its implications on good instructional design. Traditional learning theories may seem outdated and redundant at times, but some aspects stand the test of time. The world we live in is rapidly changing, but human nature generally stays constant. This is why theories like behaviorism can still have practical applications to contemporary learning theories such as CoP. Students still need some motivators and reinforcement to be productive participants in a group of peers that share similar interests and goals. The ADDIE model has also been used for many years but still holds up as a solid approach to instructional design. It may seem rigid and cumbersome at a glance, but the same phases and overall structure can be applied to new methods of teaching and learning.

Project-based learning helps prepare students for adulthood by building collaboration skills and learning how to solve problems as a group. When projects are carefully planned using both proven teaching theories and sound instructional design, the potential for increased student learning is evident. Starting with clear learning goals and monitoring assessments through the ADDIE model can ensure open-ended projects completed by students stay on track for their intended purpose. In my own teaching practice, I have not always been successful in completing these projects as intended. Projects start out well, but the final projects (if completed) sometimes need elements added for assessment. I believe with the help of proven learning theories, and the implementation of an instructional design model such as ADDIE, I will be able to be more successful in the future.

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