

EDST4500 Enabling Learning through Technology: Student Assignments

EDST4500 ENABLING LEARNING THROUGH TECHNOLOGY: STUDENT ASSIGNMENTS

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CONTENTS

Introduction to the Book	1
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Part I. Part 1: Coding in the Early Years and Student Success

1. 1.1 Introduction	5
2. 1.2 Positionality Statement	6
3. 1.3 Discussion	7
4. 1.4 Recommendations for the Future	9
5. 1.5 Reflection Questions	10
6. 1.6 References	11

Part II. Part 2: The Power of Gamification in Workplace Training

7. 2.1 Introduction	15
8. 2.2 Positionality Statement	16
9. 2.3 Discussion	17
10. 2.4 Recommendations for the Future	20
11. 2.5 Conclusion	22
12. 2.6 Reflection Questions	23
13. 2.7 References	24

Part III. Part 3: The Importance of Teaching Ethical Use of Technology

14.	3.1 Introduction	29
15.	3.2 Positionality Statement	30
16.	3.3 Discussion	31
17.	3.4 Recommendations for the Future	33
18.	3.5 Reflection Questions	35
19.	3.6 References	36

Part IV. Part 4: The Need for Professional Use of Generative AI within Education

20.	4.1 Introduction	39
21.	4.2 Positionality Statement	40
22.	4.3 Discussion	41
23.	4.4 Recommendations for the Future	43
24.	4.5 Reflection Questions	44
25.	4.6 References	45

Part V. Part 5: Enhancing Culturally Responsive Teaching Through Digital Tools

26.	5.1 Introduction	49
27.	5.2 Positionality Statement	50
28.	5.3 Discussion	51
29.	5.4 Recommendations for the Future	54
30.	5.5 Reflection Questions	55
31.	5.6 References	56

Part VI. Part 6: Assistive Technologies in Elementary Literacy

32.	6.1 Introduction	59
33.	6.2 Positionality Statement	60
34.	6.3 Discussion	61
35.	6.5 Reflection Questions	63
36.	6.4 Recommendations for Future	64
37.	6.6 References	65

Part VII. Part 7: Enhancing Learning with Assistive Technology for Students with Exceptionalities

38.	7.1 Introduction	69
39.	7.2 Positionality Statement	70
40.	7.3 Discussion	71
41.	7.4 Challenges and Considerations	74
42.	7.5 Recommendations for the Future	75
43.	7.6 Reflection Questions	77
44.	7.7 References	78

Part VIII. Part 8: Exploring the Practice of Workplace eLearning

45.	8.1 Introduction	83
46.	8.2 Positionality Statement	84
47.	8.3 Discussion	85
48.	8.4 Recommendations for the Future	87
49.	8.5 Reflection Questions	88
50.	8.6 References	89

Part IX. Part 9: Digital Divide in Education

51.	9.1 Introduction	93
52.	9.2 Positionality Statement	94
53.	9.3 Discussion	95
54.	9.4 Reflection Questions	98
55.	9.5 References	99

Part X. Part 10: Enabling Learning Through Technology

56.	10.1 Introduction	103
57.	10.2 Positionality Statement	104
58.	10.3 Discussion	105
59.	10.4 Key Challenges and Opportunities	106
60.	10.5 Reflection Questions	110
61.	10.6 Conclusion	111
62.	10.7 References	112

Part XI. Part 11: Gamification in Higher Education

63.	11.1 Introduction	115
64.	11.2 Positionality Statement	116
65.	11.3 Discussion	117
66.	11.4 Recommendations for the Future	122
67.	11.5 Reflection Questions	123
68.	11.6 Conclusion	124
69.	11.7 References	125

Part XII. Part 12: Engaging Minds and Hearts

70.	12.1 Introduction	129
71.	12.2 Positionality Statement	130
72.	12.3 Discussion	131
73.	12.4 Key Challenges, Opportunities, and Trends	132
74.	12.5 Recommendations for the Future	134
75.	12.6 Reflection Questions	135
76.	12.7 References	136

Part XIII. Part 13: Integrating E-books in Education

77.	13.1 Introduction	139
78.	13.2 Positionality Statement	140
79.	13.3 Discussion	141
80.	13.4 Recommendations for the Future	143
81.	13.5 Reflection Questions	144
82.	13.6 References	145

Part XIV. Part 14: The Role of Professional Development in the Integration of Assistive Technology in K-12 Learning

83.	14.1 Introduction	149
84.	14.2 Positionality Statement	150
85.	14.3 Discussion	151
86.	14.4 Recommendations for the Future	154
87.	14.5 Conclusion	155
88.	14.6 References	156

Part XV. Part 15: Inclusive Constructivist Learning in Technology-Rich Makerspaces

89.	15.1 Introduction	161
90.	15.2 Positionality Statement	162
91.	15.3 Discussion	163
92.	15.4 Recommendations for the Future	166
93.	15.5 Reflection Questions	169
94.	15.6 References	170
	Appendix	173

INTRODUCTION TO THE BOOK

From the Ontario Tech course catalog: *This course forms part of the Equity, Diversity and Inclusion (EDI) specialization in the BA in ESDT program. Students in this course critically evaluate opportunities and challenges in promoting equitable technology-enabled education. With the advancement of educational technologies, new affordances have emerged to enable learning to be more adaptive, personalized and embedded in everyday devices. These affordances need to be matched with pedagogical approaches that support equitable opportunities for the successful realization of educationally meaningful learning outcomes including motivation, engagement and achievement for every learner. Students will examine current research and policy for the use of technology to support inclusive education including Universal Design for Learning (UDL), accessibility and differentiation. With a focus on group work, learners will analyze how these EDI concepts and their related policies promote meta-learning competencies such as collaboration and metacognition for all students.*

This course encouraged students to apply equity and anti-racism/anti-oppression lenses to policies, practices, programs, and initiatives in technology-enabled education. I wanted to encourage students to view these not only from a theoretical perspective, but from their own lived experiences as well. To that end, students selected their own topics in the area of technology-enabled learning and used positionality to lend their own unique voice to their chapter. As part of open pedagogy, the students also engaged in a peer-review process before editing and submitting their final chapter. It is my hope that we can continue to build on this resource each year, to further highlight the amazing journeys that the students in this program have engaged in.

Have a great read!

Dr. Sarah Ann Stokes

PART I

PART 1: CODING IN THE EARLY YEARS AND STUDENT SUCCESS

By Sarah Guthrie

1.

1.1 INTRODUCTION

In today's technology-driven society, the landscape of education is rapidly changing. This change leads students to discover creativity, foster problem-solving, and develop critical thinking skills. Coding in kindergarten and primary grade is slowly becoming an essential tool in offering young learners opportunities to foster skills that will give them the skills and tools to be successful in skills such as *science, technology, engineering, art and mathematics* (STEAM). The benefits of STEAM in a kindergarten classroom are that it allows students to become innovators and cultivate creativity.

This chapter explores integrating coding in kindergarten to grade 3. We will dive into how to establish a framework for educators to effectively develop a strong coding pedagogy that emphasizes the impact of deep critical thinking and creativity in the success of solid coding and making a stance. STEAM is a foundation for a problem-based learning program. Combining science, technology, engineering, art and mathematics creates a relevant and student-centred learning environment. This autonomy in guiding their learning fuels the success of a program focused on coding and Making.

The addition of STEAM into the Ontario curriculum aligns nicely with the play-based, inquiry-based learning of the two-year kindergarten program. By empowering students to become leaders in their thinking and doing, we are supporting students in becoming lifelong learners who ask questions, find answers and work together for a common goal. As technology advances and apps become more accessible, the ability of students to become creative thinkers and innovators will improve. Lifelong learners who use coding learn about sequence, logic and problem-solving. Making allows students to express their ideas, experiment, and ideate using digital tools and hands-on materials. The combination of coding and making instils strategies for critical thinking and problem solving that can also be used cross-curricular.

This chapter aims to provide educators with resources and strategies to implement and create a rich, vibrant, and authentic learning experience for students. The chapter will examine the benefits, disadvantages and attitudes towards Coding and Making in the classroom.

2.

1.2 POSITIONALITY STATEMENT

The use of technology in today's society has grown, so we are now looking at tools, lessons, and assignments that use technology in an equitable way that celebrates and supports diverse needs and interests. Intersectionality is a term I now use to describe my understanding of anti-bias education, equity, diversity and inclusion. Intersectionality explains how our identities define us, influence us, and impact our beliefs and biases. As a white Canadian Female, I have certain privileges that allow me to live my life without discrimination, judgment or inequity. I am many things. I am a mother, a wife, an educator, a believer in god, employed, educated and do not have any disabilities. Although I have faced adversity, I am fortunate to have a rewarding and successful life. My experiences in the early childhood studies program have taught me that it is not enough to say you are informed; you must put it into practice. My awareness compelled me to intentionally foster an inclusive and equitable classroom environment—a classroom where diverse voices and perspectives are celebrated and respected by all. My intersecting roles as a mother and educator allowed me to recognize the importance of displaying empathy and understanding of children's social and emotional well-being. My awareness of social and emotional Development will also enable me to understand my student's unique learning styles and preferences. Differentiated instruction is an integral part of my teaching pedagogy as it ensures all students have the tools, skills, and confidence to be successful in their ways. The advances in technology have made differentiated instruction much more engaging for many students. Technology can bridge the gap between learning discrepancies in our students and help educators assess and keep running learning records. This is where coding and making pedagogy come into play in my practice. To support our students, we need to meet them where they are. In today's society, many students are exposed to technology and open educational resources before entering the kindergarten program. Providing students with STEAM opportunities in my classroom is where I can support students in developing critical thinking skills, problem-solving skills, math and literacy skills and build peer relationships. Coding and Making can guide differentiated instructions, leading to student success and lifelong learning.

3.

1.3 DISCUSSION

Coding and making in kindergarten fosters students' natural curiosity to explore, play, and create. In kindergarten, integrating coding and making connections takes time; however, with time and careful consideration, the success of students who can perform tasks and demonstrate their learning will be undeniable. Although many schools can access apps, OER and devices, not all students have been exposed to coding and Making. An easy way to introduce coding in kindergarten is by using Unplugged coding with students. Unplugged coding refers to hands-on tasks with simple instructions. By building a foundation in STEAM and Unplugged coding, students are exposed to key concepts and ideas using hands-on, logical and structured activities (Akiba, 2022). Examples of unplugged coding are using material in the classroom that can be moved and manipulated to follow a direction, step or spoken or visual command. These activities are a great stepping stone for introducing coding using technology. Technology has improved the ability of students to focus on their diverse learning needs and be successful in the areas of study they choose. Through the use of open educational resources, such as Scratch and Scratch Jr, students have the opportunity to thrive according to the learning preferences or styles they choose. These technologies can be reused in any context the educator needs, remixed to create a new resource, revised to suit the social constructivist learning model, kept forever, and redistributed to be shared (McNutt et al., 2022). The ability to access these technologies opens the door for all learners.

Some challenges in coding and Making are teacher preparedness and available resources. Some educators may consider coding a scary concept too difficult for kindergarten students to understand. With a complete understanding of the benefits and strategies of implementing computational thinking, coding and making a curriculum will be successful and help implement a STEAM program (2021). It is equally essential for educators to consider the developmental appropriateness of coding and when to implement coding. This is where we address the “when” and consider the stages of language and cognitive Development of our students. It will look different for different ages. For preschoolers, introducing open-ended exploration and the connection between the digital world of coding and playing with robots. Older children in kindergarten and primary grades could begin using digital programming tools to tackle real-world problems using steps and procedures (Geist, 2016).

Additionally, resources may be limited in some economically low communities, which will limit the availability of training for educators, the number of devices for students, access to stable internet and free open educational resources. These challenges were evident during the COVID-19 pandemic, which created a digital divide that made it hard to bridge the gap between equal opportunity for all students (Montiel et al, 2021).

As mentioned previously, coding is a stepping stone for many areas of learning. Coding leads to STEAM fields, which foster confidence, problem-solving skills and perseverance, to name a few. The success of coding is a gradual process that becomes evident throughout a young learner's educational journey. (Papert,1993) Research also shows that coding in early years, including math and problem-based learning, leads to future success in post-secondary education (Yadav et al., 2016).

4.

1.4 RECOMMENDATIONS FOR THE FUTURE

Educators are lifelong learners, continually being asked to learn new assessment tools, unlearn certain biases and explore new ideas. 21st-century technologies have changed the landscape of education excitingly and positively. The digital divide was brought to the forefront during COVID-19 when we quickly shifted to online learning and working from home. Two notable issues are the need for more professional development and equitable ease of access for all learners. In the article *Using Early Childhood Education to Bridge the Digital Divide*, the author offers examples of how working towards bridging the digital divide will continue to foster social-emotional skills, cognitive skills and motor skills in those students in the early years who are still developing those skills (Daugherty et al., 2014). Although the gap may never be eliminated, we can start by providing opportunities for early childhood educators and teachers to work alongside students to practice and problem-solve.

Investing in educators to receive proper professional Development is in the best interest of stakeholders such as policymakers and administrators. Professional Development should not only include learning strategies for implementing coding but should offer hands-on, real-time experience. This formal training can be essential for facilitating coding activities and nurturing the success of early learners (Akiba, 2022). One area to consider in professional development would be the integration of coding with other subjects. We have already heard about STEAM (Science, Technology, Engineering, Art and Mathematics) (Hwang et al., 2018). Coding is an opportunity to use the subjects, build confidence and resilience, and nurture a collaborative learning environment that promotes teamwork and allows students to learn from each other (Berland & Lee, 2011).

Bridging the gap between low-income schools and technology is a complex plan. Prioritizing underserved schools that lack the resources and infrastructure and focusing on ways to raise funds and get devices and technology into schools. Coding apps like Scratch JR are one of the few that offer OER that is accessible at school. These recommendations will help to serve diverse backgrounds and underserved schools. (Daugherty et al., 2014).

Coding has come a long way, particularly in the last several years, with the advancements of AI and open educational resources. The success of students exposed to coding in the early years predominantly lands in the hands of educators in the early years. The exposure and accessibility of coding in the classroom will give these students the drive to be successful lifelong learners.

5.

1.5 REFLECTION QUESTIONS

1. What are teachers' primary challenges when introducing coding in early childhood settings, and how might they overcome these barriers?
2. In what ways can coding activities be adapted to ensure inclusivity for children from diverse socioeconomic backgrounds?
3. How can early coding experiences foster creativity, resilience and success in young learners, and what classroom practices best support these outcomes?

6.

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PART II

PART 2: THE POWER OF GAMIFICATION IN WORKPLACE TRAINING

By Kim Henry

7.

2.1 INTRODUCTION

Gamification is proving to be an increasingly effective strategy for enhancing employee engagement in workplace training programs. Gamification involves using game-like elements, including badges, points, leaderboards, and challenges in non-game-like settings to improve participation and learning outcomes (Rahiman et al., 2023; Capatina et al., 2024). These elements give employees a sense of recognition for their achievements which encourages them by providing a sense of accomplishment and promotes ongoing participation. This ultimately leads to increased engagement and enhances knowledge retention. Gamification also enhances intrinsic motivation by making learning more enjoyable and rewarding, which leads to a more impactful training experience (Wang et al., 2022). Creating a positive learning experience is essential for the success of workplace training programs.

This chapter explores how gamification elements can be integrated effectively into workplace training programs to engage and motivate employees, improve knowledge retention, and enhance overall performance. Based on recent studies, the chapter provides practical recommendations for effectively incorporating gamification in workplace training settings. This content is relevant for professionals involved in the development and implementation of training programs across various sectors.

8.

2.2 POSITIONALITY STATEMENT

I am a white, heterosexual, able-bodied, English-speaking Canadian from an upper-middle-class family, a mother of two, and a business owner. Growing up in a tech-savvy family with a father in IT, I was introduced to technology early on through computers and video games. This early exposure has significantly shaped how I engage with technology in learning and daily life. My access to higher education and consistent exposure to technology have afforded me considerable advantages, including a comfort level with digital tools that many individuals may not share. My professional graphic and web design background further contributes to my ease with diverse technologies.

As a business owner, I recognize I have the autonomy to implement and adapt digital strategies freely, which gives me flexibility but also limits my understanding of those who lack similar resources, technical comfort, or decision-making power. I acknowledge my experiences limit my understanding of the challenges others face, such as accessibility barriers, unfamiliarity with digital tools, and the anxiety that can accompany learning new technologies.

Observing the challenges my colleagues face with technology and their lack of motivation during training sessions has highlighted the need to increase engagement and consider diverse perspectives when designing learning solutions. To address this, I plan to seek input from diverse viewpoints and explore ways to incorporate gamification into training sessions. My goal is to create learning experiences that are engaging, inclusive, and equitable for all employees, regardless of their technological proficiency or background, while also enhancing knowledge retention, boosting motivation, and making learning more accessible.

9.

2.3 DISCUSSION

Current State and Trends of Gamification in the Workplace

Gamification is growing in popularity in the workplace as an innovative tool for employee learning. Although originally developed within educational settings, gamification has become essential in workplace training, transforming traditional methods into more dynamic and interactive experiences that better capture employee attention and improve knowledge retention (Schöbel et al., 2020). Many employees who have participated in gamified training in the past recognize and appreciate the benefit of how gamified systems provide immediate feedback and personalized pacing, making the learning experience more interactive and engaging (Grünwald et al., 2019).

Research shows that gamified training is often more effective at improving knowledge retention compared to traditional methods. For instance, Brull et al. (2017) found that employees engaged more with learning materials when gamified elements were present, which led to better knowledge recall. Similarly, a case study by Turco (2013) showed a 75% increase in employee awareness of company values and products after implementing gamified training which also resulted in reduced coaching time and administrative costs.

Some of the more common gamification techniques that can be used are points, badges, leaderboards, and challenges. These elements act as extrinsic motivators that enhance employee satisfaction, knowledge acquisition, and information retention (Armstrong & Landers, 2018; Baxter et al., 2016). Extrinsic motivators refer to external factors, such as rewards, recognition, or competition, that encourage individuals to perform tasks for outcomes separate from the activity itself (Morris et al., 2022). Points offer employees a way to track their progress through immediate feedback and ongoing engagement with the training content (Jayalath & Esichaikul, 2022). Badges recognize achievements, creating a sense of accomplishment that motivates employees to complete the learning session and further pursue other learning opportunities (Kyewski & Kramer, 2018). Leaderboards and challenges introduce a competitive element to learning, enhancing motivation among colleagues while creating a sense of community and encouraging continuous improvement (Larson, 2020).

However, for gamification to be successful, it must align with both employee preferences and organizational goals (Rahiman et al., 2023). If gamified training is designed poorly, it can lead to superficial engagement or promote unhealthy competition, which negatively affects the long-term benefits of gamification (Rahiman et al., 2023). Accessibility is also another critical consideration. Many gamified platforms fail to accommodate employees with disabilities. In order to be inclusive, these platforms need to be designed with accessibility in

mind, accommodating auditory, cognitive, neurological, physical, speech, and visual disabilities (Smith, 2019). Without these considerations, gamified training risks excluding certain employees, which limits the potential benefits for diverse learners.

As gamification continues to grow and evolve in workplace training, the current trend highlights the importance of inclusivity and thoughtful design to maximize its benefits.

Opportunities

Gamification provides many opportunities to enhance motivation, engagement, and collaboration in workplace training through interactive and inclusive features that cater to diverse learning preferences and create a supportive team environment.

Incorporating social interaction features, such as team-based tasks and friendly competition allows employees to develop a sense of belonging that strengthens long-term engagement and relatedness (Luarn et al., 2023). In fact, as stated by Luarn et al. (2023), “competition with other teams has been shown to enhance a feeling of belonging, which in turn boosts motivation and engagement” (p. 414). Gamification also promotes knowledge sharing in collaborative environments, where employees are more likely to exchange skills for recognition or rewards (Dikcius et al., 2021).

According to Self-Determination Theory (SDT), gamification drives intrinsic motivation by satisfying core psychological needs for autonomy, competence, and relatedness, which are essential for effective learning environments (Luarn et al., 2023). Intrinsic motivation is defined as “the inherent tendency to seek out novelty and challenges, to extend and exercise one’s capacities to explore and to learn” (Ryan & Deci, 2000, as cited in Fishbach & Woolley, 2022, p. 14). A major benefit of gamified systems is their ability to provide immediate feedback on tasks and performance, which reinforces learning, encourages self-correction and improvement, and clarifies expectations. This feedback drives employees’ needs for autonomy and competence while sustaining motivation over time (Luarn et al., 2023).

Additionally, gamification allows for personalized learning experiences, catering to diverse employee needs and learning styles. Organizations can incorporate elements, such as narratives and challenges into their design to create tailored learning paths that increase feelings of competence, which increases intrinsic motivation and job performance (Wee & Choong, 2019, as cited in Bitrián et al., 2023). Research by Alsawaier (2018) further supports that the interactive nature of gamified learning leads to higher satisfaction, engagement, and long-term retention of information.

Lastly, to maximize both effectiveness and inclusivity, organizations should apply Universal Design for Learning (UDL) principles when developing gamified training. Providing multiple ways to access content, such as captions for videos, transcripts for audio, and alternative text for images ensures that employees with diverse abilities can engage meaningfully with the material (Rawashdeh et al., 2021). Also, using clear language and incorporating features compatible with assistive technologies further enhances accessibility, allowing all employees to participate fully in the learning experience.

Challenges

Along with opportunities, gamification in workplace training also presents challenges that need to be addressed. A major challenge is the “novelty effect,” where engagement initially spikes following the introduction of game elements, but quickly declines once the novelty wears off (Torresan & Hinterhuber, 2023, p. 387). This decline can compromise the long-term effectiveness of gamification in workplace training. To address this, training programs should incorporate a variety of game elements and regular updates to content to maintain interest and motivation. Bitrián et al. (2023) suggest that some game elements, including clear goals and feedback, have little impact on enjoyment, demonstrating the need for a carefully tailored, context-specific design in gamified systems.

Another challenge is the over-reliance on extrinsic motivators, such as points and badges. These items may drive short-term engagement, but they might not lead to a lasting behavioural change. Callan et al. (2015) emphasize that rewards must be thoughtfully aligned with organizational goals to prevent promoting behaviours that favour speed or quantity over quality and accuracy.

Finally, gamified training can enhance learning and engagement, but it can also create accessibility barriers for some learners. Gamified training may unintentionally exclude employees with diverse abilities and needs without careful consideration in planning. It is essential to incorporate accessibility features into the design of the training program in order for employees to fully and meaningfully participate in the training. As Smith (2019) points out, accessibility considerations including screen readers, alternative text for images, captions for audio, and flexible navigation can make a huge difference in creating an inclusive training experience. This inclusivity is so important for maximizing the benefits of gamification across a diverse workforce to make sure all employees, regardless of their abilities, can engage meaningfully and effectively with the training material (Rawashdeh et al., 2021; Smith, 2019).

10.

2.4 RECOMMENDATIONS FOR THE FUTURE

The following are two recommendations when considering incorporating gamification into a workplace training program:

Incorporate collaborative and social elements into gamified workplace training

One way to sustain long-term engagement in gamified training is by incorporating collaborative and social interaction elements into the training session, such as team-based challenges and peer feedback. For example, team-based challenges could include small groups working together to solve a real-world problem related to the training session, or they could compete in a trivia-type game for some friendly competition. Peer feedback might have employees review each other's work or progress throughout the training session by providing constructive feedback. These social elements help build a sense of community and belonging, which is important for maintaining motivation by satisfying employees' psychological needs for relatedness as identified in SDT (Luarn et al., 2023). Creating a safe, open, and collaborative environment among colleagues builds a strong foundation for sustained motivation and teamwork. When these needs are met through social rewards and collaboration, it increases individual motivation and creates a shared sense of purpose (Dikcius et al., 2021).

Further supporting this recommendation, Capatina et al. (2024) found that collaboration in gamified settings significantly improves knowledge sharing because employees are more likely to exchange ideas and skills when working toward a common goal. This shared responsibility not only promotes individual learning but also increases the overall effectiveness of training by allowing employees to benefit from diverse perspectives and expertise.

It is important for educators and workplace trainers to incorporate collaborative elements into their training programs to create an interactive and dynamic learning experience to encourage active participation and sustained engagement across the workforce (Torresan & Hinterhuber, 2023).

Personalize learning paths by applying UDL principles

It is important to recognize that employees will be motivated by different gamification elements and it is

essential to offer personalized learning paths that address these individual needs and learning styles. According to Bitrián et al. (2023), gamified systems that allow for personalization, such as allowing learners to choose specific challenges or goals, result in higher engagement and better learning outcomes. Personalized learning helps employees feel more in control of their personal development, which leads to increased motivation and job performance.

Incorporating UDL principles into personalization gamified training ensures that training sessions are accessible to employees with diverse needs. UDL emphasizes the need to provide multiple means of representation, engagement, and action to accommodate different learners (Rawashdeh et al., 2021). For example, providing content in various formats, such as videos, articles, interactive eLearning modules, and hands-on activities addresses different learning styles. It is crucial that the content is accessible by including features, including captions, transcripts, and alt-text. Additionally, allowing flexible options for demonstrating knowledge through tasks or activities that can be completed in a preferred way also supports diverse learning preferences. This leads to improved accessibility and also higher employee satisfaction and retention rates (Alsawaier, 2018), ultimately increasing profitability and productivity. Smith (2019) states that incorporating UDL into gamified learning environments benefits employees with disabilities, but it also benefits all learners by providing flexible options for different learning preferences.

Allowing employees to choose their own learning paths and making sure the content is accessible and inclusive, creates an equitable learning environment. However, it is also worth noting that it's important to offer guidance to ensure employees are gaining the necessary knowledge to succeed. This will not only increase knowledge and engagement in training but will also promote diversity and inclusivity in the workplace.

11.

2.5 CONCLUSION

Gamification has the potential to transform workplace training by making it more engaging, interactive, and effective when implemented correctly. For organizations to tap into this potential, it is important to align gamified elements with employee needs, organizational goals, and accessibility standards. Doing so creates meaningful and inclusive training environments that improve knowledge retention, job performance, and maintain long-term employee engagement, ultimately leading to improved productivity and profitability. By incorporating collaborative and social elements, custom-tailored gamified learning experiences, and prioritizing accessibility, organizations can overcome gamification challenges and create diverse and inclusive learning and workplace environments.

12.

2.6 REFLECTION QUESTIONS

1. How could incorporating gamification into your own workplace or learning environment enhance motivation, engagement, or inclusivity? Which elements (collaborative tasks, personalized learning paths, etc.) would be most effective in your organization?
2. What challenges might you come across in implementing gamified training in your organization and how could you address potential accessibility concerns to ensure that all employees can participate?

13.

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PART III

PART 3: THE IMPORTANCE OF TEACHING ETHICAL USE OF TECHNOLOGY

By Simrandeep Kaur

14.

3.1 INTRODUCTION

It is important to teach ethical use of technology, especially for students in secondary grades who interact with *artificial intelligence* (AI) daily. They encounter AI every time they use any digital device. Social media platforms have become notorious for facilitating digital sexual abuse, cyberbullying, online hate speech and radicalization, with young people being both the victims and the perpetrators of such harm (Zammit, 2022). Teaching AI ethics is crucial for students to create a safer community, and ethics must be considered while engaging with technology. Students should learn about them at school. This chapter aims to provide educators with knowledge about the challenges faced by anyone in an educational field, whether students or teachers, due to a lack of information about ethics. Teachers will also learn at the end of this chapter how administration and policymakers are not supportive enough to fix issues arising from AI. The chapter also shares recommendations for policymakers and administration to promote ethical behaviour in schools. The application of AI in educational contexts raises profound questions – for example, about what should be taught to students, the evolving role of teachers, and AI’s social and ethical implications (Adam et al., 2023). Educators can learn from recent research highlighting the importance of teaching ethics to students and supporting a safer and ethical engagement with technology.

15.

3.2 POSITIONALITY STATEMENT

I identify as a Sikh woman who came to Canada as an international student from India in 2017 and is currently a Canadian citizen. Due to my immigration status and religion, I have felt discrimination and racism in the beginning years due to wrongful perceptions about Sikh international students. These perceptions never stopped me from believing in myself, continuing my career, and making a place for myself in a new country. I work as an Early Childhood Educator, where I learnt about new cultures and how to eliminate these biases against others. I did my elementary education in India, where schools followed traditional teaching methods by avoiding the use of technology in the class or outside. Technology was something for me that only people who work in higher fields like engineering and medical specialists would use. That perspective changed when I came across different online tools after moving to Canada.

Due to the lack of technology exposure at a young age, I was more curious to learn about it. When I started working in a field where I documented using online tools, I could see the future where technology would be incorporated everywhere in every field. Even if it is my workplace or my online bachelor's program, I always think about improving myself using technology and being more confident using it. I want to build my career focusing more on technology, as moving forward, there will be countless opportunities for professional growth by having knowledge about digital spaces like online learning platforms and digital tools. According to my understanding, it is very beneficial for users to understand the ethics of any online platforms or tools they use daily.

16.

3.3 DISCUSSION

Educators need to develop AI literacy to understand how AI features in educational tools work and support the ethical use of technology by students (Zhang et al., 2022). Teachers introduce students to different tools that help them in the learning process. Some tools have AI embedded in them, but teachers are not aware of it. For example, a language learning tool, Duolingo, supports students with its engaging and gamified approach and includes AI for personalized learning experiences. AI support in Duolingo shows the positive side as it helps students to learn different languages in their own way. Students also interact with different tools, such as social media or various other digital AI platforms like ChatGPT, Quillbot, etc., which creates issues like data privacy, cyberbullying, and plagiarism when students use them unethically at school. Teachers need to know about the incorporation of AI in educational tools and then pass information about it to their students. They need to understand the use of AI in specific tools and how students can use that feature ethically to learn new information. Zammit (2022) explored how secondary schools address ethical concerns about plagiarism, cyberbullying, and discrimination. This highlights an immediate need to teach digital citizenship to students as they engage with AI platforms in their regular routines. Students need to learn how to be a responsible digital citizen and spread positivity around them.

Adam et al. (2023) emphasize that AI ethics policy guidance specific to schooling (K-12 education) has lagged, and policy responses created by policymakers are based more on adults and provide less attention to AI's impact on children. This leads to significant gaps in the school curriculum of teaching ethics, which challenges students to become digital citizens. Due to these gaps, teachers get insufficient time and support to teach ethics. The impact of AI forces students to forget about basic principles like privacy and fairness. Teachers play an essential role in introducing these principles, but they need more support and a strong policy framework to spread awareness among students. Akgun & Greenhow (2021) highlight that AI applications offer valuable benefits and pose societal and ethical drawbacks that must be addressed. The AI system in K-12 education reinforce discrimination and amplify forms of injustice such as racism, sexism and xenophobia. This also emphasizes the risks associated with educational tools used in the classroom. Students are often asked to use the internet, like using Grammarly, to check spelling or grammar for their homework. Some students need help learning the use of AI in their assignments or avoiding AI when the work is supposed to be done independently. They often need clarification between taking ideas and coping & pasting from AI. The accessibility of AI tools like chatbots and automated writing assistants has made academic dishonesty a growing issue in secondary education (Smyrniou et al., 2023).

This misuse of AI emphasizes the need for an immediate approach to AI ethics education where students

should learn how to use AI responsibly and avoid the consequences, they must face due to improper use of AI. Artificial intelligence is all around students now, whether inside or outside the school. They are surrounded by it and need to learn how to use it in their lives ethically. Teachers need to be supported by the higher authorities to provide the required education to the students in school.

17.

3.4 RECOMMENDATIONS FOR THE FUTURE

Professional training for teachers and AI literacy workshops for students will help spread an ethical environment in school. According to Zhao et al. (2022), Many teachers have been exposed to the technological environment with AI-enabled appliances, but they need help understanding the fundamental concepts. Teacher training is vital in teaching ethics, and the administration should always provide professional development training. Due to gaps in curriculum, teachers struggle to help students understand the ethical implications of these issues and continue to face risks while engaging with technology and AI. According to William et al. (2023), schools should include a curriculum designed to incorporate active learning through hands-on activities and projects, embed ethics and critical reflection about societal implications. Teachers need to be trained for this curriculum to encourage students to use AI to generate ideas and promote critical thinking to finish the assignments. Teachers should be trained to explain the importance of sharing who did the work in their assignment to avoid cheating, copyright and plagiarism issues. To begin with, when applying AI approaches, teachers must understand the fundamental concepts, knowledge, and information before providing them to students.

Zhang et al. (2022) demonstrated that interventions like AI Literacy workshops significantly improve student's understanding of AI and its ethical implications. By engaging in workshops, students internalize what they have experienced, connect to the ethical implications of technology design, and develop positive ideas about their future selves with AI. The positive results of these workshops highlight that AI education in younger grades is essential, and it should focus on filling the gap in understanding the moral and social implications. Students need to know what AI is and how they can use AI ethically in future. It also encourages future interventions to be more hands-on and allow reflective learning experiences for students. Schools should offer workshops or interactive seminars to promote digital citizenship among secondary grades. The addition of short stories with embedded ethical dilemmas is practical for secondary school students to develop an understanding of AI ethics issues such as fairness, bias and privacy (Kilhoffer et al., 2023). The gamified approach in the curriculum is also the best method to teach ethics to students by enhancing engagement and motivation. Activities should include demonstrations of existing AI systems, simulations that allow students to function as different components of an algorithm, and group discussions about how humans and computers accomplish cognitive tasks (William et al., 2023). These additions to the curriculum help students understand the differences in what they are supposed to write in the assignments that ask for human-generated work.

Policymakers should take steps immediately to combat complex issues, such as cyberbullying, plagiarism,

and discrimination, arising from the unsafe use of AI. Teachers in schools are performing based on policies placed by policymakers, which need to be modified to deal with challenges that are arising daily. Based on the positive results of developing workshops, administration and policymakers should pay close attention to the framework to teach students about AI, emphasizing teaching ethics at a young age. They should collect feedback from teachers about AI issues happening in the classroom. The student should also take part in developing policies where they can share their experience while using AI. Strengthening policy frameworks, teacher training, and interactive AI workshops help address student's lack of ethical standards and provide educators with concrete guidelines for teaching AI ethics.

18.

3.5 REFLECTION QUESTIONS

1. Students must learn ethics when interacting with technology in school or at home. While teaching these ethics, there are essential questions that teachers should consider:
2. What topics should teachers start with to teach ethics for social media platforms?
3. What challenges will teachers face while teaching ethics to students in the younger grades?

19.

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PART IV

PART 4: THE NEED FOR PROFESSIONAL USE OF GENERATIVE AI WITHIN EDUCATION

By Hamza Mohammad

20.

4.1 INTRODUCTION

Leveraging Generative AI in Education: Benefits and Challenges for Educators

Generative AI is the newest technological toy changing the world's landscape. The field of education is steadily becoming more impacted by the use of AI every day. Educators can leverage AI to simplify some of the paperwork, which can detract from having more time to engage with students in the classroom. It is imperative for educators to learn how to utilize this technology as a tool to assist in the teaching process; otherwise, to at least attain some level of knowledge within the Generative AI landscape to recognize when students may be abusing its use within the classroom. This chapter will focus on how educators can leverage Generative AI tools and the potential benefits and drawbacks. While this chapter can be considered relevant to any educator, regardless of grade level, most of the information may be more suitable for older teaching brackets, where there is likely evidence of AI use in the classroom.

21.

4.2 POSITIONALITY STATEMENT

A note about the author in this section: I am a Canadian-born Pakistani Muslim who grew up in the 1990s and early 2000s. Technology has developed rapidly in front of me, and I have always understood it well. In my professional career, I have always seemed to be some form of educator despite initially trying to get into the film industry. I have been surrounded by technology all my life and have always been willing and eager to learn how to use newer technologies. My current fascination with technology is related to Generative AI and its complexities within the field of education. To further focus on this, I am even more fascinated with how best to utilize Generative AI to improve the work-life balance for teachers. As someone who utilizes AI and sees it as a tool that can improve life going forward when used correctly, there will likely be some level of bias that will promote the use of Generative AI.

22.

4.3 DISCUSSION

Generative AI in Education: Enhancing Lesson Planning, Student Engagement, and Educator Well-Being

Education, like all sectors of society, is finding itself embarking on the unknown – tapping into the enigmatic technology known as artificial intelligence. Generative AI is a powerful tool that can help reshape how we work in most fields, especially within analytics, near-instant summarizations, editing, proofreading and beyond; AI can greatly change the lives of human beings, especially the field of education (Iqbal et al., 2024). The possibilities are near endless in adopting AI into our lives, particularly in helping benefit our use of time. Educators tend to find themselves overworked and overwhelmed when planning for the classroom, with up to thirty students in a classroom, all of which are at different skill and knowledge levels, some with varying degrees of special exceptionalities and some with behavioural needs. Needless to say, teaching topics in the classroom environment can be difficult to plan for with such a variety of needs for the students. AI can assist in developing lesson plans according to your specifications and suggest how to break the concepts down in an easier-to-understand way. Education often involves time and effort regarding the learning content, which typically requires understanding complex concepts. Chat GPT can significantly help with these problems by customizing certain materials regarding particular topics (Huang et al., 2024). Despite being more focused on the use of Generative AI in improving the development of nutritional values, this still helps show the promise of how AI can benefit people of diverse backgrounds, social statuses, and beyond. Using this form of technology as a tool to assist in lesson planning can help speed up the process of developing a plan and then having to work backward in terms of scaling down the expectations to match student performance; additionally, it can even enrich the experience for students and have them even more engaged with the suggestions generated on how to execute the learning.

Generative AI tools such as ChatGPT and Magic School AI are tools that are being used more and more in the workforce. ChatGPT is a generic Generative AI tool that is accessible and utilized by many; while Magic School AI was initially a tool for educators, it has been developed and has grown to support students as well. Magic School AI is a Generative AI platform that uses ChatGPT but is more refined to better support educators with whatever they require, ranging from rubrics to individual education plans and even professional email drafting. Generative AI tools such as ChatGPT and MagicSchool can be transformative in teaching and learning by adopting Generative AI technologies in creating lesson plans, instructional activities and helping to create differentiations of plans. Generative AI is more of a compliment to teachers rather than a replacement.

(Yang & Appleget, 2024). In my perspective, Generative AI can be used as a powerful tool for educators in developing and planning coursework and giving multiple versions of the plan to better fit the student's capabilities. It can be used to speed up the thought process by giving many recommendations that can be picked from and then adjusted accordingly by the educator to better fill the in-between, and even better, it can help bridge the gap between learners by giving Universal Learning suggestions;

“When asked if “ChatGPT and other generative AI will help instruction be more accessible for ALL learners (including those with disabilities),” 43% agreed or strongly agreed that it can be beneficial, 23% disagreed or strongly disagreed, while 32% were undecided. It is important to remember that these responses were given before the ChatGPT workshop.” (Evmenova et al., 2024, pp. 825 – 826).

The utilization of AI is still very much in its infancy, which will explain a lot of the uncertainty as stated above however, even now, it shows that a majority of educators still believe that Generative AI has the capability to make learning more universal for learners, and with newer, more powerful AI tools being developed, it is becoming more possible.

Generative AI can be a great tool to make the lives of educators easier, so long as we utilize it appropriately; “Teachers need to know how to use these new tools in an ethical way. We must remember, though, that these are only tools, and the actual human teacher will also be needed for success in teaching, learning and assessment.” (Kehoe, 2023, p. 181); however, as I have continued to say time and again in this chapter, it is meant to be used as a tool to assist. We as educators must still do our due diligence to ensure that what is being generated makes sense, appropriate, and accurate. In this space, it is vital for all educators to consider learning what to look for when students use AI in their work. Yes, generated content is still fallible and should always be double-checked (Langreo, 2023). Even my personal use of Generative AI has primarily been to give me a jumpstart on brainstorming ideas, when used to develop a rubric, I take the core idea provided in the generated text and then rework and reword the content to better fit my view of the level and to make it sound easier to understand.

Despite the drawbacks of having to check to ensure that the information is valid, Generative AI is still useful to educators as it reduces the amount of time required to develop learning plans, thus allowing educators to spend more time teaching and engaging students while also improving interactions. AI has the ability to scour its vast knowledge to develop more responsive resources, which then create a more inclusive learning environment that can improve student engagement, and can be very customizable (Educational Technology, 2023). This will also assist in improving educators' quality of life and thereby improving mood; practical implications for pre-service language teaching often focus on enhancing emotional well-being and fostering positive appraisal. These strategies help them not only highlight coping mechanisms but also the cognitive needs when AI is used for teaching and learning. (Yin et al., 2024). It is important to understand how AI can help educators utilize the various generative tools in education to improve productivity while also reducing the stress of lesson planning, thus improving one aspect of mental health, leading to less burnout.

23.

4.4 RECOMMENDATIONS FOR THE FUTURE

Preparing for AI in the Classroom: Policies, Ethics, and the Future of Learning

Generative AI is here to stay and is more likely to be utilized by more people as time marches on. All we can do is prepare for the inevitable by considering what kind of classroom policies we create in how Generative AI is used in the classroom. One recommendation would be to allow students to utilize Generative AI as a tool to assist in the development stages of assignments and to educate students on how to use AI in their education and daily lives appropriately. If educators themselves are embracing the use of Generative AI, they should allow some use of it for students to avoid being seen as hypocritical and can even create activities for students to practice identifying where AI has been used. Discussing the ethical use of Generative AI in the classroom with students is also important. Another recommendation would be to have some learning projects involve using Generative AI in order to show and teach students the strengths and weaknesses of using Generative AI in various scenarios and teach them that while it is very useful and great to use, it should still be primarily utilized as a tool to help fill small gaps, instead of being abused to write an entire essay. These recommendations assist educators in policing the ethical use of Generative AI in the class and allow them to recognize common patterns from Generated materials while also building a positive use of this form of technology in students while introducing and exposing them to this newer form of technology. AI has the potential to level the proverbial “playing field” when implementing UDL (Universal Design for Learning) strategies, such as finding alternative ways to understand information. AI can be personalized based on the user’s needs, from small adjustments to more overall generated planning. Technology can help all students have an equal footing in the learning environment. AI can help disorganized students and teachers develop some level of organizational habits.

24.

4.5 REFLECTION QUESTIONS

Adopting Generative AI in Education: Reflection and Considerations

By having the passion and drive for learning and using technology, we, as educators, would be the ones to initially adopt newer innovations in educational technology. It is most certainly something difficult to adapt and work with as technology is ever-changing. Before moving on through the rest of the OER, consider the following questions:

1. With the information provided in this chapter, how open are you to exploring ways of incorporating Generative AI into your daily practice, what factors might influence your decision to adopt or adapt it at different levels?
2. Beyond the ethical reasoning for using Generative AI in the classroom, what other considerations should we keep in mind when adapting Generative AI into the larger society?

25.

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PART V

PART 5: ENHANCING CULTURALLY RESPONSIVE TEACHING THROUGH DIGITAL TOOLS

By Camila Arriagada Jaubre

26.

5.1 INTRODUCTION

This chapter aims to bring awareness to cultural responsiveness in teaching and how to support students. More specifically, supporting English Language Learners (ELL) in a K-12 educational setting. The focus is to bring awareness to the benefits of specific collaborative and communication digital tools that assist Culturally Responsive Teaching while supporting and engaging students and their families. Considering that Canada is a welcoming country and home for ELLs and their immigrant newcomer families, it is crucial to recognize the various factors they experience since entering a new country and school system. We need to support and provide them with useful resources to set them up for success.

27.

5.2 POSITIONALITY STATEMENT

My social identities have positively intersected in shaping my past and ongoing life experiences into who I am today within society and in my academics. As a young Latina born in Canada who speaks the universal language, English, I am fortunate to have lived in a suburban middle-class community where my identities have given me instances of privilege in accessing an education with technology (e.g. Chromebooks) and speaking and understanding the language that classes are taught in. Throughout my learning experiences, I have been given opportunities to receive support and tools academically, socially, and emotionally when needed. I acknowledge this isn't the case for many immigrant students and families. Having been born and raised by an immigrant family myself, I understand the challenges and barriers one may face. Due to the resources accessible to me, my academia has been less overwhelming. Creating an inclusive school environment that can support English Language Learners (ELL) and their families is still needed. I recognize that my fortunate and positive education is due to my ability to speak English, my location, and access to technology and resources. I want to learn more about cultural responsiveness since learning through Ontario Tech University to create an environment that includes and supports all students and their families within the education system.

28.

5.3 DISCUSSION

Only recently has a considerable amount of acknowledgement been directed towards the approach of Culturally Responsive Teaching (CRT). In the education system, teaching consists of much more than just its duty in helping and instructing knowledge to students. It involves the need for inclusiveness in a classroom, considering all students and their multicultural backgrounds, leading to the use of the CRT approach (Idrus et al., 2023). In the 21st century, classrooms are progressively becoming more diverse, creating a need for the CRT approach. This is essential for English Language Learners (ELL) and their immigrant newcomer families. In examining research on CRT, technology has had an increased impact on the education system since the COVID-19 pandemic in 2020 (Rubin et al., 2022). Through technology, digital tools benefit educators and students in their teaching and learning, improving the learning experience (Chuang et al., 2020).

Understanding ELL Students and their Families

The connection between Culturally Responsive Teaching (CRT) and technology has developed the necessity of supporting ELLs in the classroom. ELLs face various challenges within the classroom in learning, considering that English is their second language and requires additional support for their academia. This also reflects on ELL students and immigrant newcomer families, as language poses a barrier when interacting effectively with educators regarding their child's education. Family engagement through multiple means increases their child's educational achievement (Hébert et al., 2022). Many digital tools, which will be discussed further, have been developed that can address the issue in supporting ELLs and their families. Through applying CRT and technology in the classroom, it aims to bridge the gap of improving the education system to be inclusive, promoting collaboration and communication.

Collaborative and Communication Digital Tools for ELL Students

In analyzing research, various collaborative and communicative digital tools can benefit ELL students throughout their learning journey. This can be demonstrated in a synchronous and asynchronous environment for learners. Any Learning Management System (LMS) is applicable for promoting collaboration and communication, especially in an online learning environment. LMS allows students to communicate and

collaborate with their teachers and classmates through various mediums (Rubin et al., 2022). In discussing a particular medium, discussion boards are a digital tool that supports ELLs. As this enforces participation through peer discussions, students can share their perspectives with their thoughts, knowledge and experiences (Mendoza, 2019). This tool helps develop ELL students' language skills and the feeling of being respected and acknowledged by peers.

Digital platforms like Microsoft Teams and Google Workspace for Education allow all students to work collaboratively online. Specific tasks like writing and brainstorming can benefit from these platforms (Rubin et al., 2022). Google Docs, part of Google Workplace for education, is a tool to increase participation equally for ELLs through collaborative writing with peers, although anonymous (Woodrich & Fan, 2017). This is due to an ELL student's need for more confidence in their development in learning English.

Digital recording tools help support ELLs' oral language development, as this diverse group of students is often disadvantaged. To ensure ELLs feel more comfortable and confident in conversations, creating multimedia content using digital recording tools can improve and assist language development, as it requires them to use their voice in the process (Spencer, 2016). Podcasts can involve multimedia components, primarily audio, where students can effectively communicate on a topic, individually or collaboratively with peers. GarageBand is a digital tool that creates and records podcasts with additional audio elements. Using this tool to create podcasts improves ELL students' self-confidence in oral language development. However, it also encourages participation in reading, writing, collaboration, and creativity (Smythe, 2010).

Collaborative and Communication Digital Tools for ELLs Families

Collaboration and communication digital tools effectively support the engagement between ELL students and their families. Tools like Google Forms, Remind and Talking Points enable educators to collaborate and communicate with families in addressing educational information, specifically progress, concerns, and school events (Rubin et al., 2022).

There are challenges with communication digital tools, primarily translation tools, as they often create issues when communicating between educators, families, and students. Google Translate poses as one of the tools that can be problematic. According to Rodríguez-Castro et al. (2018), this tool is supposed to help communication, although tone, details and context create misunderstandings. Reflecting tone, Google Translate can distribute a message that doesn't always have the appropriate tone, leading families to interpret it differently. For details, misplaced words and grammar and spelling errors impact a message. Context can be ineffective when using this tool as it can translate specific words or phrases without considering the context of a sentence (Rodríguez-Castro et al., 2018).

Overall, collaborative and communication digital tools impact English Language Learners (ELL) and their families. They are essential to support the students' learning journey while increasing the connection between

educators, ELLs and their families. These tools promote the idea of inclusivity and the necessity of incorporating Culturally Responsive Teaching (CRT) in a K-12 classroom.

29.

5.4 RECOMMENDATIONS FOR THE FUTURE

A policy is a recommendation and enforcement to support advancing the learning environment for ELL students using the culturally responsive teaching approach. Policymakers for the education system should ensure that educators, principals, and administrators are equipped with the knowledge of ELLs and their families. Specifically, they will be required to learn and complete workshops and training on collaborating with ELLs and their families. In this regard, stakeholders in this position should continuously enhance their professional development in various ways. For example, to educate oneself on research and evaluating the classroom environment, considering cultural responsiveness and learning about this diverse group.

Another recommendation is to emphasize and implement engagement with families throughout the school course/year for ELLs. Policymakers should enforce the use of translation apps in communication. In addition, they should investigate proper translation tools that can work for the education system, considering the many components of a language to resolve the barriers in communication. This will support all stakeholders, including educators, ELL students and their families.

30.

5.5 REFLECTION QUESTIONS

1. Brainstorm ways you integrate or think to incorporate to create a culturally responsive environment for all individuals to be and feel included?
2. What are the potential limitations of implementing collaborative and communication digital tools to engage ELL families in their child's education, aside from a language barrier?

31.

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PART VI

PART 6: ASSISTIVE TECHNOLOGIES IN ELEMENTARY LITERACY

By Brooke Benson

32.

6.1 INTRODUCTION

With the growing presence of assistive technologies (AT) in classrooms, it is important to examine the impact they have on instructional practices and students comprehension. In my Open Educational Resource (OER) chapter, I will explore the impacts of assistive technologies in elementary literacy studies. Literacy development in children serves as a foundational skill that is necessary to acquire. Therefore, it is imperative to study the impacts of assistive technologies in elementary literacy to increase academic success in the subject. In the following sections, I will outline research detailing the benefits, challenges, and suggestions for effectively implementing assistive technologies in literacy instruction.

33.

6.2 POSITIONALITY STATEMENT

There are many components that make up my identity. Navigating my faith as a Christian woman and being a member of the LGBTQ+ community has given me a unique perspective on intersecting and sometimes conflicting identities. These experiences have influenced how I teach and interact with students and colleagues. Moreover, growing up in poverty and in unstable environments left me excluded in educational settings as a child. This has shaped me into a caring and empathetic educator.

My experiences have made me committed to building equitable classrooms and connecting with all of my students. My identities and life experiences have made me a resilient person which has made me open-minded with my learning. I embrace teaching and learning with new technologies. Moreover, as a result of my life experiences, I always search for technologies that are cost-free, and accessible. I would like to learn more about having boundaries as an educator. As an overly empathetic person, I have, in the past, lacked professional boundaries with students and colleagues. This has led to challenging relationships with students and colleagues. Lastly, as it relates to technologies, I would like to continue to find more accessible and fun digital learning tools for students.

34.

6.3 DISCUSSION

In recent years there have been significant advances in digital technologies (Abdi et al., 2021). With the large amount of new emerging assistive technologies available, the field of education is quickly and drastically changing. Recent research has shown that incorporating assistive technology in elementary level literacy courses is beneficial for all students, and that Early Childhood Educator (ECE) teachers may not have the proficiency in AT to facilitate inclusion (Schladant et al., 2023). Therefore it is essential to analyze any barriers, opportunities, and trends to improve academic achievements in elementary level literacy classrooms.

Current State of Topic

Research indicates that AT has a positive impact on struggling readers' academic achievement in literacy (Cheung et al., 2013; Spooner et al., 2014; Flanagan et al., 2013). While Cheung notes its impact on reading abilities, especially in small group instruction, Spooner suggests that AT increases listening comprehension skills, communication and understanding and student independence. Similarly Flanagan attests that AT increases students ability to learn and work independently, especially with respect to AT that students expressed a significant level of interest in. This highlights the importance of understanding students' needs and interests to select suitable AT for literacy instruction. There are a variety of interventions available to assist educators in successfully implementing AT in literacy instruction.

Firstly, the Student Environment Task Tool (SETT) framework proposed by Marsh et al., (2021) is an easy-to-use planning tool used to identify a child's need for and to select appropriate AT. The SETT framework assists educators in choosing appropriate technology for their student by providing a list of specific questions related to the student, their environment, their task, and considerations of AT. Following these guidelines will support the educator in choosing the most appropriate technology for their student which will increase student engagement and overall success in literacy skills (Marsh et al., 2021).

Other interventions such as professional development (PD) training produced a positive impact on educators' ability to successfully integrate AT in elementary level literacy instruction (Schladant et al., 2023). This PD training was quite intensive consisting of self-guided online learning modules, in-person coaching sessions on how to integrate technology, and a classroom kit of AT devices. Such devices ranged from no-tech, low-tech, and high-tech devices to support a wide range of students. After working on the independent

modules, teachers were expected to demonstrate their learning during the in-person coaching sessions. Overall, this PD training led to increased knowledge and confidence in teachers to successfully implement AT.

Utilizing these two interventions can assist educators in choosing and integrating appropriate technology for students. Educators without access to structured PD sessions can expand their knowledge by engaging in self-directed learning such as watching online tutorials on integrating technology or connecting with colleagues who have more experience in this domain.

Challenges in Implementing Assistive Technology

Despite the positive impacts of integrating technology into literacy instruction, educators experience various challenges and barriers with implementation. High costs and a lack of teacher knowledge and training on AT are the most common barriers for educators effectively implementing AT (Schladant et al., 2023; Marsh et al., 2021; Flanagan et al., 2013; Ivan, 2023; Maich & Sider, 2014).

With the rapid growth of assistive technology, teachers are often left unprepared for supporting their use in the inclusive classroom. While important to incorporate, assistive technology is not effective in improving literacy skills on its own. Much of the success comes from the “role of the teacher, the nature and quality of professional development and follow-up” (Cheung & Slavin., 2013). Therefore it is essential to provide educators with proper training so they are able to integrate assistive technology in literacy instruction effectively.

Further research indicates equal access to technology is indeed a barrier, especially for youth who have Autism Spectrum Disorder (ASD) or Attention Deficit Hyperactive Disorder (ADHD) (Ivan, 2023). Moreover, consistency is another issue in integrating technology. Ivan (2023), suggests that families impact students’ abilities to effectively use AT by encouraging or preventing its use at home. Lastly, due to the varying needs of young students, a single device may not provide all of the elements required to fully support students in improving literacy skills and working independently (Spooner et al., 2014).

35.

6.5 REFLECTION QUESTIONS

Exploring the impact of assistive technology on literacy instruction has revealed current trends in the subject including the ability for AT to increase students reading comprehension, listening skills, independence, and overall academic performance. It also revealed barriers such as educators' lack of training and awareness of AT, and high costs of AT. A recent study indicated that post-secondary students who take courses on assistive technology do not gain a significant increase in their abilities to effectively choose and integrate technology in their practice (Atanga, 2017). Knowing this I pose two questions for students to reflect on.

1. Given the impact of assistive technology on literacy, what steps will you take to develop your skills in selecting and implementing assistive technology in literacy instruction?
2. Think about your experience in educational settings as a child. How do your experiences help or hinder your ability to effectively integrate technology in the classroom, especially as it relates to being cost effective?

36.

6.4 RECOMMENDATIONS FOR FUTURE

As noted above, the most prevalent barrier indicated in research is a dire need for educators to have increased training and awareness on choosing and integrating assistive technology into literacy instruction. A recent study examined which method best supports educators in identifying and integrating AT such as workshops, webinars, or coaching sessions. Results indicated the most effective way to train teachers is through the “interaction of professional development (on-the-job training)” (Atanga, 2017, p.38). Based on this research, I recommend that educators are provided with “on-the-job” training and coaching sessions focused on how to choose appropriate technology to effectively integrate it into literacy instruction. Specifically, funding should be set aside so an expert in assistive technology or instructional coach can co-teach alongside homeroom teachers. Such lessons should focus on how to choose appropriate AT, and how to integrate them into literacy instruction. Experts should begin by teaching the lessons and work towards the homeroom teacher taking control while the expert takes notes providing feedback on what worked well and areas for improvement. Where funding is not available, I recommend that educators collaborate with their colleagues who have more extensive knowledge on using technology. Conversations should be focused on learning about AT and how to integrate it in the classroom. Colleagues with more experience using the technology can demonstrate to others how to implement it during instruction while others observe and take notes for questions afterwards. Furthermore, with the drastic impact that AT has on academic achievements in literacy, I recommend that policymakers develop policies to ensure that this training be mandatory for all educators. In addition to this, I recommend, student teachers take courses focused on technology use during instruction to better support their future work.

The second largest barrier identified across research is the high costs of assistive technology. The high costs of technology often lead to unequal access among young students, especially for students from low-income families, or for students with disabilities (Ivan, 2023). Thus my second recommendation that additional funding be set aside in schools annual budgets to hire an instructional coach and to purchase assistive technology for students who do not have access to AT. This will encourage appropriate AT integration, and prevent barriers and learning gaps for low-income students and students with disabilities which will encourage educators to use AT during literacy instruction. Given that funds can often be limited and controlled by federal and provincial governments, where funding may not be available, I recommend that educators search for open educational resources online that can be utilized by students in the classroom. Furthermore, teachers should adopt a self-directed learning approach to understanding assistive technology. This can be done through conducting research online, watching videos, or joining and participating in free workshops and webinars.

37.

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PART VII

PART 7: ENHANCING LEARNING WITH ASSISTIVE TECHNOLOGY FOR STUDENTS WITH EXCEPTIONALITIES

By Jessica Connolly

38.

7.1 INTRODUCTION

With the implementation of universal design for learning in today's classrooms, how can we ensure students with exceptionalities have the tools they need to access quality education and improve success rates? Incorporating assistive technology (AT) into the learning environment for diverse learners tremendously impacts learning outcomes. As technological advancements evolve, AT enhances accessibility and learning outcomes for all students, especially those with exceptionalities. This chapter explores various types of AT, current trends in the field, and the benefits and challenges educators and students face while integrating these technologies into the classrooms. By exploring the impacts of AT, we can gather a better understanding of the potential AT has in enhancing learning and providing equitable education for learners with exceptionalities.

39.

7.2 POSITIONALITY STATEMENT

I am a cisgender, white woman who recognizes the privileges that have shaped my life experiences. I grew up in a financially stable household, where my father's career was technology-dependent. From a young age, I had access to technology, which had a large impact on my digital literacy skills. As an Educational Assistant working in a special education classroom, I have seen first-hand the positive impact technology can have on our diverse learners, and how some students would be unsuccessful without certain tools. Although I believe in the benefits of technology for education purposes, I also recognize how technology can create barriers for some students who may not have the same access and resources.

Both my personal and educational background have given me an advantage in technology skills for learning. I recognize that some students within special education still face challenges in accessing technology to use it effectively. I want to advocate for positive technology integration within schools to enhance learning for all students. As I move forward in my career in education, I plan to promote the use of technology as a tool to create a more inclusive and accessible learning environment, especially for those in special education.

40.

7.3 DISCUSSION

Types of AT

AT in education includes many tools and resources to support diverse student needs. Numerous tools used within educational settings can typically be categorized into text-to-speech or speech-to-text software, screen readers, alternative keyboards, closed captioning tools, Augmentative and Alternative Communication (AAC) devices, and assistive listening devices. These ATs are seen commonly throughout educational settings, even more so for students with exceptionalities. With new and emerging technologies, there is no doubt that these ATs will continue to evolve and change the way some students access education.

Current Trends in AT

It is essential to understand the current trends of AT in the education sector. Research shows that current trends can be categorized into themes such as improving accessibility, increasing positive learning outcomes, challenges with effective implementation, educators' comfort levels with AT, and evolving technology. Gray et al. (2011) indicate that in the past five years, awareness of how technologies support students with special needs have become more prevalent as ATs are being made for more mainstream use in educational settings. It is easier for students with exceptionalities to access educational materials using AT without standing out from their peers. Although these technologies are evolving, accessibility still tends to be a challenge as Mensah-Gourmel et al. (2023) discover that only one in ten people who are in need have access to these assistive products, which is prompting the World Health Organization (WHO) and UNICEF to improve accessibility for large scale use. Accessibility is a critical issue as it can support increased learning outcomes. It is reported that when students have access to AT, they are able to produce more positive outcomes not only in education but also in future employment (Maeda & Flanagan, 2011, as cited in Atanga et al., 2020). Not only does AT support academic achievement, but it also has long-lasting impacts on these students as they enter the workforce.

Another reoccurring trend in AT is educator perspectives and comfort. Research suggests that a key factor in promoting AT use within schools is teachers' comfort level with AT (Morrison, 2007; Parette and Scherer, 2004, as cited in Lamond & Cunningham, 2023). Therefore, it is essential that educators feel confident with their technological skills and learn how to integrate AT effectively. With the evolution of technology, it is anticipated that AT will follow similar trends to technology and become faster, more mobile, and more personalized as more devices and apps become more readily available for special needs students (Bolkan, 2012,

as cited in Duran, 2022). As AT evolves and becomes more commonly used, it can support equitable learning environments. However, accessibility, effective implementation, and educator training must be consistently prioritized to help all students succeed.

Benefits of AT

Collective research indicates that the many benefits of AT can be categorized into three areas: enhanced communication and social skills, increased independence, and personalized and inclusive learning. AT plays a significant role in communication and social skills, especially for students diagnosed with autism spectrum disorder (ASD). Lang et al. (2014) state that students with ASD are great candidates for ATs that are designed to support communication due to the prevalence of communication impairment, and it is not surprising that it has been used to improve social functioning as well. Research highlights that AT can be valuable in developing support plans for students, as it helps address “communication, social/emotional, and daily living/adaptive deficits” for students with ASD (Lang et al., 2014, p. 184).

AT empowers students with exceptionalities to engage more independently in their education. Genc et al. (2021) indicate that AT is essential to gaining confidence, independence, and a higher quality of life for students with special education needs. AT is valuable in creating equal access to quality education for many students with various disabilities or exceptionalities. AT can support nonverbal students with communication through AAC devices, students with physical disabilities through assistive keyboards or monitors, and students diagnosed with learning disabilities through accessibility features offered by various apps and programs (Meyer, 2016, as cited in Jones et al., 2021). By allowing students to participate in independent tasks and collaborate with peers, AT minimizes the need for constant support (Pilgrim et al., 2012, as cited in Atanga et al., 2020). Therefore, AT not only enhances student access to educational materials but also builds confidence and independence for students with diverse learning needs.

Lastly, AT use in education promotes personalized and inclusive learning for students with exceptionalities. Genc et al. (2011) emphasize that if we want to focus on personalized learning, we must ensure we are providing accessible, assistive, and universally designed technologies in all of our learning environments. AT enhances personalized learning by allowing students to utilize tools tailored to their needs, helping them learn more effectively. Jones et al. (2021) indicate that AT allows educators to support unique individual student needs as long as it is implemented appropriately. Students are more likely to be engaged and motivated with the content when it accurately reflects their learning level. Educators can customize the learning environment with various tools. For example, computers can support individual instruction with the ability to reduce distractions and stimulus over selectivity for students with ASD (Lovaas et al., 1979, as cited in Lanf et al., 2014) or can support self-paced learning resulting in an improvement across communication, attention, and behaviour (Parette & Stoner, 2008, as cited in Atanga et al., 2020) for students with Learning Disabilities. Overall, inclusive instruction ensures that all students access appropriate resources and support. By creating

an equitable learning environment, AT for personalized learning promotes engagement among all students, making them feel valued and capable of succeeding.

41.

7.4 CHALLENGES AND CONSIDERATIONS

There are a few challenges and considerations with AT that need to be addressed. Similarly, with technology use, affordability and accessibility become a significant issue with AT use. The cost of these high-tech AT tools can hinder the widespread use to enhance learning. Genc et al. (2021) agree that the high costs of these AT tools can create an unfavourable situation, making access limited. The cost of fixing these tools when they malfunction also needs to be accounted for when budgeting for these high-tech tools in the education system. Regarding accessibility, problems can occur, such as quality internet access and device or program failures (Genc et al., 2021). Without addressing affordability and accessibility, the potential benefits of AT for enhancing learning may not be accessible for many students.

Another major challenge with AT is training and implementation. Educators must be trained to ensure the effective use and implementation of AT, as many educators do not have sufficient knowledge about AT, leading to feeling incompetent utilizing them to support their diverse learners (Genc et al., 2021). Aside from knowledge of AT, many other concerns from educators involve “skills and attitudes, lack of evaluation process, ineffective planning, insufficient budget, complex use, limited time and lack of the number of assistive technology professionals” (Genc et al., 2021, p. 70). Gray et al. (2011) provide findings that although technology is commonly found in all schools, it is not being utilized to its full potential as a learning tool. Therefore, there is a high need to ensure that educators are provided with high-quality training on implementing AT and its effective use for students with exceptionalities.

42.

7.5 RECOMMENDATIONS FOR THE FUTURE

Two recommendations to overcome these barriers with AT are for educational institutions to provide ongoing professional development for educators or specific AT courses within Bachelor of Education programs, and to ensure effective implementation of AT using a model or framework. Professional development around AT use is crucial, as it provides educators with the training and skills they need to effectively integrate AT into their classrooms. Research indicates that teacher preparedness is the main factor in how students use AT and adding AT to teacher training helps them become more comfortable and familiar with it (Connor et al., 2010; Judge & Simms, 2009; Van Laarhoven et al., 2012, as cited in Jones et al., 2021). By having professional development courses or workshops, educators have allocated time to focus on building their confidence and comfort with technologies. It is essential to recognize that technology is constantly evolving, which is why educators need to be flexible, innovative, and committed to continuous learning to maintain ongoing innovation and effective use in teaching (Blackman et al., 2023). Educators should continuously update their knowledge and adapt to new changes, even if starting with an advanced understanding of tech.

When it comes to ensuring the effective implementation of AT, institutions should use a specific model or framework to provide regulation. School boards could regulate the student, environment, task, and tools (SETT) framework, as it positively impacts educators knowledge and ability to select effective AT. The SETT framework offers various factors to consider when selecting AT that are essential to ensure the tool chosen accurately matches the student's characteristics and needs to promote enhanced learning (Jones et al., 2021). Alternatively, Lerslip (2015) indicates five factors to effectively implement AT in special education: collaboration, holistic perspective, independent management of schools, learning systems and production manual for users, and development of an Assistive Technology Center. Collaboration should involve all stakeholders in the process of finding appropriate AT solutions and the integration of these tools, and a holistic perspective ensures that any AT utilized should aid the student in multiple areas of life (Lerslip, 2015). Independent management of schools suggests that educators should participate in courses to help their understanding of AT software, which could speed up the process of AT implementation or the possibility of fixing any issues that arise (Lerslip, 2015). Students should also be involved in the learning process of AT as they will be the ones utilizing it. Lastly, there should be a designated centre and staff that assess the ongoing use of these tools in the classroom and support teachers in how their use can be enhanced (Lerslip, 2015). There are also three strategies for effective AT implementation: knowing what works, letting students play and explore, and maintaining ongoing learning (Maza, 2021, as cited in Duran, 2022). It is imperative that educators pair the right AT with each student's unique needs and then also allow students to test various AT,

allowing students to gather their own understanding and purpose behind each tool (Maza, 2021, as cited in Duran, 2022). While these are all essential strategies for enhancing the effectiveness of AT implementation, it is recommended that there be a universal framework for all educators to follow that is regulated to ensure consistency.

43.

7.6 REFLECTION QUESTIONS

1. How does the integration of AT affect classroom dynamics in terms of social interactions and collaboration?
2. From your perspective, what AT tools have you seen make a positive impact on student learning for those with exceptionalities? And how can we ensure these tools remain effective?

44.

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PART VIII

PART 8: EXPLORING THE PRACTICE OF WORKPLACE ELEARNING

By Erin Moreau

45.

8.1 INTRODUCTION

In today's workplace, it would be challenging to find a business or an organization that does not leverage eLearning in some capacity. eLearning is used for a variety of training, such as WHMIS for onboarding new employees or at Walmart for teaching employees how to efficiently stock shelves (McCue, 2019). eLearning's increasingly wide reach spans educational institutions, corporate organizations and government/military applications (Rossett & Marshall, 2010). However, from lived experience in the corporate world, eLearning is often met with resistance, low prioritization or seen by employees as yet another task on an endless to-do list.

Globally, the eLearning industry is projected to reach 462.6 billion dollars by 2027 (The Business Research Company, 2023). This chapter examines eLearning's growing popularity with employers, why such a booming business is met with lukewarm enthusiasm from employees and recommendations to narrow the gap between corporate agendas and employee satisfaction. The intended audience for this chapter is those with a vested interest in corporate training, including instructional designers, administrators, corporate users, or researchers.

46.

8.2 POSITIONALITY STATEMENT

I am presenting this chapter about engaging with eLearning in the workplace through the lens of an elder millennial. The tint on my lens also includes being a white, multigenerational Canadian female. I have extensive experience in the automotive industry. Beginning as a production employee who was required to complete eLearning, I transitioned into a position where I developed and delivered training content. I am now responsible for overseeing the corporate and legal compliance of those required to complete training (including eLearning). I have lived the demands of shift work and understand a just-in-time production environment.

Being born “before the internet” provides the advantage of learning alongside the development of digital technology. I can appreciate the apprehension of using computer-based applications for daily tasks. However, I am not opposed to inviting Google into a disagreement. When technology is used in the workplace for tasks such as eLearning, the audience may have significant variation in age, skill level, experience and exposure. Straddling the pre and post cell phone era helps me connect with a wide range of perspectives.

47.

8.3 DISCUSSION

Factors Influencing Organizations to Offer eLearning

The eLearning industry has seen rapid growth, expanding by 900% since 2000 (Peck, 2024). Contributing to that growth is strong demand from corporations. eLearning is currently used by more than half of Fortune 500 companies (Tooling U|SME, 2024). eLearning developers, such as Tooling U, have consistently expanded their catalogue, now offering over 600 courses. A wide variety of eLearning and the promise of a motivated, capable and inspired workforce makes eLearning an attractive option for many organizations.

Organizations that offer eLearning genuinely seem to have their employees' best interests in mind. eLearning is an efficient method of delivering standardized training to many people at a relatively low cost (Giannakos et al., 2022). It eliminates the need (and cost) of synchronously travelling to a centralized location while offering flexibility to learners' schedules (Peck, 2024). Other affordances experienced by organizations implementing eLearning come from using a learning management system (LMS). LMSs can prescribe and track regulatory training, making compliance and record management an automated process. The opportunity for cost avoidance, wide reach, and on-demand conveniences that eLearning offers explains why the industry has flourished in such a short time.

Resistance from Users

Despite the benefits of eLearning seen at the corporate level, this method of training is often met with resistance from the workforce (Wang et al., 2010). Employees report that they do not find eLearning helpful because it does not directly support their work performance (Wang et al., 2010). Additionally, employees experience challenges connecting eLearning content to the learning objectives or to their own goals within the organization (Caudill, 2015).

Adults bring existing knowledge and life experience to the workplace, which prepares them to learn when they encounter challenges. Challenges create organic learning opportunities which drive curiosity and motivate mature learners (Hase, 2009). In contrast, eLearning is a presentation of information that the learner may not be ready to learn or not have a current use for the information (Hase, 2009).

Another hurdle preventing employees from feeling motivated by eLearning is the vast amount of it. As mentioned earlier, eLearning institutions are constantly adding content to their libraries, which employers see as a benefit and eLearning companies use as a selling feature. However, employees can become overwhelmed,

confused or disinterested by the volume. Corbeil and Corbeil describe Hermann Ebbinghaus's Forgetting Curve theory, demonstrating that humans naturally forget much of the superfluous information they receive (2023). This, combined with Miller's Law (the number of items humans can store in working memory at a time), explains the extraneous load employees feel when engaging with eLearning and why some employees feel they do not benefit from required or prescribed eLearning.

Understanding the Gap

According to Wang et al. (2010), the model for workplace eLearning is adopted from educational settings. The needs and goals of students are inherently different from those in the workplace. When providing instruction to children, educators are also teaching them how to learn and process information. However, with adult learners in the workplace, the focus is on enhancing skills and learning specialized content with tangible applications (Hase, 2009).

A dichotomy exists when eLearning is developed using the theoretical framework of educational settings. In schools, the expectation is that participants are ready to learn and will work when necessary. However, in workplace settings, the expectation is that employees are ready to work and will learn when necessary. If the structure of eLearning is not adjusted to accommodate this shift, workplace eLearning will underserve the needs of employees and, ultimately, the organization.

To further understand the gap between the needs of the organization and the needs of the employee, Morgan McCall, Robert Eichinger and Michael Lombardo's 70-20-10 framework should be considered (Rothwell, 2023). The framework suggests that 70% of learning should come from on-the-job development, 20% of learning should happen through social interactions, and 10% of learning should be obtained through formal/prescribed training, including eLearning (Rothwell, 2023). When comparing the growth of the eLearning market to the amount of recommended formal workplace training, eLearning appears to be overused and over-relied upon by organizations.

48.

8.4 RECOMMENDATIONS FOR THE FUTURE

Based on the projected growth of the eLearning industry, it is not likely to disappear from workplace learning. However, eLearning can be adjusted to narrow the gap between corporate interests and learner needs relating to employees' motivation to complete eLearning. The first recommendation is to focus on microlearning. Microlearning is the practice of breaking information down into smaller, easier-to-process pieces (Corbeil & Corbeil, 2023). Smaller pieces of information can replace hours-long eLearning courses. To further incorporate the benefits of microlearning, LMSs can be leveraged to display selected microlearning to the user more than once. According to Rothwell (2023), repeated exposure to information and experiences supports skill and knowledge acquisition. The immediate benefit to employees is the perceived reduction in time equity dedicated to eLearning.

The next recommendation stems from Caudill (2015), who suggests it is the responsibility of the entire organization to cultivate a positive learning environment. This can be achieved by reducing the amount of required eLearning organizations push to users. Corporations should consider making only external, legally required training mandatory. This will fulfil the corporate responsibility of the organization but will remove the perception of unnecessary and untimely eLearning. This does not mean removing the training altogether but rather shifting from a push system to a pull system (Corbeil & Corbeil, 2023). Organizations can provide users with on-demand access to microlearning. This allows users to engage with the content they need on a just-in-time approach.

Shifting from a push system to a pull system will increase users' motivation as they will be the ones determining their needs and the desired learning objectives. Corporations should also consider offering access to mobile learning. If employees choose, they could use a personal mobile device to access training when it is needed most.

Implementing on-demand microlearning gives employees autonomy over their learning paths. They will be motivated to use what they need when they need it. Reducing the amount of eLearning that is pushed to employees will foster a positive learning environment by negating feelings of redundancy and overburdening toward current eLearning practices. Reducing the catalogue of eLearning offerings is an opportunity for corporate cost savings and has the potential to yield better overall employee development results.

49.

8.5 REFLECTION QUESTIONS

1. Think of a time when you were required by your employer to complete eLearning. What was your initial reaction when you received the request?
2. Next, think about how much you remember from that eLearning. How did the required training directly improve or impact your overall job performance?
3. What motivates you to seek training within your career, and does your workplace provide training that aligns with your goals?

50.

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PART IX

PART 9: DIGITAL DIVIDE IN EDUCATION

By Alexis Colautti

51.

9.1 INTRODUCTION

This open resource chapter talks about the great digital divide and how it affects students in today's education. I decided to focus on the digital divide in regard to the lack of access many students have to technology and quality internet. In recent years, the usage of educational technology has increased in the classrooms, and a lot of the time, it is expected to be used outside of the school. Unfortunately, the sad truth is that many students have different access to technology and the Internet than their peers. This has become more apparent since COVID-19, when all classes were expected to be online. Some students could not access class, while others were forced to share one computer between multiple individuals within the home. Many students in rural areas did not have quality Internet access to pair with the technology they possessed. Unfortunately, this divide still causes great stress for many families who are struggling and continues to hinder students' education (Adams, 2024). In a country with so many opportunities and as the digital world continues to boom, we must focus on closing the digital divide and allowing every individual and home more access to the internet and technology.

52.

9.2 POSITIONALITY STATEMENT

I am a caucasian woman, wife, mother, educator, and student. I am thirty-one with three wonderful children, ages three, five, and seven. I am also a person who struggles with mental health myself and in my family. As all my identities intersect, one of my primary identities comes as the default parent in my family. I am the one called on for appointments, kissing ouchies, and everything in between. With this, my main goal is to give my children a childhood I never had to break the cycle and provide a healthy environment for my children and the youth I cross paths with throughout my life.

As a child who grew up in a lower-income neighborhood surrounded by mental health and addiction, I did not have access to some necessities in life, such as access to technology and education tools that could have benefitted my education journey. As a result of my past, I am very passionate about the digital divide in our society and fighting for equal rights for students and their access to the internet. In today's society, access to equal education and the technology needed should be a right for every student.

53.

9.3 DISCUSSION

Technology Access

The digital divide has been an ongoing issue for individuals we have been fighting for the past two decades (Schweitzer, 2024). With the never-ending evolution of technology and wireless connections, individuals have struggled to keep up with technology or have the ability to access quality wireless internet. The digital divide has become more apparent after the last few years as COVID ran rampant when schools and workplaces were forced to move to virtual platforms online. This caused much distress for families with a lack of access to technology or the internet, with multiple individuals finding themselves in the position of having to share technology. In 2019, it was reported that families in Toronto with an income under \$50,000 had less than one computer per person in the home. (Mapping Toronto's Digital Divide, 2021). In Ottawa, a survey taken by the Community Housing tenants found that 56 percent of individuals had access to a smartphone with data, 47 percent had access to a laptop, 43 percent had access to a tablet, and 31 percent had access to a desktop computer. (National Post, 2022)

This can significantly affect students academically when more and more work is being done online. Some examples of how educators utilize technology more are virtual classrooms, communication between educators and guardians, collaborative software, Google Classroom, and gamification. While a student may have access to these during school hours, the same can't be said once a student goes home. As of 2019, 97% of elementary and 100% of secondary school educators admitted using technology as the preferred way to communicate with students and parents (Kapoor, 2019). These communication tools can be in the form of emails, websites or specific school apps such as Edsby. This can cause parents to have a lack of communication, fall behind in their children's learning, and miss key updates or messages.

Ontario Schools and the BYOD Policy

Some School boards have tried to close the widening gap by adopting a BYOD policy, which in turn allows students to bring their own technology to school in the form of laptops, tablets, or smartphones. Around 33% of elementary and 66% of secondary schools have adopted this policy across Ontario (Kapoor, 2019). While this may seem like a positive way to mend the digital divide gap, many factors must be considered when considering this policy. Some students from high-income areas may take advantage of the policy, while students from lower-income areas and schools who can not afford technology, suffer due to not having adequate

technology to participate in the BYOD policy. Allowing students to bring technology to school also opens up the possibility of these personal items potentially going missing and or damaged. This policy also goes against Ontario's new cellphone ban (Lim, 2024) on schools, and how the BYOD policy will be navigated through this legislation will be interesting to see in the future. While bringing your device to school may seem like a quick fix to students' education, it should not be relied on as a solid basis for educators to focus lesson plans around.

The digital divide will also play a considerable part in Ontario's new legislation that states that Ontario high school students must complete two online credits to graduate with an Ontario Diploma. (Ministry of Education, 2022) Although this is a great idea to promote digital literacy and online knowledge, if a student does not have quality access to the internet at home, this can pose great difficulties. While a student may have a computer and compatible internet at school to use, this may only be available during breaks or lunches, hardly giving them enough time to complete lessons and homework solely online.

Internet Accessibility

In 2018, almost half of Canadian households with a household income of under \$30,000 a year did not have access to high-speed Internet. One-quarter of lower-income families said they had sacrificed money they should have spent on food or other necessities to be able to afford the Internet. (Internet PoInternet). However, even though an individual may give everything they can to afford wireless Internet, the signal available may not be quality Internet, and the speed will be insufficient for the tasks needed. This is because many internet companies price their Internet that is faster and better quality with a much higher price tag than basic low-speed Internet.

The Effect on Student Education

The ongoing issues regarding access to technology and the Internet can take a significant toll on students' education. Due to the fact many educators in today's society use technology daily, they are more likely to assume that students have full access or can find access to the internet or technology. If a student does not have it at home, their only other option is to access a school computer during lunch in their schools or the public library. These options alone are often less than ideal and take up a significant amount of time for the student that should be used for more appropriate tasks. Some schools do have programs where you can borrow a laptop; however, this option is not always available and can lead to students feeling less than or feeling ashamed of their home situation.

Solutions

Although this seems like a never-ending battle of evolving technology and raising prices, some solutions can

help mend the gap in the digital divide. With the lack of access to technology as a barrier many youth face, many companies are fighting to get technology into the hands of all needed individuals. ReBoot Canada (ReBoot Canada, 2023) is a great company that helps provide lower-income families and non-profit companies with the needed technology. Computers For Success Canada (Computers for Success Canada, n.d.) is another excellent company aiming to lessen the digital divide in today's society. This company helps supply refurbished technology to lower-income schools and indigenous communities. The work these companies are doing is a great help in mending the gap in the digital divide. They allow individuals to access technology they may not have otherwise.

Another way to combat the digital divide would be the Right-to-repair legislation (Rosborough, 2021). The fact is, a lot of modern technology is very difficult to repair on your own. Many companies create locks on their devices, creating difficulties when fixing an item independently. These barriers can make fixing a device on its own difficult or impossible, and sometimes, it's cheaper to toss and buy a new one altogether. The Right to Repair legislation will encourage companies to make technology easier to fix and prolong the life of technology in the hands of consumers. This will not only save the environment from unneeded accumulative waste but will also allow individuals with technology the ability to fix the device and prolong the longevity of the technology.

Funding is another crucial aspect in closing the divide. All schools deserve equal funding, prioritizing schools in lower-income areas (Kapoor, 2019). Funding also needs to be put into infrastructure, mainly in rural neighborhoods that currently do not have access. According to the Ontario Internet Access map (Ontario Internet Access Map, 2024) many communities north of South River have less access to quality internet services or may not have fixed broadband at all.

Although many internet companies still need the infrastructure to provide their services, some companies are still trying to do their part in combating the digital divide. Companies like Rogers have programs such as Connect for Success (Rogers Canada, n.d.), where if qualified, users can get quality internet for cheaper prices. The pricing starts as low as ten dollars a month and goes up depending on speed. Although this does not help areas that do not have the infrastructure in place, it can significantly aid lower-income neighborhoods and families. These types of programs can greatly benefit many individuals, and we hope to see all internet companies follow suit, creating programs for lower-income homes.

54.

9.4 REFLECTION QUESTIONS

1. What might be the long-term effects on students who have to compromise their education due to their accessibility to technology and/or the Internet?
2. With educators being mindful of their students' situations; how can they adapt their teaching to create equity in their classrooms and beyond?

55.

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PART X

PART 10: ENABLING LEARNING THROUGH TECHNOLOGY

By Jordan Daley

56.

10.1 INTRODUCTION

Gamification in education is an emerging, powerful way to engage and motivate students by using game-based elements in conventional learning environments. Gamification is one of these changes that may present itself as a useful, cost-effective, and efficient tool for educators to improve learning outcomes (Sanchez et al., 2020). Over the past few years, gamification has become more popular among educators who realize the power of making learning more interactive, rewarding, and fun. Research shows that most of the papers report encouraging results from the experiments, including significantly higher engagement of students via forums, projects and other learning activities (Sanchez et al., 2020). Gamification combines specific elements, like points, badges, leaderboards and game mechanics, transforming instructional activities into experiences that generate curiosity and perseverance in students of all ages.

This chapter aims to summarize gamification and how it can be applied in the classroom to help benefit the students and teachers of K-12 education. (Kenny et al., 2017) It has been argued that gamification improves results in learning outcomes, with 53% of gamification self-effectiveness promoting student-led gamification initiatives. This chapter also explores gamification as a theme, its educational benefits, and how to use it to implement gamification in K-12 teaching. We also review real-world research-backed examples of gamification in use and how gamifying helps to reshape students' feelings about playing, learning, and the game.

The chapter highlights not only what works for gamifying K-12 education but also what does not. It also provides teachers, curriculum designers, and school leaders with insights and tools to adapt gamified approaches for diverse educational goals and diverse learner needs. A problem highlighted by the lack of proper technological support is one of the major obstacles to applying game elements to education (Sanchez et al., 2020).

I would like to share a unique point of view based on my learning challenges and socio-economic barriers. Limited access to technology outside of school, along with my management of traditional education with ADHD, has very much shaped my understanding of inclusive education. From these experiences, I have learned, based on personal experiences, how to support students with exceptionalities as an educational assistant. Having this background, I can put myself in students' shoes and feel motivated to offer them the various personalized resources needed to meet each of their diverse learning needs.

57.

10.2 POSITIONALITY STATEMENT

In my youth, I experienced some obstacles formed by the socio-economic circumstances I found myself in. My parents lacked the best financial means, resulting in reduced access to technology outside of school. The reality of limited access fostered my understanding of educational platforms and resources students use, particularly in technology. Growing up with an ADHD diagnosis meant that for me, traditional learning styles like sitting quietly and reading a book were problematic. With constant fidgeting and difficulty in staying focused, I found traditional reading exercises daunting at certain points and often resulted in outbursts and being asked to leave the classroom. However, the computer reading programs that were offered by my school at the time completely changed how I learned to read, as I had always had an interest in technology. Using a computer with unique features and engaging content made me enthusiastic and more attentive. I achieved better reading abilities than traditional approaches allowed me to and passed my grade level. The design of these digital tools created a setting in which I thrived without some of the common interruptions that would knock me off track. This foundational experience revealed how specific tools can significantly change results in education.

I understand that as an educational assistant working with children who have exceptionalities, I have similar personal experiences as those of my students. Socio-economic factors, as well as having ADHD, influence my work production. I can see first-hand how important it is for students to be given materials that are suitable to their capabilities and learning needs. I often reflect on how my experiences mirror theirs. Growing up with certain challenges has molded my work methods to better assist those students with individualized learning needs.

58.

10.3 DISCUSSION

In K-12 education, gamification—taking features from game contexts and applying them to non-gaming contexts—has become popular for engaging students, personalizing learning experiences, and achieving skill development more interactively. With points, levels, badges, leaderboards, and other game mechanics, educators can create experiences to motivate and engage students and keep them around for more. As outlined in the research, this digital generation is more familiar with games, which is the main reason for the growing interest in gamification and research findings that identify the possibility that learning based on engagement can stimulate cognitive and emotional development (Kaur et al., 2020).

Gamification applications in K-12 settings have evolved from basic reward systems to much more robust pedagogically sound strategies. Digital tools like Kahoot, Classcraft, Duolingo, and Minecraft Education now make gamified learning available in a variety of forms, and teachers have several adaptable ways to teach several different subjects. Integrated into classrooms, these tools have been utilized to enrich fields from math and science to social studies and language arts, using gamified environments to foster self-paced learning as well as collaboration. In addition, (Sanchez et al., 2020) the growth of mobile-assisted learning has allowed for gamification in education and helped the use of apps to not only facilitate learning but also make it fun and allow students to interact both inside and outside of the classroom.

59.

10.4 KEY CHALLENGES AND OPPORTUNITIES

Key Challenges

Accessibility

The issue is making sure students have equal access to these gamified tools. The trouble with gamification is that there is no single solution for all students to have access to digital devices. It may not always be easy to implement gamified learning experiences in schools without technological resources (Sanchez et al., 2020)

Teacher Training and Preparedness

When educators are well versed in how to design game-based learning activities based on educational standards, then gamification becomes effective. However, teachers may not have enough training in gamification principles to create gamified learning successfully, and the gamified learning prediction may not be pragmatic. A spectrum (Dicheva et al., 2015) of implemented support for the instructors introducing gamification approaches in teaching frameworks should be identified, varying from no automated support at all to the use of standalone gamification platforms.

Curriculum Integration

Gamified activities can be complex to align with curriculum standards and assessment requirements. Accordingly, teachers may not see value in gamified activities due to the difficulty of applying traditional assessment metrics to the systems.

Key Opportunities

Enhanced Engagement and Motivation

Games have the potential to raise student engagement levels, especially for students who are less self-motivated

about the conventional forms of instruction. Gamified education mixes challenges with immediate feedback or uses elements of interactivity (Buckley & Doyle, 2014) to help learning become more enjoyable and, in the process, memorable.

Development of 21st-Century Skills

Gamified experiences can help focus the development of necessary 21st-century skills: Students face everyday scenarios, including problem-solving, collaboration, creativity and adaptability. Students solve these problems using real-world challenges, decision-making tasks, and role-playing tasks.

Personalized Learning Paths

A Gamified approach allows flexibility in the student learning pace, or it provides a possibility of targeted feedback, as many gamified tools are designed to allow personalization easily. This is very adaptable and will be very useful in differentiated learning, as teachers will be able to adapt to the different needs of different learners. For example, Kahoot! It provides flexibility in building its specific quizzes and has the option to have different tracks for reaching different students who take a personalized learning path. For example, teachers can see where students need an extra helping hand after taking a quiz on a certain topic after a class completes it. This information can then be tapped into to create follow-up quizzes using Kahoot! and focus on those exact areas so students can practice and grow those concepts as they didn't fully understand them. Kahoot also provides students with real-time feedback, knowing where they went wrong, and they will be able to pick up from there. (Wang & Tahir, 2020) Kahoot! is a great tool for differentiated learning because it can be customized to tailor quizzes and give immediate feedback. Therefore, students will be eager to participate, either being able to progress at their own pace or getting the support as needed based on individual student needs.

Data-Driven Insights

Digital gamification platforms can help track data on student performance, engagement traces, and how those parenting signs can be improved to support the educator when using these platforms.

Adaptive Gamification

Gamification, where game mechanics change based on the individual student's needs and performance, is something of growing interest. This also serves to support the personalized learning space, whereby students can independently progress at their own pace and face the needed challenges of their ability.

Gamification in Social-Emotional Learning (SEL)

Increasingly, educators are being tapped to attempt gamified approaches to social-emotional learning, especially with the early grades in mind. These techniques (Kaur et al., 2020) allow students to practice skills like empathy, self-regulation and good communication through role-play and scenario-based activities. Early grades are utilizing gamification to augment Social Emotional Learning (SEL) by having students take part in games that foster empathy, self-regulation and communication skills. An example of this is students using role-play to resolve conflicts between the characters and are rewarded for positive behaviours, as demonstrated by the characters.

Integration with Virtual and Augmented Reality (VR/AR)

Gamified learning is slowly becoming supported by VR and AR technologies, enabling students' knowledge of complicated ideas by making their learning experience immersive. For instance, virtual field trips and augmented learning experiences (Olmo-Muñoz et al., 2020) allow students to visit historical sites to see scientific phenomena or historical events in forms that were impossible before.

Sustainability and Global Citizenship

Gamified activities with themes have been growing more and more increasingly to concerns of global citizenship, environmental sustainability and social responsibility. Games developed on these themes allow students to participate in simulated decision-making scenarios that instill awareness of pressing global issues.

Recommendations for the Future

To advance the topic of gamification in primary education and address the challenges faced by various stakeholders, the following actionable strategies are recommended.

Enhance Collaboration Among Stakeholders

To develop a sustainable digital education ecosystem, we should cherish collaboration amongst government agencies, that is, education institutions and technology companies. Collaborative efforts amongst stakeholders are essential for effective educational practices. (Dhasmana et al., 2024). Digital education initiatives should be equitable and impactful, and so resources and some insights should be shared among the stakeholders through partnerships. For example, the public sector could plan policies that encourage innovative technology in education, and the private sector could provide the necessary facilities and resources for the platform to conduct students' learning (Dhasmana et al., 2024).

Integrate Gamification into Curriculum Design

When educators incorporated gamification strategies into their method of teaching (Kenny et al., 2017), the learners became more engaged and effective. Through designing educational experiences that are game-like and fun, educators facilitate an interactive learning environment and motivate learners. One must note this approach is an informed pedagogy and to be adapted in various settings (Dhasmana et al., 2024), prepared to understand the learners and is meant to create a more purposeful and recreational learning environment.

Educator Support

Educators understand that they need comprehensive training, accessible and practical design tools, and effective classroom strategies to introduce gamification into the classroom effectively. They commonly state that they need professional development to develop skills in gamification and other innovative teaching techniques. Educators mention, “We don’t have time to think,” “We don’t have the skills and time to create it [a design] ourselves, and “...I need to collaborate with someone”. (Mårell-Olsson., 2022) Highlight the need for structured training programs that help teachers understand and develop the skills needed to introduce gamification effectively.

Additionally, providing practical design tools can be instrumental to teachers in designing exciting lessons. Designing for gamification teaching activities and finding the pedagogical balance within this context is a complex process (Mårell-Olsson., 2022) and requires a mix of different knowledge and skills. Offering readily available templates and resources can make it possible for educators to develop their gamified activities, feeling unfounded without learning how to do it.

Furthermore, appropriate classroom strategies to promote the cooperation of the teachers are necessary. Highlighting the feelings of educators is important when attempting to introduce gamification, and “...if I have to do it just by myself, it will never happen, I’m afraid” (Mårell-Olsson., 2022). This highlights why it is important for schools to encourage their educators to collaborate and share their ideas and resources that will help carry out gamification teaching techniques within their classrooms. Addressing these areas can provide you with a comprehensive framework for supporting educators in their professional growth and increasing student engagement through gamification.

60.

10.5 REFLECTION QUESTIONS

1. What role do you think teacher preparedness and training play in the success of gamification in the classroom?
2. How do you view gamification's impact on student motivation and engagement in our diverse classrooms?

61.

10.6 CONCLUSION

K-12 education through gamification has promising potential to make the learning period in the classrooms more interactive and engaging as well as effective. Though it experiences some difficulties concerning access, teacher preparedness and types of motivation, gamification can be strategically implemented to improve student involvement, accommodate the diverse needs in learning, and educate students on the skills they would need in the future. Technology advances offer more opportunities for immersive, adaptive and purpose-driven gamification that will be a reality in education for K-12.

62.

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PART XI

PART 11: GAMIFICATION IN HIGHER EDUCATION

By Sarajane Di Totto

63.

11.1 INTRODUCTION

As digital and remote learning become increasingly prevalent, sustaining student motivation and encouraging active participation have become significant challenges for educators. Gamification, which integrates game design elements such as points, badges, leaderboards, and interactive challenges into learning environments, presents a promising strategy for enhancing student engagement. This chapter explores how gamification and game-based learning (GBL) can be effectively integrated within online higher education platforms. By examining relevant theoretical frameworks and practical strategies, this chapter aims to demonstrate how gamification can be aligned with course objectives to enrich the learning experience and improve learning outcomes. The relevance of this exploration lies in its potential to transform traditional teaching approaches, making learning more interactive and motivating for students in a rapidly evolving digital landscape.

64.

11.2 POSITIONALITY STATEMENT

Reflecting on how my intersecting identities influence my approach to technology-enabled learning is essential. As a biracial woman born in the early 2000s, my perspective is formed by my cultural heritage and the technological advancements that have surrounded me throughout my life. Growing up in a digitally immersive environment has influenced my preference for technology-based education, particularly for gamification and GBL. As a member of Generation Z, I take a critical stance on traditional, passive teaching approaches and believe that our generation often values interactivity, personalization, and creativity, seeking learning experiences that are engaging and relevant. My technology-rich upbringing has led me to value educational technologies' engagement-enhancing potential.

Nonetheless, I recognize the dynamics affecting access to these technologies and how they can support or restrict engagement among diverse learners. Mindful of how my generational identity and technology-rich upbringing influence my views, I reflect on how these biases shape my approach to digital learning tools. While I see great potential in gamification for enhancing engagement and motivation, I also acknowledge that my perspective may differ from those with less access to technology. I seek to balance my enthusiasm for technology-enabled learning with an awareness of these disparities, aiming to create engaging and equitable approaches for all learners.

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11.3 DISCUSSION

Current State of Gamification and GBL

Gamification and GBL are becoming increasingly recognized within higher education as methods to improve engagement and motivation, particularly in online settings. These approaches address today’s learners’ changing expectations, increasingly seeking interactive and personalized learning experiences. However, while common elements like points, badges, and leaderboards are becoming more prevalent in educational contexts (see Table 1), many implementations lack solid theoretical foundations, limiting their educational impact (Khalid et al., 2023). Structured frameworks that ensure gamification aligns with educational objectives are essential to promote meaningful learning.

Table 1
Gamification Mechanics

Game Elements	Description	Educational Purpose
Points	Accumulated by completing tasks	Reinforces behaviour, provides feedback on progress, and creates a sense of reward
Badges	Earned for achieving specific milestones	Recognizes achievement, boosts self-esteem, and serves as motivation
Leaderboards	Ranks participants based on performance	Encourages competition and peer interaction and can drive motivation
Quests and Challenges	Tasks or puzzles to solve	Engages critical thinking and problem-solving and offers real-world applicability
Levels	Sequential stages or difficulties	Tracks progression, structures learning in stages, and sustains motivation
Immediate Feedback	Instant responses to actions, helping students gauge their progress	Supports self-regulation and reflection

Note. This table illustrates core gamification elements in education contexts and highlights how each feature contributes to specific learning outcomes.

The integration of Commercial-Off-The-Shelf (COTS) games represents a significant development in gamification strategies. Becker (2017) notes that COTS games can provide educators with ready-made, engaging content that can be effectively repurposed for education objectives. However, selecting appropriate COTS games requires careful evaluation of their alignment with learning goals and consideration of technical requirements. The adaptability of these games allows educators to leverage proven, immersive content that resonates with students while supporting specific learning objectives (Becker, 2017).

A significant development in gamification is the shift toward personalization, supported by data-driven technologies that adapt game mechanics to individual learner profiles. This evolution aligns well with the principles of adult learning, which emphasize autonomy, relevance, and practical application (Becker, 2017). Personalized gamification has the potential to enhance engagement by tailoring experiences to adult learners' unique needs and professional goals. GBL complements this approach by offering flexible, motivating tools that align with individual learning objectives (Khalid et al., 2023).

Despite the advantages of gamification, research on its effects has primarily focused on traditional undergraduate students, leaving gaps in understanding how it affects nontraditional students, including adult learners with diverse needs (Turner et al., 2018). However, game-based learning has shown promise in increasing cognitive engagement and stimulating emotional connections with the learning material by offering immediate feedback and incremental achievement. This interactive environment allows students to apply academic knowledge in practical contexts (Turner et al., 2018).

Nevertheless, significant barriers, such as the need for specialized training, continue to restrict the widespread adoption of gamification and GBL. The lack of robust empirical evidence on gamification's effects on academic achievement is mixed; some studies report no significant impact on knowledge retention or test scores compared to traditional methods, highlighting the need for further research on optimal strategies (Khalid et al., 2023). Moving forward, evidence-based approaches and adaptive, data-driven models tailored to diverse learner needs will be essential to enhance the effectiveness of gamified experiences (Turner et al., 2018).

Challenges in the Implementation of Gamification and Game-Based Learning

Integrating GBL and gamification into higher education presents challenges that must be addressed for these approaches to be sufficient. Macías-Guillén et al. (2021) emphasize that GBL must directly support academic content; otherwise, they risk becoming mere entertainment with limited educational value. The shift to gamified learning involves understanding game mechanics, user engagement, and motivational psychology—skills many educators lack formal training in. Bawa (2020) notes that inconsistent application of game-based strategies often results from inadequate training, undermining the effectiveness of gamification in enhancing student engagement.

Resource constraints present another significant barrier to implementation. Designing meaningful gamified experiences demands considerable resources, including specialized software and virtual environments, which

many institutions struggle to provide (Macías-Guillén et al., 2021). Without adequate resources, the scalability and sustainability of gamification across programs remain limited. Additionally, institutions must provide the necessary support and training to help educators integrate gamified elements meaningfully into their curriculum, addressing the current gap in expertise among educators.

Diversity of Learners and Technological Barriers in Gamified Environments

Implementing gamification in higher education faces unique challenges related to student diversity and technological access. Khalid et al. (2023) emphasize that students' varied motivations, prior knowledge, and learning preferences present significant challenges in applying uniform gamification strategies for all parties involved. The complexity of higher education subjects further complicates the standardization of gamification approaches across disciplines, necessitating careful consideration of individual student needs and learning contexts (Khalid et al., 2023).

Technological infrastructure presents additional challenges, particularly in online learning environments. Many institutions lack the infrastructure to support complex game mechanics within learning management systems, while limited technical support further restricts implementation (Macías-Guillén et al., 2021). The digital divide among students, manifesting in varying levels of technological literacy and access to required platforms, can significantly impact their ability to engage with gamified elements effectively (Becker, 2017).

Cultural and perceptual barriers also influence the effectiveness of gamification in online higher education. Filatro and dos Santos Garcia (2021) note that some individuals view gamification as trivial, potentially undermining its educational value. These perceptions arise from students' diverse cultural values, beliefs, and learning preferences, potentially leading to a disconnect between game elements and students' cultural expectations (Filatro & dos Santos Garcia, 2021).

Assessment Challenges in Game-Based Learning

Assessment practices in gamified environments present another challenge. Traditional assessments, such as exams and essays, may not effectively measure competencies like problem-solving, creativity, and collaboration, which are central to GBL (Macías-Guillén et al., 2021). Bawa (2020) highlights the difficulty in assessing the impact of gamification on student performance, emphasizing the need for new assessment frameworks to capture the experiential learning facilitated by game-based activities.

Time constraints on educators further complicate the implementation of effective assessment strategies in gamified environments, particularly in adult education, where learners often require tailored support and practical application of concepts. The additional responsibilities of course preparation and grading, combined with the complexity of designing and managing gamified activities, may discourage educators from fully

adopting gamification strategies, limiting the potential to meet the diverse needs of adult learners (Lester et al., 2023).

Opportunities of Gamification and Game-Based Learning in Higher Education

Gamification offers significant opportunities to transform higher education through enhanced student engagement and personalized learning experiences. The immersive nature of gamified environments, characterized by challenges and achievements, can significantly boost intrinsic motivation and student interest in the course material (Macías-Guillén et al., 2021). This aligns with Activity Theory (AT), which emphasizes the importance of mediation in human activities (Bawa, 2020). In a gamified environment, the tools—points, levels, and rewards—mediate interactions between students, their peers, and the content, enhancing their sense of agency and accomplishment and enabling students to develop connections with the academic content.

Furthermore, gamified systems can adapt to individual learner needs, allowing students to engage with content that matches their skill levels and knowledge (Turner et al., 2018). This personalized approach promotes learner autonomy and empowers students to take control of their educational journey, an essential component of online learning. Gamified systems can also provide real-time feedback, enabling students to adjust their strategies and improve their performance over time (Turner et al., 2018). Through this lens, AT suggests that the interaction between the individual (student) and the tools (game mechanics) supports the accomplishment of learning goals (objectives), making the educational process more dynamic and participatory (Bawa, 2020). This creates a continuous cycle of engagement and learning consistent with the AT principle of mediated actions.

Additionally, gamification encourages collaboration and builds a sense of community among learners. Social elements, such as team-based challenges and leaderboards, encourage peer interaction, enhancing the social presence of online learning environments. Activity Theory highlights the significance of the social dimension in learning, suggesting that community and collaboration are integral to educational processes (Bawa, 2020). Learners collaborating in gamified settings share insights, strategize, and solve problems, reinforcing the communal nature of learning emphasized in AT. This collaboration helps students develop critical soft skills such as teamwork and communication, which are highly valued in professional settings (Pardim et al., 2023). Moreover, the collaborative nature of gamified learning environments can alleviate the isolation fatigue felt in online education (Bawa, 2020).

Addressing Diverse Learner Needs through Gamification

Gamification effectively addresses diverse learning preferences by offering various mechanics that cater to different learning styles. Storytelling and narrative elements, in particular, enable students to better understand

and retain course materials (Macías-Guillén et al., 2021). Activity Theory further supports this perspective by highlighting how tools—such as narratives and game-based systems—mediate and enhance individual learning experiences (Bawa, 2020). The tools allow learners to engage actively with content, reinforcing AT’s premise that learning is a mediated process shaped by the tools and the social context surrounding it.

Emerging Trends in Gamification and Game-Based Learning in Higher Education

The integration of gamification and GBL in higher education continues to grow, reflecting a shift toward more interactive and engaging learning experiences aligning with the needs of today’s diverse learners. As more educators and institutions explore gamification, these methods will likely continue to refine and adapt to various education contexts, enriching student learning outcomes.

Furthermore, Bawa (2020) highlights that GBL is gaining popularity as educators seek immersive, engaging learning environments to enhance motivation, engagement, and understanding of course concepts. This trend aligns with the growing recognition of gamification as a tool to improve student engagement, especially among the current and upcoming tech-savvy generations. The personalization of gamification is another essential movement, with data analytics and artificial intelligence enabling adaptive learning experiences that cater to individual student progress and concentration levels. As technology advances, gamification and GBL are increasingly integrated into online and face-to-face learning environments, supported by growing digital infrastructure (Irwanto et al., 2023).

Media Attributions

- Table 1

66.

11.4 RECOMMENDATIONS FOR THE FUTURE

Integrating Gamification Principles at the Curriculum Design Stage

A fundamental step to enhancing gamified learning in higher education is embedding gamification principles at the initial course design phase rather than as an auxiliary addition (Alnuaim, 2024). For instance, educators could incorporate game mechanics like levels, scoring, and competition that directly align with learning objectives, reinforcing academic content and enhancing engagement (Pardim et al., 2023). To support this, institutions should offer structured professional development, helping educators gain familiarity with gamification platforms and the theories behind effective game-based learning. Ongoing training, workshops, and peer collaboration sessions can provide faculty with the necessary skills and confidence needed to design and implement gamified content that is pedagogically sound (Turner et al., 2018). Educators could also collaborate with instructional designers to ensure the gamified aspects are cohesive and tailored to specific courses, resulting in a more meaningful and engaging learning experience that appeals to diverse learning preferences (Pardim et al., 2023).

Data-Driven Feedback Systems and Student Involvement in Gamified Learning

Institutions should implement data analytics tools to monitor and assess the effectiveness of gamification on student outcomes, allowing for real-time adjustments to gamified content based on student performance and engagement data. This can provide insights into which gamified elements work best for specific cohorts and identify areas for improvement (Alnuaim, 2024). Additionally, integrating continuous feedback mechanisms within gamified systems can support students' learning progression by offering personalized guidance and real-time encouragement, promoting a sense of accomplishment and reinforcing motivation (Bawa, 2020). Similarly, inviting students to participate in designing and refining gamified learning activities—via surveys, focus groups, or pilot programs—can ensure these methods resonate with students' interests and motivations (Turner et al., 2018). This participatory approach aligns with best practices in student-centred learning while encouraging collaboration where students feel invested in their academic pursuits (Pardim et al., 2023).

67.

11.5 REFLECTION QUESTIONS

As the educational landscape increasingly embraces gamification to enhance student engagement, educators, students, curriculum designers, and policymakers need to consider the broader implications of these practices. Gamified approaches offer numerous benefits but pose challenges that require thoughtful reflection and adaptation. The following questions are intended to encourage readers to critically engage with the content of this chapter, examining the potential and complexities of integrating gamification into higher education.

1. How can educators effectively balance gamified elements, such as points, badges, and leaderboards, with the need to maintain academic standards and meaningful learning outcomes in higher education?
2. How can gamification be tailored to meet the diverse needs of learners, particularly those who may not initially respond positively to game-based approaches?

68.

11.6 CONCLUSION

Integrating gamification in higher education presents a promising path to enhancing student engagement and learning. By aligning game mechanics with curricular goals, educators can create immersive, interactive experiences that resonate with diverse learning styles and needs (Turner et al., 2018; Bawa, 2020). However, effective gamification implementation requires a strategic approach—beginning with professional development for educators and collaboration with instructional designers to ensure that game-based elements enhance rather than distract from academic standards (Paradim et al., 2023).

Future recommendations should focus on interdisciplinary collaboration, data-driven evaluations, and the adaptability of gamified learning experiences across different educational contexts and technological advancements (Macías-Guillén et al., 2021). By prioritizing these aspects, institutions can leverage gamification to transform traditional educational models, cultivating cognitive skills and essential competencies like teamwork, problem-solving, and critical thinking. Through collaborative efforts among educators, students, curriculum and instructional designers, and policymakers, future learning can be as engaging as it is effective.

69.

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PART XII

PART 12: ENGAGING MINDS AND HEARTS

By Joanne Matheson-Walker

70.

12.1 INTRODUCTION

I will explore how gamification can engage elementary school-aged students and provide ways to develop critical social skills in an increasingly tech-driven world. I will also examine how to incorporate game elements into educational activities to enhance social engagement, especially for students struggling with traditional social learning approaches. These strategies enable students to interact and grow, both academically and emotionally. I will provide strategies in my research to support how educators can create a more dynamic and inclusive learning environment by integrating gamification into teaching pedagogy, particularly those focused on social interactions.

71.

12.2 POSITIONALITY STATEMENT

“Each friend represents a world in us, a world possibly not born until they arrive, and it is only by this meeting that a new world is born.” – Anais Nin.

I will explore how gamification can engage elementary school-aged students and provide ways to develop critical social skills in an increasingly tech-driven world. I will also examine how to incorporate game elements into educational activities to enhance social engagement, especially for students struggling with traditional social learning approaches. These strategies enable students to interact and grow, both academically and emotionally. I will provide strategies in my research to support how educators can create a more dynamic and inclusive learning environment by integrating gamification into teaching pedagogy, particularly those focused on social interactions.

Many different experiences have been shaped by the decades of changes in the social and technical world throughout my life. As the youngest of six in a large family, my parents and three older siblings moved from Scotland to Canada for a better life and then had three more children. Despite tight finances, I was given education opportunities and was the only one of my siblings to attend post-secondary school after high school.

As a member of Generation X, my childhood was marked by freedom and creativity—playing outside until the streetlights came on (no phone to text me to come inside), using encyclopedias (now internet), and watching TV shows with a corded remote (no Netflix on my laptop). My first technology was a typewriter, followed by a bulky Macintosh (now Apple) computer with floppy disks. When I started working, everything was done on paper, and we shared one computer among the staff.

Twenty-five years ago, as a Child and Youth Counselor (CYC) working in schools, I remember showing social-emotional videos to students by wheeling out a giant TV and VCR or using an overhead projector—now a dinosaur in schools. How times have changed! Everyone has a technology device, and the classroom could not exist without wifi. Children who want to play with their friends play remotely through video games. How times have changed!

Today, technology is essential in teaching and learning. I use technology every day to teach social-emotional learning skills. By helping students engage and learn, I see how technology can bridge gaps and bring students together. In my OER chapter, I would like to explore how gamification can enhance engagement while developing social skills, offering new ways for students to interact and learn using technology.

72.

12.3 DISCUSSION

The Role of Gamification in Enhancing Student Engagement and Social-Emotional Learning

Gamification in education has received attention over the last few years as an educational tool to improve student engagement and learning outcomes by integrating game elements such as points, leaderboards and badges into the classroom to make learning more interactive and enjoyable (Cheong et al., 2017). My research includes various academic sources from peer-reviewed journals covering primary and secondary studies, such as systematic reviews, meta-analyses, and editorials. Research has shown that gamification can foster motivation and engagement, but its effectiveness largely depends on how these elements are used and the context in which they are used (Sailer & Homner, 2019). Studies have highlighted that social interaction and feedback are crucial in maintaining student interest and encouraging active participation (Chung & Pan, 2023). However, the challenge in applying gamification is the risk of overcomplicating the experience for students or making the game mechanics too difficult, which could discourage the learning process (Marques et al., 2023). Integrating digital tools for social-emotional learning (SEL) is also increasing, with many educators recognizing the importance of teaching social skills, emotional regulation, and peer interaction (Short, 2016). As more schools explore ways to integrate SEL into their curriculum, gamification offers a promising approach to fostering these skills. Gamification in the classroom that creates social-emotional opportunities can help students practice social skills in a safe, supportive environment (Dibello, 2012).

Positive Impact of Gamification

Multiple studies support gamification in improving different elements of learning. Sailer and Homner's (2019) meta-analysis indicates that gamification can positively affect cognitive, motivational, and behavioural outcomes. This meta-analysis also suggests that gamification can increase academic performance and student engagement. Cheong et al. (2017) found that students responded positively to game elements when these features included progress tracking and some competition. These findings highlight the importance of utilizing well-balanced and thoughtful gamification strategies.

73.

12.4 KEY CHALLENGES, OPPORTUNITIES, AND TRENDS

Challenges and Concerns in Gamification

There were concerns about the potential of gamification, particularly when it leads to excessive competition to become a form of escapism. Marques et al. (2023) stated that escapists in gaming can affect mental health and social behaviour and could have both positive and negative outcomes. These concerns suggest that educational games focus on cooperative play and positive feedback, which can foster healthy social interactions and support emotional well-being.

Finding the right balance between the fun aspects of games and the educational goals of gamification in education can be challenging. Students can lose focus on the learning objectives if the game elements distract or encourage too much competition. It is important to ensure the game is enjoyable and engaging while keeping the lesson focused (Cheong et al., 2017). Another area for improvement is that focusing too much on rewards like points or badges can make students more motivated by those rewards than by actual learning. Over time, this can lower their intrinsic motivation (Marques et al., 2023). Teachers must monitor how students respond to the game elements and adjust them to ensure that learning stays the main focus.

Opportunities in Gamification

Gamification can tap into what interests students and motivate them to learn by using game elements that match their learning styles. Adding social activities, like group challenges, can help students work together and develop social and emotional skills and academic knowledge (Sailer & Homner, 2019). Gamification can also be personalized, allowing students to learn at their own pace and receive tailored feedback, which is especially helpful for students struggling in a traditional classroom (Dibello, 2012). Considerations in gamification include using more up-to-date technologies, such as virtual and augmented reality, which make learning experiences more interactive and real-world-like. These tools can create dynamic, gamified environments that help students apply their learning in realistic situations (Chung & Pan, 2023).

Social-Emotional Learning Through Gamification

Integrating digital tools for social-emotional learning (SEL) is increasing, with many educators recognizing the importance of teaching social skills, emotional regulation, and peer engagement (Short, 2016). Incorporating gamified learning for SEL is earning more attention as educators increasingly recognize the importance of teaching social skills, emotional regulation, and peer interaction. Gamified SEL lessons provide a promising avenue for fostering these skills. Classroom activities designed with gamified elements can create opportunities for students to practice social skills in a safe and supportive environment where students can build confidence and improve peer relationships (Dibello, 2012).

The article *Assessing the effects of flow, social interaction, and engagement on students' gamified learning: A mediation analysis* highlights the role of peer interaction and social influence in motivating students within gamified environments (Chung & Pan, 2023). The findings suggest that educators can use gamification to create activities that promote academic growth and support student's social and emotional development. With the growing focus on SEL, gamification can be an effective tool to foster empathy, enhance problem-solving abilities, and improve emotional regulation skills (Chung & Pan, 2023).

Balancing Engagement and Educational Goals in Gamified Learning for Social-Emotional Development

Striking the right balance between engaging game elements and educational goals can take time and effort. If game elements distract from learning objectives or over-emphasize external rewards like points or badges, students may lose focus or rely too heavily on extrinsic motivation (Cheong et al., 2017; Marques et al., 2023). Educators should adjust the game mechanics to provide meaningful learning by using gamification to personalize the learning experiences with self-paced progress and tailored feedback. Incorporating collaborative activities, such as group challenges, can help students develop academic knowledge and social-emotional skills (Sailer & Homner, 2019). These approaches are particularly valuable for students struggling in traditional classroom settings (Dibello, 2012). Emerging technologies, such as virtual and augmented reality, enhance gamification's potential to create immersive and real-world learning experiences (Chung & Pan, 2023). These tools can engage students in active activities that connect classroom learning to practical applications.

74.

12.5 RECOMMENDATIONS FOR THE FUTURE

Boosting Social Interaction and Learning with Collaborative Gamification

Implement Social Interaction through a collaborative game design and ensure that elements increase positive peer interactions, improving students' social interactions and learning outcomes for all students. Research shows that combining these elements fosters teamwork while allowing learners to compete against other teams (Chung & Pan, 2023). Creating social interactions through a collaborative approach encourages cooperation by incorporating team-based challenges that tackle problem-solving tasks and receive shared rewards. Studies show that peer interaction and social influence are crucial for enhancing students' engagement and learning in gamified settings, ultimately improving social skills and mental health outcomes (Otani et al., 2024).

Teachers can add feedback and reflection to personalized game design to improve learning in game-based environments. Feedback helps track how students are doing, and making changes based on that feedback can improve the overall learning experience (Barz et al., 2023). Since students learn differently, it is important to customize game elements to fit their preferences. This personalized approach supports different social and learning needs (Barz et al., 2023; Marques et al., 2023). It also helps to consider each student's skill level when making game challenges. Students might get frustrated or bored if a game is too hard or easy. Matching challenges to what students can do makes learning more engaging and fun. Research shows that tasks matching students' skills can lead to a state of "flow," where they are fully focused and learning well. Providing clear instruction support and adjusting the difficulty level means more students can achieve success (Chung & Pan, 2023). By considering these factors, teachers can make game-based learning fun and engaging.

Teacher training can address the digital divide by providing teacher training in digital literacy and online teaching strategies, which can create inclusive learning environments for all students. School boards must prioritize funding for professional development to prepare educators with the skills to navigate digital learning environments Dibello (2012). Educators can create an engaging, inclusive, and positive learning environment by incorporating these recommendations successfully. A safe environment that promotes social interactions, integrates feedback, personalizes learning, and designs developmentally appropriate games will enhance academic success and foster essential social skills development. These actionable strategies will empower educators and policymakers to leverage the full potential of gamification to improve education and address challenges like the digital divide.

75.

12.6 REFLECTION QUESTIONS

1. How can the strategies for technology-enabled personalized learning and gamification, as discussed in this chapter, be applied to your own educational experiences, and how might these approaches influence your teaching methods, classroom environment, and students' social skills development?
2. As an educator, how do you think gamification and personalized learning could impact your students' motivation, engagement, and social skills, and how could you better adapt these strategies to support your students' social development and collaboration?

76.

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PART XIII

PART 13: INTEGRATING E-BOOKS IN EDUCATION

By Dania Kazkaz

77.

13.1 INTRODUCTION

With the rapid advancement of technology, integrating technology into education has become increasingly popular. Because of its significant impact on the teaching process, many stakeholders, school administrators, and educators have integrated various digital platforms into their approaches to development. Digital platforms like Raz-Kids provide various materials, from interactive lessons and real-time feedback to collaboration tools that adapt to different learning styles.

Integrating technology such as e-books to help elementary school children's reading in multiple areas motivates and supports them. The high quality and quantity of interactive electronic books available on Raz Kids increase students' engagement and develop their reading experience (Amelia et al., 2020). English language learners typically require more assistance to improve their language skills. Raz Kids personalizes learning by including a variety of elements that respond to the needs of children. This paper will address this integration of technology in education to support elementary school students in general and English Language Learners in specific in their reading skills.

78.

13.2 POSITIONALITY STATEMENT

I am an Arabic woman who immigrated to Canada, facing challenges like re-adapting, accepting diverse cultures, raising kids, finding a career, and speaking a different language. I incorporated technology into my study in a variety of ways. In the Educational Support program, I utilized a variety of platforms to enhance my learning outcomes. In my final year's assignment, I created an E-portfolio as an electronic library for my study resources and research, and I included Pinterest, which was a huge step because it allowed me to pin any research or apps into organized boards. In the future, I hope to provide more valuable free features for those platforms in order to involve as many community members as possible, particularly for platforms that might help students better their academic performance. For example, as a mother of an English Language Learner, free access to digital e-books is quite limited, and the quality of the free books given is low. On a platform like Raz Kids eBook, I have to pay to access the required book level to gain the benefits of integrating technology into education.

79.

13.3 DISCUSSION

Language is an essential element that influences an individual's communication activities. Students use several areas of English language skills, such as listening, speaking, reading, and writing, to improve their proficiency and communication. Students' reading levels vary, and teachers must spend twice as much time in class to meet the academic needs of all pupils. English Language Learners, for example, require distinct types of support in various areas of reading to show growth. Ahmadi (2018) defined technology integration as the use of technology to improve the educational environment. The reviewed literature indicated that the use of technology plays a key role in language learning, helps in self-understanding, does not stop interaction with the teacher, and creates high motivation in learners for the effective learning of language skills. To sum up, technology provides interaction between teachers and learners, provides comprehensible input and output, helps learners to develop thinking skills, makes learning and teaching become more student-centred, promotes learners' autonomy and helps them feel more confident, and increases learners' motivation to effectively learn a foreign language.

E-book platforms show a significant impact on students' reading levels for many reasons. It is user-friendly and does not require any specific skills to navigate. Even young children without new literacy development can utilize e-books independently without any adult input. The e-book implements the concept of UDL strategy in its design and use in multiple areas. The touch screen is quickly earning a position in the life of families with young children. An interactive book with audio narration that allows children to learn vocabulary and become aware of sounds, indicating that using e-books alone may be a helpful activity for encouraging kids to develop of early literacy abilities without adult assistance while teachers or parents are elsewhere busy. In addition to the instant feedback, quality of e-book design, and appropriate selection. López-Escribano et al. (2021) stated that “e-books, on the one hand, have a more educational value for young children compared to those that were on the market a decade ago”. All of these features and more make digital e-books the recommended platform to enhance student's literacy skills, not only for typical students but also for children living in a deprived context, at risk of learning disabilities, and English Language Learners benefited from all the reviewed e-book interventions, which highly improved their literacy skills, regarding concepts about print, phonological awareness, vocabulary, and reading comprehension. digital learning and e-books represent a potential compensatory strategy for these children. Results of the present study show that the presence of an adult does not have an advantage for phonological awareness and vocabulary learning. We are aware that young children learn best from exchanges with caring adults, but in the case of learning with e-books, their role might shift away from direct support to a more distal role while children are using the e-book (i.e., adequate

selection of the e-book, the design of strategies, and the adaptation to the context where the e-book is used (López-Escribano et al., 2021).

The quality and quantity of interactive electronic books provided on Raz Kids enhance the students' engagement and develop their reading experience. This platform contains a wide range of books, allowing students to get diverse knowledge while also selecting books that interest them. The interactive and attractive style in which the books are designed and shown encourages children to read more. Raz-Kids had been suggested as an educational platform that could support English language teaching through technology in elementary school. Raz Kids provides opportunities for ELLs to choose the book that suits their interests and is relevant to their culture, encouraging them to read more. Davis (2018) mentioned that when students read contents that are culturally relevant, they not only like them more but also grasp them better (p. 22). Providing audiobooks helps ELLs with their pronunciation and spelling skills. (Wang, 2022) stated that RazKids could be an effective supplement to struggling readers' reading instruction and individual reading assistance(p.47). The quiz given at the end of each book lets the teacher determine the students' level of reading comprehension. "Raz Kids, as an e-book platform, gives educators opportunities to assess the student's reading levels by including different resources of fiction and non-fiction texts to support personalized reading teaching, which can be used inside the classroom" (Amelia et al., 2020).

80.

13.4 RECOMMENDATIONS FOR THE FUTURE

In addition to the teachers, the school leadership has invested much in integrating technology into education, which is insufficient to achieve the desired benefits. School administrators must create systems and make organizational improvements which encourage student learning through developing and monitoring curricular programs by providing instructional support staff who directly offer professional development, which can help develop teachers' perspectives, beliefs, self-efficacy, and knowledge of educational technology. Another way that school leaders can help integrate technology into education is by creating communities of practice for teachers where they can provide ongoing collaboration and support for one another's educational technology learning beyond formal professional development. Individualized consideration is when considering an individual teacher's strengths and needs when building capacity for integrating educational technology in their school's classrooms. Leaders carefully plan with the local context in mind (Trust, 2016) and allow individuals to follow their curiosity or need (Courduff et al., 2015). School leaders might also tap into the expertise of individual teachers who might aid their peers and contribute to the design of professional development, which might result in the further benefit of more ready teachers stepping forward to lead a ripple effect. Connecting with external partners on how to engage families and community involvement and build productive relationships when leading technology (Dexter & Richardson, 2019).

Another recommendation for integrating technology in education is to bridge the gap between schools and families. Educators offer a range of approaches to sharing digital literacy practices with families. This could be done through traditional face-to-face parent/teacher and student-led conferences or participation or visits in the classroom where family digital literacy practices can be discussed. Parent training with their children can be done during instructional time for parents who are available during school hours or through more technology methods such as podcasts or DVD newsletters for parents who are unable to come to school during the day. It is a good recommendation to provide a variety of ways to reach out to the families because if one way does not work, then the other one will (Jung, 2018, p 38). Another recommendation is to provide an environment for parents to share technology with the school. Zweiback et al. (2012) did not specifically recommend any particular strategy for parents to share their family digital literacy practices, they recommend that schools may want to consider ways to partner with parent education programs in their communities, linking community resources (such as adult education programs or existing parenting programs) and schools has the potential of creating positive learning environments for both children and families (p.17).

81.

13.5 REFLECTION QUESTIONS

Integrating technology into education can provide numerous benefits to those who use it. E-books are making a significant contribution to children's reading skills development. However, there are still a lot of questions about using these platforms:

Q1: Algorithms have an impact on e-book features such as font types and size, accessibility features like text-to-speech and personalized suggestions, therefore how these e-book algorithms are made to guarantee access for all users, including those with various learning needs, disabilities, or cultural backgrounds.

In addition, unlike human teachers who are able to clarify and modify their evaluation in real time, e-book exams may not be able to ask follow-up questions or explore further. Moreover, automated tests could emphasize fact recall (such as multiple-choice questions) over more complex understanding abilities like application or synthesis. Therefore, how accurate e-books are in determining the exact student reading comprehension level?

82.

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PART XIV

PART 14: THE ROLE OF PROFESSIONAL DEVELOPMENT IN THE INTEGRATION OF ASSISTIVE TECHNOLOGY IN K-12 LEARNING

By Kishola Levine

83.

14.1 INTRODUCTION

Assistive Technology (AT) is defined as any piece of item or equipment used to increase, maintain, or improve the functional capabilities of a child with a disability (Individuals with Disabilities Education Act, 2004). Integrating assistive technology into classrooms is a powerful approach to creating inclusive and accessible learning environments, particularly for K-12 learners (Torrato et al., 2020). These tools allow students to access learning materials in a format that aligns with their individual needs, enabling them to participate in activities. Unfortunately, there are multiple barriers to implementing assistive technology in classrooms. Barriers such as limited resources, lack of training, and teacher vulnerability can hinder effective AT integration (Hunt, 2021). This chapter examines how professional development can address obstacles by equipping educators with the skills and knowledge needed to select, adapt, and implement AT effectively (Schladant et al., 2022). It emphasizes the importance of empowering teachers to navigate challenges in the classroom through targeted training. Ultimately, the chapter emphasizes the significance of equipping educators with professional development to overcome barriers and foster learning environments that enable all students, regardless of their abilities, to succeed.

84.

14.2 POSITIONALITY STATEMENT

As a black cis-gendered, immigrant woman and undergraduate student at Ontario Tech University specializing in Equity, Diversity, and Inclusion, I have been educated on a variety of assistive technologies that I previously had no exposure to. My personal journey navigating barriers in accessing technology has developed my deep passion for equity in education, specifically the need for all students to have access to assistive technology in the classroom. Growing up in the Caribbean, I firsthand saw how students from lower socio-economic households struggled to gain access to technology. For a short period, I experienced this, and it negatively impacted my academic performance. The school system was solely based on traditional teaching methods, viewing technology as a privilege instead of a tool. Many families lacked the finances to afford devices, and those who could afford them excelled in their studies. Due to a lack of education on the benefits of technology, special needs students were removed from classrooms and sent to a school for ‘special education,’ creating segregation and reinforcing inequities. My outlook on equity in education heightened after having a child with a disability. My lack of exposure to technology in the Caribbean hindered my ability to advocate for his needs, but once he was introduced to technology, I was amazed at the significant improvement it made in his development. Access to assistive devices helped him to participate in lessons and be included in class activities. I am now devoted to addressing educational disparities and advocating for integrating assistive technology into classrooms. I understand the benefits assistive technology provides and recognize the importance of creating level playing fields for students with diverse learning needs.

85.

14.3 DISCUSSION

Assistive Technology

Over the past five years, technology in classrooms has evolved significantly, enhancing the delivery of education (Converging Trends in Educational and Assistive Technology, 2011). This shift has led to the development of more devices and online applications designed with accessible and customizable features to support the needs of diverse learners. With the use of assistive technology on the rise, there is a promising future ahead for students. Although assistive tools were initially developed to assist students with disabilities, they have now become mainstream technology and are enjoyed by all (Abraham, 2024). For instance, spell-check applications such as Grammarly are greatly beneficial to students with dyslexia but have also benefited other students and professionals in improving their writing skills and identifying grammatical errors (Grammarly, 2024). Examples of assistive tools include screen readers, interactive whiteboards, and digital organizers.

In K-12 classrooms, assistive technology is used to facilitate Universal Design for Learning (UDL), a framework that supports the design of accessible, inclusive, and stimulating learning environments through flexible methods of engagement and representation (CAST, 2024). The Individuals with Disabilities Act requires schools to provide assistive technology to students with disabilities. (IDEA, 2004). Educators must become well-versed in the wide range of available tools, understand their purposes and functions, and learn how to integrate them effectively into K-12 learning environments.

Benefits of Assistive Technology in K-12 Classrooms

Assistive technology plays a significant role in creating an inclusive environment that children with disabilities, their parents, and special educators seek. It is one of the most valuable accommodations institutions can offer (Areej, 2018). When integrated correctly, assistive technology transforms the learning experience for K-12 learners, making learning more personalized, engaging, and accessible to support learners in reaching their full potential (Alsolami, 2022). High-tech AT tools, such as Speech-to-text software, are used to support students by transcribing spoken words into digitized text, which is useful in enhancing communication for students with hearing impairments. Learners who have access to AT gain greater independence (Copley & Ziviani, 2004). A comprehensive study on the benefits of AT found that independence was among the most cited benefits achieved. Students are equipped to complete tasks independently, promoting self-sufficiency in learning. Assistive technology promotes inclusion by enabling students with disabilities to remain in

mainstream classes and learn alongside their neurotypical peers. This approach builds social skills and encourages participation in collaborative activities, fostering a sense of belonging while reducing stigmas associated with disabilities.

Barriers to implementing Assistive Technology in K-12 learning

Organizational practices can either facilitate or hinder the use of educational technology to support the needs of diverse learners. Failure to adopt frameworks like the Universal Design for Learning creates barriers for students. A learning barrier refers to anything that challenges or hinders an individual's ability to access education (Dacus-Hare, 2023). AT devices require repairs and frequent software upgrades to remain current to continuously meet the needs of students, making them costly to maintain (Agree, 2015). Financial constraints are a major barrier to AT in K-12 classrooms. Many schools have limited budgets, which can prevent them from providing students with educational technology in the classroom.

Another barrier to implementing AT is the unawareness of the benefits they provide (Boot et al., 2018). When educators and parents are unaware of the types of tools available and how students can benefit from them, students are at a disadvantage because they miss opportunities to resources that will enhance their learning. Although technology has brought numerous advantages to the classroom, its implementation has presented several challenges. If not integrated wisely, technology can become a distraction in the classroom (Harvard University, 2024). There is a risk that students may use technology for non-educational purposes like social media and gaming.

Excessive screen time is also a concern in the integration of AT in classrooms (Muppalla et al., 2023). Unfortunately, some students have unlimited access to screens at home, and in addition to the access they have in class, they may start experiencing health issues like eye strain and headaches. Therefore, educators must closely monitor students to ensure assistive tools are being used for the intended purpose. In a recent study conducted on barriers teachers encounter when implementing technology, teacher vulnerability and lack of training were reported as leading barriers to implementing technology to support Universal Design for Learning (Dacus-Hare, 2023). Educators expressed that the lack of training support was a major reason for them not implementing new technology. They shared that if they received training, they would be more confident introducing new tools to their students.

Professional development

Professional development (PD) is an internal process where individuals engage in a formal or informal setting, focusing on critical self-reflection of the practice. The process enables professionals to identify areas of growth and take corrective action to improve their performance (Parsons, 2022). Successfully integrating technology

into educational settings does not only rely on the availability of the tools but on the educator's knowledge and confidence to use the tools effectively. Professional development plays an important role in equipping educators with the skills needed to implement technology to foster equitable learning (Schladant et al., 2022). Studies have shown that as a result of PD educators build the capacity to implement AT as a responsive instructional strategy. This Professional Development Intervention Study revealed educators who received PD experienced an increase in knowledge and admitted to being more prepared to use AT to facilitate a culture of inclusion. Educators reported a significant increase in the literacy skills of their students with disabilities, underscoring how instrumental the use of assistive technology is to students when integrated correctly.

Through continuous training, educators remain updated on the latest advancements in AT. With technology evolving rapidly, new tools and features are emerging with innovative ways to support students. Without access to regular training, educators will be inadequately prepared to leverage the benefits of new technologies in their practice (Downing, 2021). Training helps to bring Universal Design for Learners to the classrooms by ensuring every student can participate meaningfully with the content, benefitting the entire class, not only students with disabilities. Additionally, professional development fosters collaboration among educators, creating a support community. Teachers' readiness to use technology is critical for its integration into the classroom. A lack of preparedness leads to the underutilization of tools, diminishing the possible benefits. In this study on the effectiveness of PD, it has been proven that when educators feel prepared and confident navigating devices, they are more likely to use them to enhance the learning experience for their students (Avci et al., 2020). This readiness can be achieved by hands-on training and practice with assistive tools. By encountering technical issues and receiving guidance on how to troubleshoot them prior to the devices being distributed, educators become knowledgeable of what students may face, but most importantly, they will be skilled enough to assist their students in overcoming such technical challenges. In a study on the influence of teachers' knowledge on using assistive technology, it was reported that teachers' knowledge has a positive impact on the use of AT in primary and secondary classes, emphasizing the importance of professional development for educators (Giek, 2021).

Educators trained through professional development recognize the importance of using AT to meet the needs of students with disabilities in K-12 learning and are confident to advocate for their integration into classrooms (Szlamka et al., 2022). When educators know the law and requirements outlined, such as those in the Individuals with Disabilities Act, they are better prepared to initiate conversations with stakeholders regarding integrating AT to create inclusive classes. Advocacy is extremely important for addressing systemic barriers such as limited funding and lack of awareness. This is why professional development is needed to give teachers the skills to push for the integration of AT to create equitable and accessible learning environments where all students can thrive.

86.

14.4 RECOMMENDATIONS FOR THE FUTURE

The successful integration of assistive technology into K-12 classrooms depends on several factors, one of which is educators having access to the right resources and tools. Professional development plays a vital role in the integration of assistive technology because it offers a structured environment where educators can receive the support they need. The following are recommendations to ensure that professional development remains effective and beneficial to educators.

Develop data-driven practices

School administrators should regularly assess the effectiveness of the PD programs by collecting feedback from participants to evaluate and improve training where necessary. To demonstrate the effectiveness of assistive technology, data should also be collected to compare the performance of students before and after educators received training on devices (Giek, 2021).

Technology Coaches

Introduce technology coaches or assistive technology consultants/coordinators to schools for personalized support with AT. This may include recommending devices or training on troubleshooting technical problems (UNESCO, 2024).

Ongoing Support

Providing educators with access to online resources with tutorials and webinars allows them to revisit the content when needed. Access to instructional videos can reinforce what educators covered during PD and assist with AT integration (The Advocacy Institute, 2021).

87.

14.5 CONCLUSION

Assistive technology has the potential to create inclusive learning environments for K-12 learners once integrated correctly. Providing students with the tools they need to succeed encourages engagement and motivation to participate in activities, leading to their academic growth and success. The chapter highlighted the benefits of using assistive technology and also common barriers students face to accessing them, such as limited funding, lack of awareness and inadequate teacher training. Professional development emerges as a vital component to integrating technology into K-12 classrooms. It ensures that teachers possess the knowledge they need to transfer to students on how to use AT to support their learning. PD enhances educator's proficiency in tools and equips them with the confidence to advocate for their students who will greatly benefit from AT. To do so, ongoing support and data-driven practices must always be a priority. Through these strategies, educators can create learning environments where all students feel welcomed and accommodated.

88.

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PART XV

PART 15: INCLUSIVE CONSTRUCTIVIST LEARNING IN TECHNOLOGY-RICH MAKERSPACES

By Kimberly Boss

89.

15.1 INTRODUCTION

This chapter will examine learning in makerspaces, specifically considering how effective and informed technology integration into academic makerspaces can support inclusive constructivist learning in STEM (science, technology, engineering, and mathematics) disciplines. It will introduce makerspaces and their growing popularity, then identify the challenges of fostering intentional learning in these spaces rather than serving only as places for playful tinkering. In makerspaces, like classroom settings, educators face many challenges in integrating technology to meet curriculum requirements; however, this chapter will consider how professional development and networking opportunities can support them in overcoming these difficulties. Further, since makerspaces are often designed and frequented by white males, especially in informal settings, this chapter will assess how intentional design choices can foster a more gender-inclusive environment.

90.

15.2 POSITIONALITY STATEMENT

I acknowledge that my identities and experiences have shaped my worldview. As such, this chapter is presented through the lens of my mostly privileged upbringing and perspectives. As a white, English-speaking cisgender woman of primarily European ancestry, it is easy for me to see myself represented in my local community of Sault Ste. Marie, Ontario, and in the media I consume.

I am a millennial raised until adolescence in a home with a stay-at-home mother and a blue-collar father. I had access to a family computer with Internet connectivity from age ten and a personal laptop from age thirteen. I attended well-funded institutions with access to higher-quality technology not afforded to lower-income communities. I seek for everyone, regardless of gender, ethnicity, economic status, or other defining traits, to have access to technology as I did. I also seek to understand better the societal barriers that prevent equitable access.

I have two college diplomas in Journalism and Business and am completing a university degree in Educational Studies. I also have over ten years of experience working as support staff in college registrar offices. While I overcame barriers in pursuing my educational and professional pursuits, my struggles were outweighed by the benefits afforded to me from these experiences, including access to newer technologies. I recognize that my positionality influences my understanding of this topic, and I will address this by challenging my unconscious biases and seeking input from marginalized communities.

91.

15.3 DISCUSSION

Learning in Academic Makerspaces & The Role of the Educator

Makerspaces have existed for decades as shared spaces for individuals and groups to make, tinker, play, explore tools and materials, and create projects and artifacts (Shanshan, 2016); however, over the past decade, they have become popular in formal learning spaces like schools, libraries, and museums. Depending on their location and intended users, makerspaces offer various tools and resources to support making, like Lego blocks, crafting and building materials, robotics kits, electronic components like circuits, computers with specialized software, 3D printers, and more. They may supply pre-made STEM kits, loose materials, or both. Often, these spaces provide opportunities for informal learning through tinkering and exploration; however, in more formal settings like schools, they are often expected to extend STEM instruction and enhance students' digital competencies (Kajamaa & Kumpulainen, 2020) and 21st-century skills like creativity, critical thinking, collaboration, and problem-solving (Soomro et al., 2023).

Despite a growing interest in using technology-rich makerspaces for formal learning in STEM curricula and fostering 21st-century skills, the design and integration of these spaces are often done unsystematically. This lack of standardization across makerspaces means that each space is designed and integrated differently depending on the background and expertise of the individuals creating or using the space, varying the quality of learning that can be achieved (Turakhia et al., 2023). Barring the introduction of a more uniform makerspace design in academic settings, upgrading educators' technical skills and ability to integrate these technology-rich makerspaces into the curriculum will help close the learning gap.

According to Yurtseven Avci et al. (2020), there is an expectation that present-day teachers understand how to use technology for teaching and learning effectively; however, they face many barriers to doing so. Barriers include resources, knowledge, skills, and beliefs in realizing these goals. These challenges are as prevalent in makerspaces as they are in classrooms, specifically for educators with limited or no experience with makerspace technology or how to insert makerspace learning and assessment into an already packed curriculum (Fasso & Knight). This can result in the underutilization of available technology and materials in makerspaces for learning, with some educators relying solely on ready-made STEM kits (Fasso & Knight).

Educators cannot fully realize the potential for learning in academic makerspaces without access and time for training and development opportunities, experimenting with technology, planning the best technology to meet their learners' needs, and institutional support to realize these goals (Stevenson et al., 2019).

Constructionism

While there are no standardized approaches to learning in makerspaces, their active, problem-based, process-over-product approach aligns with existing constructionist and social constructivist theories. Piaget's constructivist theory, a predecessor to Papert's constructionism, states that knowledge is constructed through experiences (Shanshan, 2016), aligning with the hands-on experience of makerspaces. Papert's constructionist theory proposes something more tangible, where individuals construct a physical artifact (Shanshan, 2016) or product (Hatzigianni et al., 2020). In a makerspace, students are provided opportunities to create physical products by interacting with technology and tools. Further, Vygotsky's social constructivism builds on this by considering the role of social collaboration and interaction when constructing knowledge (Hatzigianni et al., 2020). In a makerspace, learners can co-construct knowledge with peers. There are opportunities for peer teaching or mentoring to allow more knowledgeable students to share their experiences with those who are less familiar.

To support learning in makerspaces, educators should adopt this student-focused approach, acting as facilitators rather than learning directors. By creating environments where students actively, and sometimes socially, construct knowledge through exploration, problem-solving, and the iterative process of designing, students are afforded the benefits of constructionist and social constructivist education. Learners will develop collaboration, creativity, and critical thinking skills while becoming more engaged in learning, taking ownership of the learning process, and developing deeper connections to course content.

Gender Inclusion in STEM Learning

Addressing gender inequities in education, specifically in STEM disciplines, is a global priority of the United Nations Educational, Scientific and Cultural Organization (UNESCO, n.d.). Makerspaces have been proposed as a potential strategy for challenging this male dominance in STEM fields (Ottemo et al., 2023) and providing opportunities for girls and women to develop interest, knowledge, and skills in these areas. Increasing this diversity not only has the potential to close the gender gap in these fields but also to foster improved innovation in these areas, attributable to increased diversity, equity, and inclusion (Marshall et al., 2022). Despite these benefits, both STEM learning and makerspaces remain highly gendered and designed to privilege white males (Tomko et al., 2020), especially those with pre-existing interests in STEM areas (Ottemo et al., 2023), limiting their potential for supporting those who are excluded.

A study by Ottemo et al. (2023) revealed that even when a makerspace is designed to be open and attract a more diverse population, its approach may still unintentionally favour white males with prior interests and experience. Their study focused on a makerspace at a Swedish university that attempted to recruit more female participants by incorporating forms of making assumed to be more popular with females, like crafting through e-textiles and pottery (Ottemo et al., 2023). Despite these efforts to be more gender inclusive, the space was dominated by male participants. Ottemo et al. (2023) state, "Tying pluralization ambitions to redefining

what making and engineering is about, comes at the risk of sidestepping rather than critically addressing and analytically deconstructing links between masculinity and technology” (p. 116). Focusing on traditionally feminine types of making can further limit female participation instead of increasing it because it perpetuates ideas about the differences between women and men as makers.

92.

15.4 RECOMMENDATIONS FOR THE FUTURE

Recommendations for inclusive technology-rich academic makerspaces

Technology-rich makerspaces offer opportunities for all learners to actively and socially engage with peers to develop STEM-related knowledge and experiences alongside creative problem-solving and other 21st-century skills; however, a lack of uniformity in how they are designed or integrated with classroom learning has raised several concerns. First, learning is often self-guided and perceived more as informal than formal, with missed opportunities for curriculum connections. Second, there is insufficient investment in training educators to use the technology within makerspaces and to use the space to reinforce and extend classroom learning. Third, STEM learning and makerspaces often favour white males in their design, which can worsen gender disparities in education.

Based on these challenges, the following recommendations are proposed:

1. Increase professional development and networking opportunities related to technology and makerspaces for educators, and provide time, resources, and support for integrating makerspace technologies into their existing curriculum.
2. Take actionable steps toward correcting the gender gap in STEM and makerspaces to enhance the benefits of social constructivism.

Professional Development for Educators

With a lack of guidance or standardized approaches, makerspaces and their integration into the classroom vary significantly from one educator or institution to another. Supporting educators so that all can effectively leverage technology-rich makerspaces requires research-informed professional development about makerspaces and technology to provide them with the knowledge and skills they need to use these spaces successfully (Stevenson et al., 2019). It also requires a network of colleagues and other professionals to maintain motivation and have an ongoing dialogue about classroom integration (Yurtseven Avci et al., 2019). Acknowledging that there are already barriers resulting from limited funding and resources, professional development and networking opportunities should be endorsed by school leadership as a priority and designed to be as accessible

to educators as possible, perhaps through a combination of in-person hands-on training along with virtual, self-paced workshops and an online community for support.

Fully realizing the benefits of learning in makerspaces requires investment in training at many levels. It can start with technology-rich teacher education programs so new educators are better equipped to leverage these spaces when they enter the field. Current educators should also have access to professional development informed by research and best practices, as well as have access to colleagues with similar goals. For this to be achieved, schools and the larger system must invest time and money and prioritize training educators to benefit from the outcomes of engaging students in technology-rich makerspaces that build STEM expertise along with 21st-century skills.

Actionable Steps Toward Inclusion

Challenging gender norms in STEM studies and incorporating more perspectives and experiences into makerspaces requires deliberate effort by educators. They should examine their biases and address differences in representation in course materials and expectations to limit exclusionary messages sent to female students. By identifying and addressing these messages that perpetuate female exclusion or inferiority, the focus can shift toward actively encouraging and empowering females to envision themselves as capable and confident makers.

Fasso & Knight (2020) state that if the focus is on equity and individualization, then understanding the learners they want to involve is mandatory. To do this, educators should invest time in getting to know their female learners and understanding their interests and reservations about making, makerspaces, or STEM studies. With an understanding of their knowledge, skills, interests, and potential reservations, an educator can plan to overcome barriers and create an environment more welcoming to these learners. This might include peer teaching, tutoring, or guest speaking from females skilled or experienced in STEM or a female STEM club established by and for female students and teachers (Global Education Monitoring Report Team, 2024).

Conclusion

Over the past decade, the number of makerspaces in academic settings has increased. These spaces have proven capable of extending learning in STEM studies, enhancing 21st-century skills, and providing an opportunity to address gender inequities in these fields. Still, without standardization in their design or approaches for integrating makerspace use into the classroom, the effectiveness of using these spaces for learning can be limited by the educators' prior knowledge and experience. Educators need time and access to professional development and networking to intentionally use these spaces for inclusive constructivist learning that meets STEM learning outcomes. They must also be supported in dismantling existing systems that exclude groups of students, such as females, from using these spaces and recognizing their potential as capable makers. Educators can ensure that

gender does not limit the potential for STEM or 21st-century skill development by creating a more equitable, informed, and supportive learning environment for all.

93.

15.5 REFLECTION QUESTIONS

1. With minimal resources available, how can professional development about makerspaces and makerspace technologies also support educators with effectively integrating technology and hands-on learning into their everyday classrooms?
2. Increasing female representation in STEM disciplines and makerspaces is more than simply adding making options traditionally perceived as more feminine. How can educators use makerspaces to challenge gender norms and integrate collaborative, STEM-focused projects highlighting diverse contributions to the field?

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APPENDIX

This is where you can add appendices or other back matter.