A LITERATURE REVIEW OF EQUITY AND ETHICS IN THE FLIPPED CLASSROOM SETTING

D. MCKELL
Auburn University at Montgomery
Clement Hall, 7071 Senators Drive, Suite 300
Montgomery, Alabama 36124-4023
Tel: (334) 244-3215
dmckell@aum.edu

ABSTRACT

This paper involves a literature review of equity and ethics related to technology proposed for use in a flipped, socially distanced, live-streamed classroom. It is a companion piece to a previously published article (McKell, 2021) related to the flipped classroom pedagogical model (Sams & Bergmann, 2013). The type of technology used in a flipped classroom is similar to that used in education and business throughout the COVID-19 pandemic and is still being used today in both arenas. Internet resources, such as simulations, are employed and learners are being reached in their homes on computers or mobile devices and often through live streaming events. This research identifies areas of concern that could adversely impact learners in a flipped classroom setting where technologies are used and could be considered invasive or may not be available to all learners. The areas identified related to equity were access to technology and the internet and mobile technology. Areas identified from the ethics literature stream were the internet, mobile technology, requirements to see the learners visually during virtual class time, and digital citizenship. Finally, as we move into the age of artificial intelligence (AI), it must be considered how those we bring with us might be impacted.

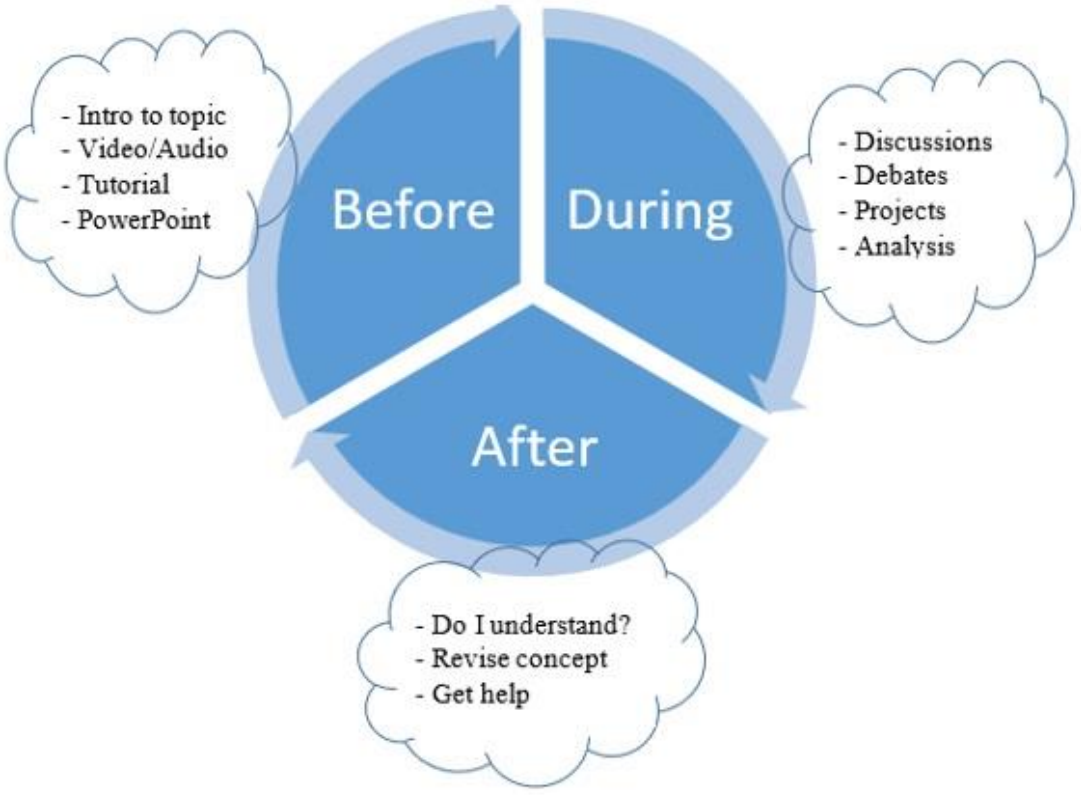
Keywords: Digital Citizenship, Distance Learning, Educational Technology, Equity, Ethics, Flipped Classroom, Artificial Intelligence

A LITERATURE REVIEW OF EQUITY AND ETHICS IN THE FLIPPED CLASSROOM SETTING

The considerations presented in this paper involve equity and ethics surrounding the use of digital technology and the internet in the flipped, socially distanced, live-streamed classroom (FC) (McKell, 2021). The research questions are: what are the equity and ethical concerns when technology is introduced into the flipped classroom model, i.e., what are the flipped classroom model's equity, ethical, and risk warnings that should be evaluated when designing a course that includes educational technology? Implementation of the model, where appropriate, should be with these warnings in mind.

The design of the flipped classroom model is depicted in Figure 1 as adapted from FIC (2020) and Bashir et al. (2020). Essentially, the learner is exposed to the course material through

Figure 1.Infographic adapted from FIC (2020) and Bashir et al. (2020).



some form of educational technology. Currently, popular avenues are simulations, internet searches, social media, and webinars. However, Narrated videoed PowerPoints can be used in conjunction. The objective is to have the learner learn independently and then communicate with others, online or in person, to determine if their understanding of the material needs revision.

The International Society for Technology in Education (ISTE) has standards to guide educators (ISTE, 2017) and identify desired learner competencies (ISTE, 2016). Several of these standards address equity (educator standard 2b) and ethics (educator standard 3c). Educator standard 2b states that educators should "advocate for equitable access to educational technology, digital content and learning opportunities to meet the diverse needs of all students" (ISTE, 2017, p.1), while standard 3c indicates educators should "mentor students in the safe, legal and ethical practices with digital tools and the protection of intellectual rights and property" (ISTE, 2017, p. 1). Closely related to ethics is digital citizenship, which is also covered in the guidelines. A rigorous look at the design and implementation of a flipped classroom must include evaluating the impact the flipped classroom will have on learners related to the ISTE standards cited. Also, in implementing a flipped classroom, particular care should be taken to make learners aware that, along with the benefits associated with educational technology and the use of the internet in a flipped classroom, there comes a responsibility to be a good digital citizen (ISTE learner standards 2 a-d; educator standard 3d). Learner standard 2 a-d explains the learner competencies that are desired in a good digital citizen. ISTE educator standard 3d (2017, p.1) directs educators to "model and promote management of personal data and digital identity and protect student data privacy." The concerns and the risks associated with technology in the classroom should be identified and it is the driving force behind this research in complying with these standards.

METHODOLOGY

An equity and ethics literature review related to technology used, or technology with the potential to be used in a flipped classroom, was conducted using key search terms, and 78 related articles were identified from peer-reviewed published journal articles and conference proceedings using two university library systems, one extensive (Georgia State University) and one mid-sized (Auburn University at Montgomery). Repeated themes from the articles were considered prominent areas of concern.

One area, access to technology and the internet, was identified as an equity concern in a flipped classroom, while four foci are pertinent to ethics and are reviewed here: 1) internet use, 2) mobile technology, which includes the subsections of equity and risk, to include social media risk, 3) the current issue of whether or not to require learners to have their web cameras on during virtual class, and 4) digital citizenship. The potential impacts of the use of artificial intelligence is an emerging concern.

EQUITY

The questions to be considered are: is Instructional Technology equitable? If present, how do inequities impact learner achievement? A review of the literature indicates that inequities do exist. The disparities can impact learner achievement if the educational system is not cognizant of them or if no attention is paid to them proactively. Individual teachers also need to be aware of the inequities before teaching and introducing new technologies into the classroom. There is growing pressure to introduce emerging technologies to the learning environment to improve it (Krutka, Heath, & Willet, 2019). Therefore, the effort to avoid making inequalities worse or creating new ones, which is a possibility (Hall, Roman, Jovel-Arias, & Young, 2020), is even more imperative. The inequalities are primarily related to access to technologies in one form or

another. The restriction of access can be exceptionally problematic for persons with disabilities. Part of the problem is that the concept of access to technology is not a well-known theme. It has been suggested that a more explicit definition of accessibility is needed to promote the idea in higher education (Coleman & Berge, 2018). The concept of accessibility must include anything that prevents the learner from using technology appropriately to enhance learning. Federal and, in most cases, state mandates exist to ensure that institutions address accessibility for persons with disabilities, and there are accessibility guidelines. Nevertheless, inaccessible technology was found commonly in kindergarten through 12th-grade schools (Shaheen, 2019).

Online Distance Education

Online distance learning is ramping up, with most institutions in the process of adding more online courses, presenting new challenges for learners (Rath, Olmstead, Jie, & Beach, 2019). Open universities that function entirely online have grown in numbers, and there are new learner challenges related to the use of online educational resources in that environment. Teachers also face unique challenges when teaching online including creating online communities for an optimal learning environment (Mphahlele & Makokotlela, 2020).

The introduction of digital technology in the classroom, virtual or face-to-face, has created access inequities along divisional lines called "digital divides," which impact learner learning experiences detrimentally. The divides are further explored in the following sections that explicate the most common disparities identified from the literature.

Access to Technology

Inequity related to access to classroom technology is not new. From the earliest days, it has been unequal. Early on, however, the challenges were different. Race, socioeconomic status, and gender were significant "physical" impediments. In the 1800s, the wealthy in Northeastern

states could hire private tutors to teach the classics to their offspring, or their children could attend private academies. In the southern states that were more rural, education was conducted in a one-room schoolhouse for grades one through eight. When public schools became available, they were limited to white children. (Unknown2, n.d.). At the close of the 18th century, there were dame schools that consisted of home instruction fashioned after the English Model, generally taught by older women in the community. The male learners were prepared to go to town schools. Girls were allowed to attend dame schools, but they rarely went on to town schools (Madigan, 2009). Access in this era referred to access to education, not merely access to educational technology (ET). Fast forward to the 20th century, and these physical barriers have, for the most part, been removed.

As to technology in the 1700s and 1800s, rudimentary technology has been used in the classroom as early as colonial days. The technology came in the form of Horn-Books, which were wooden paddles with written text for the learning of verses (Purdue Online, n.d.). Table 1 in Appendix A presents the technological additions to education over the years.

With the advent of the Internet, a host of classroom resources have become available, including YouTube, search engines, and professional learning communities where educators can exchange new best practices, to name a few. These resources rely on the availability of computer hardware and software, knowledge of how to use those components, access to the Internet, and the availability of technical support (Starkey, Sylvester, & Johnstone, 2017).

For various reasons that are more nuanced than the previous physical impediments of the 1800s, it appears that there is still race and socioeconomic status in play. Salvo, Shelton, and Welch (2017, p. 9) state that "….50% of African American male learners are raised by their mothers in single-parent households." This specific demographic has a higher incidence of

poverty, associated with a lower performance in education (Salvo et al., 2017). In 2016, 35% of African Americans did not have broadband Internet access in their homes, and almost half (46%) of African American college learners were enrolled in remedial classes in 2010 (Salvo et al., 2017). There are still more subtle gender gaps that have reversed in some demographics, or have they always been there but not observed because certain groups were excluded from education? That is a question for research beyond the scope of this paper.

It has been suggested that the digital divide conversation has shifted from the ownership of computer hardware and software to high-speed broadband Internet access in terms of the haves and have-nots (Shaheen & Lohne-Watulak, 2019). Perhaps the discussion should remain in both theatres since some demographics use smartphones as their primary resource for Internet access (Coleman & Berge, 2018). Smaller screens used during learning have been associated with poorer learning outcomes (Salvo et al., 2017). Hillier (2018, p. 114) proposes a modular offline learning education assessment platform to address learners in remote areas of developed countries and learners in developing countries. The author defines a Modular Offline Learning Education Assessment Platform as "An alternative solution that builds on a number of existing projects is proposed as a way forward in addressing the issues of economics, hardware provision, multi-hardware compatibility and integration of assessment in a modular software environment." The existing projects are the e-Exams System (M. Hillier & Fluck, 2013, 2017) and the Moodle Learning Management System (LMS; (Miletić, 2011)), with added support tools. According to Hillier and Fluck (2018, p. 113), "Moodle is the most commonly used LMS worldwide because it is open source and free to obtain." At this point, the Modular Offline Learning Education Assessment Platform is only a concept. What needs to be added is two-way communication ability and, when a network is present, the ability to send and receive updates.

Persons with Disabilities Access to Technology Persons with disabilities can also suffer inequities in technology access even if they have computer hardware, software, broadband access, technical support, and are technologically capable. For these individuals, assistive technologies that aid the learner in using the technologies must be built into the course design. When this is not done, learners who are disabled are limited in their use of the technologies. When procuring systems in education, vendors should be asked about the system's accessibility features for persons with disabilities.

There are additional inequities among learners in this demographic that are socioeconomic in nature. These inequities come in the form of being unable to afford assistive technologies to allow them access. As an example, the learning platform may create documents that electronic braille devices can read. However, can all persons with vision impairments afford them? The American Foundation for the Blind indicates that "The price of braille displays range from $3,500 to $15,000, depending on the number of characters displayed." (Uknown[a], n.d.).

Starkey et al. (2017) have provided future policy directions that may be of assistance to reduce or eliminate some of the divides. The authors suggest making high-speed broadband available for all schools and professional development to improve teachers' digital capability so that they can include learner digital literacy and the use of social inclusion technologies as part of their taught curriculum.

ETHICS APPLIED TO THE FLIPPED CLASSROOM

According to Merriam-Webster (n.d., para 2b-d), ethics is defined as "the principles of conduct governing an individual or a group; a guiding philosophy; a consciousness of moral importance." Ethics should not be confused with morals, which "often describes one's particular values concerning what is right and what is wrong." (Merriam-Webster, n.d., para 5). The issue

is that sometimes the ethical rubs up against the moral, resulting in a dilemma that requires choice.

Problems and risks surrounding the various uses of technology in a flipped classroom are discussed in the following sections, along with possible solutions.

The Internet

There are three areas of study in ethics: normative, meta, and applied ethics (Murukannaiah & Singh, 2020). Normative deals with one's conduct and how it affects others, meta-ethics concerns the meaning of ethics and its origins, while applied ethics relates to the principles within different fields. As an example, there are norms specific to conduct within the field of education. Another example would be machine ethics, which involves building ethical behavior into robots and artificial intelligence. Machine ethics brings the discussion to the internet and its use as more internet technology applications are using Artificial Intelligence, but first, a definition. Kaplan and Haenlein (2020, p. 40) define Artificial Intelligence as "a system's ability to interpret external data correctly, to learn from such data, and to use those learnings to achieve specific goals and tasks through flexible adaptation."

Murukannaiah and Singh (2020, p. 54) describe the interaction between internet users and internet applications as "sociotechnical systems." These interactions can involve exchanges of data that would not otherwise have happened, such as the current trend of asking personal questions about the mother's maiden name and favorite pets so that when users forget their password, their account can be unlocked.

Artificial Intelligence collects data based on the designers' algorithms, which can enhance the user experience by making the sociotechnical systems more interactive. Interactive animations and simulations are currently being used in both higher education and employee

training, and studies suggest that critical thinking and knowledge acquisition show improvement when these tools are used (Lai & Bower, 2020). These educational technologies are Artificial Intelligence-based. Leddo (2018, p. 6) found that using an intelligence-based tutoring technology "produced four times the learning." Simulations have the intelligence to provide different pathways for the learner based on the learner's responses. The risks associated with Artificial Intelligence and the internet are the amount of data collected and how it is used.

Further, as Artificial Intelligence becomes more and more "intelligent," the ethics built into Artificial Intelligence becomes more and more critical (Kaplan & Haenlein, 2020). Kaplan and Haenlein argue that the humans who design algorithms and Artificial Intelligence systems are not perfect. They may create commands that are "fuzzy," imprecise, or based on biased or erroneous data, which could lead to unintended outcomes. Ignoring the incorporation of ethical fail-safes, i.e., ethical guidelines when constructing algorithms within Artificial Intelligence systems, might lead to the catastrophic consequences of which nightmares are made (Kaplan & Haenlein, 2020). Walz and Firth-Butterfield (2019) proposed a "graded governance model" to address Artificial Intelligence ethical concerns through regulatory guidance. It is interesting to note the suggestion that technology and mobile apps be used to teach ethics (Montiel, Delgado-Ceballos, Ortiz-de-Mandojana, & Antolin-Lopez, 2020).

The evaluation of technologies under consideration for business and educational use should include an investigation of the data collected by the technology, its specific use and reuse, and security measures embedded in the application and the educational institution or organization. A complete discussion of technology security is beyond the purview of this paper. In brief, the educational institution's or organization’s information technology resources should be aware of the risks associated with e-learning systems, as identified by Salimovna, Salimovna,

and Ugli (2019) and Zamfiroiu (2018). Those resources should also be aware of emerging security tools for technologies, such as Blockchain, which can also assist with the validation, verification, authentication, and storing of data (Li et al., 2019; Pfeiffer, Bezzina, Wernbacher, & Kriglstein, 2020) and e-learning assessment and certification (Li et al., 2019).

Mobile Technology

Equity The use of mobile technology in the flipped classroom can become involved when learners attend class remotely or in the physical classroom when they need to work in groups with learners who are attending remotely. Participants remotely attending may or may not have desktop or laptop computers. Not all learners who do have desktop or laptop computers are using the same operating system. In the classroom, this issue can be eliminated using institution-provided computers or devices, as in McKell's Model (2021). For technology used outside the classroom, the course designer should be mindful of how the course content appears on multiple devices and operating systems. In the interests of equity and inclusion, learners without access to the internet, mobile devices, or computers could be accommodated as they could choose to participate through the face-to-face group of the flipped classroom course.

Risks The suggestions above address some equity problems; however, remote learning and using any devices in the FC involve using resources from the internet that present a set of risks elucidated by the ISTE that can have long-term detrimental effects. The 2017 standards highlight a) cyberbullying; (b) potential for public dissemination of information initially intended for a limited audience; (c) ease and speed with which digital materials can be shared; (d) risk of unethical use of archived materials; and (e) parental and learner consent for recording classroom activities (Huffman, Shaw, & Loyless, 2019).

Social Media Another consideration that can negatively impact educators and learners is social media technology used in and outside the flipped classroom for educator-to-learner and peer-to-peer communication. To begin, a definition of social media is in order. Kaplan and Haenlein (2020, p. 39) define social media as a "group of internet-based applications that build on the ideological and technological foundations of Web 2.0 and that allow the creation and exchange of user-generated content."

The model presented by McKell (2021) does not include social media. However, the risks that come with its use should it be included are similar to those identified for internet use. Moreover, social media subjects its users to internet trolling, which, even if it does not harm, can be considered unethical (DiFranco, 2020). Personal social media use is not recommended for use in an educational setting (Huffman et al., 2019). Private education communications should be kept separate. Learners should use alias accounts so that any confidential, sensitive, or identifiable information they provide intentionally or unintentionally cannot be traced back to them. After all, this separation is routine for personal and business or education email addresses and personal and official company or education social media. It should be the same for educator-to-learner and learner-to-learner social media communication. Establishing private social media groups may add some protection, although this may not be hacker-proof, and social media administrators may have access. Huffman et al. (2019, p. 93) provide additional, detailed guidelines for social media's use for educational purposes and education technology "quality implementation" guidelines using the SIMPLE Model, staff and learner assessment, inventory, measurement, planning, leadership, and evaluation. Additionally, Huffman et al. (2019, p. 96) provide "four basic rules" for learners using social media.

Virtual Classroom - Video On or Off Ethics

Equity and Ethics in the Flipped Classroom

Whether or not to require learners or employees working remotely to have their web cameras turned on has become a burgeoning issue, with so many learners forced to attend school virtually. California has left it up to the school districts, with most districts requiring the web camera to be on (Johnson, 2020). Requiring the web camera to be on raises a legal issue as the Family Educational Rights and Privacy Act protects personally identifiable information that may be shared in class innocently. Many of these in-class sessions are recorded. Therefore, they can remain in the cloud forever through tweets, retweets, and other postings. California has addressed this by providing exceptions, opt-out forms, and little to no consequences if the camera is not on, especially for learners with poor connections or technical difficulties. To further protect privacy, backdrops or images can replace the learner's background, although care must be taken to ensure that it is functional on all types of devices.

Moses (2020) suggests that requiring that the web camera is on can adversely affect learners and provides five reasons why: 1) Increased anxiety and stress, 2) Zoom fatigue, 3) Competing obligations, 4) Right to privacy, and 5) Financial means and other kinds of access issues.

Johnson (2020) raises the question of whether or not mandating that the web camera be on should be based on the type of class. For example, when the course requires learners to do presentations, it would seem reasonable to require that the instructor can see the learner for an appropriate assessment. However, it may not be necessary for a history course.

It can be argued that virtual classrooms might decrease learner participation, particularly with the camera turned off. As one faculty member put it, "Cold-calling those black boxes often results in silence, strongly implying that the learner isn't actually there" (Reed, 2020, para. 3). Johnson (2020), through an interview with the Director of Digital Learning Initiatives at

Stanford's Graduate School of Education, provides some alternatives for monitoring learner engagement, such as reaction buttons, interactive whiteboards, and polls. The flipped classroom is ideal for monitoring engagement, as there is no formal lecturing. The class consists of activities with live interactive communication in groups with peers and between the instructor and the learner(s). The engagement monitoring tactics identified by Johnson (2020) fit easily within the flipped classroom framework.

A final consideration involving web cameras is an emerging trend of using facial recognition software to monitor learner engagement with and understanding of the course material being provided. Using facial recognition is already happening in China and is being researched here in the United States using EngageSense software (Bala, 2020). This development also raises privacy concerns related to what data is being collected and how it is being used.

Digital Citizenship

Cooney, Nugent, & Howard (2018, p. 2) describe digital citizenship "as the norms of appropriate, responsible behaviour when engaging with others via Information Communication Technology." The authors note that there appears to be a dichotomy of ethical principles regarding online versus face-to-face interactions, at least as observed at their institution. This dichotomy prompted a Digital Citizenship Initiative that is ongoing at their university. Digital citizenship terminology began in the twenty-first century with the advent of globalization.

Burgess-Wilkerson, Hamilton, Garrison, & Robbins (2018, p. 1) state that "A responsible digital citizen" is a person skilled in using the internet to buy and sell products/services safely; engages in making practical, safe, responsible, ethical, and legal use of technology; understands the rights and responsibilities that come with being online and is someone who uses technology in a positive manner."

Digital citizenship requires high-order thinking skills, in particular, critical thinking, to navigate the nine elements of digital citizenship: digital commerce, digital communication, digital literacy, digital etiquette, digital law, digital rights and responsibility, digital health and wellness, and digital security. Al-Abdullatif and Gameil (2020) point out that studies have shown that learners and educators are lacking in some of these elements. The authors provided a complete description of each component and found that 85.3% of their survey participants were not knowledgeable about digital citizenship. Also, more than 95% were unaware of all the elements that comprise it.

So, how does one go about instilling these competencies to produce a "responsible digital citizen?" Barak and Green (2020) suggest that digital citizenship lessons should be embedded in courses across the campus in all fields, especially in Business Communication courses.

The question then becomes: What are the best pedagogical practices to use to convey digital citizenship principles, resulting in their use in practice? A study investigating learners' prior perceptions of ethics in online ethics in research courses and later ethical practices found that collaborative, case-based, and contextual learning promoted ethical practice. Further, an educational benefit was observed related to case-based instruction (Barak & Green, 2020). These knowledge delivery forms are the antithesis of individual learning and machine-graded activities that enhance feelings of isolation (Barak & Green, 2020) and are generally thought of as "online education." The alternate delivery methods are also precisely the type of activities prescribed for the FC and deeper learner learning (Deng, 2019).

A lack of digital citizenship competencies can have severe consequences in the business world, and employers are acutely aware of the impact this lack can have (Burgess-Wilkerson et al., 2018).

DISCUSSION

In any discussion of ethics in the classroom regarding the technology used, equity must be included. It must be recognized that a digital divide exists between those learners who have ready access to technology and the internet and those who do not. Also, there are unique access issues related to persons with disabilities. When it comes to fruition, the Modular Offline Learning Education Assessment Platform concept appears to be a promising means to address the have-and-not divide. However, it does not address the access gap associated with disabilities. Adding audio and captioning capabilities to the concept is an area recommended for future research. Classroom design must take into account the needs of the learner population being served. An instructor might consider administering a survey that evaluates learner access to technology at the beginning of the course to identify where technology issues might come up. For example, The Consortium for School Networking (CoSN; 2016) Sample Out-of-School Connectivity Survey could be used to survey learners and, where appropriate, parents. The information gleaned from the survey could inform course design, content, and delivery.

There are many benefits to technology use in face-to-face, virtual, and online classrooms. A study that examined 73 systemic literature reviews from the field of educational technology found support in 65 papers for its positive effect on "knowledge gain, knowledge acquisition, content understanding, and improvement in test scores or acquisition of skills," or both (Lai & Bower, 2020, p. 249). Lai identified studies that indicated that animations and simulations positively affect overall learning outcomes, while simulations, more specifically, improve critical thinking and knowledge acquisition. Hamilton (2015, p. 80) states, "The effective use of instructional technology encourages active participation by learners, which keeps them involved and places much of the learning load on them."

Using this technology, the course designer and the instructor should evaluate its risks before implementation. Identifying risks is not the only factor to consider. Methods to ameliorate the risks should be implemented or addressed by the course designer to protect all users, learners, and instructors. As noted earlier, Huffman et al. (2019) recommend the SIMPLE Model as a guide to quality technology implementation. If the technology considered is AI-based, extra precautions concerning the type of information collected by the technology and how the data will be used are in order. There is even more concern on the horizon if web cameras are used with face recognition software. Given the achieved learner engagement and the apparent beneficial effects of technology, the benefits outweigh the risks, particularly if the risks are mitigated or controlled.

The debate surrounding web camera requirements is ongoing. Outside of the financial consideration, on one side, instructors are concerned about learner engagement. If web cameras remain off, how do instructors know if the learner is "attending?" This question could be answered by the course design, specifically a flipped classroom design where the learners must interact with each other and the instructor through activity-based course content. On the other side of the debate, there are privacy issues, such as learners finding out how and where each other live. Safety then becomes an issue. Many learners use their bedrooms to attend virtually and are uncomfortable sharing their private space with everyone. However, Johnson (2020) suggests that the warmth of the relationship between learner and instructor could make the learner more comfortable sharing.

Another example is when the learner might share a bedroom with siblings, which could be a source of embarrassment. This knowledge in other learners' hands might be used to ridicule

them as additional private information can be used. This type of potential behavior brings the discussion to ethics.

Ethics, or the lack of ethics related to a flipped classroom, can have far-reaching consequences and negatively impact learners and instructors. Appropriate guidelines and protections should be in place to mitigate potential damage to technology users. Technology, including social media, comes with risks that users should be mindful of to avoid possible privacy loss and identity theft.

In terms of technology user responsibility, digital citizenship must be taught in the classroom to protect learners and instructors from intentional or unintentional harm and to engrain the "principles of conduct" and the accountability that comes with technology use. Evidence to support the need for learner training in digital citizenship is provided by Al-Abdullatif and Gameil (2020). Digital citizenship goes far beyond the classroom. It is a competency that is essential in both business and personal interactions.

PRACTICAL IMPLICATIONS AND CONCLUSIONS

It is essential to take a holistic approach to serve students effectively. The concept is to meet the students where they are and bring them all to a level plane to take full advantage of the learning process. There are vital factors that need to be addressed case by case in a checklist-type fashion to do this.

The first pillar of a potential framework, and foremost, is practical inaccessibility in the form of student lack of broadband access. In rural areas, there is no service, and even in well-populated areas where the income demographic is low, there is no service due to lack of affordability. The rural demographic may be addressed in the future by the Broadband Initiatives Program (BIP) created by the American Recovery and Reinvestment Act of 2009. When

implemented, there is evidence that the BIP has a positive overall impact on employment growth, with the most significant effect in micropolitan areas (Rupasingha et al., 2023). In addition, Ashuri et al. (2023) provide funding strategies for broadband initiatives in underserved and disadvantaged communities.

The next pillar that is an obstacle to full accessibility is the technology to use broadband. Techno Hub (2024) provides information on how to get free mobile devices through ten different sources and guidance on other avenues to pursue.

Once students are able to access the internet, the question of student privacy online (the third pillar) must be addressed. Both students and teachers need to understand the rules that apply to the data that is being collected by the software and the systems they use (Archambault, 2021). Through a case study of a sample of California state regulations, Archambault (2021) found loopholes, and California is considered a role model for student privacy regulations. Future research could include this type of case analysis for each state to identify areas of concern. Privacy in video conferencing must also addressed. Atawneh et al. (2024) provide a privacy framework for the Zoom Conferencing System so widely used during the COVID-19 pandemic.

On the horizon are risks associated with artificial intelligence from ethical and security standpoints. This new technology is rapidly exploding in education with few guard rails in place. Huang (2023) provides recommendations specific to artificial intelligence and student data security, while Nguyen et al. (2023) propose a set of ethical principles as a framework for guidance.

Course design is the fourth pillar. There is evidence that inaccessible technology was common in kindergarten through 12th grade education (Shaheen, 2019). Inaccessibility does not

apply only to persons with disabilities, for whom there is some legal protection through Section 508 of the Rehabilitations Act of 1973 and the Americans with Disabilities Act of 1990, as amended in 1998. These laws had some benefits for all learners in terms of course design, particularly Section 508, subsection E205, which provides Web Content Accessibility Guidelines (WCAG) 2.0. However, with a broader definition of accessibility, the Universal Design for Learning (UDL) framework takes this a step further with a set of curricular principles and guidelines that establish accessibility for all learners. Gronseth (2018) suggests that the WCAG and UDL should be used in tandem, as they can be connected.

Finally, students must be made aware of the duty to be a good digital citizen. To protect the privacy of themselves and others, they interact with online. The course design should include a section on what digital citizenship means.

In summary, this research proposes a framework to address the current educational environment in an attempt to reach all learners to ensure an effective, safe learning experience.

Framework

First Pillar: Broadband Access with sufficient speed

Second Pillar: Access to physical technological devices

Third Pillar: Privacy and Security

Fourth Pillar: Curricular Content accessible to all learners

Fifth Pillar: Digital Citizenship Education

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Declaration of Competing Interest

Equity and Ethics in the Flipped Classroom

None.

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APPENDIX A. CLASSROOM TECHNOLOGIES THROUGH THE YEARS

Table 1. Classroom Technology History

Technology	Description/Comment	Manufacturer/Inventor	Year
Pencil	As we know it today, with an eraser	Hymen Lipman	1858
Magic Lantern	Primitive slide projector	Carpenter and Westley	1870
Chalkboard	A simple piece of slate	James Pillans (UK, 1801)	1890
Radio	Public radio broadcasting	Lee de Forest	1920s
Overhead Projector	For displaying documents	3M	1930
Ballpoint pen	Patented in 1943	Biro Brothers	1940
Videotapes	Electric impulses on magnetic tape	Ampex Corporation	1951
Photocopier	First mass-marketed	Xerox	1959
Skinner Teaching Machine	System of Teaching and Testing	BF. Skinner	1961
Handheld Calculator	Just over six inches tall	Texas Instruments	1967
Scantron	System of Testing	Michael Sokolski	1972
Whiteboards	Existed before 1975, but dry-erase markers did not.	Pilot Pen	1975
First portable computer	Osborne 1 – 24 pounds	Osborne	1981
Mac	Apple computer	Apple	1984
Mass-market laptop	T1100	Toshiba	1985
Commercial use of the Internet	The National Science Foundation (NSF) removed restrictions	NSF	1993
MySpace	Social Media	Thomas Anderson & Chris DeWolfe	2003
Facebook	Social Media	Mark Zuckerberg	2004
Twitter	Social Media	Evan Williams	2007

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