NARROWING THE DIGITAL DIVIDE: BUILDING A SENSE OF COMMUNITY USING ONLINE TOOLS IN A POST-PANDEMIC WORLD

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The COVID-19 pandemic pushed teachers, students, and parents to find ways to adapt to a virtual education model, which brought challenges on several fronts. Parents, students, and teachers had to turn their bedrooms, kitchens, and living rooms into home offices and/or classrooms. A digital divide was exposed during this process. This divide not only revealed the inequalities surrounding access to resources, but also illuminated a gap in both student and teacher interest levels in online learning. In this study, we examined some of the digital tools that could be effectively implemented for all students in order to avoid further deepening educational inequalities. It is worth noting that these digital strategies cannot be seen as temporary fixes, but rather as a way to prepare students for the post-pandemic world, which will likely follow a blended approach between in-person and virtual learning and work environments. In this paper, we discuss how Zoom, Flipgrid, Edmodo, and Quizizz can be part of an educational model that looks to build community and ensure learning goals are met, while preparing students for a blended workforce in a post-pandemic world. The limiting factors for any of these applications are access to technology and teacher hesitancy. In this paper, we articulate the importance of ensuring that all students have access to high-speed Internet connectivity and underscore the need for teacher leaders and administrations to design effective professional development in order to improve teacher confidence in effectively incorporating digital tools in their lessons.

KEY WORDS: community, digital tools, digital divide, social–emotional learning, higher-order thinking, assessment, professional development, post-pandemic education

1. INTRODUCTION

On March 11, 2020, the World Health Organization (WHO) declared COVID-19 a global pandemic [the WHO Director-General's speech, as cited in Cucinotta and Vanelli (2020)].

Given the virus' highly contagious nature (Cucinotta & Vanelli, 2020), governments around the world implemented some form of a stay-at-home order. Professionals in all sectors had to scramble in order to adapt to the ever-changing situation. Education was no different. Overnight, teachers, students, and parents had to put in place a system that would allow students to continue their learning from home. This brought on challenges on several fronts. Parents, students, and teachers had to turn their bedrooms, kitchens, and living rooms into home offices and/or classrooms. A digital divide was exposed through this process. This divide not only refers to the issue of access to digital technology, but exposes broader inequalities that pervade our educational systems. For example, not every child had a quiet, safe place to work at home, or a supportive adult on hand. This is especially prevalent in low socio-economic households, where both adults and children struggle with overcrowding. In addition, with the growing economic uncertainties, domestic violence was on the rise, which again affected student learning environments. It is important to appreciate that the COVID-19 pandemic was not the cause of the inequalities it has exposed; however, it has exacerbated these inequalities in many communities. In many families, three or four people were sharing the same device for work and/or study. In addition, in situations where families had multiple devices, not all could afford a high-speed Internet connection that could effectively support virtual learning—especially in relation to applications that used videos, which require a larger Internet bandwidth (Breslin, 2021).

The digital divide in online education not only sheds light on the access to resources, but also underscores the gap in both student and teacher interest levels in virtual learning. In this paper, we examine digital tools that could be effectively implemented for all students in order to avoid further deepening the educational inequalities. These digital strategies cannot be seen as temporary fixes, but rather as a way to prepare students for the post-pandemic world, which will likely follow a blended approach between in-person and virtual learning and work environments. Certain sectors, such as retail, had already implemented a blended business model pre-pandemic, allowing shoppers the option of both in-person and online shopping (Breslin, 2021). Education and other fields could follow a similar business model post-pandemic.

Historically, education has always had to adapt to market pressures. One such example was the inception of the public school system in North America, paid for by taxation. This shift in thinking was driven by the economic pressures of industrialization that increased the need for human capital. To meet this demand, schools were designed like a factory production line, preparing students to join the labor force (Labaree, 1997). Similarly, a post-pandemic education model should focus on preparing students for a future with a blended workforce. As educators and administrators (the agents of change) consider the most effective way to start the school year, it is recommended that they design a plan that is trauma-sensitive to both students and teachers. Community building should be at the forefront, since social isolation has impacted both children and adults alike. In this paper, we discuss Zoom, Flipgrid, Edmodo, and Quizizz as some of the potential tools that could effectively help build community, while also ensuring learning takes place.

2. HYPOTHESIS

The versatility of Zoom, the social-media-like nature of Flipgrid and Edmodo, as well as the game-like structure of Quizizz, make these applications an integral part of an education model that looks to build community, ensure learning goals can be met, and prepare students for a blended workforce in a post-pandemic world.

3. ANALYSIS

In order to test the hypothesis, the accessibility and initial configuration process of each online tool was explored. In this paper, we discuss the major features of the aforementioned applications in terms of their ability to help meet the pedagogical goals of instruction, assessment, social–emotional learning (SEL), and higher-order thinking skills (HOTS). In addition to the advantages of each application, potential drawbacks that need to be considered during implementation will be outlined.

3.1 Zoom Meeting Benefits

The first tool we explored was the Zoom Meeting virtual-meeting conference application. This is a powerful and versatile video-conferencing application that helps to make education more accessible to students. It is available on PC, Mac, and Android devices, making it more convenient to access for everyone. Its basic plan allows for 40 minutes of video conferencing, with up to 100 participants concurrently, free of charge. However, one-on-one meetings are free with no time limits. This application can be downloaded from Zoom (https://zoom.us), Google Play, and the App Store. To sign up, an email address is required; however, to join a meeting, an email address is not required. This means that students do not necessarily need an email address; instead, they can simply use the Zoom code sent by the host (i.e., the teacher). For teachers, a unique Zoom identification number can be created for each class, which allows students to enter the meeting. For optimal operation, both teachers and students need access to a strong Internet connection, camera/webcam, and microphone. In order to analyze the effectiveness of Zoom, it is necessary to examine how each of its features can benefit student learning.

3.1.1 Screen Sharing

This feature allows both teachers and students to share their screen to display PowerPoint (PPT) slides, Word documents, show audio-visual clips, etc. This is an effective feature for synchronous teaching. During synchronous teaching, teachers can display the lesson, provide instructions for activities, go over rubrics, etc. With this feature, students can also see

the teacher's face on a smaller window. All of these help to stimulate visual and audio senses, and help to alleviate the cognitive overload to some degree.

3.1.2 Annotation

Another effective feature in Zoom is the ability of teachers and students to annotate on a shared screen. Teachers can write additional information on their PPT slides. For example, when teaching about an important concept, it helps to underline and circle key points. It is also an effective way for students to demonstrate their understanding on the slide, allowing teachers to receive instant feedback on students' learning. This is an example of how formative assessment could be used to inform one's lesson plans.

3.1.3 Polls

In Zoom, Teachers can use polls as quick checks on how students are interacting with new knowledge. For example, a chemistry teacher could ask "how confident did you feel about the Bronsted-Lowry Theory of Acids and Bases?" Students would either choose "very confident," "somewhat confident," or "not very confident." Again, these polls help to inform teachers' lesson planning, especially around accommodating students' SEL (Hansen, 2019).

3.1.4 Chat Box

This feature in Zoom offers an accommodation for students who do not have a microphone or camera. Using the chat box, students can continue to communicate with their teachers and peers through text messages. Educators can use the chat box as a way to check student understanding. After discussing a concept, teachers can ask students, "do you understand?" and they can respond by typing "understood" or "not quite." This is equivalent to asking students to raise their hands or give a thumbs up or thumbs down on the concepts covered during in-person learning.

3.1.5 Breakout Rooms

In the Zoom application, students can be grouped into different breakout rooms if they need to collaborate in smaller groups. Teachers can use breakout rooms very effectively during group projects, where students are assigned to different rooms and the teacher can float from group to group monitoring their progress and answering any questions they may have. At the end of the session, students can present their project in their individual groups using the various features mentioned previously.

3.1.6 Recording Meetings

To accommodate students who may have Internet connection difficulties, a teacher can use Zoom to record a lesson, and then upload it to a learning management system such as Edmodo (see Section 3.3). This allows students to watch the recording at a later time, ensuring that they did not miss any important information due to Internet connectivity issues. This feature in Zoom facilitates both asynchronous teaching and the flipped classroom education models (Nouri, 2016).

3.1.7 Waiting Room

This feature in Zoom requires students to sit in the waiting room after logging into the meeting before they can enter the virtual classroom. Teachers then have to permit their entry one by one. This feature is especially important since it prevents people with ill intentions from gaining access to the classrooms. There have been reports of security breaches in Zoom early in the pandemic, where outsiders were able to attend classes and present vulgar images to the attendees (O'Flaherty, 2020). The waiting room allows teachers to identify each student and permit their entry accordingly; otherwise, anyone with access to the link could enter the meeting, sometimes without the teacher's awareness.

3.2 Zoom Meeting Challenges

From its vast collection of features, it is evident that Zoom Meeting can have a positive impact on education. However, as with any tool, there are potential challenges that will need to be addressed. The following is a list of potential challenges that educators, administrators, and policy makers need to consider.

3.2.1 Access to Technology

Zoom Meeting requires a strong Internet connection, and with more participants, a larger bandwidth is required. For optimal interaction, both teachers and students should have a camera/webcam and microphone. This could be a potential issue in low-income households.

3.2.2 Privacy

Classroom privacy could be breached if the teacher does not activate the waiting room, and individually permit students to enter the virtual classroom; otherwise, hackers and phishers can access your classroom, leaving you and your students' safety vulnerable.

3.2.3 Teacher Hesitancy

Some teachers may have hesitancy when it comes to using new technologies. This is when the leadership team must step in. Zoom offers how-to-do videos on their website (https://zoom.us/resources) that can be helpful to present during staff meetings.

3.2.4 Cognitive Overload

Teachers will also need to take into account the cognitive overload that comes with virtual meetings. It is evolutionarily awkward for humans to stare at their own faces for such a long time (Ozenc & Fajardo, 2021). Educators should strike a balance between face time and quality independent work off the camera using other educational platforms such as Edmodo, which will be discussed subsequently.

3.2.5 Student Engagement

Establishing rituals can help to connect people in a more effective way. Rituals are patterns in behavior and speech that give meaning to special moments (Ozenc & Fajardo, 2021). Virtual meetings only provide stimuli to the visual and audio senses, but not to the touch, smell, and taste senses. In other words, there is a hearing and seeing overload. All of this leads to cognitive overload, disinterest in the meeting, and eventually stress—which we are trying to avoid post-lockdown. According to Ozenc and Fajardo (2021), each virtual meeting should be like a movie, which tells a story with characters, conflict, plot, and setting. For instance, it is quite easy and enjoyable to stare at the screen and binge-watch Netflix for hours. For us educators, the characters are the students, and we should think of ways to give them roles so they can each be heroes in their own way. The plot refers to the journey each of the characters (students) will take in order to tackle the problem (the conflict). The setting can refer to the context in which the problem has to be solved. Think of it as the real-world application of the problem.

These challenges associated with Zoom Meeting will need to be considered during instructional planning, teacher training, and policy development at all levels of the educational system.

3.3 Edmodo Benefits

The second tool that we explored was Edmodo, which is a versatile virtual learning platform that is effective in both online and in-person learning models. It is available on PC, Mac, and Android devices, making it more convenient to access for everyone. Students, teachers, and parents can sign up with full access, free of charge. This application can be downloaded from Edmodo (https://new.edmodo.com), Google Play, and the App Store, and requires an email

address to sign up. The teacher creates a unique classroom code for each of class, with which students and parents can enter their respective classrooms. For optimal operation, all parties need access to a strong Internet connection. In order to analyze the effectiveness of Edmodo, it is necessary to examine how each of its features can benefit student learning.

3.3.1 Posting Threads

Edmodo is where social media meets education. Teachers can post announcements and documents in various formats (doc, pdf, ppt, etc.). Students can like and comment on posts, similar to the Facebook format. Using threads, teachers can post lecture videos that were recorded via Zoom, thereby facilitating asynchronous learning and the flipped classroom education models.

3.3.2 Creating Assessments

Edmodo also allows the teacher to create quizzes, which can be assigned and timed. Quizzes are effective for quick homework checks, which act as formative assessments. Teachers can design various types of questions for the quiz, including multiple choice, fill in the blank, true or false, and short answer quizzes. In addition to quizzes, Edmodo allows teachers to create assignments that summative in nature, which can be used to check for more comprehensive understanding. For assignments, students can be encouraged to demonstrate their learning in written, graphic, or audio-visual forms. Upon completion, students can upload their assignment into an assignment folder. If the assignment is submitted in the form of a Word document, teachers can provide feedback directly on the document. For pdfs, teachers have to download the document for each student, provide feedback, and then upload it back to the assignment folder. This requires the pdf editing application provided by Acrobat Reader. It may be necessary to install a special fonts pack (i.e., the Asian Font Pack), without which some student's handwriting will not be recognized by Adobe Reader. With assignments, students should be encouraged to demonstrate their understanding by showing complete solutions. By performing calculations step by step, and communicating their answers using words, graphs, and diagrams, HOTS are promoted in students (Bloom et al., 1971). This also helps to ensure that academic integrity is maintained.

3.3.3 Gradebook

Assessment scores are tracked in Edmodo, allowing students, teachers, and parents to monitor learning progress. This can be an effective reference as students develop their metacognitive skills (Buoncristiani & Buoncristiani, 2012). Students can refer to these assessments when reflecting on their learning in their journals. Students can be invited to write a reflection after every major assessment, allowing them to think back and examine what they have learned and what they could improve on. By doing this, students can look

back on these notes at the end of the year and monitor their progress. Students can submit their reflections in the form of an assignment, which can be used as a formative assessment.

3.3.4 Small Groups

As in the Zoom breakout rooms, Edmodo allows the teacher to create small groups. This is similar to creating groups on social media, where conversations and file sharing between group members are facilitated and remain private. Teachers can be a member of each small group, which will allow them to monitor the level of discussion and participation of all members. This is an effective tool for educators who assess group discussions/contributions as criteria in their rubrics.

3.3.5 Direct Messaging

As with social media, in Edmodo students can directly message their teacher in a safe and educational-based environment. This is helpful when it comes to aiding students with the subject matter outside of class time.

3.3.6 Polls

This feature in Edmodo invites students to express their day-to-day feelings on the subject matter (similar to the Zoom polls), which again promotes SEL in students.

3.3.7 Communicating with Parents

As previously mentioned, in the Edmodo application parents can join their child's respective classes and are able to communicate with the teacher through the direct messaging feature. Furthermore, parents can be aware of the learning that is taking place by monitoring the threads with announcements and deadlines for assignments and quizzes. This line of communication is critical to ensure students' academic, social, and emotional learning needs are being met.

3.4 Edmodo Challenges

Although Edmodo is a powerful virtual learning platform that facilitates communication between all of the stakeholders, there are potential drawbacks that need to be considered by educators, administrators, and policy makers. The following sections list the challenges to consider.

3.4.1 Access to Technology

Similar to Zoom, for optimal use of Edmodo, one needs access to a strong Internet connection. This is not only important for uploading and downloading documents, but is also important during live quizzes. Without a stable connection, upload and download times will be extended, and may even lead to unsuccessful uploading and downloading of files, since the session may time out. Similarly, for quizzes, without a stable connection, student answers may not be completely saved, which will affect their score and feedback. Another note regarding uploading and downloading files: even with a stable Internet connection, files are still limited by the 100 MB size restriction. This is only an issue for large video files. One way to meet this challenge is to compress large files before uploading them using the FreeConvert video compressor program (https://www.freeconvert.com/video-compressor).

3.4.2 Teacher Hesitancy

Some digitally novice teachers may face hesitancy with an online classroom platform. Edmodo has a large collection of resources that support teachers with all levels of digital competency, which can be accessed from the website's help center (https://support.edmodo.com/hc/en-us).

3.4.3 Quizzes

One of the challenges when creating a quiz on the Edmodo platform is related to inputting special mathematical and scientific formulas and notations. Teachers will have to develop a series of computer input friendly notations to represent a whole host of mathematical and scientific notations; for example, a double-headed arrow for chemical equilibria and exponents for oxidation numbers and ionic charges. It is extremely important that for the short answer portion of a quiz, students input the symbols exactly as instructed by the teacher; otherwise, it will be deemed incorrect by the program, which can cause headaches for all parties. Another challenge with these quizzes is academic honesty. Teachers should primarily use these as formative assessments since there is no way to control the academic integrity of the results, unless they are monitored in an in-person learning environment.

These potential issues with incorporating Edmodo will need to be considered during instructional planning, teacher training, and policy development at all levels of the educational system.

3.5 Flipgrid Benefits

The third application we investigated was Flipgrid, which is a versatile, virtual learning platform that is effective in both virtual learning and in-person learning models. It is available

on PC, Mac, and Android devices, making it more convenient to access for everyone. Teachers can sign up with full access, free of charge. This application can be downloaded from Flipgrid (https://info.flipgrid.com), Google Play, and the App Store, and requires an email address to sign up. Teachers create groups as classes, and Flipgrid creates a join code for each class. Teachers also need to create a username for each student. The students use the class code and their username to join their respective classes. For optimal operation, teachers and students need to have access to a strong Internet connection, camera/webcam, and a microphone. In order to analyze the effectiveness of Flipgrid, one needs to examine how each of its features can benefit student learning.

3.5.1 Video Responses

Flipgrid is an effective application that allows students to record their video responses and submit them privately to their teachers. This tool helps to develop students' oral communication skills. This platform also allows students to edit their videos before posting, similar to TikTok. For example, the editing feature allows students to embed pictures of their written solution in the video. In addition, students have expressed strong enthusiasm toward being able to trim their videos and add emojis and creative backgrounds to their videos. Teachers can strictly control the duration of each video response by changing the time setting when creating assignments. Once a video is created, edited, and submitted by a student, it will be sent directly to the teacher without having to worry about size restrictions, as is the case with Edmodo.

3.5.2 Rubric

Flipgrid allows the teacher to comment on the videos and also create rubrics that are quite convenient to design and use for the students' video responses. This feature facilitates the transfer of feedback from the teacher to the student.

3.5.3 Privacy

Teachers have the option to set each student's video as private or active. The active setting allows all students to view and comment on each other's videos, whereas the private setting restricts the access to only the teacher. This setting can be adjusted depending on the school culture and the teacher's pedagogical approach.

3.6 Flipgrid Challenges

Although Flipgrid offers a collection of engaging features, there are potential challenges that will need to be addressed before incorporating this tool into the classroom environment. The following sections list challenges that should be considered when using this application.

3.6.1 Access to Technology

For optimal function when using Flipgrid, both teachers and students will need to have access to a strong Internet connection and should have a camera/webcam and a microphone.

3.6.2 Teacher Confidence

Again, with any new technology, there will be some hesitancy on the part of digitally novice teachers. By simply searching for Flipgrid tutorials on YouTube (https://www.youtube.com), teachers will find there are a host of video tutorials available that can help them feel more confident.

3.6.3 Tedious Usernames

It can be quite tedious to design a username for each student, which is necessary for them to log into their respective classes in Flipgrid. One option is to follow an algorithm such as using their last names followed by an underscore and then their first names. For example, student John Doe will have the username, Doe_John. However, once the teacher has done this, everyone can benefit from the features of Flipgrid as previously mentioned.

These potential concerns with incorporating Flipgrid will need to be addressed during instructional planning, teacher training, and policy development at all levels of the educational system.

3.7 Quizizz Benefits

The fourth and final application that we tested was Quizizz, which is an effective online assessment tool that helps to make education more accessible to students. It is available on PC, Mac, and Android devices, making it more convenient to access for everyone. Teachers can create a class, and each student can join that class using a code. Teachers can sign up with full access, free of charge. This application can be downloaded from Quizizz (https://quizizz.com), Google Play, and the App Store. In order to analyze the effectiveness of Quizizz, it is necessary to examine how each of its features can benefit student learning.

3.7.1 Competition and Feedback

In Quizizz, once enrolled in the class, students can take quizzes chosen by their teachers as their homework assignment or as a live game they can play against their peers. Instant feedback is provided to students upon completing each question. Teachers should primarily use these quizzes as formative assessments since there is no way to control the academic

integrity of the results, unless they are monitored in an in-person learning environment. It is a fun way to prepare for summative assessments. Teachers can use these quizzes for quick concept checks that involve vocabulary and simple manipulation of scientific formulas.

3.7.2 Statistics

Teachers can view the statistics of student learning progress. That is, teachers can monitor how long it took students to answer each question, the accuracy of their answers, and the overall understanding of the outcomes. This can help inform teachers' lesson planning and assessment strategies in the future.

3.8 Quizizz Challenges

Despite the various features offered by Quizizz, the following sections list potential challenges that need to be considered when incorporating this tool into an educational model.

3.8.1 Access to Technology

Students will need access to a strong, reliable Internet connection. Some students have faced issues with logging in due to poor Internet connections.

3.8.2 Teacher's Confidence

Again, with any new technology, there will be some hesitancy regarding use and implementation. Video tutorials and other resources can be found on the Quizizz website (https://quizizz.zendesk.com/hc/en-us).

These potential challenges will need to be considered by educators, administrators, and policy makers when instructional planning, teaching training, and developing policy at all levels of the educational system.

4. PEDAGOGICAL IMPLICATIONS

According to the previous discussion, one can notice the recurring challenges with implementing online learning for all students; first is access to technology and second is teacher hesitation. Access to technology refers to having access to both a strong Internet connection and electronic devices. In one instance, it was reported that students in remote parts of Pakistan lacked the technological infrastructure necessary for a strong Internet connection (Mahmood, 2020). This report underscores the need for policy makers to ensure that favorable Internet connectivity is available in all geographical areas in order to narrow the

gap between advantaged and disadvantaged students. In addition to stable Internet connectivity, access to electronic devices is pertinent in narrowing this achievement gap. In April 2020, the Department of Education in the United Kingdom implemented the Get Help with Technology Program, which made laptops or tablets available to disadvantaged households (Breslin, 2021). While this well-intended policy was not a full-proof solution, it did provide a framework for future initiatives that could make electronic devices more accessible to disadvantaged communities. For more information on this initiative, visit the U.K. Department of Education website (https://www.gov.uk/guidance/get-help-with-technology-for-remote-education).

As for teacher hesitancy, education leaders and administrators must play an important role. Administrators and teacher leaders should hold training sessions leading up to the school year to ensure each teacher is well prepared. As indicated by Ozenc and Fajardo (2021), certain rituals could help to create a more comfortable professional development (PD) environment for teachers, while ensuring time is used productively. Planning the staff PD session like a story will help to ensure that the meeting is meaningful; otherwise, like their students teachers could also face cognitive overload.

One of the important items on the staff meeting agenda should be attachment theory (Breslin, 2021). Depending on the extent of the lockdown in the community, stress-induced trauma could have led to separation issues in children coming back into the in-person school environment. It will be important for educators to help rebuild relationships and make the students feel safe again by using attachment language. That is to say, replace the terms *I* and *you* with the inclusive word *we*. Alexander (2021) discussed another attachment-affirming strategy that includes establishing a caregiver lounge. It is essentially a space that allows caregivers to be accessible to their children during the school day. For implementation such strategies, see Alexander (2021).

The applications discussed in this paper help to engage students as they interact with new knowledge, promote SEL (Hansen, 2019), and instill HOTS (Bloom et al., 1971). However, it is worth noting that it will always be challenging to replace wet laboratory experiments with online simulation applications. While online simulations such as PhET and Gizmos do allow for data collection and analysis, they do not facilitate the development of important skills associated with conducting laboratory experiments. For example, in chemistry classes wet laboratories help students develop skills in troubleshooting laboratory equipment and making chemical solutions, all of which develop fine motor skills and accommodate tactile learners. These special skills are involved in neurogenesis and synaptogenesis, which help to improve HOTS and aid in mood regulation (Conyers & Wilson, 2016).

Future applications should look at incorporating immersive-virtual reality (I-VR) technology in the science classroom. A literature review done by Hamilton et al. (2021) reported various studies looking at how I-VR was being applied to various disciplines. One study reported by Hamilton et al. (2021) demonstrated how a virtual environment allowed students to manipulate DNA strands in order to study its double helix structure, thus providing a rich educational experience. Looking ahead, it will be intriguing to see how I-VR could potentially

help to simulate wet laboratories that are commonplace in a chemistry classroom, with the use of a state-of-the-art headset.

5. CONCLUSIONS

Overall, versatile video conferencing applications such as Zoom, the social media-like nature of Flipgrid and Edmodo, and the game-like application, Quizizz, can be a part of an educational model that looks to build community, meet learning goals, and prepare students for a blended workforce in a post-pandemic world.

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