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A comparison of HBCU students' academic performance and perceptions of course modalities: Face-to-face vs. hybrid vs. online

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Abstract

This study examined students' perceptions of learning based on course modalities. Two hundred-two (202) students at a Historically Black College and University (HBCU) in the southwestern region of the United States participated in the study. The results confirmed the following: Course format proved to be positively associated with expected course outcomes ($r = .34$, $p < .01$). Mean comparisons using ANOVA models revealed significant differences in grade expectations between students in the online ($M = 84.05$, $SD = 10.31$), hybrid ($M = 79.76$, $SD = 9.21$), and face-to-face ($M = 89.49$, $SD = 8.17$), courses; $F(2,199) = 23.99$, $p < .001$. Students proved to hold higher amounts of negative course perceptions for online ($M = 23.4$, $SD = 9.68$) and hybrid courses ($M = 23.04$, $SD = 9.94$) in comparison to face-to-face courses ($M = 14.84$, $SD = 9.62$; $F(2,199) = 17.01$; $p < .001$). Course format proved to be a significant predictor of negative course perceptions ($F(1,200) = 28.71$, $p < .001$). These findings yield important implications for instructional and institutional consideration.

Introduction

For over a century, HBCUs, account for only three percent of the nation's colleges and universities, led to educating African American college students who excel in their fields (U. S. Department of Education, 2016). There is a sparse amount of research outlining the differences in outcomes (e.g., student performance), benefits (e.g., accessibility), and students' perceptions of course modalities when considering course formats offered at HBCUs. Only recently has there been a focus on face-to-face vs. distance-learning at Historically Black Colleges and Universities (Graham, 2019); however, these analyses focus almost primarily on the instructors' views. It is equally vital to understand how students' perceptions of these course modalities may lend themselves to students' subsequent academic performance. Further, the integration of online technologies in educational practices renders new opportunities for teaching and learning (Scagnoli et al., 2009).

Through this study, we expanded Bandara & Wijekularathna's (2017) work, offering a novel approach to examining HBCU students' perceptions of course format. We analyze how learning in face-to-face vs. hybrid vs. online modalities converges to improve the learning environment for students at an HBCU, particularly taking into consideration students' perceptions of course modalities. We examine: 1) the relationships between students' academic performance, perceptions of course modalities, and instructional format(s)experienced; 2) the differences in academic performance as gauged by self-reported GPA when considering course format and students' perceptions of course modalities, and 3) the differences in students' perceptions of the learning environment when considering course modalities.

Literature Review

Very little research exists surrounding HBCU students' perceptions of learning in distance-learning and face-to-face courses. According to an earlier study focused on non-HBCU students, comparing a graduate online course with an equivalent face-to-face course, students in the traditional course held slightly more positive perceptions about the instructor and overall course quality, although the two courses formats mirrored one another in several key measures of learning outcomes (Johnson et al., 2000). Haywood and Murty's (2018) assessment of HBCU students in online psychology classes indicates that, except for peer networking and support, students proved to be "very satisfied" with all course-related elements. Other research confirmed that students preferred face-to-face instruction to the hybrid modality. For example, Wright and Holmberg-Wright (2018) note that although more students are taking online courses, there is a preference for traditional face-to-face instruction rather than hybrid learning. In addition, researchers confirm that students favor the face-to-face environment (Fish & Snodgrass, 2016; Weldy, 2018). Overall, Fish and Snodgrass (2016) posit that as institutions continue to integrate online education into their curricula, research on students' perceptions of the value of online versus face-to-face courses has produced mixed results. Platt et al. (2014) found that, overall, students did not perceive online and face-to-face classes to be equivalent. However, previous exposure to online classes was positively associated with perceptions of general equivalence, comparative flexibility, comparative knowledge gained, and the comparative level of interaction in online versus face-to-face classes. Relative to performance in course formats, Bettinger and colleagues (2014) note that, on average,

students performed worst in online courses compared to how they would have performed in a traditional, in-person class setting. Marquis and Ghosh (2017) provide evidence of negligible differences in student performance between those in blended learning and traditional face-to-face learning environments. This is most notable as the researchers assessed perceptions when considering similar student performance outcomes; again, the students showed a preference for the hybrid design. More recent research findings indicate that the success of all students declines as they take a great proportion of their course load online (Hamann et al., 2020). Reuter (2009) found no significant differences in students' course grades between online distance education students and students in the traditional course face-to-face course. Additionally, Flowers et al. (2014) revealed similar grade distributions regardless of the course delivery method. Carrol and Burke (2010) also confirm that students' academic achievement, course engagement, and scholastic effectiveness did not differ pending face-to-face or online modality. Overall, differences in students' learning outcomes between those in online and face-to-face classrooms are inconclusive (Wright & Holmberg-Wright, 2018). While colleges across the nation are expanding their online courses offerings, more research is needed, especially as it pertains to HBCU students, surrounding the effects of traditional versus remote courses, students' perceptions of varying course modalities, and students' academic success.

Methodology

Procedures

Professors within the Department of Psychology teaching sections of Human Growth and Development (DEP2004) or Introduction to Psychology (PSY2012) were provided a link to the self-report survey; then, students were sent invitations informing them of the opportunity to participate in the study. The study link was posted on their respective learning management system websites (blackboard); thus, allowing potential participants to complete the study at their leisure. Pending the instructors' preference, student participants completed the study survey for course credit, extra credit, or voluntarily. The weblink directed participants to the online study, developed using the Qualtrics assessment and surveying software. We captured this pilot data within the first two months of the fall 2019 semester; students were allowed to complete assessment metrics in one sitting.

Participants

Using convenient sampling techniques, we pooled respondents who attended a public HBCU in the southwestern region of the United States. The study relied on data from $n = 202$ students (39 = Male; 163 = Female). Students were in face-to-face ($n = 130$), hybrid ($n = 50$), or online ($n = 22$) courses in Introduction to Psychology or Human Growth and Development courses. The self-reported GPA of participants ranged from 0.5 to 4.0, $m = 2.94$ ($SD = 60$). The bulk of the participants (roughly 40%) self-identified as sophomores ($n = 80$); the sample included 42 freshmen (21%), 45 juniors (22%), 32 seniors (16%), and only three (3) graduate students.

Measures

The online survey and assessment, hereafter, referred to as the Student Perception of Course Modality (SPCM) Scale, included demographic questions, a section gauging previous experiences with courses of various formats, and a specific section tailored to capture students' perceptions of the individual course enrolled versus those of other modalities.

Demographic information. The demographic questionnaire was relevant to the present study for the collection of self-reported information on participants' age, gender, racial and ethnic self-identification, classification, major, and cumulative grade point average. While the utilization of self-reported GPA may be considered a typical methodological limitation, extant literature notes relatively high accuracy in respondent-provided GPA and official grade point averages provided by institutions (Caskie et al., 2014; Sticca et al., 2017).

Past Course Modality Experiences. To assess students' previous experiences with online, hybrid, and traditional courses, we developed twenty-seven general items posed to all participants. First, participants responded to three things that assessed "*face-to-face course experience*" and "*online [or hybrid] course experience*" by selecting from provided answer choices: [(I have taken only face-to-face courses (0), I have taken mostly/primarily face-to-face courses (1), Roughly half of my courses have been face-to-face (2), Less than half of the courses I've taken have been face-to-face (3), Less than 25% of the courses I've completed have been face-to-face (4) ($M = .73$, $SD = .61$) – or – (I have not taken any online (or hybrid) classes (0), I have taken one-two online (or hybrid) classes (1), I have taken three-four online (or hybrid) classes (2),

I have taken five or more online (or hybrid) classes (3), (M =.97, SD = .91 and M =.53, SD = .71) respectively]. Here, students with more diverse collegiate-course experience(s) would obtain a maximum of 10 points (e.g., those with only traditional/face-to-face course experience would receive a score of 0; M =2.23, SD = 1.61). Next, participants responded to sixteen (16) Likert-type questions, aimed at assessing students' general perceptions of the three-course modality types (participants select responses ranging between Strongly agree, Somewhat agree, Neither agree nor disagree, Somewhat disagree, and Strongly disagree). These questions include variations of items such as "*Face-to-face (hybrid/online) classes help my progression towards graduation due to the flexibility in scheduling (i.e., course time and location offerings)*," "*Hybrid courses are more challenging than face-to-face or fully-online courses*," and "*Online courses feel impersonal in terms of student-student interactions*." Finally, using the same Likert-type responses, participants answered eight (8) questions that compared the three-course modalities on a range of vital elements (i.e., "*In the following (face-to-face/online/hybrid), I am best able to succeed due to outside course resources*," "*In the following course modalities, I feel there is more classroom engagement*," and "*It is difficult to "prepare for class" when the course is offered in the following modality*").

Perception of Current Course Modality. Following the sections noted above, participants completed twenty-five (25) questions on their perceptions of a current face-to-face, online, or hybrid course (either DEP2004 or PSY2012 pending students' enrollment). First, we asked students to provide the grade they anticipated receiving in the specific course. Next, we posed a series of questions to capture students'

perceptions of the course (i.e., "*Given the course format, the description of the assignments (i.e., assignment layouts, labeling of materials, and blackboard modules) was acceptable*"; "*The course information (e.g., PowerPoints, lecture materials, announcements, etc.) was readily available*"; "*This online course required more energy or effort from me than it would have if the course were a hybrid or face-to-face course*"; and "*I am confident that I would have obtained the same grade if the course was a hybrid course*"). The 5-point, Likert-items, again, ranging from Strongly Agree to Strongly Disagree, were coded such that more favorable responses that indicate positive perceptions were weighted as five (5) while lower ratings were rated as one (1).

Statistical Analyses

IBM SPSS Statistics Software version 26 was utilized to complete the analyses. To examine associations between variables (RQ1), we utilized Pearson's zero-ordered correlations. To determine if differences existed in anticipated grade (RQ2) based on students' course type, we ran several t-tests and ANOVA models. Likewise, to examine the final research aim (RQ3), we constructed ANOVA models and a stepwise regression-analysis model to a) determine if students proved to hold higher amounts of negative course perceptions when considering the course modality experienced, and b) examine the extent to modalities and other elements captured to serve as significant predictors of students' perceptions observed.

Results

The results of the study follow based on the presented research questions:

RQ1) What associations prove to exist between student's past academic performance, anticipated course performance, perceptions of course modalities, and past enrollment

experiences with the three-course modalities (e.g., 0-10), indicating no to greater

enrollment online and hybrid courses)? Correlational analyses reveal positive

associations between students' self-reported GPA and expected course grades (r

= .41, p< .01). Similar to the findings presented by Hamann and colleagues (2020),

students with greater experiences with hybrid and online enrollment (course format

experiences) expected lower grades in the course of record (r = -.20, p < .01).

Students with higher grade expectations proved to hold lower amounts of negative

course perceptions (r = -.21, p< .01).

RQ2) What differences are observed in anticipated academic performance when

considering course modality and students' perceptions of course modalities. Students'

self-reported GPA did not differ based on course format [online (M = 2.84, SD = .53);

hybrid (M = 2.89, SD = .44); and face-to-face (M = 2.9, SD = .66); F(2,199)= .63; p

>.05]; however, mean comparisons using ANOVA models revealed significant

differences in grade expectations between students in the online (M = 84.05, SD =

10.31), hybrid (M = 79.76, SD = 9.21), and face-to-face (M = 89.49, SD = 8.17),

courses; F(2,199)= 23.99, p < .001. Course format proved to account for 11.3% of the

variance observed in expected grades (p < .001); subsequently, negative course

expectations proved to account for 4.4% (p< .001) of variance in expected course

grades.

RQ3) What differences exist in students' perceptions of the learning environment when

considering course modality, and to what extent do modalities account for variances in

students' perceptions. Students in the online and hybrid courses proved to hold higher

amounts of negative course perceptions (M = 23.4, SD = 9.68 and M = 23.04, SD =

9.94; respectively) in comparison to those in face-to-face courses (M = 14.84, SD = 9.62; F (2,199) = 17.01; p <.001. Moreover, the course format factor proved to be a significant predictor of negative course perceptions F (1,200)= 28.71, p < .001), accounting for roughly 12.5% of the variance observed in negative course perceptions. As indicated by beta values (β=-5.39), students in the face-to-face courses held lower amounts of negative course perceptions than those in the hybrid and online courses. Overall, the findings are in line with the existing literature on the comparisons on academic achievement and comparisons of course modality.

Discussion

The results of this study are important as they augment the literature on HBCU students' academic performance and their perceptions of course modalities. These initial results provide insight into the important associations between student course perceptions and the grade they anticipate receiving. While the students were at similar proficiency levels outside of the courses assessed (given self-reported GPAs), those holding more adverse or negative course perceptions believed they would receive a lower grade. Students in the face-to-face courses anticipated receiving higher grades and held significantly lower amounts of adverse perceptions about the course format. Interestingly, those in the hybrid courses held adverse perceptions that mirrored the online students' perceptions; however, students in the hybrid course anticipated significantly lower end-of-term grades. While these are important outcomes, we also understand that other factors outside the purview of this study (i.e., major alignment, academic engagement, interest in course subject matter, etc.) may impact students' overall course perceptions. A delimitation of the present study is that we use convenient

sampling at one HBCU. Thus, the findings may not necessarily be generalizable to other demographics or students enrolled at other institutional types (i.e., Primarily White Institutions, Minority Serving Institutions, or Hispanic Serving Institutions).

While regression analyses results indicate course format as more influential of expected course grade than negative course perceptions $F_{(2,199)} = 13.84$, $p < .001$), this trend may differ in coming years as the educational landscape may shift. Student enrollment in online and remote courses may change, due to elements outside of their control, such as COVID-19; so, it is likely that collegiate students' exposure and experiences in hybrid and online courses may differ since the collection of the present study data. While results indicate that those in the face-to-face courses tend to expect higher grades and hold higher perceptions of the modality, as students become more accustomed to remote learning, this finding may likely change. We provide a general narrative as it relates to students' perceptions of course modalities and their relation and contributions towards students' academic outcomes; however, more work is needed to further investigate the minutia relative to the topic at hand. Due to the dearth of research in this area, future inquiry should focus on differences in HBCU students' perceptions of course modalities before, during, and following the COVID-19 health pandemic.

In summary, our findings support other work which suggests that HBCU students' perceptions, specifically perceptions of rigor, prove to impact students' academic performance (Tani& Ray, 2018); while our results corroborate this, we extend on past work by highlight the overall importance of course modalities afforded to students. These findings also help us to understand the importance of students' perceptions towards a class, above and beyond their initial abilities, and how these perceptions

influence academic performance. Educators and administrators should take care when considering the types of learning formats provided to students and consider how students' perceptions relate to and contribute to students' subsequent academic successes.

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Pre-Service Teachers' Self-Efficacy in Managing the Virtual Classroom

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Abstract

The challenges of managing a virtual classroom impact the self-efficacy of pre-teachers as they navigate the expectations associated with online learning. In response to an increase in virtual learning, pre-service teachers find themselves placed in virtual classrooms with expectations of managing students in the virtual environment while simultaneously delivering academic instruction. The demands of teaching in these situations may affect the pre-service teachers' self-efficacy regarding classroom management. This paper examines the current research regarding pre-service-teacher self-efficacy, the challenges and opportunities of a virtual classroom, and suggestions for educator preparation programs to model, support, create and monitor the growth of pre-service teachers as they strengthen their virtual classroom management skills.

Keywords: virtual classroom management, self-efficacy, pre-service teachers

Introduction

As educational institutions faced a national pandemic in 2019, school leaders pivoted to online instruction, forcing educator preparation programs to send pre-service teachers to virtual classrooms for student teaching. Conducting field experiences with simulation software and video instruction became the norm. Suddenly, teaching classroom management changed dramatically, and teacher educators scrambled to support pre-service teachers facing the challenges of online education. These changes in classroom environments threatened the tenuous self-efficacy of pre-service teachers' classroom management skills. Managing a virtual classroom compared to a traditional classroom requires a different set of tools. This paper examines the literature surrounding virtual instruction, the self-efficacy of pre-service teachers regarding their classroom management skills, and the process of preparing pre-service teachers with the skill set needed for managing the virtual classroom to build confidence in their success.

Review of Literature

Teaching is a complex profession. Organizing the classroom and managing the students at the school is an integral part of the teaching process. The pre-service teacher (PT) may find this part of the job to be intimidating and difficult to master, which lowers their confidence in teaching abilities. Building the PT's confidence in managing the classroom leads to better overall teaching, higher student success, and more substantial school retention data. Research indicates a connection between high self-efficacy and quality teaching. Holzberger et al. (2013) discovered that teachers with

high self-efficacy would teach at a higher quality level, including classroom discipline and management, connecting the learning to real-world situations. Student performance is impacted by the teacher's level of confidence in classroom management. Subsequently, the teacher educator (TE) has the task of preparing PTs for the classroom; thereby, influencing their self-efficacy in classroom management. Holzberger et al. (2013) also determined a connection between awareness of a teacher's ability to educate students and the quality of instruction the following year. The residual effects of high self-efficacy build a strong case for self-reflection from the PTs about their confidence level in teaching. Darian (2012) stated that "in education settings, teachers with high self-efficacy expect to be successful in classroom practices both in teaching and in handling students well" (p. 2). Developing a high level of self-efficacy is achievable, even for pre-service teachers with limited experience in the classroom.

The online teaching events have chipped away at the PT's confidence in managing students in the virtual setting. While developing a desire for high self-efficacy in teaching, the ability to manage online classroom environments is imperative. "It is necessary to provide student teachers with opportunities and skills for online teaching, including interacting with children through this medium, and also have students reflect about how best to promote development and learning using online communication tools" (Kim, 2020). Opportunities to practice skills of managing the virtual setting offer space for trial and error. PTs are able to experience the virtual classroom, work with students using online tools, and reflect on their management skills. This experiential process allows for improvement over time. Patterson and Farmer (2018) found that "self-efficacy beliefs of pre-service teachers regarding their ability to manage their classroom

significantly increased from the beginning to the midpoint of their student teaching as well as from the beginning to the end of their student teaching" (p. 140). Practicing virtual teaching improves self-efficacy, giving PTs the confidence necessary to grow and develop as teachers. Beginning teachers are faced with the reality of the demands of classroom management with little experience or training. Dicke et al. (2015) found that "a classroom management intervention can have a significant effect on beginning teachers' perceived classroom management skills and well-being, thus helping to prevent reality shock, support teacher retention, and further foster the cultivation of high-quality teachers" (p. 31). If PTs are prepared to manage their classrooms, the effects of the shock of a real-world setting could be mitigated.

Many components of traditional management are transferable to the virtual setting; however, some techniques used in the traditional classroom may not work in the virtual classroom. Evertson and Harris (1997) state that teacher actions help reduce potential behavior problems and maintain student involvement in the instructional activities. These actions include providing clear instructions, checking for understanding of instructions, monitoring students' behavior, and providing for smooth transitions. All of these actions are important in a traditional and a virtual environment. On the other hand, some common teacher actions do not work as well in the virtual setting. "When teaching online, we must learn to do without many of the classroom management strategies we've become accustomed to, such as stern glances, flicking lights on and off, or detentions. Be open to the possibility that our students will learn more responsibility, develop social-emotional skills, and master more content than they would in a live classroom" (Lusciandrello, n.d.).

Teaching is much more than delivering lectures and giving exams, especially in the virtual classroom. The virtual environment requires intentional design and implementation. Scott (2017) states that "teaching is purposeful. It is something that requires both knowledge of the skill and content and an ability to communicate in such a way that the person receiving instruction is likely to be successful" (p. 11). Setting classroom norms, asking volunteers and non-volunteers to answer questions, and intentional student grouping can be effective in any classroom environment; however, applying these strategies to the virtual classroom requires different teacher actions (Evertson & Emmer, 2013). Efficacy beliefs are related to teacher behaviors. "Efficacy affects the effort they invest in teaching, the goals they set, and their level of aspiration" (Tschannen-Moran & Hoy, 2001, p. 1). The confidence of PTs regarding classroom management in the virtual classroom impacts other areas of teaching.

The Virtual Classroom

The virtual classroom involves a variety of teaching strategies and management tools. Introducing PTs to the virtual environment during their preparation program is critical to their success. Managing a traditional classroom by using techniques such as 'withitness,' proximity control, and using the classroom layout may not translate to the virtual classroom (Kounin, 1970). Virtual classrooms may require alternatives to the traditional tenets of behavioral management (Evertson et al., 1999; Evertson & Weinstean, 2006). Virtual teachers are faced with learning new strategies such as applying group meeting technology, establishing meeting norms, encouraging virtual engagement, and creating connections with students with a computer screen and microphone. Online learning can give students "an enhanced sense of purpose and

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allow them to invest more time into pure learning—rather than some of the trappings of in-person schoolings, such as getting from class to class, visiting lockers, handing in homework, or trying to borrow the same library book that 20 of their peers need for the same assignment" (Salters, 2020, p. 16). The sudden shift to widespread virtual learning caused teachers and schools to adapt quickly; however, the "future of teaching will necessarily have to change to incorporate more technology because education is a tool to arm children for their future, and the structure of the worldwide job is changing to require technological savvy" (Salters, 2020, p. 17).

According to Berman & Dubinski (2021), it is important to model for students how to "positively cope through challenging times" (para. 7). Supporting social-emotional health and building positive relationships with students is important to the virtual classroom setting. The isolation of virtual learning can lead to the feeling of a loss of normalcy (Haverback, 2020). Students face new challenges during virtual learning, such as avoiding distractions at home during their virtual class, using unfamiliar technology, and participating in the virtual classroom.

The structure of online learning can be described in two general terms: asynchronous and synchronous. Kim (2020) provides the following table (Table 1) to distinguish the two types of learning.

Table 1

Asynchronous and synchronous learning

_____

	Asynchronous	Synchronous
Timing	Log in at your own time Learn at your own pace	Log in at the same time
Communication	Post responses to activities Read and write feedback	Face-to-face interactions Talk back and forth within a group
Tools	E-mail Discussion boards	Video and/or audio tool (e.g., Google Hangout, Blackboard Collaborate, Zoom Meeting, Microsoft Teams)
Teacher Role	Set up discussion boards Facilitator between students	Instructor Interact with students.

These two types of online learning provide the foundation for lesson planning, student engagement, and assessment in the virtual environment. Since the K-12 environment focuses on synchronous delivery, this article deals with this type of delivery. With many hurdles and obstacles, the virtual classroom can be challenging and confusing for teachers and students; however, the need to master the management of the virtual classroom is vital to the evolution of teaching.

Building Confidence in Virtual Classroom Management

Due to the importance of navigating these challenging environments, TEs have the huge task of preparing PTs to take charge of the virtual classroom and manage with confidence. According to Patterson (2018), "the approach and delivery of classroom management training may determine how well teachers are able to apply the strategies they have been taught in their own classroom (p. 141). The responsibility for quality teacher preparation lands squarely in the hands of the TEs and the educational preparation programs. Jackson and Miller (2020 found that "more ways to authentically involve candidates in understanding and implementing classroom management practices to enhance a sense of self-efficacy should be included in teacher preparation programs and courses on classroom management" (p. 1). In response to this important challenge, one TE offers several steps to build confidence in virtual classroom management.

The first step toward building confidence in virtual teaching is to **model** strong virtual classroom management for PTs in their education program. The TE intentionally described effective teaching strategies while modeling the strategies in the virtual classroom. For example, the TE set norms for the virtual classroom: camera on, mic muted, use 'raise hand' emoji, show interest in the discussion, join from a calm space (not a vehicle or playground), and be on time. The TE also used breakout rooms to encourage group discussion and produce group projects. The TE joined the breakout rooms randomly to answer questions and assess progress. Another important way to model effective virtual strategies included demonstrating formative assessment technology tools. When the PTs engaged in the formative assessment technology tools

as a student, they noticed the value and impact of using formative assessment in their own classroom. Some examples of formative assessment tech tools included NearPod, PlayPosit, EdPuzzle, Flipgrid, LessonUp, Pear Deck, and others. Providing an introduction to tech tools along with the practice gave PTs the confidence to use the tools in their own classrooms.

Using the chat feature in the preferred meeting software offered an added element for enhancing online instruction. The TE and PTs used the chat feature to share links, pose questions, make comments, and allow peer-to-peer conversation during the lesson. For example, during a student presentation, the presenters shared a link to a video to be viewed by participants independently. After viewing the video, students discussed the video as a group. The chat settings were adjusted to meet the needs of the class. Also, using participation icons and random selection can support student engagement and feedback, as well as encourage students to pay attention during the lesson.

Polls, surveys, and forms also provided specific technology tools to enhance learning in the virtual environment. Polls were developed and administered in the virtual setting. The TE developed polls for lessons to gauge student opinion and to formatively assess student learning. For example, the TE delivered polls asking PTs a series of multiple-choice questions about a specific classroom management model. The PTs responded, and the TE shared the results of the poll, made adjustments to instruction, and re-assessed the learning after the lesson. The TE shared links to surveys and forms as other assessment options. The assessment results were easily accessed and analyzed, allowing the TE to target specific objectives for reteaching.

The second step toward building confidence in virtual teaching is to support the building of a virtual management toolbox for effective instructional and management strategies. Equipping PTs with technology tools for the virtual classroom helps to build confidence in management skills by offering specific, intentional teaching materials to engage students in learning. Lisciandrello (n.d.) provides several technology tools to support student learning (Table 2).

Table 2

Categories and examples of technology tools

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Learning Management	Video Conferencing	Personalized Learning	Presentations	Collaborative Documents	Other
Google Classroom	Google Meet, Zoom, Congregate.Live	IXL, Khan Acaademy, NoRedInk	PearDeck, nearPod, Google Slides	Google Suite	Desmos, Geogebra, FlipGrid

_____

Management and instruction are inseparable (Evertson & Harris, 1997). For example, the TE combined management and instruction by using management tools such as responsive icons and instructional tools such as NearPod and Kahoot. By connecting classroom management and instruction, PTs gained confidence in their choices for all of the activities in the classroom.

The third step toward building confidence in virtual teaching is to create real-world opportunities to practice virtual classroom management. The TE required PTs to include management techniques in their class presentations to peers, such as camera-on expectations, response to questions, and student engagement. PTs were also

needed to use some form of formative assessment tech tool in presentations. The TE demonstrated the use of Class Dojo and ClassCraft during lessons. This allowed PTs to add valuable tools to their teaching toolbox, include tech tools in lesson planning, and implement them in real-world settings. PTs engaged in authentic field experiences to practice the skills of classroom management in a virtual setting under the direction of high-quality mentor teachers. During field experience opportunities, PTs act as student teachers in the classroom. Hoy (2000) explains that during student teaching, some of the most powerful experiences are developing pre-service teachers' self-efficacy. The TE required PTs to complete a reflection assignment about their experiences in the field. PTs reflected that the use of technology tools in the TE's classroom gave them more confidence to use the tools in their student teaching environments.

The last step toward building confidence in virtual teaching is to **monitor** changes in self-efficacy from the beginning to the end of their education program to continually evaluate growth. Some examples of monitoring include surveying students during education programs (beginning, middle, and end), including management techniques in a variety of courses (teaching strategies, classroom management, classroom assessment courses, etc.), and providing valuable field experiences giving students opportunities to practice classroom management in a virtual environment. As students practice management skills in the virtual classroom, their level of self-efficacy is expected to improve.

Conclusion

The national pandemic in 2019 changed the way educational institutions teach classroom management to pre-service teachers. Online instruction expanded in the K-12 setting, forcing preparation programs to focus on preparing pre-service teachers to perform in the virtual environment. The self-efficacy of pre-service teachers regarding virtual classroom management was affected by the sudden shift to online learning and the lack of experience in the classroom. Since traditional and virtual classrooms require different types of management skills, it became incumbent upon teacher educators to better support pre-service teachers in their virtual management skills.

This paper examined the literature surrounding virtual management, the self-efficacy of pre-service teachers regarding their management skills, and the process of preparing pre-service teachers with the skill set needed for managing the virtual classroom. One TE's examples of modeling strong management skills, supporting the building of a tech toolbox, creating real-world opportunities for practice, and monitoring the change in self-efficacy toward virtual management offered one example of practice to support self-efficacy. Pre-service teachers will continue to face challenges with online instruction and classroom management, which impact their level of self-efficacy; however, teacher educators have opportunities to help build pre-service teachers' confidence in their management abilities in the virtual classroom.

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Using UDL to Support STEAM Instruction for Children with Disabilities

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Abstract

Science, Technology, Engineering, Art, and Math (STEAM) are all critical features that need to be taught to children at an early age. Children who are exposed to teaching that involves STEAM are exposed to critical thinking, problem-solving, and inquiry-based learning (Linder & Eckhoff, 2020). Additionally, Universal Design of Learning (UDL) is another crucial way of teaching a young child how to learn by optimizing teaching based on how students learn best (CAST, 2021). It is through these teaching structures that the opportunity to help young children with disabilities learn more effectively is recommended.

Keywords: Critical thinking, Children with Disabilities, Scaffolding, STEAM, Universal Design of Learning

Science, Technology, Engineering, Art, and Math (STEAM) is an integrated and hands-on approach that allows young children leeway to inquire about their learning experiences. STEAM promotes vocabulary, critical thinking, communication, problem-solving, and reflection for students after participating in a curriculum that incorporates STEAM activities (Linder & Eckhoff, 2020). Through STEAM activities, young children learn how to look at problems through a different lens. They understand that there are various ways to approach a problem, work together to solve a problem, and come to a solution or inquire further into an experiment to learn more. Additionally, through STEAM integration, teachers can focus on content for young children (*what* to learn) and the processes (*how* to learn) (Linder & Eckert, 2020). While STEAM is beneficial for young learners in the classroom, it also opens doors for teaching children with disabilities.

Teaching children with disabilities requires planning and specialized practices to participate and engage meaningfully in learning activities (Kurtts, 2006). Marino (2010) found that successful participation by students with disabilities in STEAM classes is directly linked to a teacher's ability to understand the unique learning needs of that student. Struggling learners may require extra scaffolding with the STEAM curriculum (Samsonov, Pederson, & Hill, 2006). Scaffolding involves providing the appropriate amount of support and instruction that the child is learning and working in STEAM activities. Through scaffolding, teachers can cue, prompt, question, and discuss with children to help them develop their own understanding (NCECD, 2020). Through the techniques that come through scaffolding, teachers can support diverse learners in the process and make STEAM an enjoyable and supportive learning experience for them. Teachers teaching STEAM curriculum should also ensure that their curriculum is

engaging and addresses the needs of all students in their classroom (Basham & Marino, 2013). By providing different learning experiences, the teacher can observe how the children are learning. These experiences include drawing, painting, building, nature observations, graphing, and technology, just to name a few (Denton & West, 2002). While STEAM is an excellent avenue for children with and without disabilities to learn, another component needs to be considered in the learning process.

Universal Design for Learning (UDL) calls for the design of curricula with the needs of all students in mind so that methods, materials, and assessments are usable by all. UDL is a means of using multiple means of engagement, representation, and expression to provide access to the curriculum for all types of learners (CAST, 2021). First, this is accomplished by providing multiple means of engagement. This means that there is enthusiasm and motivation for the learner through different means of engaging with the learning material. Second, multiple means of representation present information in a variety of ways so that we can meet the needs and different learning styles of young children. Third, through means of action or expression, we offer options so that the child can demonstrate what they have learned in various ways. This means that choice is highlighted so that the child can demonstrate their strength in the learning process (CAST, 2021). Therefore, differentiated instruction can be provided through the principles of UDL. Differentiation provides a process for the child to learn according to their interests, learning preferences, and readiness levels. First, through differentiating the content, the teacher considers what the child needs to learn; they choose content that is based on student interest as well as student strength. Additionally, various texts and resources are provided for the child to learn. Second, the

process of learning has to be considered. How is the child going to learn the information? Through providing differentiated instructional strategies such as scaffolding, flexible grouping, varying instructional strategies, and curriculum compacting, students have the opportunity to acquire information and process it, and then demonstrate their learning. When students demonstrate their learning process, this is the third step in differentiation, the product. The product in the learning process considers various opportunities and choices for children to demonstrate the concepts that they have learned (Westman, 2017). The product that is presented also considers the learner's style and how they present the information to those around them. This leads to the final step in differentiation, the learning environment. The learning environment is where and with whom the child learns. Considerations in the learning environment should include the arrangement of the room, student interaction in the classroom, spacing, and the child's responsibility in the environment (Westman, 2017).

With the understanding of what STEAM and UDL stand for and what they do, how can we teach children with disabilities using the concepts of STEAM and UDL together? First, it is critical to remember that early learners do not have preconceived notions (Sneidman, 2013). As a result, it is easy to adapt and teach STEAM concepts for children with disabilities incorporating UDL concepts. It is also key to incorporate the use of senses in STEAM activities. Through the five senses of seeing, touching, tasting, smelling, and listening, young children can learn about different STEAM concepts using the principles of UDL to reach diverse learners. Young children with developmental delays or disabilities require planning and specialized practices that allow them to participate and engage meaningfully in the learning process (Division for Early

Childhood of the Council for Exceptional Children, 2014). By incorporating the senses, hands-on learning, and opportunities to learn and share through different modes of learning, children learn to interact, engage and stimulate interest and excitement for the learning process (DECCEC, 2014). Additionally, teaching STEAM activities utilizing UDL principles provides opportunities for children to learn from their peers and to learn concepts in different ways that involve interactive learning. It allows for expression, communication, and improved self-confidence in children (Brookes, 2018). Also, when UDL principles are incorporated into a STEAM lesson, barriers are then removed. This is critical so that curriculum and learning centers are accessible to all students with learning differences (Conn-Powers, Cross, Traub & Hutter-Pishgahi, 2006).

STEAM falls under the umbrella of inquiry instruction. Inquiry instruction encourages students to think critically, problem-solve, communicate, and reflect through active, hands-on learning experiences (Linder & Eckhoff, 2020). Inquiry practices provide young children with opportunities to approach problems in a variety of ways. Early childhood educators are encouraged to integrate STEAM instruction across subject areas within a meaningful, relevant context (Linder & Eckhoff, 2020). How can STEAM instruction be integrated into the classroom? One method for integrating STEAM instruction is using inquiry-based learning projects, such as designing, planting, and caring for a class garden, providing students with the opportunity to collaborate, think critically, and engage in activities across multiple subjects. Another method for integrating STEAM instruction is through the use of guided play centers in the classroom. Guided play provides opportunities for student exploration within a context

specifically designed with a learning goal in mind, yet it still maintains the positive

aspects of free play (Hassinger-Das et al., 2017).

Using STEAM and incorporating the principles of UDL in STEAM instruction

introduces ways to make learning more accessible and applicable and provides a

means for children with disabilities to learn with diverse, hands-on approaches so that

the learning becomes a meaningful process (Basham & Marino, 2013).

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Using Technology to Enhance Teaching Experiences

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Abstract

The purpose of this article is to demonstrate how teacher candidates benefit from utilizing technology, GoReact, to self-reflect on their own authentic teacher experiences. Candidates video-recorded their implementation of a research-based instructional strategy during their field experiences. This required GoReact video recording is the first opportunity in the candidates' education program to practice instruction during their field placement. The teacher candidates collaborate with their mentor teacher to select a strategy that works well with an already planned lesson. Candidates then use the manageable GoReact technology to upload, record, and stream their videos. Teacher candidates' educational benefits include evaluating their instructional strengths and weaknesses, building their self-efficacy, and constructing actionable discussions to influence change. Providing teacher candidates with authentic experiences help them make real-classroom application of the course's research. Even though state assessments serve as a standard for improving teacher quality, practice-based knowledge is necessary for the teacher candidate's training.

Keywords: technology, authentic teacher experiences, self-reflection, self-efficacy, practice-based knowledge, metacognition

Introduction

A fundamental theory-to-practice approach is to train teacher candidates to implement pedagogical strategies during their field experiences skillfully and to self-reflect on the performed process employing a video recording. Recent studies have compared teacher candidates' authentic field experiences with purposeful self-reflecting videos as valuable theory-to-practice connections. It is essential to design and deliver a practice-based preparation that ensures teacher candidates have the necessary skills to engage and enact certain important teaching practices (Robinson & Nemr, 2017). In one mid-western public university's education preparation program (EPP), the fifth semester's instructional strategies course is the first education course that teacher candidates practice instructing a learned strategy during their field experience. In past field experiences, the K-6 mentor teacher was the only professional who could observe and provide feedback regarding the teacher candidate's ability to implement appropriate pedagogical strategies in the classroom. A video recording provided an avenue that would bring a new level of depth and awareness to teacher reflection; a firsthand sense of self rather than the hearsay of others could make it a highly useful tool for continuing professional development" (Spalding, 2020).

Due to limited technology in the EPP, any video recording equipment was exclusively utilized by the teacher candidates during their student teaching experiences. To enhance teacher candidates with rich self-reflecting skills before their student teaching, the Department of Teaching and Learning procured the GoReact technology tool for teacher candidates to practice authentic and reflective field experiences. It was essential to the EPP to provide valuable experiences that would enhance the teacher

candidates' ability to critically analyze legitimate classroom instruction for their professional development (Hong & Riper, 2016). Furthermore, the use of GoReact increases flexibility, improves reflective practices, eliminates travel and time constraints that deter timely feedback.

The significance of a GoReact recording for the teacher candidates includes the opportunities to apply best practices, identify and evaluate components of a lesson one-on-one with students or in a whole group setting. The instructional strategies course framework provides the teacher candidates an opportunity to record their observations and evaluations during instructional and questioning strategies. Well-designed early field experiences (EFEs; Darling-Hammond, 2010) that include initial assessment in the EPPs help teacher candidates apply instructional strategies (Andrade & Valtcheva, 2009; Price, 2005). These practices strengthen the candidates' long-term professional training and self-efficacy (Taras, 2010).

The Advantages of Authentic Field Experiences

Practice experiences need to occur through an EPP's beginning coursework to culminating student teaching (Robinson & Nemr, 2017). For this reason, before the EFEs, teacher candidates are prepared to study various instructional strategies by reading, practicing, and discussing the pedagogical benefits of differentiating instruction in the K-6 classroom. The evidence-based instructional practice (EBP) recommends that "deliberate practice is carefully sequenced and a calibrated practice that builds on one's current knowledge and skill" (Ericsson, 2014; Ericsson, Krampe, & Tesh-Romer, 1993). The advantages of learning methods such as communication, motivation, and

modeling can help the candidates with their metacognitive practices, as well as understand their students' abilities to modify their learning to new contexts and tasks (Bransford, Brown, & Cocking, 2000; Palincsar & Brown, 1984). The course instructor serves a vital role in modeling these instructional strategies before EFE placement. According to Salisu & Ransom (2014), modeling is an appropriate strategy for all students to analyze the teacher's thought process. In this study, the course instructor models effective feedback by providing written and verbal responses to the teacher candidates. Research indicates that EBP strategies are most effective when learning and practicing 'how to teach something or someone' in courses is correlated to learning and practicing 'how to teach something or someone within the EFE (Robinson & Nemr, 2017).

After completing their field experiences, candidates form small groups to complete a collaborative peer evaluation on each member's video. One candidate at a time explains his/her video responding to analytical prompts. Group members make observations and document notes on peer evaluation. The use of technology transforms the candidates' EFEs into more reflective practitioners that frame their understanding in the context of their own experiences (Darling-Hammond, 2005; Scherff & Sizer, 2012). Furthermore, empowering candidates to assess and give others constructive feedback develops lifelong skills (Center for Teaching Innovation, 2020).

Technology Benefits

We have identified three advantages of using technology with our teacher candidates during their EFEs. One advantage is that candidates can observe their

areas of strengths and weaknesses before a documented evaluation. Next, the video-aided reflection influences teacher candidates to make necessary changes that promote better practices. Finally, the video recording allows for more constructive and actionable meetings with the evaluator. The reliable video recording is less distracting for the teacher candidates than the evaluator's hurried note-taking. The video brings a new level of depth and awareness to teacher reflection, a firsthand sense of self rather than the hearsay of others, making it a highly useful tool for continuing professional development" (Spalding, 2020). Furthermore, the teacher candidates are equipped with skills to self-assess and improve their work.

The use of the GoReact does not require complex equipment to capture and critique the video. It is advantageous for the college to support their low socioeconomic student population with a cost-savings tool. Additionally, there is no complicated training required to utilize the GoReact video recording making it more likely the candidates will use it during their EFE. Candidates can easily upload the recorded video to the instructor's assigned courses for assessment. The instructor can view the uploaded video and provide effective feedback with a time stamp aligned with the comment. The instructor's ability to provide specific and targeted feedback on the candidate's video improves performance, advances understanding, and motivates them in self-reflective practices.

Self-reflection using video recording challenges the candidate's perspective, focus, and understanding of oneself. According to Sitzman, Ely, Brown, and Bauer (2010), "accurately self-assessing one's performance is intrinsically difficult" (p. 3). A video recording can engage candidates in the metacognitive task of assessing their

performance, urging them to be more active and self-reliant in their learning (Wiggins, 1998). The use of technology such as GoReact does not replace the university professor's guidance; however, the intent is to expand collaborative efforts between the EFE placement and university to be more coherent, intentional, and purposeful for the candidates. When EPPs provide teacher candidates with purposeful EFEs, they are more confident in their instructional experiences (Tschannen-Moran et al., 1998).

Conclusion

Authentic EFEs Build Confident Student Teachers

The implementation of GoReact during authentic EFEs helps teacher candidates self-evaluate in ways that positively support their development (Baecher, Kung, Jewkes, & Rosalia, 2013). The candidates' academic conversations help them self-reflect and thoughtfully explain instructional strategies based on academic studies instead of trial and error. The practice of observing video recordings provides candidates with real-time skills to self-reflect on their knowledge and competencies. Providing candidates with authentic EFEs deepens their understanding of their teaching styles, which enhances their ability to question the use of traditional models of practice and explain why some are more effective than others (Shandomo, 2010). The advantages of using GoReact allow EPPs to reduce financial expenditures and travel time that now can be devoted to quality time supporting the candidates. EPPs can provide teacher candidates with more purposeful EFEs that allow for self-reflective practices. The more intentional EPPs are in their self-reflection training, the more deliberate teacher candidates can be in their instruction.

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Student Preference for Reading and Inquiry: An Avenue for Differentiation with E-text

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Abstract

Regardless of the delivery method, virtual learning, or face-to-face, a majority of today's students spend a great deal of time learning via computer or similar device. In turn, students often access material online in the form of digital text or e-text rather than traditional mediums. This paper revisits the widely referenced concept of differentiation in relation to the educator's important role of facilitator. In consideration of students' learning styles and learning preferences, differentiation should be of high importance; however, differentiating instruction can be quite challenging. This paper reviews the authors' qualitative content analysis of existing digital tools and related literature that educators can use to seamlessly support their students in authentic reading and inquiry.

Keywords: differentiation, digital text, online learning, virtual delivery, digital tools, authentic reading, inquiry, learning preferences, scaffolding, digital literacies

Introduction

In an increasingly digital world (Bishop & Counihan, 2018), a great deal of daily reading and information consumption is facilitated online through the use of electronic devices. This holds equally true in classrooms at all levels of education and for students of all ages. The COVID-19 pandemic moved education for students and teachers online at unprecedented rates (Li & Lalani, 2020); however, the use of devices to facilitate reading experiences for students was widely prevalent before the pandemic. Learning through online tools is undoubtedly here to stay now that teachers and students have become more adept at learning with online materials than ever before. If classroom materials are going and (or) remaining virtual, teachers must consider their students' potential struggles and preferences as learners in a digital space just as they would in the physical classroom. This paper reviews the authors' qualitative content analysis of existing digital tools and related literature that educators can use to seamlessly support their students in authentic reading and inquiry.

Regardless of the delivery method, whether virtual learning or face-to-face, a majority of today's students spend a great deal of time learning via computer or similar device. In turn, students often access material online in the form of digital or e-text rather than traditional mediums. The complex nature of reading online adds a physical strain and can create new obstacles for students with regard to navigation, engagement, and comprehension (Goldsborough, 2012; Liu & Gu, 2020). For educators, this warrants an increased awareness of the differences in physical works as compared to digital works and the related reader experience. Many students do not prefer learning online. While teachers can respect that preference, what should be done when there is no choice?

The experiences of the authors shape their perspectives and research interests. Through experiences in roles such as classroom teachers, reading specialists, and college professors and those made in both the private and public sectors, the authors of this research have encountered learners who have identified a wide variety of technological struggles, and these struggles have prevented them from being able to engage with the content as meaningfully as intended. The authors of this work have learned that in an age where technological learning experiences have taken center stage—and will continue to be emphasized in the classroom going forward—teachers owe it to their students to support, scaffold, and accommodate their learning in a digital environment. While an overarching goal is to support students at varying ability levels, the current research is in regard to student's readiness, interests, and specifically learning profiles and (or) preferred approaches to learning. The authors' interest in and emphasis on the need to provide tools that accommodate digital learning goes beyond the simple prevalence of technology in today's education. Yes, technology is partly utilized to deliver instructional materials because of its convenience: materials and assignments are distributed, collected, and stored much more efficiently in a digital form, and they can be accessed anywhere that a student or teacher has access to a device. However, the importance of supporting students' digital learning experiences goes far beyond the interest of convenience and efficiency. The work of much of the educational disciplines— and even how individuals consume information and interact in their personal lives--now largely takes place in a digital space (Wickens, Manderino, & Glover, 2015), and teachers should prepare today's students to work in that space.

Teaching and Learning Today

Today's educators are tasked with developing learners and future professionals that will thrive in the 21st century with emerging digital literacies (Summey, 2013). The learning of all disciplines has now grown to include a variety of vital digital learning experiences and digital skills unique to those fields. The development of the vital literacies and skills to be obtained through these digital learning experiences have the potential to be thwarted by students' unique learning needs if they are not addressed. We, as teachers, have the responsibility to provide students with such learning experiences and appropriate accommodations to prepare them to function and succeed in a digital environment.

The digital literacies inherent to a 21st-century education represent a cross-section of a larger variety of emergent literacies (Summey, 2013). Today's students should be prepared for a wide variety of functions and skills to be carried out digitally as they will be expected to consume, create, and communicate technologically for a range of different people and purposes (Burke, 2013). Students should be able to find useful information, filter out important content, and organize and curate it for their own purposes. They need to engage in sharing information, collaborating with others to create and generating new information using technological resources. As new genres of reading and writing emerge alongside these new digital literacies, today's students should even be prepared to reuse and repurpose existing media resources to extend on a discussion and create new meaning.

Clearly, the end goals of educational experiences facilitated through technology are not simply based on familiarity with technology itself but the ability to use technology

to further the goals of the disciplines. Students should be able to make digital learning experiences their own rather than being intimidated by the delivery system used to share materials. In the physical classroom, students can hold texts in their hands, track their understanding through annotations and highlights, and have their learning needs accommodated through differentiation. Learning in the digital space should be no different. Educators can provide students with online tools for digital differentiation, allowing them to better control their learning experience and engage with class materials in meaningful ways (Yeh, Hung, & Chiang, 2017). We incorporate technology in the classroom to further the learning of content we are teaching and to help students become digital citizens in school and beyond (Summey, 2013). Thus, educators provide tools that help students overcome the barriers of technology use so they can engage with text regularly, develop relevant skills, and to enable them to thrive in a digital environment as students and beyond.

As trends in hurdles faced by students when learning with technology emerged, the research objective for this study was to gather tools that could help them overcome these barriers. An ongoing, overarching goal is to support students in authentic reading and inquiry. Thus, the authors sought to find efficient and easy-to-use resources for students to use in a digital learning environment so that they can 1) access online texts without inhibitions or barriers, 2) meaningfully engage with online texts as they develop the digital literacies and skills relevant to their disciplines, and 3) gain control of their online reading experiences as they develop into digital citizens beyond the school building.

Differentiating Online Learning

According to both theory and best practices, student interest and the ability to make choices are conducive to authentic learning. Further, educational research supports the practice of scaffolding (Gunning, 2020), or the "varied guidance and support for each student, which ensures students are appropriately challenged" (Wilson, 2015, p. 26). If instructors should adjust support as related to student ability, and interest and choice are key components for learning success (Gunning, 2020; Tomkins, 2017; Tomlinson & Moon, 2013; Wilson, 2015), how does this fit school-aged and higher education learners?

Although differentiating instruction can be quite challenging, educators cannot afford to avoid it due to a virtual learning environment. Instead, they should seek out and incorporate resources to support students through differentiated instruction. In looking more closely at student interest and choice- for K-12 and higher education learners, the authors of this study heavily consider learner preference. Many educators are familiar with the topic of differentiation and as such, differentiating the content, process, product, and environment are familiar (Tomlinson, 2017). Tomlinson and Moon (2013) provided a clear and concise explanation of what differentiation should look like for students by claiming that the avenues for differentiation (content, process, product, affect/learning environment) should be in accordance with individual student's readiness levels, interests, and learning profiles - all components that can be addressed through technology tools. Considering what those in the educational field know about the need to support students by challenging and supporting them appropriately, student preference and factors that may support students while also enhancing the learning experience must be considered.

The 2020-2021 academic year provided educators an avenue through which to gauge student perspectives with regard to online learning and all that is required (Trybus, 2020). As the researchers of the current study, we turned to our observations of students' common complaints or challenges to identify struggles they tend to face when reading and learning online. Some of the most frequent comments included: "I need my blue blockers;" "The screen gives me headaches;" "My eyes are just so tired;" "So many pop-ups/ads;" "I have been sitting all day;" "I am Zoomed out;" and "I hate reading online because I can't take notes on what I'm reading." There is no doubt that these notions sound familiar to teachers everywhere. Through an analysis of common complaints such as these, a general trend became clear: students are experiencing problems with viewing, engaging with, and tracking their understanding of online texts. The authors of this study believe that if teachers provide students with tools that can help accommodate these challenge areas, these students will not only experience more academic success but will also be relieved of some of the physical strain of long-term screen time.

Discussion of Online Tools for E-Text Differentiation

As the authors of this study, our criteria for identifying helpful digital tools for accommodating online learning were simple. Firstly, as stated previously, we wanted to find tools that enabled students to better view, engage with, and track their understanding of online texts according to their learning needs and preferences. Secondly, we were interested in identifying tools that were easily and freely accessible. In fact, many of the tools we identified are available as extensions of the Chrome web browser (Google Chrome, 2021), the most widely used Internet browser. Thirdly and finally, we sought out

tools that were intuitive, simple to learn, and easy to use. After all, a learning tool is of little value if the effort to learn and use the tool inhibits learning rather than enhancing it. With these criteria in mind, we identified a handful of tools that we hope teachers and students find useful for improving online reading. To enhance the viewing experience, we selected Magnifying Glass (Magnifying Glass, 2018), Screen Shader (Guiselin, 2021), and Reader View (Reader View, 2021). For better engagement with online texts, we chose Diigo (Diigo, Inc., 2021) and XODO (XODO Technologies Inc., 2018). Lastly, for better understanding digital reading materials, we found Read Aloud (LSD Software, 2021), Newsela (Newsela, 2021), and Rewordify (Rewordify, 2021).

Viewing

Magnifying Glass (available as a Chrome extension)

Magnification devices and large print versions are common accommodations for students with visual impairments that may prohibit them from completely engaging with print materials in the physical classroom (Johnson-Jones, 2017). Other students may simply prefer larger print when reading on paper or online for ease of reading. This assistive technology enables users to apply a magnified circle to any area of a given webpage without having to manipulate the rest of the page. Any text within the "magnifying glass" on the screen is enlarged by a factor of the user's choosing, but the remaining text is unchanged until hovered over. While web browsers frequently offer a zoom feature for enlarging the entire page, zooming in on the whole screen usually makes navigating and scrolling the page inconvenient and tedious. The Magnifying Glass tool takes the place of the user's cursor as they read or view images, allowing the rest of the

page to maintain its original size and position and reducing the need for added sideways or downward scrolling.

Screen Shader (available as a Chrome extension)

An increase in online reading and learning naturally leads to an increase in screen time. As the time spent staring at a screen mounts, users can come to experience the symptoms of "computer vision syndrome," or CVS. According to the National Institute for Occupational Health and Safety, only two hours spent looking at a screen each day can lead to the effects of CVS, such as "dry and itchy eyes, eye redness, blurred vision, double vision, temporary inability to refocus your eyes, sensitivity to light, and headaches" (Goldsborough, 2012). Furthermore, research from the University of Houston found that artificial blue light can prevent sleep by reducing levels of melatonin at night while preventing blue light exposure can improve sleep (Headline Science, 2017). With students potentially spending several hours each day engaging with digital materials in an online learning environment, teachers should be mindful of their students' sleep, eye health, and comfort levels. Customized screen lighting is a proven preventative against the effects of long-term device use and CVS (Goldsborough, 2012). The Screen Shader tool offers users the ability to customize the color shading of the computer screen so that the harshness of blue light is filtered through a range of shades more soothing to the eye. Furthermore, Screen Shader offers recommended presets, as well as customizable settings that adapt automatically to the time of day.

Reader View (available as a Chrome extension)

Online reading is often plagued by clutter, pop-ups, advertisements, distractions, and fonts of all types and sizes. Recent research into online reading among students

found that "as students are processing information from digital media and educational materials, they are increasingly being interrupted by competing media and their surroundings. This trend of increased interruptions suggests the continuous increase of instances of fragmented reading in learning settings" (Liu & Gu, 2020). As a result of these fragmented reading experiences, students tend to portray reduced levels of understanding (Liu & Gu, 2020). Research also shows that various aspects of fonts such as "stroke weight, letter width, and letter spacing stroke weight, letter width, and letter spacing vary in their influence on reading ability depending on the reading scenarios" (Beier & Oderkerk, 2019), with students generally being adversely affected by these aspects as they get older. Reader View is a tool that allows users to filter out the clutter of busy web pages, enabling them to focus on the text rather than the other features that may compete for their attention. Not only does Reader View allow readers to clear away distractions, but it also allows for other reader preferences, such as customizable background colors, font types, font sizes, and line spacing.

Engaging

Diigo (available as a Chrome extension)

Annotation has long been used as a strategy to support reading comprehension and engagement with texts. Although the possibility for physical interaction with the page is eliminated when reading digital texts, the importance of annotation remains the same. In fact, opportunities for online annotation have been proven to help students to better engage in e-reading and improve their comprehension (Yeh et al., 2017). Furthermore, having students engage with a variety of texts and perspectives on a common topic is an effective strategy for developing conceptual knowledge and inquiry skills. Diigo is a social

bookmarking web tool that allows readers to annotate, archive, bookmark, screenshot, tag, and collect their reading from around the web in the interest of collaborating and creating meaning with others (Dennen, Cates, & Bagdy, 2017). As a Chrome extension, Diigo allows users to highlight and annotate directly onto any webpage rather than having to toggle back and forth between word processors and browser windows to take notes. All annotations and highlights are recorded and saved into an "outliner," which can easily be accessed through the Chrome extension button or directly on the Diigo website. No longer does the reading and research process need to be fragmented or interrupted by digging up lost notes or articles: Diigo allows the user to easily engage with online texts, capture their reading reactions, and save their sources and findings in one location for later use.

XODO (available as a Chrome extension)

Although it does not carry all the features of Diigo in terms of social bookmarking, XODO is another web tool that provides users the capability of onscreen annotations. The reason XODO is particularly helpful is that it allows users to view, annotate, highlight, underline, and add shapes and signatures to PDFs, and then save or print the marked-up version of the document locally. In an online learning environment, electronic reading materials are often shared with students in the form of PDFs. However, not all students have access to software on their devices that allows them to add their own markups or annotations and purchasing such tools can be expensive. XODO is offered for free directly on its website or as a Google Chrome extension, allowing all students to meaningfully engage with any PDF shared with them by an instructor.

Understanding

Read Aloud (available as a Chrome extension)

Reading aloud has long been accepted as a helpful strategy to support literacy development (Hurst & Griffity, 2015). Not only does reading aloud support language development, phonological awareness, cognitive development, and reading comprehension in early childhood through elementary grades (Merga, 2017), but this strategy also holds practical implications for scaffolding, vocabulary development, and understanding for students in middle and high schools (Hurst & Griffity, 2015). The Read Aloud extension enables users to experience all the benefits of being read to while learning in an online environment. Read Aloud allows users to hear their online reading materials spoken by voices from an extensive list of accent and language options. Users can also customize the speed, pitch, and volume at which the text is read, as well as select which passages are read by highlighting the text on the screen.

Newsela

As was previously established, the process of annotating a text can greatly enhance a reader's level of engagement and understanding. Additionally, factors such as reading level, relevance, and student interest are also key components in ensuring understanding and comprehension of a text. In a study of using reading levels to differentiate reading comprehension in English classrooms, FitzPatrick (2008) found that using reading levels to select texts and guide instructional decision-making allowed teachers to increase engagement among students by providing them with texts and tasks appropriate to their levels of independence (FitzPatrick, 2008). Relevance and student interest are factors shown to increase understanding and enhance autonomy by engaging

students with texts that have connections with life outside of school (Guthrie, McRae, & Klauda, 2007). Newsela is a one-stop solution for educators seeking to provide their students with engaging, differentiated reading experiences online. This platform offers collections of reading materials aligned to a variety of national and state standards and suitable to all subjects and grade levels. Not only does Newsela provide texts that are both relevant and appealing to student interests, but it offers content that is differentiated at five different reading levels to meet the needs of students at all levels of readiness (Newsela, 2021). Through Newsela's online platform, students can track their understanding through onscreen annotation and test themselves using a variety of writing prompts and comprehension quizzes. Though Newsela is not available as a Chrome extension, it can be integrated with a wide range of online learning management systems such as Canvas, Google Classroom, Microsoft, Nearpod, and more.

Rewordify

Similar to Newsela, Rewordify is a tool that allows teachers to select texts from around the web to meet their students' interests while still being able to differentiate word choice and vocabulary, enabling all students to understand and engage meaningfully with the text (Plante, 2020). On its website, Rewordify indicates that it can "intelligently simplify difficult English for faster comprehension, effectively teach words for building a better vocabulary, help teachers save time and produce engaging lessons, and help improve learning outcomes" (Rewordify, 2021). Users of Rewordify can simply copy and paste any text into the page's text box, and the passage will instantly have its more difficult vocabulary words translated into simpler synonyms or replaced by definitions. The site also offers helpful features that will pronounce any challenging words out loud and chart

each word in the passage by its part of speech—a resource that would be beneficial for struggling readers and English language learners. Although this resource offers many more features such as bookmarking, progress monitoring, and assessments, the most attractive feature for this research is Rewordify's ability to translate difficult text passages for vocabulary building and ease of understanding. Rewordify is not available as a feature of Chrome, but it can be utilized efficiently by visiting www.rewordify.com.

Conclusions

Upon careful consideration of today's learners, the available avenues for digital learning, and the need for differentiated instruction in the online learning environment, we conducted a qualitative content analysis of a variety of practical, intuitive digital tools. The objective of this study was to locate tools for learners of all ages and to address the ways in which these could enhance the online learning experience. These not only allow learners to tailor their online reading experience to their individual preferences but also provide teachers with resources to offer support to individual students as directly related to learning needs. Though the findings presented are beneficial and diverse in their application as they help students better view, engage, and understand digital texts, the list of tools under study is not exhaustive. We encourage teachers in all settings to not only explore the resources discussed here but to continue exploring the available tools for meeting the online learning needs of their students.

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