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Notifications on the Go: The Impact of Using the Blackboard App

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The focus of this study was to evaluate the use of the Blackboard™ App by students in traditional and online learning environments. The participants in this study were students in a first-year college orientation course, and undergraduate and graduate students enrolled in educational technology (EDT) courses, all at a 4-year public university in the Midwest. The orientation course is a traditional seated class with the Blackboard Learn™ learning management system supplementing the face-to-face instruction; the graduate and undergraduate EDT courses are all fully online, taught through Blackboard Learn. The study compared whether students prefer the Blackboard App over the use of email for communicating with their instructors. Descriptive statistics were used to analyze the survey response data. Students' positive responses concerning the Blackboard app and their preference for email were summarized and discussed.

Keywords: Blackboard Learn™, Learning Management System, LMS, Blackboard™ App, mobile learning, m-learning, mobile e-learning, distance education, online learning environment, digital learning experience

INTRODUCTION

The debate over the merit, quality, and efficacy of web-based online learning has come to an end. According to the National Center for Educational Statistics (cited in Clinefelter et al., 2019), "In fall 2018, there were 6,932,074 students enrolled in any distance education courses at degree-granting postsecondary institutions" (p. 15). Clinefelter et al., (2019) also cite an International Society for Technology in Education (ISTE) study that states that $1.7 billion dollars was spent on educational technology in 2019 in the U.S. These numbers clearly indicate that online education is a mainstream method of delivering educational content.

Add to these student numbers and dollars spent, the fact that nearly all of education worldwide, from K-12 to Higher Education, was abruptly forced to migrate to online teaching formats due to the 2020 pandemic, and the utility of online learning, also referred to as virtual learning, made it the mainstream. A UNESCO statistic cited by Li and Lalani (2020) state that the number of learners impacted by national school closures worldwide during the pandemic reached 1.38 billion students! Those researchers state that the pandemic has changed education forever. Whether or not this is an accurate assessment is a debate for another time, and a question for other studies.

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What is without question is the fact that virtually all of the schools which had online programs pre-pandemic, as well as all those that were forced to abruptly migrate to a web-based online learning alternative, utilized a learning management system (LMS) to facilitate their online initiatives, whether pre-existing or initiated by the crisis. LMSs have been around since the 1960s, but it was not until the 1990s that LMSs and digital course content delivery as we know it today came about, primarily due to the rapid expansion of the internet and development of multimedia (Sulun, 2018).

A learning management system is a software application designed to create, store, and distribute educational content. The platform can be housed locally on a district's or institution's own servers, or hosted by the LMS vendor on their servers, or in the cloud. All LMSs have a core set of functions including a secure, password protected platform only accessible to those enrolled in the course, as well as scheduling capabilities, automated test scoring, announcements, and discussion forums, to name just a few of the features (Valamis, n.d.).

Users can access an LMS from any computer with internet access, and more recently via mobile devices. With the advent of smartphones, tablets, and 'air weight' laptops, more and more learning management system users began demanding mobile access to their LMS platforms – and mobile learning or m-learning arrived. "As m-learning continued to develop, the multiple affordances the devices offered to further extend learner-centered pedagogies became evident" (Crompton, 2013, p. 56). User demand for mobile access quickly lead LMS developers to begin creating mobile apps to accommodate their users in order to stay competitive.

Blackboard, one of the largest educational LMS providers, created their Blackboard Mobile Division in 2009 and a year later released their first version of the Blackboard App ("Blackboard, Inc.", 2021). Since then, the Blackboard App has gone through a number of iterations. It is this specific mobile learning application and its use at a Midwest university that is the focus of this research. The following research questions guided this study.

RESEARCH QUESTIONS

1. Do the users believe the Blackboard App is a more effective course communication tool than email communication?
2. Are Blackboard App users more likely to react in a timelier manner to a communication or to a notification from their instructor than email users?

Prior to exploring these questions, the following review of the literature provides the reader with a brief synopsis of email and email communication; a historical overview of the development of learning management systems; review of mobile learning (m-learning); followed by a look at the development and use of the Blackboard App, and specific to this study, as an alternative to course-related email communications and notifications from their instructor in a digital learning environment.

LITERATURE REVIEW

EMAIL COMMUNICATION

The first electronic messages were transmitted in 1965 by a system known as MAILBOX at the Massachusetts Institute of Technology. However, email as it is known today with the familiar @ sign, is generally credited to Ray Tomlinson as its inventor. This occurred in 1971 while he was working for ARPANET, the government research project that eventually became the internet (Gibbs, 2016). Fast-forward 50 years, and it is estimated that worldwide, over 300 billion emails are sent daily ("Number of sent and received e-mails", 2020). These numbers clearly indicate that email is still one of the most viable methods of electronic communication in use today in virtually all areas, including education.

Students at all levels have found email to be an effective way for instructors to communicate with them (Chang et al., 2015), and Dahlstrom (2014) found that 99% of all institutions offering

online courses utilize a learning management system (LMS) that includes native email functionality. And even though instant messaging and social media also have become part of everyday life, college students have not ignored the use of email for communication with their instructors as one study found that,

> 85 percent of Bowling Green students said they check their university email every day, and if they find a message from a faculty member, they are highly likely to read it. Only 11 percent of surveyed students said they sometimes, rarely or never open those emails. (Stramsheim, 2016, para. 6)

Thus, email remains a viable and regularly utilized form of communication used by students and their instructors.

As a result of the mobile learning or m-learning movement, yet another form of communication is available to the distance learning community i.e., the use of a mobile app to post information to an LMS in real time. The institution in this study uses the Blackboard Learn LMS and the institution highly promotes the use of the Blackboard App. In fact, a link to the app (see Figure 1) is even embedded under the "My Institution" tab of the Blackboard entry screen on all course sites. This became the impetus for the current study – to determine just how utilized this highly promoted app is, and whether it has become preferred over email communication.

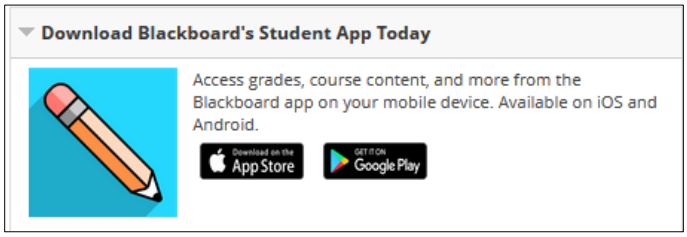

Figure 1. Blackboard student app link

LEARNING MANAGEMENT SYSTEMS

Distance education evolved from correspondence courses in the late 1800s, to the use of radio then television in the 1950s to deliver educational content. But it was not until the establishment of the Open University in Britain in the1970s and the University of Wisconsin in the 1980s that computer technology began to be utilized to deliver educational content (AECT, 2001). Coll (2015) as cited in Sulun (2018) described the early days of the LMS,

> In the first stages of their expanding use, there was no common name for these systems as there is today. They were referred to as learning platforms, distributed learning systems (DLS), course management systems (CMS), content management systems (CMS), portals, instructional management systems (IMS), and finally learning management systems (LMS). (para. 6)

EKKO, the first fully functioning LMS, was developed and released in 1991 by Norway's NKI Distance Education Network (Paulsen & Rekkedal, 2001) and educators began debating what constituted this new educational technology. One of the most widely accepted definitions for learning management systems is that of Ellis (2009) who broadly defined an LMS as a web-based platform that gives instructors the ability to provide learning content; document, track and report the delivery of the content; and implement the learning process. Sulun (2018) adds that "…an instructor using any type of LMS, should be able to prepare and manage the education content in electronic format, as well as allow the learner to use the course materials and participate in their performance" (para. 3).

As mentioned earlier, LMSs and digital course delivery as we know it today were fully developed by the 1990s (Sulun, 2018). Today, all modern LMSs are web-based and/or cloud-based applications, and many LMS vendors now offer SaaS (Software as a Service) i.e., leased versions of their LMS platforms. There are several LMS vendors that cater exclusively to corporate, heath

care, and other non-educational enterprises, but those products are outside the scope of this study. Additionally, there are a number of smaller learning management systems, primarily catering to K-12, such as Kiddom, Google Classroom, Edmodo, Schoology, and others, that also are beyond the scope of this study.

The top four LMS providers in use in Higher Education in the United States as of the end of 2020, by number of institutions are: Canvas (36.7%), Blackboard (26.8), Moodle (16.2%), and Desire2Learn (11.5%). By number of students enrolled, these same four LMSs are at the top: Canvas (7.3M), Blackboard (5.2M), Desire2Learn (2.1M), and Moodle (1.8M) users. (Edutechnica, 2020). Worldwide however, Moodle, an open-source platform, has the largest installed base (Hill, 2017).

Like most other products, over the years, a number of learning management systems have come and gone. WebCT (acquired by Blackboard), ANGEL Learning (acquired by Blackboard), Pearson eCollege (retired in 2017), ConnectEDU (bankrupt), and others that had been developed, were either acquired by competitors, or did not survive financially ("Blackboard, Inc.", 2021; EdSurge, 2014). Despite the early vicissitudes, learning management systems are not only here to stay, but have become the essential support platforms for online education.

MOBILE LEARNING AKA M-LEARNING

Precisely when mobile learning 'arrived' is a debated topic. One could argue that it started with Gutenberg's printing press and the Industrial Revolution (Crompton, 2013). However, for the purposes of this study, only mobility in the digital learning experience will be considered. Using this parameter, the start of mobile learning as we know it today coincided with the time when portable computers started becoming available (Gardner, et al., 1994). According to Brown and Mbati (2015) "Mobile learning (mLearning) emerged as a new concept towards the end of the previous millennium as educators (teachers/lecturers/practitioners) started exploring the use of mobile technologies in teaching and learning environments" (p. 115).

There have also been debates concerning precisely what constitutes mobile learning, sometimes referred to as m-learning, mLearning, and mobile e-learning. Lieberman (2019) suggests that a definition from Educause might be the best definition,

> Using portable computing devices (such as iPads, laptops, tablet PCs, PDAs, and smart phones) with wireless networks enables mobility and mobile learning, allowing teaching and learning to extend to spaces beyond the traditional classroom. Within the classroom, mobile learning gives instructors and learners increased flexibility and new opportunities for interaction. (para. 3)

Crompton (2013) states that the literature suggests that there are four central constructs that are the attributes of m-learning, "pedagogy, technological devices, context, and social interactions" (p. 3-4).

The original focus for defining mobile learning was on the technology. Naismith, et al., (2004) cited by Crompton (2013) stated, "The computer was no longer a conduit for the presentation of information: it was a tool for the active manipulation of that information" (p. 5). Thus, changes in pedagogy were also a primary contributor to m-learning. Crompton also outlined the pedagogical shifts toward a learner-centered approach to education that provided an additional impetus for m-learning. Constructivism, problem-based learning, and other learner-centered approaches helped make m-learning a reality. Context and social interactions meant that learning could occur in or outside of a classroom, and learning can be self-directed or directed by others. Crompton (2013) and her colleagues later finalized their definition of m-learning as "learning across multiple contexts, through social and content interactions, using personal electronic devices" (p. 4).

If asked today, most students and educators would say that mobile learning is simply the use of a smartphone to access an LMS and other learning materials, and for online searches. And the number of users indicates that mobile learning has become mainstream. A 2018 annual report of online college students by Magda & Aslanian (2018) lists nine key findings, which include that virtually all online college students own a smartphone and/or a tablet; that 87% of students use

mobile devices to search for their online program, and 67% for completing online coursework. These researchers also found that of 1,500 exclusively online students surveyed, nearly 80% complete some or all of their coursework using a mobile device. Based on their findings Magda & Aslanian (2018) recommend that "Ensuring course content and websites are optimized for mobile is vital for colleges and universities that are pushing to grow and retain their online student population" (p. 5). The 2019 annual report of online college students (Clinefelter, et al., 2019) found that,

> Fifty-six percent of current and past online college students use a smartphone or tablet to complete at least some of their online course-related activities, while two-thirds of prospective online college students want to use a mobile device to complete coursework. (p. 17)

Despite the demand, 17% of respondents indicated that their program did not support mobile access" (p. 17). This indicates that at least some resistance to mobile learning exists. Lieberman (2019) cites a 2017 Educause survey that found that 70% of almost 44,000 students reported that "instructors banned or discouraged the use of smartphones in the classroom" (para. 8). Despite this, more than a third of the respondents said they use their smartphones in the classroom anyway, "to make other connections with the material" (para. 8). Finally, Clinefelter, et al., (2019) also found that students 45 and older are "significantly less likely to use or want to use a mobile device for coursework, highlighting a generational difference" (p. 17).

THE BLACKBOARD APP

CourseInfo, the precursor to Blackboard, was founded in 1996 by Cornell University students. Blackboard LLC was founded in 1997, and in 1998 merged with CourseInfo, dropped the CourseInfo name, and officially became Blackboard, Inc. In June of 2004, Blackboard went public with the stock market ticker BBBB. Since then, the Blackboard platform has gone through a number of iterations, to Blackboard Learn, Blackboard Learn SaaS (Software as a Service), and Blackboard Learn Ultra ("Blackboard, Inc.", 2021). It is the cloud-based SaaS instance of Blackboard Learn in use by the site of this study.

As mentioned earlier, Blackboard launched its Mobile Division in 2009. The Blackboard Learn Mobile App (BLMA) first introduced to the market in 2010 received primarily negative responses from users, which resulted in a complete redesign in 2013 (Venter, et al., 2015). The app has gone through a number of additional upgrades since its initial redesign.

According to Blackboard, online students are typically active learners who, by using the app can "stay connected with classmates and instructors with digital class discussions and real-time virtual class sessions" ("Blackboard App", 2020, para. 3). Blackboard's website promotion of the product also states their app "…gives students the information they want, the connections they crave, and the personalization they demand, on the go" ("Blackboard App", 2020, para. 2). In 2018, the Software & Information Industry Association (SIIA) gave Blackboard their 'Best Higher Education App for a Mobile Device' award ("Blackboard App", 2020, para. 6).

While one could argue that any mobile app designed specifically for use with an LMS should be able to do all of the things Blackboard's website touts, it is nonetheless the case that the Blackboard App currently enjoys a large user base, and has won at least one major award. However, as mentioned, there have been issues throughout the life of the app.

Venter et al., (2015) conducted a study of the use of the Blackboard Learn mobile app by students at a university in South Africa. Even though Blackboard had completely redesigned the app in 2013 due to user complaints, two years later these researchers nonetheless found a low adoption rate of the app. Two issues were high data costs, and mobile devices that do not support the app. It could be argued that these two issues are location-specific and would not generalize to different geographic locations. However, other problems with the 2013 redesign included "uploading content, watching YouTube videos, posting replies on discussion forums, completing online assessments and submitting online assignments" (Venter et al., 2015, p. 313).

One of the greatest advantages of the app mentioned by the participants in that study was "the push notifications that are sent directly to their mobile device which keep them up to date with everything that is happening in their courses" (Venter et al., 2015, p. 313) – which relates directly to this study.

TrustRadius, a business technology evaluator, provided 173 vetted Blackboard Learn reviews and ratings. Positive comments about the Blackboard app included, the Blackboard Mobile App provides quality HTML content, multiple methods of communication, a grade portal, and multiple methods of providing feedback. One reviewer stated that it is "crucial to my ability to teach effectively with Blackboard" ("Blackboard Learn Reviews", 2019, para. 20). Nonetheless, there are still numerous issues with the app. Other TrustRadius reviewers stated that mobile access is rudimentary and inconsistent, has no ability to enhance text, and needs to be made compatible with voice-to-text. It was also stated that the app is not easy to navigate for casual users, and training is necessary to master all of the features.

UX/UI developer Suarez (2020) interviewed Blackboard App users and found that students preferred checking Blackboard via its desktop version over using the Blackboard App. Their interviews found that only four out of ten students were truly satisfied with the Blackboard App. The study grouped together issues based on similarities and delineated the primary concerns with the app: "discoverability of features; organization of content; unclear use of language; inefficient navigation; and overwhelming alert display" (Suarez, 2020, para 6). As a result, this researcher suggested redesigning the app based on the needs of the users as gleaned from user testing and interviews. "For future redesigns of this app, I would definitely love to try incorporating some UX gamification such as interactive progress bars and added user statistics report to increase user engagements and performance" (Suarez, 2020, para. 20).

Clearly there is room for improvement with the Blackboard Mobile App. One can find pros and cons about the app from just about all sectors of education users. One TrustRadius reviewer stated that the latest version of the Blackboard app is optimized for Blackboard Learn Ultra, the latest version of the LMS ("Blackboard Learn Reviews", 2019) which may be a factor concerning the app's effectiveness for institutions using a different version of Blackboard.

In any case, the Blackboard app is the mobile app utilized at the site of this study, and was the mobile app reviewed by the study participants. What follows is the methodology employed in this research study.

METHODOLOGY

PARTICIPANTS AND SETTING

Convenience sampling was utilized to recruit the 218 participants utilized in this study. The participants consisted of first-year college students in two sections of a required, seated, college orientation course; as well as undergraduate and graduate students enrolled in fully online technology courses at a four-year, public institution of higher education in the Midwest.

As mentioned, the orientation course is a traditional seated class with the Blackboard Learn™ Learning Management System supplementing the face-to-face instruction; the graduate and undergraduate technology courses are all fully online, taught through Blackboard Learn. All the students received instructions during the first week of the semester on how to download and use the Blackboard App and were encouraged to use the app during the semester.

PROCEDURE

A three-part survey on use of the Blackboard app was developed by the researchers. After researchers received permission to conduct the study from the university's Institutional Review Board, the survey was administered online using SurveyMonkey® to 218 students.

Students were informed that their participation was voluntary; their survey responses would be completely anonymous; and that they had the right to withdraw from the study at any time without consequences.

Students were provided with an informed consent form as part of the survey link. Clicking on the survey link took the participant to the consent form page. In order to complete the survey, they were required to first give their consent by clicking "Agree" to the consent form before they could access the survey on the next page. The survey took approximately 10 minutes to complete. Data collected was used in aggregate so individual participants could not be identified.

SURVEY

Researchers developed a three-part survey consisting of demographic information, questions on the use of the Blackboard App, and an open-ended question on use of the app. The 16-question survey (see Appendix A) was administered to 218 participants with 100 valid responses (46% response rate).

The survey included seven demographic questions, eight questions specific to the use of the Blackboard App, and one open-ended question for participants to share comments on their use of the Blackboard App. The series of eight questions used a Likert scale with strongly agree, agree, neutral, disagree, and strongly disagree to respond to the questions related to the use of the Blackboard App – specifically how the participants compared the app to email communication; and whether they responded to the messages received through the Blackboard App in a more timely manner.

Descriptive statistics were used to analyze the survey response data. The following section delineates the results of the survey and provides responses to the research questions as well as insights into student preferences concerning the Blackboard App.

DATA ANALYSIS AND RESULTS

BLACKBOARD APP USAGE DATA

The Blackboard App requires a smartphone for its use. All of the valid responses received (100 out of 218) indicated that the participant had a smartphone and had signed up for the Blackboard App. Thirty-seven percent of the respondents were from the orientation courses, and the remaining 63% were undergraduate and graduate education technology (EDT) students. Twenty-four percent of the participants in the orientation course were first year students or transfer students; 26% were undergraduate EDT students; and 50% were graduate EDT students.

When asked how often they check the Blackboard App, 38% of the participants responded 'daily'; 32% 'weekly'; 17% seldom; and 13% never. Of those participants who stated they checked their Blackboard App daily, 66% stated 'whenever I receive a notification'; 11% said three or more times a day; 6% said twice a day; and 17% said once a day.

When asked how quickly they respond to a Blackboard App notification, 28% said immediately; 25% within 3-6 hours; 22% within 12-24 hours; 10% within one week; and 15% stated they do not respond.

RESULTS FOR RESEARCH QUESTIONS

Research Question 1. Do the participants believe the Blackboard App is a more effective course communication tool than email communication?

The first three of the survey questions referred to Research Question 1. When participants were asked if they prefer to receive course information via a Blackboard App message rather than email, 31% strongly agreed or agreed that they did prefer to receive course information via the app. The results are listed in Table 1.

Table 1. *Participants Prefer to Receive Course Information via the Blackboard App Rather Than Email*

	Frequency	Percent
Strongly Agree	14	14.14
Agree	17	17.17
Neither agree nor disagree	33	33.33
Disagree	25	25.25
Strongly Disagree	10	10.10
Total	99	99.99

The next survey question asked the participants if they check their Blackboard App notifications and/or messages more frequently than emails. Of the respondents, 28% strongly agreed or agreed that they do check their Blackboard App notifications and/or messages more frequently than email, as shown in Table 2.

Table 2. *Participants Check Their Blackboard App Message More Frequently Than an Email*

	Frequency	Percent
Strongly Agree	11	11.11
Agree	17	17.17
Neither agree nor disagree	21	21.21
Disagree	33	33.33
Strongly Disagree	17	17.0
Total	99	99.82

The remaining survey question referring to Research Question 1 asked the participants if they check their email more frequently than their Blackboard App notifications and/or messages. Of the respondents, as shown in Table 3, 60.6% strongly agreed or agreed that they check their email more frequently than their Blackboard App notifications and/or messages.

Table 3. *Participants Check Their Email More Frequently Than Their Blackboard App*

	Frequency	Percent
Strongly Agree	34	34.34
Agree	26	26.26
Neither agree nor disagree	15	15.15
Disagree	17	17.17
Strongly Disagree	7	7.07
Total	99	99.99

Research Question 2. Are Blackboard App users more likely to react in a timelier manner to a communication from their instructor or to a notification in Blackboard?

The next five survey questions referred to Research Question 2. When participants were asked if they believe the Blackboard App notifications and/or messages help them meet assignment due dates, Table 4 (see next page) shows a clear majority (63.6%) strongly agree or agree that the Blackboard App did help them meet their assignment due dates.

When asked if they believe the Blackboard App messages help them organize their learning, 60.2 agreed or strongly agreed that the app helps them organize their learning. The results are listed in Table 5 (see next page).

Table 4. *Participants Believe the Blackboard App Helps Them Meet Assignment Due Dates*

	Frequency	Percent
Strongly Agree	28	28.28
Agree	35	35.35
Neither agree nor disagree	24	24.24
Disagree	7	7.07
Strongly Disagree	5	5.05
Total	99	99.99

Table 5. *Participants Believe the Blackboard App Helps Them Organize Their Learning*

	Frequency	Percent
Strongly Agree	24	24.49
Agree	35	35.71
Neither agree nor disagree	23	23.47
Disagree	11	11.22
Strongly Disagree	5	5.10
Total	98	99.99

As indicated in Table 6, when the participants were asked if they believe they react to information receive from the Blackboard App more quickly than from email messages, 38.8% agreed or strongly agreed that they react more quickly to app notifications.

Table 6. *Participants Believe They React to Information From The Blackboard App More Quickly Than Email*

	Frequency	Percent
Strongly Agree	16	16.33
Agree	22	22.45
Neither agree nor disagree	26	26.53
Disagree	24	24.49
Strongly Disagree	10	10.20
Total	98	100.00

Table 7. *Participants Believe the Blackboard App Notifications Are Helpful*

	Frequency	Percent
Strongly Agree	24	24.49
Agree	45	45.92
Neither agree nor disagree	20	20.41
Disagree	5	5.10
Strongly Disagree	4	4.08
Total	98	100.00

As shown in Table 7, the participants were asked if they believe the Blackboard App notifications are helpful. A clear majority of 70.4% agreed or strongly agreed that they find the app notifications helpful.

Finally, when the participants were asked if they believe the Blackboard App helps keep them on track with their course assignments, again a majority of 61.2% agreed or strongly agreed that the app helps keep them on track with their course assignments. Table 8 lists these results.

Table 8. *Participants Believe the Blackboard App Helps Keep Them on Track With Course Assignments*

	Frequency	Percent
Strongly Agree	25	24.51
Agree	36	36.73
Neither agree nor disagree	24	24.49
Disagree	7	7.14
Strongly Disagree	6	6.12
Total	98	98.99

Open-ended Question. If you are a Blackboard App user, why do you prefer this app? If you do not prefer this app, please share your reasons.

This open-ended question was asked at the end of the survey. There were at total of 62 respondents (the question was optional). Thirty-seven of the responses were positive and 25 of the responses were negative towards the app.

The positive responses revolved primarily around Research Question 2. Comments included the convenience of receiving instant messages, meeting due dates, checking grades, and so on. Several actual responses to the open-ended question:

- I like the convenience of having access to class information on my phone. I can check grades or hop on the discussion board while on-the-go which is great.
- I prefer the Blackboard App because I usually have my phone right by my side where my laptop is not always by me. It's a lot more accessible and easier to keep track of my assignments.
- I appreciate the flexibility to check-in on instructor messages, due dates and grade postings. I can even get in a bit of work on assignments when I'm away from my PC.
- It helps remind me if I have an assignment and I can always look at it unlike my computer where I have to be in my dorm room.

The negative responses revolved primarily around Research Question 1. Comments included a preference for email, and others corroborated comments found in the review of the literature such as, the app has technical issues, is difficult to navigate, and so on. Several actual responses to the open-ended question:

- I do not use the Blackboard App because it seems like I can get all the same information on my laptop at blackboard.com. The app is a little hard for me to navigate. I check my email about as often as I check blackboard announcements on a computer.
- I check my email daily, so I don't see a need to go on the app every day.
- I don't like the blackboard app. It is always one step behind the actual website. I also am not able to see my discussion boards or work within the app like I want to.
- Sometimes my app glitches more times than not. It is just easier to check my email.

Figure 2 provides an overall summary of the most agreed upon results.

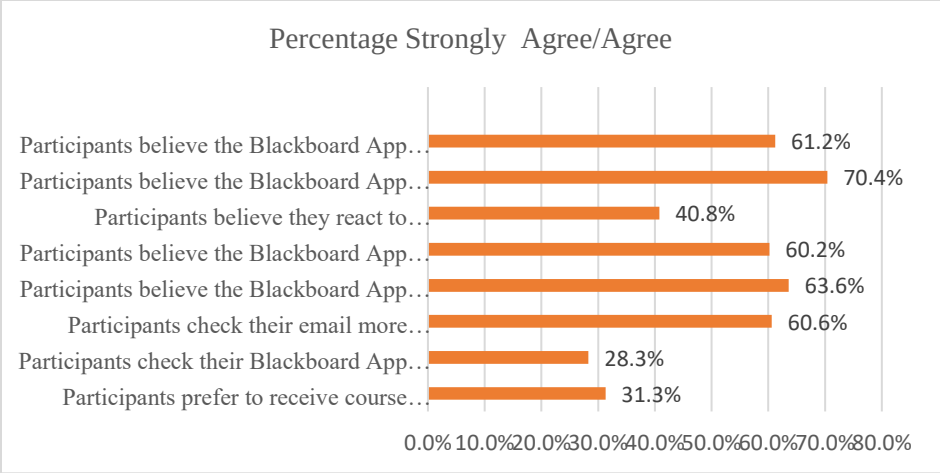

Figure 2. Overall summary of the results

What follows next is a discussion of the results of this study and conclusion.

DISCUSSION AND CONCLUSION

This study evaluated the use of the Blackboard™ App by students in traditional and online learning environments. Student preference for the Blackboard App was compared with the use of email for communicating with their instructors. The research questions asked if the users believe the Blackboard App is a more effective course communication tool than email; and if Blackboard App users more likely to react in a timelier manner to a Blackboard App notification.

Among the top reasons for positive responses concerning the Blackboard app included the convenience of checking grades, not needing a computer, the app keeping them 'on track' with due dates and schedules, and instant notifications; all of which made the app preferable over email. The majority (61%) stated the app helped keep the on track with assignments; over 70% said the app notifications were helpful; almost 40% said they react more quickly to app notifications than to email; and almost 64% stated that the app helped them meet assignment due dates.

Nonetheless, the Blackboard app, after the numerous revisions, apparently still suffers from technical difficulties like some of those mentioned in the review of the literature. Among the problems are difficulty navigating the app, lagging behind the Blackboard website instance, and a non-user-friendly interface (see e.g., Suarez, 2020; Venter et al., 2015).

These respondents find the app 'glitchy' when trying to take a quiz, access a discussion forum, and other forms of graded assignments. The smartphone screens are not large, and it is difficult to type, particularly if trying to complete a text-intensive assignment; plus text formatting is not possible.

Overall, the participants in this study indicated a preference for email (about 68%) over the Blackboard App in regard to receiving course information. The respondents indicated that an email is easier to read, particularly if there is an attachment or image embedded in the communication. It was also stated that email takes fewer steps to access the information. Additionally, due to glitches with the app, participants simply found it easier to check their email, and some perceived email as a back up to the app. Thus, as was also found in the review of the literature on this comparison, both positive and negative responses to the Blackboard App were reported by the participants.

FUTURE DIRECTIONS

Again, this research found both positive and negative responses from participants concerning the use of the Blackboard app, as compared to using email communication. It is possible that future upgrades to the Blackboard app will mitigate some of the negative aspects mentioned by the participants in this study and in the literature review.

As research continues, the use of the Blackboard app may someday be found to have an impact on other areas of the digital learning experience such as mediating procrastination, community building between students and faculty, and exploring the role of less formal forms of course communication (see e.g., Chang & Pearman, 2018).

It also would be thought-provoking to determine if *gender* or *age* might be variables impacting participant responses. A study to determine if males or females were more amenable to the use of the Blackboard app over email could provide interesting and useful information. Also, could age be a factor i.e., are there generational differences as Clinefelter, et al., (2019) found? In the current study, 50% of the participants were first year students or undergraduate students (assumed to be in the traditional 18-22 year range); and 50% were graduate students (assumed to be beyond the traditional college student age). Intuitively one might presume that older students would prefer email – possibly due simply to greater familiarity with this method of communication than with an app utilizing instant messaging.

Since 2010 when the Blackboard app was first introduced, and through the several upgrades of the product, there still remain a number of glitches in the app ranging from simply annoying all the way to deterring its use. One can only wonder, as the use of mobile devices for educational purposes continues to skyrocket (Armitage, 2015), whether Blackboard will respond with a new upgrade of the app with improved UX/UI capabilities. If they do, a replication of this study might very well result in much different participant responses. Until then, users and educators can only wait and see.

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APPENDIX A

Survey Questions

Demographic Data

1. Do you have a smartphone? ☐Yes ☐No
2. Did you sign up for the Blackboard App in your GEP 101 course or an EDT Technology course? ☐Yes ☐No
3. Your academic status: ☐GEP freshman ☐Undergraduate student ☐ Graduate student
4. Do you use the Blackboard App? ☐Yes ☐No
5. How often do you check the Blackboard App on your phone?
   ☐never ☐seldom ☐weekly ☐daily
6. If daily, how often do you check the Blackboard App on your phone?
   ☐once ☐twice ☐3 or more times ☐whenever I receive a notification
7. How quickly do you respond to or comply with Blackboard App notifications and/or messages?
   ☐immediately ☐within 3-6 hours ☐within 12-24 hours ☐within 1 week ☐do not respond/comply

SA=Strongly Agree; A=Agree; N=Neither Agree nor Disagree; D=Disagree; SD=Strongly Disagree					
	SA	A	N	D	SD
Text-based Communication					
I prefer to receive course information via the Blackboard app rather than by email.					
I check my Blackboard App notifications and/or messages more frequently than emails.					
I check my email notifications and/or messages more frequently than my Blackboard App.					
I believe the Blackboard App notifications and/or messages help me meet assignment due dates.					
I believe the Blackboard App notifications and/or messages help me organize my learning.					
I react to information from Blackboard App notifications and/or messages sooner than from emails.					
I find the Blackboard App notifications and/or messages helpful.					
I find Blackboard App notifications and/or messages help keep me on track with my course assignments.					

Open-ended Question

If you are a Blackboard App user, why do you prefer this App? If you do not prefer this App, please share your reasons.