

The Effect of Twitter Use in the Classroom on Student’s Acceptance of Technology using the TAM-3 Model

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The focus of this research was measuring the effect of Twitter use in the classroom on students’ acceptance of technology using the TAM-3 model. This mixed methods study revealed a significant effect from students’ use of Twitter in classroom assignments not only on increasing candidates’ view of Twitter as being useful, easy to use, and relevant but also the view of the LMS as being useful and easy to use as well. Qualitative reflection data helped to further explain candidates’ perceived usefulness and perceived relevance of technology at tools for connecting with others and learning beyond the classroom.

The growing prevalence of mobile technology use for learning over the last two decades is well documented in the existing literature (Chung et al., 2019). The last ten years have seen a particularly large increase in research studies related to the use of mobile technology for learning in higher education institutions (Krull & Duarte, 2017; Pimmer et al., 2016) and specifically in teacher education (Baran, 2014). The findings in the majority of these studies have highlighted the positive impact of mobile technology on the learning process (Baran, 2014), and the affordances of mobile technology allowing for “anytime, anywhere” learning and more efficient collaboration and community-building across time and space (Chawinga, 2017; Chung et al., 2019; Pimmer et al., 2016).

The response by educational institutions to the COVID-19 pandemic in 2020 has further illustrated the necessity of

communicating and learning remotely. A recent Pew Research Center survey noted that most higher education institutions were forced to shut down their campuses and move to fully online instruction as a result of the pandemic response, causing 17% of American adults to rely on the internet as a means of attending classes and accessing course content (Vogels, 2020). Additionally, 87% of these Americans reported that access to the internet during the COVID-19 pandemic was something they considered important, with 53% of respondents stating that the internet has been an essential utility during the pandemic (Vogels et al., 2020).

However, simply having access to technology and the internet does not guarantee that students know how to use technology in a useful and relevant way. In his review of the extant research, Selwyn (2009) noted that “if anything, young people’s use of the internet can be described

most accurately as involving the passive consumption of knowledge rather than the active creation of content” (p. 372). More recent research has proven this assertion to be true, finding that university students’ use of technology tools in general has a far more limited scope than one might assume (Lei, 2009; Thompson, 2013). While today’s university students report frequent use of “rapid communication technology,” such as social media and instant messaging, they do not report the intentional use of technology for learning as an innate skill that is hard-wired into their brains (Lei, 2009; Thompson, 2013; Thompson, 2015). These and other findings emphasize the important role that university instructors have in scaffolding the use of technology to help students cultivate academic skills, strengthen productivity, and take full advantage of the affordances of the technology in instructional contexts (Chung et al., 2019; Thompson, 2013; Thompson, 2015).

Use of Twitter as a Professional Learning Tool

As digital communication and networking have taken on a more critical role in education, especially with the rapid transition to connectivity apps and online learning due to the COVID-19 pandemic, leveraging social media tools to learn, share, and connect has become increasingly more important. In light of this, researchers have highlighted the critical need to train preservice teachers to access and explore the use of social media platforms in educational contexts and for their own professional development, growth, and advancement (Krutka & Carpenter, 2016b; Tang & Hew, 2017). Other research has suggested that incorporating tools with which students are familiar or comfortable, learners may be in a better position to transfer the social capital gained from networking and collaboration

activities (Carmichael, Archibald, & Lund, 2015; Valenzuela, Park, & Kee, 2008; Hofer & Aubert, 2013) to other academic settings and uses, including other educational technologies, such as a learning management system (LMS), which is used to deliver, document, and track student learning and engagement (Hofer & Aubert, 2013).

According to Budak and Agrawal (2013), students tend to be more focused on informational supports rather than emotional supports, creating the perfect environment for academic and professional connection and then transference into dispositions and behaviors conducive to active engagement with the LMS and course content. Budak and Agrawal (2013) highlight the value of Twitter and social media by noting those tweeting are more likely to return or sustain participation when retweeted or mentioned, providing insight into the power of social inclusion and community in the context of learning.

Many preservice and inservice teachers have been drawn to Twitter because of the immediacy and the personalized, collaborative nature facilitated by the medium (Carpenter & Krutka, 2014). A review of literature on the use of Twitter in education by Tang and Hew (2017) articulated several general uses and benefits for Twitter in education, including multiple ways to interact within and outside the classroom as well as increased collaboration and opportunities for reflection. Malik, Heyman-Schrum, and Johri (2019), in their meta-analysis of the impact of Twitter in educational contexts, further highlighted widespread findings that Twitter had the potential to improve student learning, motivation, engagement, and information-sharing while facilitating communities of practice.

Kassens-Noor (2012) found that student Twitter activities enhance active and informal learning, leading to increased engagement

both in and beyond the classroom. Hsieh added, “Twitter chatting invokes principles of *connectivism* (Siemens, 2005), specifically in relation to learning as a continual process that can often occur through informal work-based relationships and technology” (2017, p 552). When leveraging Twitter in the classroom, students are exposed to and experience productive interactions and collaborative learning, which has been shown to increase their ability to bring the dispositions and behaviors of connectivism to their work within an LMS. Not only is their understanding in the power of community and professional development enhanced, learners that participate in Twitter chats develop professional identity, collaborative and communicative skills, and promote ongoing active learning and engagement that can be applied to LMS activity (Hsieh, 2017). This raises the question of how (and to what degree) Twitter may impact learners’ use and acceptance of the social medium as a learning tool as well as their acceptance and use of other technologies that support learning (e.g., learning management systems).

TAM-3

Further qualitative research conducted by Thompson (2015) found that students’ attitudes and beliefs regarding technology were complex, diverse, and representative of their lived experiences, highlighting the belief that attitudes, beliefs, and individual experiences are far more indicative of an individual’s intention to use and actual use of technology, both in general, and as a learner (Baran, 2014). Therefore, a framework with the capability to measure individuals’ perceptions of technology is necessary to fully understand the efficacy of technology use in the university classroom.

Thus, to determine the significance of the use of Twitter as a component of classroom assignments, we chose to use the Technology

Acceptance Model (TAM-3), which having undergone two revisions from Davis’s seminal work (1989), has been validated in numerous studies (Venkatesh & Davis, 2000; Venkatesh & Bala, 2008; Donaldson, 2011; Fan, 2014; Hidayanto & Setyady, 2014; Ramayah et al., 2002; Shroff et al., 2011; Yuan et al., 2017), and has been used to classify various components of technology use that relate to increased usage and acceptance of technology systems.

The TAM-3 has identified two key factors specifically related to increased technology usage and acceptance: perceived usefulness and perceived ease of use (Ramayah, Ma’ruf, Jantan, & Mohamad, 2002). Davis (1989) said if a user feels a particular technology application (software or hardware) will aid him or her at his or her job, the user is more likely to implement the application. Further, if the user perceives the technology as easy to use, he or she is more likely to utilize it (Davis, 1989). Essentially, if users view a technology application (e.g., Twitter) as easy to use and useful, they are more likely to use the technology in broader applications. In this case, Twitter was selected because of its popularity as a social media application and its research-supported benefits to learning applications, particularly in the area of collaboration and participatory learning (Blessing et al., 2012; Mills, 2014; Carpenter & Krutka, 2014; Carpenter 2015; Krutka & Carpenter, 2016a; Chawinga, 2017).

To add further dimensionality to the study, perceived relevance from the TAM-3 as a measure of technology acceptance was also included because of its ability to quantify students’ perception of how relevant Twitter was to their classroom assignments. In the present study, relevance is defined as “utility value” or “the value a task has for an individual because it is useful for achieving current or future goals” (Priniski et al., 2018, p. 15). This definition is derived from the

expectancy-value model (Eccles, et al., 1983).

In their review of the literature regarding research trends in mobile learning in higher education, Krull and Duart (2017), identified the TAM as one of the most commonly used theoretical frameworks in this line of research. In their meta-analysis examining 45 TAM studies comprising 300 correlations, Sherer and Teo (2019) found the TAM to be “a powerful model that explains pre- and in-service teachers’ intentions to use technology” (p. 106). Additionally, previous research using the TAM-3 has demonstrated the effectiveness of Twitter in increasing perceptions of usefulness and ease of use with regard to educational technology among in-service teachers (Meredith, 2018). The constructs of TAM have also been used to compare technology acceptance among in-service and preservice teachers (Teo, 2015) and to study the technology acceptance of preservice teacher university students (Baydas & Goktas, 2016; Parkman et al., 2017; Teo & Zhou, 2014). These applications of the framework support the use of the TAM as a measure of technology acceptance in the present study.

While previous studies have examined the general acceptance and use of Twitter (Chawinga, 2017; Tang & Hew, 2017; Mills, 2014) and users’ overall acceptance of technology (Baydas & Goktas, 2016; Teo & Zhou, 2014) as well as acceptance of specific technologies for learning (Donaldson, 2011; Fan, 2014; Parkman et al., 2018), there is a gap in the literature regarding how students’ acceptance of Twitter might also impact their acceptance of specific learning technologies, such as a traditional learning management system (LMS). The present study seeks to extend the literature by exploring the use of social media as a tool for learning and as a means of increasing students’ acceptance of the LMS. In light of COVID-19 precautions taken by higher education institutions and the

subsequent increase of online learning and remote connectivity, the understanding of what may affect the acceptance of learning management systems and other remote digital tools by learners is critical.

Research Problem and Purpose

The purpose of this explanatory sequential (mixed methods) study was to explore the use of Twitter alongside a traditional learning management system (LMS) as students completed classroom assignments and subsequently to determine if using Twitter as a direct part of these classroom assignments would impact the perceived ease of use, usefulness, and relevance of Twitter itself or the LMS being used by students.

The fundamental research questions explored in this study were the following:

1. Do students perceive a greater sense of usefulness, ease of use, and relevance of using Twitter as a direct component of classroom assignments alongside a traditional learning management system (LMS)?
2. Do students perceive a greater sense of usefulness, ease of use, and relevance of using a learning management system (LMS) by integrating Twitter as a direct component of classroom assignments alongside the LMS?
3. How do students experience the use of Twitter as a direct component of classroom assignments alongside a traditional learning management system (LMS)?

Methods

Participants & Settings

Teacher candidates from two suburban/rural regional universities, one in the South and one in the Northeast, engaged

in reflection and creation activities related to assignments in an introductory educational technology course. These students were asked to share a reflection or summary of their understanding of the content both in traditional text form and also through visual media. The students were then required to share their reflection/summaries through Twitter and through the traditional LMS.

This study relied on a sample of convenience, relying on enrollment in the courses and the assignments given in the classes. The majority of the participants ($n=81$) were female (65.4%) and under the age of 25 (86.4%). Candidates with a major in upper secondary (Grades 7-12) comprised the bulk of the participants (67.9%), with the remaining participants majoring in upper elementary and middle level grades (Grades 4-8; 30.9%) and a small number seeking a degree in early elementary (P-4; 1.2%).

Methodology

Prior to the administration of the first assignment, participants completed a survey that measured their general comfort with technology and social media in particular (including preference for specific social media apps), attitude toward learning and media creation, along with demographic information intended for later disaggregation.

Participants in the experimental group ($n=46$; **Twitter+LMS**) completed four assignments on a range of topics, and at intermittent opportunities within the semester, participants created a reflection artifact for the four assignments. The reflection artifacts included the students' summary of what was learned, a takeaway of sorts. Participants shared these takeaways in two modes and through two mediums, resulting in four assignments.

- *Assignment #1:* Participants brainstormed their

summary/reflection and then shared a concise **textual summation** of that reflection (takeaway) with their classmates in a **closed LMS** (learning management system).

- *Assignment #2:* Participants created a **multimedia artifact** (e.g., short video, digital poster, infographic) that articulated their reflection (takeaway) with their classmates in a **closed LMS** (learning management system).
- *Assignment #3:* Participants brainstormed their summary/reflection and then shared a concise **textual summation** of that reflection through social **media** (Twitter), tagged with hashtags to ensure high visibility of the reflection.
- *Assignment #4:* Participants created a **multimedia artifact** (e.g., short video, digital poster, infographic) that articulated their reflection through social **media** (Twitter), tagged with hashtags to ensure high visibility of the reflection.

Participants in the control group ($n=36$; **LMS only**) completed their assignments by interacting only within a traditional LMS. Subsequent surveys were sent after each assignment to measure participants' level of ownership of the content they shared. After completing all of the assignments outlined above, a sample from the experimental group was asked to collect and share their Twitter analytics (i.e., impressions, likes, and retweets) and complete a final video reflection as a regular course assignment. While these data were not initially considered in the study design, the researchers noticed a rich set of qualitative data that could inform and help explain the quantitative survey results of the study. Therefore, additional IRB approval was obtained to analyze this data.

The Twitter analytics were collected through the course LMS and placed in a spreadsheet to gain a general understanding of what volume of interactions had taken place. Of the tweets sent in the experimental group, there were 70,634 impressions (or views), 870 “Likes,” and 407 retweets. The video reflections were transcribed into a spreadsheet and participants' names were removed to protect confidentiality and privacy. Transcriptions were checked for accuracy by a second member of the research team. A basic qualitative approach (Merriam

& Tisdell, 2016) was used to code the video reflection data and identify to what extent, if at all, the qualitative data support and explain the quantitative survey data.

The demographic survey administered at the beginning of the term was adapted from a survey used in an earlier study on social media use, Twitter in particular (Mills, 2014). The TAM-3 portion of the survey was adapted per the use of TAM-3 in previous studies (Venkatesh & Bala, 2008; Jeffrey, 2015; Meredith, 2018).

Table 1

Means (SDs) by Group for Study Variables by Construct (Post-Survey)

	Mean (SD)	Difference
Perceived Usefulness of LMS Twitter & LMS LMS Only	6.32 (.909) 5.74 (1.22)	+0.58
Perceived Ease of Use of LMS Twitter & LMS LMS Only	5.74 (.958) 5.09 (.919)	+0.65
Relevance of LMS Twitter & LMS LMS Only	6.12 (.882) 5.75 (1.11)	+0.37
Perceived Usefulness of Twitter Twitter & LMS LMS Only	4.95 (1.70) 3.40 (1.35)	+1.55
Perceived Ease of Use of Twitter Twitter & LMS LMS Only	6.46 (.897) 4.78 (1.65)	+1.68
Relevance of Twitter Twitter & LMS LMS Only	5.16 (1.64) 3.37 (1.43)	+1.79

Data & Results
Quantitative Findings

A multivariate analysis of covariance (MANCOVA) examining differences between those using Twitter along with the learning management system (LMS) of the class was conducted, and the result was a statistically significant difference between the control and experimental groups on the combined dependent variables after controlling for the pre-survey results, $F(6,66)=6.536$, $p<.001$, Wilks Lambda = .627, partial eta squared=.373).

Compared to the students who used a learning management system only to share their classwork with fellow classmates and the instructor, students who were instructed to use Twitter for at least two assignments

showed an increased likelihood to find overall relevance, usefulness, and ease in using Twitter and overall usefulness and ease in using the LMS as well. Bonferroni corrections were used to reduce the possibility of Type I error for all univariate analyses. Concurrently, there was little significance in how the students in the experimental group found relevance in the learning management system (LMS), reported in Table 1.

Subsequent univariate tests of covariance (ANCOVA) revealed identical findings and indicated varying levels of effect size on select components of the TAM3 relative to perceptions of Twitter use and are reported in Table 2.

Table 2. Findings for Experimental (LMS+Twitter) Group by Construct

	df	F	Sig.	Partial η^2	η^2
Perceived Usefulness (PU)					
Perceived Usefulness of LMS	1	5.732	.019	.070	.071
Perceived Usefulness of Twitter	1	19.435	<.001	.204	.218
Perceived Ease of Use (PEOU)					
Perceived Ease of Use of LMS	1	8.954	.004	.105	.118
Perceived Ease of Use of Twitter					
Relevance (REL)	1	33.462	<.001	.306	.316
Relevance of LMS	1	2.573	.113	.033	.034
Relevance of Twitter	1	25.498	<.001	.251	.254

Participants remarked consistently on the value of being able to use Twitter as a means to collaborate and connect with other educators. As preservice teachers, the participants noted that this would be important for them as novices in their chosen profession. The theme of connecting with a larger community of educators as a support system ran throughout the reflections, especially in regard to building a support system for professional practice.

Communicating with families and future students.

Participants also discussed the importance of a tool like Twitter for communicating with their future students and families. One participant discussed how Twitter could be used for students to share what they are learning with an online audience. This aligns with the assignments that participants in the experimental group were asked to complete during the study and shows a level of transfer with regard to how participants might take their learning experiences and apply them to their own professional practice. For example, using Twitter to communicate with families about the learning taking place in the classroom.

Learning beyond the classroom.

Multiple participants noted the importance of Twitter as a learning tool not just during this study, but also for their future professional use. Participants noted that Twitter could connect them with professional learning resources that may not otherwise be available to them in their program of study or in their future place of employment.

Discussion

This research confirms earlier studies (Malik et al., 2019; Carpenter & Krutka, 2014; Krutka & Carpenter, 2016a; Meredith, 2018; Mills, 2014) that suggest educators

perceive Twitter as being easy to use, useful, and relevant and expands these earlier findings by linking the use of Twitter as a required part of class assignments (Tang & Hew, 2017). Ramsay (2014) also notes students may value social media because there may be a greater awareness of how their work is being viewed by others in extended audiences, and as a result students may even be encouraged to produce higher-quality work (Grisham & Wolsey, 2006).

The findings indicate a strong link between perceived usefulness, relevance, and ease of use not only of Twitter itself but also, to some degree, of the LMS being used. These findings further suggest the use of Twitter actually increased students' positive feelings of the LMS being used, specifically in regard to perceived ease of use and usefulness. In short, assigning Twitter as a required part of classroom assignments may increase students' perceived ease of use, usefulness, and relevance of Twitter and also may increase students' perceived ease of use and usefulness of an LMS being used. This is highly compelling in light of higher education institutions' dramatic shift to online learning and remote connectivity, which is largely delivered through learning management systems. Notably, the strongest effects were found for Twitter itself while modest effects were found for the LMS being used.

The extension of these findings is to analyze how the social media component specifically contributed to an environment that fostered collective learning and social rapport (Jang, 2014; Meredith, 2018). Based on earlier empirical studies of using Twitter in educational settings, the indication of a high level of perceived ease of use, usefulness, and relevance of using Twitter for educational purposes may result in the cultivation of a collaborative learning culture that features transformational learning opportunities and better instructional

practices all around (Mills, 2014; Carpenter & Krutka, 2014; Carpenter 2015; Krutka & Carpenter, 2016a; Chawinga, 2017; Visser, Evering, & Barrett, 2014).

Limitations

Although the findings may be generalizable across geographic areas, the study is limited by the prevalence of females, which was a result of the sample of convenience. Also, the researchers did not disaggregate the participants by race or ethnicity, further limiting the generalizability. Because the qualitative data were collected and analyzed after the completion of the study, we did not have the ability to practice triangulation and member checking, which would have enhanced the validity of the qualitative results (Creswell & Creswell, 2018). However, the use of in vivo coding (Gall et al., 2015) ensured that participants' voices were included in the study directly, rather than relying primarily on the researchers' interpretation of the reflection data. While the qualitative results may lack generalizability beyond the study, they do help to explain and provide context for the quantitative results of the study.

Conclusion

There is still a great deal to learn about the impact of students' use and acceptance of Twitter on their subsequent use and acceptance of learning management systems and other educational technologies that facilitate remote learning. This study revealed using Twitter as part of classroom assignments has a significantly large effect on teacher candidates' view that Twitter itself is useful, relevant, and easy to use as well as a significant and moderate effect on candidates' view that the learning management system itself is useful and easy to use. The overwhelming and rapid

dependence on learning management systems and other remote learning applications due to the COVID-19 pandemic emphasizes the need to explore what factors impact the acceptance and use of applications that facilitate networking and collaboration. Social media and Twitter in particular will continue to be a significant influence on educators, and while it remains to be seen what social media practices contribute most to teacher efficacy and student learning, it is clear Twitter has become an integral and significant addition to remote learning and connectivity.

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