TEACHING ONLINE DURING COVID-19: TEACHER SELF-EFFICACY AND THE EXTENDED TECHNOLOGY ACCEPTANCE MODEL

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ABSTRACT

The COVID-19 global pandemic caused a shift from face-to-face to online teaching across K-12 education. The present study sought to examine the relationship between K-12 teachers' teaching self-efficacy and their perceptions toward using Learning Management Systems (LMS). Results indicated that the levels of support that teachers received, as well as the perceived usefulness of the LMS, impacted their level of online teaching self-efficacy. Further, teachers' self-efficacy for using a LMS directly influenced ease of use, their attitudes toward using the LMS, and their intention to use the LMS in the future.

Keywords: *Teacher self-efficacy, COVID-19, Learning Management System (LMS), Extended Technology Acceptance Model (TAM)*

The COVID-19 global pandemic has disrupted nearly every aspect of life in the United States, especially K-12 teaching and learning. In 2020, most governments around the world temporarily closed educational facilities to prevent the spread of COVID-19. These abrupt changes created unprecedented challenges as school leaders scrambled to plan, develop, and implement curriculum remotely by way of an online platform. The massive shift to move instruction online in just a matter of days impacted 91.3% or 1.5 billion students enrolled in schools worldwide (UNESCO, 2020).

The global pandemic exposed significant gaps in teacher preparation and training for remote learning. With little notice, teachers needed to quickly figure out how to deliver curriculum and shift their pedagogies to remote teaching (Hodges et al., 2020). The United States Department of Education Office of Technology (OET) (2016) postulated that teachers need to be fluent users of technology. Teachers who were already confident users of technology transitioned quickly, implementing additional tools to provide support to their students (Christensen & Alexander, 2020). Teachers who lacked experience with technology found themselves feeling overwhelmed and underprepared. However, it is important to note that even those teachers who struggled with technology were still willing and able to adjust their pedagogies to support student learning during this challenging time (Trust & Whalen, 2020).

The success of any teaching and learning context is largely dependent upon the educator's perceived teaching self-efficacy (Kyung Ryung & Seo, 2018; Tschannen-Moran & Barr, 2004). This claim remains true in both remote or distance learning environments. Further, teachers' positive attitudes toward online Learning Management Systems (LMS) both support and positively impact their student's learning (Al-Sayyed & Abdalhaq, 2016; Horvitz et al. 2015; Lee & Tsai, 2010; Liaw et al., 2007; Lin & Zheng, 2015; Robinia & Anderson, 2010; Yuen & Ma, 2008). The present study sought to explore how K-12 educators' attitudes toward technology, including the LMS, influenced their remote teaching self-efficacy as the teaching and learning environment transitioned from a traditional classroom setting to an emergency remote setting during the COVID-19 global pandemic.

TEACHING SELF-EFFICACY

Bandura's social cognitive theory was the foundation from which self-efficacy evolved (Bandura, 1997). Self-efficacy influences a person's behavior, the goals they set for themselves, and how they handle challenges. Specifically, teaching self-efficacy (TSE) refers to a teacher's beliefs in their ability to effectively handle the tasks, obligations, and challenges related to their teaching practices (Taimalu et al., 2010). These beliefs correlate to teaching approaches (Temiz & Topcu, 2013), as those teachers with high teaching self-efficacy tend to be more student-centered, more confident in their content knowledge, and have greater student engagement than those with low self-efficacy (Pitkäniemi, 2002; Temiz & Topcu, 2013).

Teaching self-efficacy also has an impact on student achievement and learning. Kyung Ryung & Seo (2018) conducted a meta-analysis of 16 studies and found a significant relationship between the mean for teacher efficacy and student academic achievement, however, the effect size was small. Tschannen-Moran and Barr (2004) found that collective teacher efficacy had a significant positive relationship with student achievement among eighth-grade students in multiple subjects. Moreover, at the individual level, teachers' teaching self-efficacy was significantly related to the strength of the teacher-student relationship (Poulou, 2017).

Although teachers' self-efficacy has been shown to play an important role in student achievement, the constructs used to measure teaching self-efficacy have not always been clear. Tschannen-Moran and Hoy (2001) indicated that the majority of teaching self-efficacy instruments have focused on more global aspects of teaching efficacy and have lacked more specific aspects. Yoon et al. (2012, 2014) noted that subject knowledge, instructional practices, student engagement, classroom management, and outcome expectancy are major tenants of teachers' self-efficacy. Upon concluding their studies, the researchers added the tenants of motivational self-efficacy as well.

TEACHING SELF-EFFICACY IN REMOTE/ONLINE LEARNING SETTINGS

Context matters when a teacher's competency level is determined (Tschannen-Moran et al., 1998). For example, a teachers' level of teaching self-efficacy during remote instruction may be low, whereas it is high in a traditional face-to-face setting. Researchers suggest a strong relationship between teachers' self-efficacy in remote settings and the technology used (Corry & Stella, 2018; Lee & Tsai, 2010; Robinia & Anderson, 2010).

Lee and Tsai (2010) believe it is essential to include technology components when studying teachers' self-efficacy in an online environment. Their research examined instructors' self-efficacy for online teaching in higher education institutions, which found a high correlation between teachers' internet usage and their online teaching self-efficacy. Results from a similar study (Robinia & Anderson, 2010) of nursing faculty suggested that the more instructors were engaged in and involved with online teaching, the higher their levels of online teaching self-efficacy.

In conclusion, during the COVID-19 global pandemic, K-12 teachers were forced to abruptly transition from traditional face-to-face instruction to delivering instruction in an online teaching environment. Their degree of online teaching self-efficacy played an important role in their successful teaching and learning outcomes. Corry and Stella (2018) reviewed 361 studies focused on online teaching self-efficacy and concluded that the Technology Acceptance Model (TAM) has been widely used to better understand the teachers' online teaching behaviors and their relationship with their online teaching self-efficacy. This model and its implications will be outlined below.

TECHNOLOGY ACCEPTANCE MODEL (TAM)

The Technology Acceptance Model (TAM), widely used in multiple fields over the last decade, has been found to be highly useful in determining the factors that have the potential to impact e-learning platforms (Eraslan et al., 2019). The Technology Acceptance Model (TAM) is grounded by the Theory of Reasoned Action

(TRA; Fishbein & Ajzen, 1975) and the Theory of Planned Behavior (TPB; Ajzen, 1991). In the Theory of Reasoned Action (TRA), researchers suggest that an individual's attitudes and subjective norms directly predict behavior intention, which in turn, influences actual behaviors. This hypothesis is supported by empirical studies, particularly those in consumer behaviors and technology usage (Davis, 1989; Davis et al., 1989; Hartwick & Barki, 1994). Ajzen (1985) included perceived behavioral control as another factor in the existing Theory of Reasoned Action (TRA) and renamed it as the Theory of Planned Behavior (TPB) model. In the Theory of Planned Behavior (TPB), Ajzen illustrated that attitude, subjective norms, and perceived behavioral controls are three predictors of an individual's behavioral intention that influence their actual behavior.

Davis (1989) reviewed both the Theory of Reasoned Action (TRA) and the Theory of Planned Behavior (TPB) in an effort to investigate the relationship between users and the use of newly adapted technology. Davis believed that both external factors and internal beliefs impacted an individual's technology adaptations. In Davis' Technology Acceptance Model (TAM), perceived usefulness and ease of use of the technology impacted an individual's attitude toward using technology, which led to the actual use of this technology.

LEARNING MANAGEMENT SYSTEMS (LMS) AND THE EXTENDED TECHNOLOGY ACCEPTANCE MODEL

Fathema's (2013) study on university faculty perceptions toward Blackboard (a popular LMS) using the extended Technology Acceptance Model (TAM) found that faculty members' attitudes toward using Blackboard positively predicted their actual use of Blackboard when teaching online. Their intention to use Blackboard served as the mediator between their attitude and actual usage. Other common LMS utilized by institutions of higher learning include Canvas and Blackboard Learn. Internally, a teacher's perception of the usefulness and the ease of use of the LMS influences their attitudes to use the LMS. One's attitude toward using the LMS then influences a teacher's intention, which leads to the actual use of the LMS.

Technology self-efficacy refers to an individual's confidence in using a LMS to facilitate remote teaching (Fathema, 2013). Research from the field suggests that a higher level of confidence for using a LMS leads to positive perceptions of the usefulness and ease of use of the LMS (Fathema, 2013; Ong & Lai, 2006; Yuen & Ma, 2008). The quality of a LMS is determined by the usability, availability, reliability and adaptability of the system (Delone & Mclean, 2003). Thus, the system quality positively affected individuals' perceptions of the usefulness, the ease of use, and their attitudes towards use (Andersson, 2006; Dong Hee, 2009; Fathema, 2013). Finally, the facilitation conditions indicate the availability of resources and support that teachers receive to use the LMS effectively (Teo, 2010). Research indicates that the facilitation conditions also influenced the perceptions of usefulness and ease of use (Fathema, 2013; Tao, 2010).

THE RELATIONSHIP BETWEEN ONLINE TEACHING SELF-EFFICACY AND THE EXTENDED TECHNOLOGY ACCEPTANCE MODEL (TAM)

There remains a paucity of research into the relationship between teaching self-efficacy and the extended Technology Acceptance Model (TAM) in K-12 remote learning settings. Research into this relationship is critical during this time in which remote learning is increasing exponentially as K-12 educators are attempting to reach learners during the COVID-19 global pandemic. Research conducted in higher education has suggested that several variables in the extended Technology Acceptance Model (TAM) have an impact on teaching self-efficacy (Al-Sayyed & Abdalhaq, 2016; Horvitz et al. 2015; Lee & Tsai, 2010; Liaw et al., 2007; Lin & Zheng, 2015; Robinia & Anderson, 2010; Yuen & Ma, 2008)). For example, Wang et al. (2015) explored K-12 science teaching self-efficacy and teachers' attitudes toward internet-based instruction. Their results indicated that teachers' attitudes toward online education had a positive impact on their belief in their teaching, which can effectively influence students' learning. Yuen and Ma (2008) conducted a study of in-service K-12 teachers which indicated that perceived ease of use significantly predicted their online teaching self-efficacy while the perceived usefulness failed to be a predictor. Downing and Dyment (2013) explored teachers' readiness in teaching online courses, and found that the majority of the participating instructors lacked confidence in teaching online due to their lack of confidence in technology and online teaching pedagogical skills. The researchers pointed out that teachers would gain more competence in teaching online if individual support and professional development were offered. The quality of technology not only directly influenced teachers' online teaching self-efficacy, it also had an indirect effect on teachers' intention to use e-learning (Al-Sayyed & Abdalhaq, 2016; Liaw et al., 2007).

HYPOTHESIZED MODEL

The current study sought to explore the relationship between the extended Technology Acceptance Model (TAM) and its relationship with K-12 teachers' online teaching self-efficacy during the COVID-19 global pandemic (Figure 1). It was hypothesized that K-12 teachers' technology self-efficacy would have an impact on their perceived usefulness and the perceived ease of use of the LMS, as well as on their on-line teaching self-efficacy. Further, it was hypothesized that perceived system quality would have an impact on teachers' perceived usefulness and their attitudes toward the LMS. It was also hypothesized that perceived system quality would have an impact on teacher's perceived ease of use as well as their online teaching self-efficacy.

Next, it was hypothesized that teachers' perceived facilitating conditions would impact their perceived ease of use, their attitudes toward using the system and their perceived usefulness of the LMS as well as their online teaching self-efficacy. It was further hypothesized that teachers' perceived ease of use would have an impact on their attitudes toward using the LMS. Next, it was hypothesized that teachers' perceived usefulness would have an impact on their attitudes and intentions toward using the LMS, and their online teaching self-efficacy. Finally, it was hypothesized that teachers' attitudes toward using the LMS would impact their intention to use the LMS, that their intention to use the LMS would impact their actual use of the LMS, and that teachers' online self-efficacy would impact their intention to use the LMS.

Thus, technology self-efficacy in using a LMS, the perceived quality of an LMS, the facilitating conditions to support teachers in using an LMS, the perceived usefulness, the ease of use, attitudes toward use, intention to use, and actual usage of a LMS were all variables that were included in the extended hypothesized Technology Acceptance Model (TAM). Among those variables, perceived self-efficacy, system quality, and facilitating conditions are exogenous variables in the hypothesized model. Other variables in the extended TAM model, including perceived usefulness, perceived ease of use, attitudes toward using, intention to use, actual use, and teaching self-efficacy are the endogenous variables in the hypothesized model. In contrast, perceived usefulness, ease of use, attitudes toward use, intention to use, and actual purpose are mediators between three exogenous variables: perceived self-efficacy, system quality, and facilitating conditions, and the endogenous variable: teaching self-efficacy. All hypotheses are listed in Table 2. The hypothesized model may be seen in Figure 1.

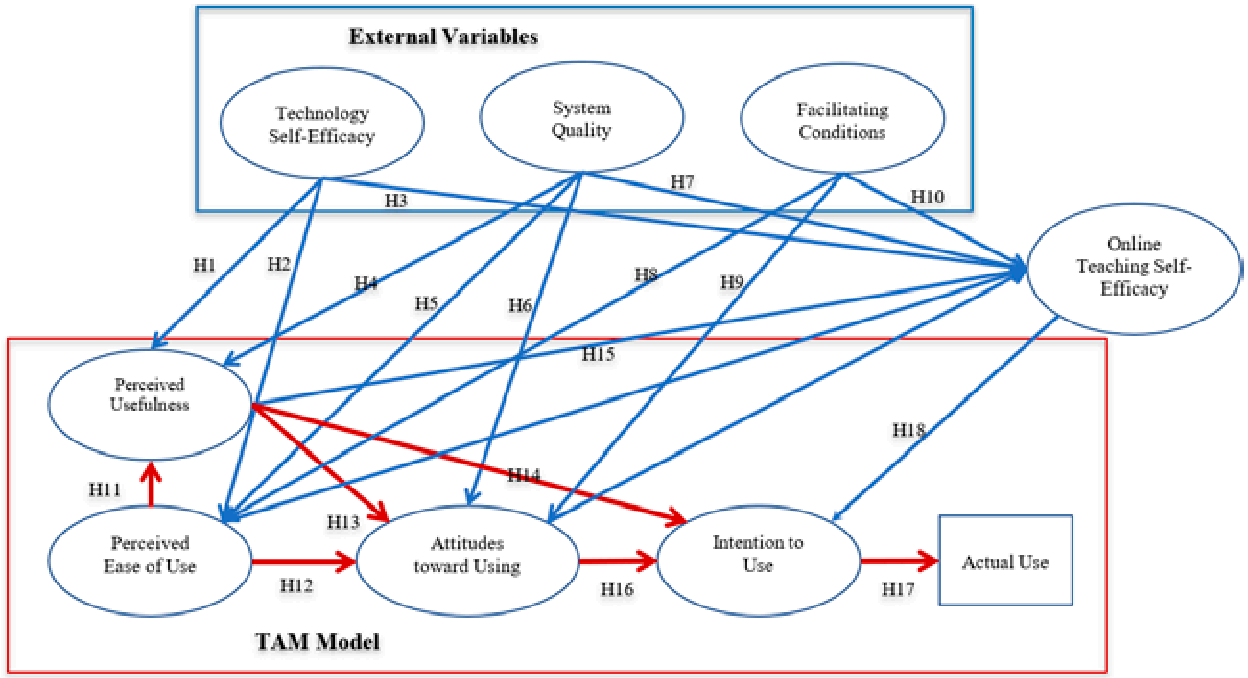
METHOD

The present study investigated the relationship between K-12 teachers' perceived teaching self-efficacy and their attitudes toward online LMS during the COVID-19 global pandemic. Participants were recruited using a snowball sampling procedure by posting the recruitment message on the researchers' Facebook pages and allowing Facebook friends to share the post. Utilizing the snowball sampling procedure afforded researchers the ability to recruit participants during a global pandemic while maintaining safety for both the participants and researchers. However, using Facebook as a tool to recruit participants leads to a sampling error. Those who did not have Facebook accounts or seldom log into their Facebook account might not have had a chance to participate in the study. Data were collected using an electronic survey hosted by Qualtrics.

PARTICIPANTS

In total, 255 participants started the survey. After removing responses that had a completion rate of less than 80%, only 141 responses were usable with a good response rate at 55.29%. Participants' ages ranged from 22 to 72, with a mean age of 40.61 (*SD* =11.55). Among the final participants, nine (6.38%) were males, while 127 (90%) were females. Of the participants, 131 (92.91%) were Caucasian, 2 (1.41%) were African American, 3 (2.13%) were Asian American, and 1 (0.70%) was biracial. A majority of participants noted holding a master's degree (*n* = 80, 56.74%),

Figure 1 Hypothesized Model



40 participants held a bachelor's degree (28.37%), 13 participants had education specialist credits (9.22%), while 3 held a doctoral degree (2.13%). Among all teachers, 72 were elementary school teachers (51.06%), 54 were secondary school teachers (38.30%), while others were special education or ESL teachers (n = 7, 4.96; n = 3, 2.13%, respectively). Among secondary school teachers, 24 participants taught reading, language, or social studies (44.44%), while others taught areas classified as STEM (Science, Technology, Engineering & Math) (n = 30, 55.56%). Of the teachers sampled, the results yielded Google Classroom high as the LMS (n = 71, 50.35%). Additionally, 32 teachers used Canvas (22.70%), 10 teachers used Schoology (7.09%), and 7 teachers used Microsoft Teams (4.96%). The remainder of those sampled used other platforms such as WebEx, Seesaw, Class Dojo, Zoom, or Education Galaxy to deliver learning materials (n = 25, 17.73%). A majority of the participating teachers had online learning experiences (n = 118, 83.69%). However, only 13 of participating teachers had online teaching experiences (9.22%) with an average of 3.08 years of online teaching experience (SD = 2.49).

INSTRUMENTS

Online Teaching Self-Efficacy Scale

The Teaching Self-Efficacy Scale was selected and modified as informed by Yoon et al. (2012, 2014). The researchers conducted a literature review focused on teaching self-efficacy and modified six teaching self-efficacy instruments into one instrument that measures the K-12 Teaching Engineering Self-Efficacy Scale (TESS). The TESS originally included a 128 question 6-point Likert-type scale in five factors, including Knowledge, Instruction, Engagement, Discipline, and Outcome Expectancy. After validation, the final TESS included six factors: Knowledge, Motivation, Instruction, Engagement, Discipline, and Outcome Expectancy, with a total of 41 questions. The internal consistency reliability Cronbach's Alpha for each factor was .98, .84, .92, .88, .94, and .88, respectively, in the original study. The current study used four subscales, Motivation, Instruction, Engagement, and Outcome Expectancy, with 18 questions. The questions were modified to fit the online teaching setting without any specific subject. The items were modified into a 7-point Likert-type scale ranging from 1 to indicate *strongly disagree* to 7 which indicated *strongly agree*, making it more consistent with other measures in the survey and reducing complexity for the participants to respond. After the modification, the internal consistency reliability Cronbach's Alpha for the modified survey within the four subscales were: .82, .74, .83, and

.83, respectively, indicating the scores measured by those scales are reliable. The Cronbach's alpha for the modified overall Teaching Self-Efficacy Scale was .91.

Extended Technology Acceptance Model (TAM) Measures

A total of 25 items were used to measure 7 constructs in the extended Technology Acceptance Model (TAM). These constructs included: System Quality, Facilitating Conditions, Perceived Self-Efficacy, Perceived Ease of Use, Perceived Usefulness, Attitudes Toward Use, and Behavioral Intention to Use. Items were rated on the 7-point Likert-type scale ranging from *strongly disagree* (1) to *strongly agree* (7). The System Quality (n = 4), Technology Self-Efficacy (n = 3), and Behavioral Intention to Use (n = 3) measures were adapted from Liaw (2008). The overall internal consistency reliability in Liaw's study was .97, while the Cronbach's Alphas were .87, .93, and .90, respectively, in Fathema's (2013) study. In the current study, the internal consistency reliability Cronbach's Alpha for those three constructs were .87, .94, and .91, respectively. The Facilitating Conditions (n = 3) and Attitude toward Use (n = 4) were adapted from Teo (2010) with reliability Cronbach's Alpha at .88 and .96. The internal consistency reliability Cronbach's Alpha were .88 and .93 in the current study. The measures for Perceived Usefulness (n = 4) and Perceived Ease of Use (n = 4) were adapted from Venkatesh and Davis' (1996, 2000) study with reliability at .96 and .93, while they were .90 and .88 in the current study. There was also one item asking participating teachers about their frequency of access to the LMS to teach per week as the measure of their actual use.

Demographic Questionnaire

The participating teachers also answered demographic questions, including whether they used any LMS to teach online during the pandemic, the frequency of using LMS, age, gender, ethnicity, education level, online teaching experiences, and online learning experiences.

PROCEDURE

The anonymous electronic survey was hosted in Qualtrics to collect data. The front page of the survey was the information letter approved by the IRB. A screening question was set at the beginning to ensure all participants were 19 years and older. Following the screening question, participants were asked to respond to Teaching Self-Efficacy Scale, Extended Technology Acceptance Model (TAM) measures, an Open-ended Questionnaire, and Demographic Questions. A recruitment message was posted on the researchers' personal Facebook pages. There was no follow-up or reminder sent.

DATA ANALYSIS

Quantitative data were analyzed using SPSS 26 and AMOS 26. To be more specific, descriptive statistics were used to describe the characteristics of the participants. A covariance-based with maximum likelihood estimation Structural Equation Modeling (SEM) was used to evaluate the hypothesized model. In addition, multiple regression analyses were used to examine the significant predictors in the Extended Technology Acceptance Model (TAM) to Motivational, Instructional, Engagement, and Outcome Expectancy variables.

The covariance-based SEM can investigate the relationships among latent variables and between observed (manifest) variables at the same time (Hair et al., 2006), and examine the mediator effect (Tabachnick & Fidell, 2007). Model fit indices, including goodness-of-fit test (Chi-square statistic), comparative fit index (CFI), Tucker Lewis Index (TLI), and Root Mean Square of Error Estimation (RMSEA), were used to evaluate the hypothesized model. The general cut-off value for the indices are larger than .95 for CFI and TLI, and less than .08 for RMSEA (Hair et al., 2006). If the results from evaluating the hypothesized model indicate a poor fit, the model can be improved by removing insignificant paths using a trimming process or adding relationships between variables based on the modification indices (Hox & Bechger, 1998; Kline, 2010; Ullman & Bentler, 2013) then re-evaluating the model after adding or removing one path at a time until it reaches an adequate fit (Hox & Bechger, 1998).

RESULTS

Table 1 displays the summarized descriptive statistics for each variable, as well as the bivariate Pearson correlation coefficients among those variables. A significant moderate to large relationship existed among all variables (r = .23~.78, p < .001), except the Actual Use. The frequency of Actual Use correlated with the levels of Outcome

Table 1 *Descriptive Statistics and Correlations for Study Variables (n = 141)*

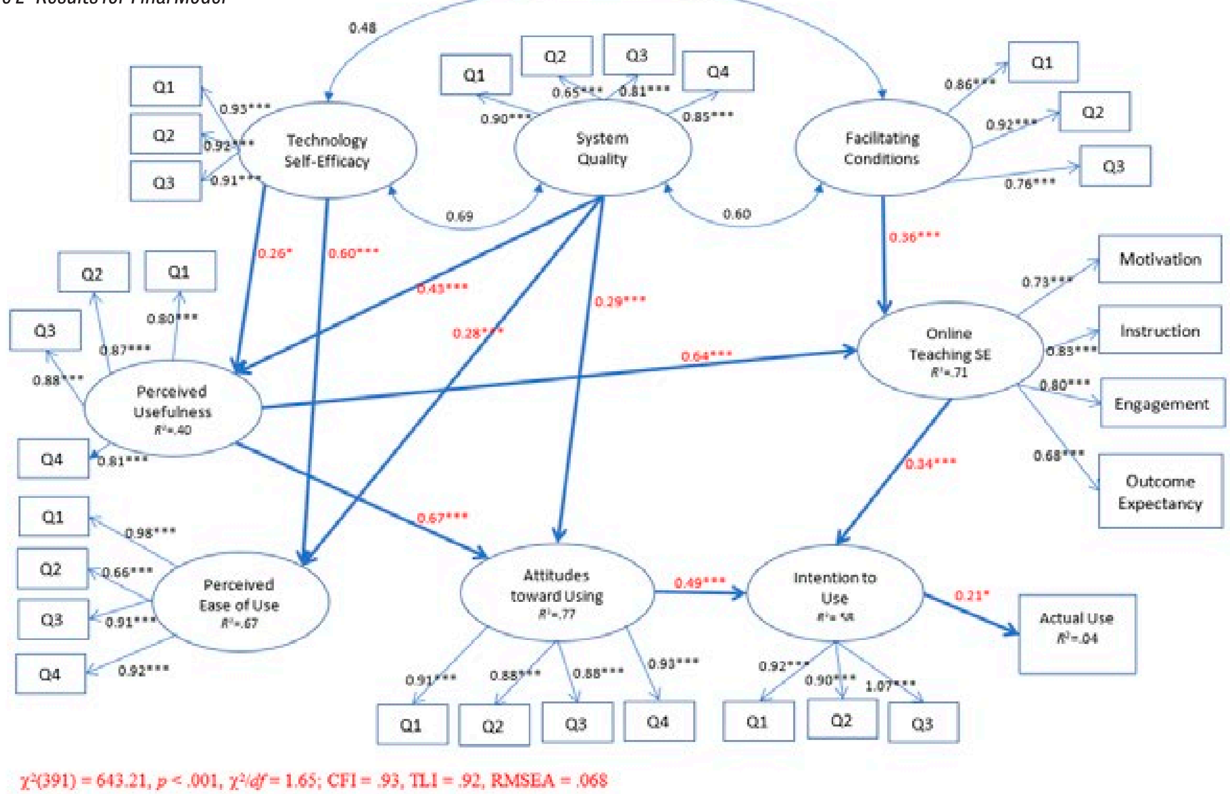
	M	SD	1	2	3	4	5	6	7	8	9	10	11
1. Motivation	5.09	0.92	---										
2. Instruction	4.96	0.86	.61***	---									
3. Engagement	5.49	0.93	.61***	.62***	---								
4. Expectancy	5.15	0.80	.47***	.53***	.56***	---							
5. Self-Efficacy	5.00	1.52	.39***	.54***	.38***	.31***	---						
6. Usefulness	4.57	1.45	.45***	.58***	.58***	.48***	.52***	---					
7. Ease to Use	4.04	1.45	.37***	.50***	.39***	.31***	.78***	.50***	---				
8. Attitude	4.54	1.48	.48***	.55***	.65***	.45***	.53***	.78***	.57***	---			
9. System Quality	4.43	1.35	.44***	.60***	.47***	.32***	.61***	.52***	.67***	.62***	---		
10. Facilitating	4.73	1.58	.32***	.47***	.35***	.35***	.43***	.23***	.49***	.30***	.56***	---	
11. Intend to Use	5.18	1.21	.44***	.49***	.54***	.50***	.45***	.66***	.43***	.70***	.56***	.36***	---
12. Actual Use	5.33	1.89	.06	.12	.04	.19*	.20*	.11	.19*	.07	.16	.21*	.20*

* $p < .05$; ** $p < .01$; *** $p < .001$

Expectancy, Technology Self-Efficacy, Ease to Use, Facilitating Conditions, and Intend to Use ($r = .19 \sim .21$, $p < .05$).

The hypothesized model's results indicated an acceptable fit between the hypothesized model and the observed data. The goodness-of-fit test was statistically significant, $\chi^2(384) = 670.58$, $p < .001$, $\chi^2/df = 1.75$. The fit indices indicated an acceptable fit, CFI = .92, TFI = .91, RMSEA = .073. However, not all of the paths reached statistical significance ($p < .05$) nor demonstrated practical significance ($\beta > 0.3$). After deleting nonsignificant coefficients one by one and re-evaluating the model, Figure 2 summarized the final model results. While the Chi-square test was still statistically significant, $\chi^2(391) = 643.21$, $p < .001$, $\chi^2/df = 1.65$, other fit indices

Figure 2 Results for Final Model



indicated a good fit, CFI = .93, TFI = .92, RMSEA = .068, and all of the path coefficients were statistically significant ($p < .05$). Some of the paths demonstrated practical significance ($\beta > 0.3$).

The endogenous variables of Perceived Usefulness, Perceived Ease of Use, Attitude toward Using, Intention to Use, and Online Teaching Self-Efficacy accounted for a large amount of variance with $R^2 = .40$, $R^2 = .67$, $R^2 = .77$, $R^2=.58$, and $R^2=.71$, respectively. The manifest variable, Actual Use, accounted for a small to moderate amount of variance with $R^2 = .04$. Based on the final model, levels of Perceived Usefulness of the LMS and the Facilitating Conditions directly impacted K-12 teachers' perceived Teaching Self-Efficacy. Teachers who considered the LMS useful for facilitating remote teaching and perceived more resources and supports in using the LMS in their teaching had higher levels of online teaching self-efficacy. The levels of technology self-efficacy in using the LMS and the system quality directly influenced K-12 teachers' perceived usefulness and ease of use of the LMS. When teachers had higher levels of technology self-efficacy in using the LMS and also considered the LMS to be usable and reliable, they felt that the LMS was more useful and easier to use in remote teaching settings. Thus, the levels of system quality and perceived usefulness directly influenced K-12 teachers' levels of Attitudes Toward Using LMS, while their levels of Online Teaching Self-Efficacy and Attitudes Toward Using directly impacted their Behavioral Intention to Use and then influenced their Actual Use Behaviors. In other words, K-12 teachers who perceived that the LMS were usable, reliable, and useful had more positive attitudes toward using it in remote teaching. When teachers had higher levels of online teaching self-efficacy and positive attitudes toward using the LMS in the remote teaching conditions, they were more likely using the LMS to facilitate their remote teaching, which then led to higher levels of actual usage of the LMS.

Finally, K-12 teachers' levels of perceived usefulness of the LMS was the mediator between their technology self-efficacy and their levels of attitude toward using the LMS as well as the online teaching self-efficacy. It was also the mediator between their perceived system quality and their attitudes toward using the LMS in remote teaching setting. Moreover, their levels of Attitude Toward Using and Behavioral Intention to Use were mediators between perceived usefulness in the LMS and their actual use.

Table 2 Research Hypotheses and Results

Hypotheses		Results
H1	Teachers' Technology Self-Efficacy has impact on their Perceived Usefulness of the LMS.	Supported. $\beta = .26$, $p = .02$.
H2	Teachers' Technology Self-Efficacy has impact on their Perceived Ease of Use of the LMS.	Supported. $\beta = .60$, $p <. 001$.
H3	Teachers' Technology Self-Efficacy has impact on their Online Teaching Self-Efficacy.	Not supported.
H4	Teachers' perceived System Quality has impact on their Perceived Usefulness of the LMS.	Supported. $\beta = .43$, $p < .001$.
H5	Teachers' perceived System Quality has impact on their Perceived Ease of Use.	Supported. $\beta = .28$, $p < .001$.
H6	Teachers' perceived System Quality has impact on their Attitudes toward using the LMS.	Supported. $\beta = .29$, $p < .001$.
H7	Teachers' perceived System Quality has impact on their Online Teaching Self-Efficacy.	Not supported.
H8	Teachers' perceived Facilitating Condition has impact on their Perceived Ease of Use.	Not supported.
H9	Teachers' perceived Facilitating Condition has impact on their Attitudes toward using the LMS.	Not supported.
H10	Teachers' perceived Facilitating Condition has impact on their Online Teaching Self-Efficacy.	Supported. $\beta = .36$, $p < .001$.
H11	Teachers' Perceived Ease of Use has impact on their Perceived of Usefulness of the LMS.	Not supported.
H12	Teachers' Perceived Ease of Use has impact on their Attitudes toward using the LMS.	Not supported.
H13	Teachers' Perceived Usefulness has impact on Attitudes toward using the LMS.	Supported. $\beta = .67$, $p < .001$.
H14	Teachers' Perceived Usefulness has impact on their intention to use the LMS.	Not supported.
H15	Teacher's Perceived Usefulness has impact on their Online Teaching Self-Efficacy.	Supported. $\beta = .64$, $p < .001$.
H16	Teachers' Attitudes toward using the LMS has impact on their Intention to Use the LMS.	Supported. $\beta = .49$, $p < .001$.
H17	Teachers' Intention to Use the LMS has impact on their Actual Usage of the LMS.	Supported. $\beta = .12$, $p = .018$.
H18	Teachers' Online Self-Efficacy has impact on their Intention to Used.	Supported. $\beta = .34$, $p = .001$.

The summary of the results for each hypothesis are listed in Table 2.

DISCUSSION

Results from the final model indicated that resources (facilitating conditions) used to assist teachers in using a LMS to teach online and the perceived usefulness of the LMS had a direct impact on teachers' online teaching self-efficacy. The results corroborated those from Downing and Dyment (2013) who claimed that teachers would have more confidence in online teaching if they received enough support and professional development opportunities. However, an opposing view asserted by Yuen and Ma (2008) pointed out that teachers perceived usefulness was not a good predictor of online teaching self-efficacy, which differed from our results. It is important to note however that these prior studies were conducted pre-pandemic. Hence, this could be a potential factor causing these different results.

Additional research is needed in order to conclude whether teachers' perceived usefulness of the LMS could be a good predictor to online teaching self-efficacy. Teachers' technology self-efficacy in using an LMS and the quality of the LMS directly influenced teachers' perceived usefulness of the LMS and indirectly impacted their online teaching self-efficacy. The results were the same as suggested by research previously conducted (Al-Sayyed & Abdalhaq, 2016; Downing & Dyment, 2013; Liaw et al., 2007).

In addition, technology self-efficacy in using an LMS and the system quality of the LMS directly influenced teachers' perceived ease of use of the LMS. These results corroborated those of previous studies (Delone & Mclean, 2003; Fathema, 2013; Ong & Lai, 2006; Yuen & Ma, 2008). Teachers' perceived usefulness of using an LMS then predicted their attitudes toward using and intention to use the LMS, and then led to their actual use of the LMS, which was also consistent with TAM theoretical model and previous studies (Davis, 1989; Davis et al., 1989; Hartwick & Barki, 1994). There were two results that differed from previous studies, however. Teachers' perceived usefulness did not impact their intention to use the LMS, and their perceived ease of use had no impact on their attitudes toward using the LMS in the current study. The present study was conducted under an emergency remote teaching context which might be a factor that led to different results. Finally, teachers' online teaching self-efficacy directly influenced their intention to use the LMS in remote teaching, which corroborates the results from previous studies (Al-Sayyed & Abdalhaq, 2016; Liaw et al., 2007).

Hodges et al., (2020) stated that during the pandemic, many teachers scrambled to figure out how to deliver content. Yet the present research identified the perceived usefulness of the LMS as a major factor that predicted the attitudes and intentions of the teachers to use an LMS, and this led to their actual use of the LMS. As teachers tried to figure out how to deliver content curriculum and shift their pedagogical practices to support emergency remote learning, the teachers also reflected on the usefulness of the platform. However, teachers' perceptions of the usefulness of the platform was not the only factor that impacted teachers' online teaching self-efficacy and their actual use of the platform. Their self-efficacy in using the platform, along with using a well-designed and user-friendly platform, were important factors that served to improve a teacher's self-efficacy in teaching online and their willingness to use the platform.

One major limitation in the current study is the sample size. Conducting a covariance-based SEM requires a large sample size in order to obtain reliable and consistent estimations. Usually, 200 data points is considered the "critical sample size" (Hoelter, 1983). The authors of this study acknowledge that we are slightly shy of those data points.

IMPLICATIONS

The results of the present study suggest that teachers' self-efficacy in using the LMS, the quality of the LMS, resources provided to the teachers to be more efficient while using the LMS, and their perceived usefulness of the LMS had direct or indirect impacts on their online teaching self-efficacy. Thus, it is suggested here that providing a quality LMS for teachers to use, promoting teachers' technology self-efficacy, and providing the necessary resources to help teachers to use the LMS are all critical to improving remote teaching and learning effectiveness and performance. The United States Department of Education Office of Technology (2016) has proclaimed the need for teachers to be fluent in technology. The need for emergency remote teaching tested the depth of teacher fluency of technology.

Professional development for teachers mostly focuses on using an online teaching platform or LMS. This type of professional development is critical to improving teachers' self-efficacy and usage. Several studies have indicated the importance of the positive relationship between professional development and teaching self-efficacy in online settings (Cory & Stella, 2018; Downing & Dyment, 2013; Lin & Zheng, 2015). Lin and Zheng (2015) posited that the teachers in their study expressed a need for more professional development that is aimed at transitioning from face-to-face to online settings. Other studies have also suggested that professional development could increase teachers' knowledge in online pedagogy and, perhaps, improve their self-efficacy and effectiveness in teaching online (Corry & Stella, 2018; Horvitz et al., 2015; Lee & Tsai, 2010; Robinia & Anderson, 2010).

CONCLUSION

The present study drew upon existing frameworks expanding on the results of previous studies (Bandura 1997; Liaw 2008; and Yoon et al., 2012, 2014) for the advancement of teachers' online teaching self-efficacy and remote teaching in grades K-12. Future research related to the type of instruction that was provided, aligned with teachers' self-efficacy to engage in online instruction, is warranted and recommended. In addition, the identification of the pedagogies used and the quality of online teaching and self-efficacy in remote teaching during a worldwide pandemic is necessary.

The results of the present study indicated that professional development is one of the keys to ensuring the quality of online teaching for both students and K-12 teachers. Thus, district and school administrators should be aware of studies that inform exemplary online instruction. Specifically, the results of the present study suggest that this professional development should provide the necessary resources to help teachers to benefit from LMS. Further, the results indicated that when teachers perceived more resources, they had higher levels of teaching efficacy. This teaching efficacy influenced K-12 teachers' perceived usefulness and ease of use of the LMS as well as their positive attitudes toward using the LMS.

District and school administrators can also impact the success of online instruction with an explicit continuous improvement plan to provide technology training and technology support for K-12 teachers as a means to aid the transition to online instruction. A continuous improvement plan would create a venue for all stakeholders to have shared ownership of the culture of incorporation of this technology into instruction. In conclusion, the results of the present study suggested that when K-12 teachers perceived that support and resources were available, and that the LMS was useful in accomplishing their teaching objectives, this perception served to help them to develop their sense of technology efficacy. Further, this self-efficacy for using a LMS directly influenced their perceived ease of use, their attitudes toward using the LMS as well as their intention to use the LMS in the future during the COVID-19 global pandemic.

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