Teacher Efficacy for Online Teaching During the COVID-19 Pandemic

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Tim Dolighan* and Michael Owen

Brock University

Abstract

This study examines secondary teachers' efficacy for teaching in a fully online teaching environment during the sudden transition to online teaching due to the COVID-19 pandemic. The study sought to identify how specific variables, teaching experience, professional development (PD) experience, and teaching supports correlate with the self-efficacy perceptions of teachers transitioning to online teaching during a pandemic. More specifically, we examined self-efficacy perceptions of teachers in the domains of student engagement, instructional strategies, classroom management, and computer skills. The instrument used to measure teacher efficacy for online teaching was a 32-item, web-based survey that was given to Ontario secondary teachers in a southern Ontario Catholic district school board. We argue that prior experience with online learning such as additional qualification (AQ) courses or online PD would build greater self-efficacy amongst teachers as they transition to online learning. The results indicate that higher online teaching efficacy scores correlated with having taken online AQ courses and online PD sessions. The highest online teaching efficacy scores correlated with having previously used a board-provided learning management system (LMS) and using virtual technology supports. These indicators are correlated with higher scores of online teaching efficacy but require further investigation as to how they can better provide support for teachers in online learning environments.

Keywords: online teaching, self-efficacy, COVID-19 pandemic, professional development

* tim.dolighan@brocku.ca

The challenge of doing something new usually is accompanied by apprehension and fragile confidence. Having to suddenly transition to a new teaching and learning environment, as is the case for teachers across Ontario and the world, is daunting. Online or virtual teaching and computer-based instruction are substantially different from face-to-face practice and require different teacher training and preparation (Barbour & Unger, 2014). This study is Phase 1 of a two-phase mixed methods approach (Creswell et al., 2011; Northcote et al., 2015) identifying supports for teachers that build efficacy for online teaching. Supporting teachers in an emergency transition to online teaching has to recognize the need to support teachers' mental health and well-being by examining the impact of occupational stress on self-efficacy (Panisoara et al., 2020). This study, first, aims to measure teacher self-efficacy in the early stages of transitioning to fully online environments in the spring of 2020 in the hopes of better understanding what support and training secondary teachers will need to effectively make that transition and for ongoing professional learning and training going forward in the context of the COVID-19 pandemic and the lasting effects on education.

Review of Relevant Literature

Self-Efficacy and Technology Use

In their review of the literature of teacher self-efficacy in online education, Corry and Stella (2018) indicate that researchers agree that online and face-to-face education have different contexts and warrant examining teacher self-efficacy for online education. Much of the teacher self-efficacy measurement instruments used in online education research were based on scales that were internally validated for teachers in a face-to-face context. Most instruments were originally designed to measure pedagogical knowledge or content-specific pedagogy and few include the extensive use of technology in instruction. Research suggests there is a link between technology use in the classroom and teacher self-efficacy (Kopcha & Alger, 2011; Mishra & Koehler, 2006). Corry and Stella (2018) further suggest research that links self-efficacy and technology integration could be of specific importance to studying online education given the inherent role of technology in online learning environments. However, work still needs to be done to validate teacher self-efficacy measurement instruments modified for online learning.

A growing body of literature measures teachers' self-efficacy and use of technology (Angeli & Valanides, 2009; Ertmer & Ottenbreit-Leftwhich, 2010; Ertmer et al., 2014; Moore-Hayes, 2011). Eickelmann and Vennemann (2017) reviewed measurements for teacher attitudes and beliefs. The technological pedagogical content knowledge (TPCK/TPACK) framework developed by Mishra and Koehler (2006) is designed to reflect teachers' knowledge necessary for effective integration of technology in teaching. Other studies explored teachers' self-efficacy and outcome expectations with regard to integrating technology in education. Niederhauser and

Perkmen (2010) considered self-efficacy and outcome expectations as important variables for effective teaching with technology and provided a way of assessing where teachers are before and after an intervention or professional learning experience. Perkmen (2008) found that technology integration, self-efficacy (TISE) and instructional technology outcome expectations (ITOE) constructs have mutual relationships in the prediction of technology integration performance and that participants with high self-efficacy also have high outcome expectations. Semiz and Ince (2012) examined the combination of the TPACK, TISE, and ITOE constructs with pre-service physical education teachers. The findings suggest that the significant and positive relationship of the TPACK variables with technology integration self-efficacy and ITOEs mirrors similar findings of other subjects in the literature (Angeli & Valanides, 2009; Semiz & Ince, 2012). Previous studies also identified intervention programs' positive influence on improving the technological pedagogical content knowledge perception of both in-service and pre-service teachers' self-efficacy for integrating technology into teaching (Angeli & Valanides, 2009; Mishra & Koehler, 2006).

Research also has focused on specific elements of teaching digital technology. Hatlevik and Hatlevik (2018) found that teachers' general self-efficacy for using information and communication technology (ICT) is related to their use of ICT in teaching. The authors suggest that general ICT self-efficacy is necessary for developing ICT self-efficacy for educational purposes, which is supported by other research on self-efficacy and the use of ICT for teaching (Fanni et al., 2013; Hammond, 2011; Hatlevik, 2017; Teo, 2014). Hatlevik and Hatlevik (2018) also showed that collegial collaboration among teachers has a positive association with the use of ICT in their teaching practice. Tondeur et al. (2017) reported a promising approach to long-term professional development (PD) builds on pre-service teacher education and beliefs reinforced through ongoing collaborative inquiry. Moore-Hayes (2011) compared self-efficacy for technology integration of pre-service and in-service teachers and found a significant difference between the two groups from a quantitative perspective but noted that open-ended questions about examples from practice revealed teachers in both groups experienced feelings of low self-efficacy related to technology integration, suggesting a distinction between instructional self-efficacy and technology self-efficacy (Horvitz et al., 2015; Lin & Zheng, 2015; Robinia & Anderson, 2010). Engaging ongoing professional learning through summer workshops and supplemental online courses, the study found that teacher efficacy improved and remained high over the long-term versus just having a PD workshop.

Our review of the literature also suggests the need for a better understanding of barriers that prevent teachers integrating technology into their instructional practices. These barriers include lack of time, lack of resources, rigid schedules, and examination requirements that support and encourage teacher-centred approaches to use of technology (Tondeur et al., 2012). The review also revealed the importance of a multi-dimensional approach to the relationship between

pedagogical beliefs and technology use. Research that examined barriers to teaching online in higher education found the top inhibiting factors included teachers' resistance to innovation and online teaching methods, unfamiliarity with effective online teaching pedagogy, technical concerns about reliability, the impersonal nature of online teaching, and lack of institutional support (Berge,1998; Liu et al., 2007; Shea, 2007). Effective PD is ongoing, and continually updates and extends teachers' professional knowledge and beliefs in the context of their work (Kopcha, 2012; Sang et al., 2012; Tondeur et al., 2017). Teacher PD must enable internal changes in knowledge, attitude, and beliefs as well as an external culture of collaboration and inquiry that will foster and sustain change.

Self-Efficacy and Online Teaching

A number of studies placed teacher beliefs and self-efficacy as a primary barrier to using technology in education (Ertmer & Ottenbteit-Leftwhich, 2010; Ertmer et al., 2014; Moore Hayes, 2011). Bandura (2006) provides guides for constructing self-efficacy scales that underlines self-efficacy as a main factor in achieving learning outcomes. In terms of using technology, TPACK and teacher self-efficacy are critical dimensions for ensuring effective integration of technology into education (Mishra & Koehler, 2006). However, characteristics of teachers who use technology for professional use and who are currently immersed in transitioning to online teaching have not been examined in detail. Lee and Tsai (2010) explored teachers' self-efficacy for using the internet for teaching. They added a web component to the TPCK framework to examine correlations between self-efficacy and the TPCK-W score. Correlations with web-based teaching, self-efficacy, and positive attitudes towards the use of the internet for teaching were found.

The integration of technology into teaching has been imposed by the COVID-19 pandemic restrictions requiring teachers across Ontario and the world to teach online from home. Not only the context is different in the virtual classroom; the qualities and characteristics of the teaching and learning experiences also are different (Cho & Shen, 2013; Rice, 2006). The skills necessary for teaching in the virtual environment are different than face-to-face instruction. These skills include managing the online classroom, creating instruction for the online platform, motivating and engaging online students, instructional design in the online environment (Jackson & Jones, 2019; Kennedy & Archambault, 2012), and fostering a social and learner presence in the online setting (Anderson, 2017; Garrison & Akyol, 2013). Min-Ling Hung (2016) studied elementary and middle school teachers' readiness for teaching online using the teacher readiness for online learning measure (TROLM). The scale was comprised of four factors: communication self-efficacy, institutional support, self-directed learning, and learning-transfer self-efficacy. Results found that male teachers exhibited statistically significantly greater readiness in the dimension of learning-transfer self-efficacy than did

female teachers. Teachers with a master's degree reported higher communication self-efficacy and learning-transfer self-efficacy than did teachers with a bachelor's degree. The study also found that teachers with fewer teaching years' experience reported higher communication self-efficacy and higher self-directed learning was reported by teachers with more years of teaching experience. A study by Lin and Zheng (2015) examined PD for online primary and secondary teachers' adjustment to online teaching. The results of the study identified a distinction between instructional self-efficacy and technology self-efficacy and showed a correlation between content-related instructional practices and instructional self-efficacy. This study as well as other studies that focused on online pedagogy supported the result of teachers' desire for technology specific PD (Horvitz et al., 2015; Robinia & Anderson, 2010). Studying teachers' efficacy for online teaching, Corry and Stella (2018) reviewed the literature over the past 15 years on teacher self-efficacy in online education. The authors found that researchers have examined the balance of technological and pedagogical knowledge that supports the development of teacher self-efficacy, the role of learner self-efficacy, and whether teacher self-efficacy differs fundamentally in online education. Further, Corry and Stella suggest that the association of teacher self-efficacy and student success has yet to be empirically validated. The review identifies and explores three areas of research: ease of adopting online teaching; online teaching self-efficacy in comparison to demographic and experience variables; and changes in teacher self-efficacy in PD scenarios where self-efficacy was measured before and after intervention. Corry and Stella conclude that the literature supports further research investigating the construct of teacher self-efficacy in online education and possible correlations between self-efficacy and student success in the online learning environment.

The Self-Efficacy for Online Teaching Instrument

Teacher self-efficacy refers to "teachers' beliefs about their own capacity as teachers" (Tschannen-Moran et al., 1998, p. 202). Teacher efficacy has been studied extensively since the 1970s (Armor et al., 1976; Ashton et al., 1982; Berman et al., 1977; Tschannen-Moran et al., 1998). Bandura et al. (1999) defined perceived self-efficacy as a future-oriented belief in one's level of competence in a given situation. Self-efficacy beliefs are correlated with the effort people are willing to expend to attain a goal and how persistent they are in the face of adversity and recover from setbacks (Bandura, 1986, 1993). Teacher efficacy has been correlated with a number of academic and behavioural elements such as student achievement (Armor et al., 1976; Ashton & Webb, 1986; Berman et al., 1977; Tracz & Gibson, 1986). High teacher self-efficacy also correlates with maintaining high levels of student engagement (Good & Brophy, 2003; Martin et al., 2012). Research also shows teacher self-efficacy is correlated with perceived work environment and job satisfaction and teachers with low self-efficacy tend to have higher stress and higher likelihood of burnout (Klassen & Chiu, 2010). Teacher self-efficacy is also related to years of teaching experience and the level of grade taught. Teachers

with a strong sense of self-efficacy tend to do more planning and organization and are more willing to experiment with new methods to meet the needs of their students (Stein & Wang, 1988). Self-efficacy also influences a teacher's level of persistence and resilience in the face of setbacks (Beltman et al., 2011), which in the context of the transition to a new online learning environment seems to be a useful measure to examine. Corry and Stella (2018) advocate for research that ties together teacher self-efficacy and technology integration with online teaching and learning. While the link between teacher self-efficacy and integrating technology into the classroom is made by researchers (Kopcha & Alger, 2011; Mishra & Koehler, 2006), the role it plays in how confident teachers are teaching online is not well established. Self-efficacy measurements identified by Corry and Stella are largely adapted from scales internally validated for teachers in a face-to-face teaching environment. Corry and Stella explain that efforts to validate teacher efficacy instruments modified for online education have been made but conclude that much more effort is needed given the influence of teacher self-efficacy on student outcomes in face-to-face education. Northcote et al. (2015) used the online teaching self-efficacy inventory (OTSEI) developed by Gosselin (2009) to measure higher education instructors' self-efficacy beliefs specific to online instruction. Northcote et al. (2015) found that a multi-faceted approach to professional learning programs that focus on developing online teaching abilities and pedagogy increasingly empowers teachers in their design and delivery of online learning. Teacher self-efficacy for online teaching in all these identified areas of research are of concern in this study but with the added element of forced transition and stresses that the restrictions imposed by the pandemic produced. Using the self-efficacy measurement developed by Tschannen-Moran et al. (1998) and modified for online instructors by Robinia and Anderson (2010) provides a familiar framework of pedagogy and instruction such as student engagement and classroom management, with the inclusion of measures for technology use and online instructional strategies.

As shown above, research on teacher efficacy presents a number of instruments used in different scenarios. A review of literature did not turn up an instrument used specifically for measuring teacher self-efficacy for online teaching at the secondary level. Therefore, the teacher self-efficacy scale by Tschannen-Moran et al. (1998) was chosen, and modifications for online teaching were considered using the MNESEOT variation of the scale that measured nurse educators' efficacy for teaching online (Robinia & Anderson, 2010). The model provided by Tschannen-Moran et al. (1998) emphasizes the strong cyclical nature of teacher efficacy, which is enhanced by mastery experiences encouraging greater effort, persistence, and performance on task. Both Robinia and Anderson (2010) and Horvitz et al. (2015) found similar results with nursing faculty who had more experience teaching online courses reporting higher self-efficacy, which suggested experience teaching online could impact self-efficacy.

Ontario teachers, along with hundreds of thousands of teachers worldwide, transitioned to

online teaching environments in spring 2020 as a response to the COVID-19 pandemic. A study of teacher efficacy for online teaching presents an opportunity to better understand where teachers are in terms of confidence for teaching online and how to better support teachers in an unprecedented transitional phase. Given the challenges faced by secondary teachers during the spring 2020 school term due to the requirement to transition from face-to-face to an online learning environment, Tschannen-Moran et al. (1998), as modified by Robinia and Anderson (2010), guided the development of our research questions and hypotheses.

Research Questions

This study sought to measure and understand teacher efficacy in the early stages of transitioning from face-to-face to fully online environments. We argue that prior experience with online learning including online Additional Qualification (AQ) courses[1] and/or online PD would build greater self-efficacy amongst teachers as they transition to online learning. We also argue that having support from technical support teams (e.g., IT support, instructional designers) and knowledge of the school district's learning management system (LMS) supported teachers' positive efficacy. More specifically, we asked the following research questions:

1. How confident do secondary teachers feel in preparing, conducting, and evaluating online courses?
2. Is there a difference in online teaching efficacy in relation to: (a) age, (b) gender, (c) years of face-to-face teaching experience, and (d) years of online teaching experience?
3. In what ways do experience with online teaching, PD, and perceived support from experts or instructional designers influence teachers' reported self-efficacy for online teaching?

We therefore hypothesize that:

- There will be a positive relationship between levels of online teaching efficacy and (a) years of online teaching experience and/or (b) number of online teaching experiences.
- Teachers who have participated in online AQ experiences for (a) teaching in general and/or (b) online teaching will have significantly higher levels of online teaching efficacy.
- Teachers who report experiences of expert and/or instructional designer support contacts will have significantly higher levels of online teaching efficacy.

[1] Additional Qualification (AQ) courses are courses accredited by the Ontario College of Teachers (OTC) that qualified teachers can take to upgrade knowledge and skills and gain qualifications in a certain teaching division or subject (OCT, 2021).

- Teachers who report taking online PD courses or seminars for online teaching will have significantly higher levels of online teaching efficacy.
- Teachers who report using board-provided online teaching platform (D2L or EDSBY) prior to the transition to online will have significantly higher levels of online teaching efficacy.
- Teachers who use virtual technology support for online teaching will have significantly higher levels of online teaching efficacy.

Methods

Sample population was determined based on access to secondary teachers at a Catholic school district in southern Ontario. Following ethics approval from the school district and Brock University, emails were sent to all secondary teachers inviting them to complete a web-based survey using Microsoft forms. Out of 432 secondary teachers employed at the board, 132 responded; 61% are female, the average age was 48, 73% had a bachelor's degree (e.g., B.A. or B.Sc. plus/or B.Ed.) and 70% have been teaching for 16 or more years in public education. Eighty-one percent of respondents reported teaching 5 or less years online. Of those who reported $\leq$5 years' experience teaching online, 88% (or 71.3% of respondents) reported 1 year or less online teaching experience.

The survey was a digital survey developed using Microsoft forms and based on the Michigan nurse educators sense of efficacy for online teaching (MNESEOT) instrument (Robinia & Anderson, 2010). The survey consisted of 32 questions that asked participants to rate their perceived self-efficacy for online teaching on a Likert scale of 1-9 (1 being "nothing" and 9 being "a great deal"). The mean for each subscale (student engagement, classroom management, online instruction, and use of computers) was calculated and added together to produce a total mean score. Across the entire survey, participants' mean score was 22.06 with a standard deviation of 4.38 across a scale of 4-36. Without a standard to measure against, it is difficult to say how teachers compared to the secondary school teacher population in Ontario, so all measures are determined within and between the one survey.

The instrument used showed a Cronbach alpha of .951 with this sample (n=132), changes to the MNESEOT were made to some of the questions to reflect secondary teachers' experience with online teaching. Online pedagogies and strategies for online teaching were considered based on the signature pedagogies for e-learning by Eaton et al. (2017).

Process for Data Collection

Demographic questions were asked to identify variables that may or may not impact efficacy ratings. Teachers were also asked about the value of online AQ courses, seminars, and PD for online instruction, the use of expert help, and virtual support for teaching online.

Data Analysis

Study questions were addressed by calculating means and standard deviations of the teacher sense of efficacy for online teaching survey (TSEOT) scores (Horvitz et al., 2015; Robinia & Anderson, 2010; Tschannen-Moran et al., 2001) for the four measures: student engagement, classroom management, online instruction strategies, and computer skills. The Pearson correlation coefficient was used to determine relationships between interval variables. Analysis of variance (ANOVA) was used to assess differences of means of online teaching efficacy scores. An alpha of .05 was used for all tests.

Ethics Approval

The study was reviewed and approved by the research ethics board (REB) of the school board and Brock University. The use of Microsoft forms allowed for secure submission of surveys and for the researchers to anonymize the data. Respondents were asked not to include any identifying marks or information within the text options of the survey.

Results

The survey consisted of 32 questions that asked participants to rate their perceived self-efficacy on a Likert scale of 1-9 (1 being “nothing” and 9 being “a great deal”). The mean for each subscale (student engagement, classroom management, online instruction, and use of computers) was calculated and added together to produce a total mean score. Across the entire survey, participants’ mean score was 22.06 with a standard deviation of 4.38 across a scale of 4-36. Overall, teachers surveyed believed they could do “very little” to “some” with regards to preparing, teaching, and evaluating online courses.

Table 1

Total TSEOT Scores

Total TSEOT score (n=132)	Mean	SD	Range
Student engagement	4.73	1.13	1 to 9
Instructional strategies	5.76	0.77	1 to 9
Classroom management	5.35	0.83	1 to 9
Computer skills	6.23	1.65	1 to 9
Total TOETS score	22.06	4.38	4-36

An independent t-test showed no significant difference between males, n=46 (M=22.04, SD=4.37) and females, n=80 (M=22.07, SD=4.36), p =0.40 (two-tail).

The Pearson product moment correlation revealed no significant relationship between the variables of age, highest degree, years teaching online, years teaching face to face, and TESEOT scores. Significant correlations (2-tailed) were found with having taken an online AQ (r=.180, p=.039); doing PD sessions for online teaching (r=.262, p=.002); the number of PD sessions (r=.194, p=.028); using a board LMS (r=.248, p=.004); using virtual tech support (r=.291, p=.001), with the dependent variable measure of the TSEOT scores.

Table 2

Pearson Correlation Matrix

Correlations

		1	2	3	4	5	6	7	8	9	10	11
TEOTS score	Pearson Correlation	1										
	N	132										
Yrs Teaching Online	Pearson Correlation	0.038	0.161									
	Sig. (2-tailed)	0.662	0.067									
	N	132	131									
# of yrs Teaching online	Pearson Correlation	0.086	0.075	1								
	Sig. (2-tailed)	0.328	0.395									
	N	132	131	129								
Yrs teaching F2F	Pearson Correlation	-0.04	-0.055	0.246	1							
	Sig. (2-tailed)	0.651	0.53	0.005								
	N	132	131	129	132							
Taken Online AQ	Pearson Correlation	0.180*	0.082	0.134	0.03	1						
	Sig. (2-tailed)	0.039	0.353	0.131	0.73							
	N	132	131	129	132	132						
# of online AQs	Pearson Correlation	0.059	0.144	-0.03	-0.002	0.436	1					
	Sig. (2-tailed)	0.506	0.105	0.732	0.979	0						
	N	129	128	129	132	132	132					
PD for online teaching	Pearson Correlation	0.262**	0.233	0.526	-0.018	0.193	0.131	1				
	Sig. (2-tailed)	0.002	0.007	0	0.837	0.026	0.134					
	N	132	131	129	132	132	132	132				
# PD sessions For OT	Pearson Correlation	0.194*	0.205	0.132	0.262	0.069	-0.044	-0.015	1			
	Sig. (2-tailed)	0.028	0.02	0.137	0.002	0.433	0.618	0.865				
	N	129	128	129	132	132	132	132	132			
Used Expert help	Pearson Correlation	0.149	0.167	-0.02	0.24	0.169	0.051	-0.055	0.383	1		
	Sig. (2-tailed)	0.089	0.056	0.827	0.006	0.056	0.565	0.537	0			
	N	132	131	126	129	129	129	129	129	129		
Using board (LMS)	Pearson Correlation	0.248**	0.029	-0.083	0.086	0.008	0.08	-0.036	0.319	0.238	1	
	Sig. (2-tailed)	0.004	0.741	0.349	0.328	0.924	0.362	0.681	0	0.007		
	N	131	130	129	132	132	132	132	132	129	132	
Used virtual tech support	Pearson Correlation	0.291**	0.068	-0.024	0.101	0.064	0.205	0.029	0.215	0.445	0.571	1
	Sig. (2-tailed)	0.001	0.437	0.787	0.255	0.471	0.02	0.741	0.014	0	0	
	N	132	131	126	129	129	129	129	129	127	129	129

* significant at 0.05 level
** significant at 0.01 level

Although the data showed a significant correlation between having taken an online AQ course that supported online teaching, (r=.180, p=.039), the data did not support any significant correlation between number of online AQs taken with higher efficacy scores. Participants were asked to rate the value of taking online AQ courses, the value of taking PD for online teaching, and how well virtual tech support prepares for online teaching on a Likert scale of 1-5. The mean response for the value online AQ courses provide was 2.78 (Disagree to Neutral). The mean response for the value of taking PD for online teaching was 3.5 (Neutral to Agree) and the mean score for the value of virtual tech support for online teaching is 3.31 (Neutral).

Mean scores for the subscales were calculated: student engagement (M=4.70, SD=1.28), class management (M=5.30, SD=1.36), instructional strategies (M=5.74, SD=1.39), computer skills (M=6.16, SD=1.31). Paired sample correlations revealed significant relationships between all pairs. A paired samples t-test was performed to look closer at paired differences. Significant differences were found in the scores for student engagement (M=4.70, SD=1.28) and computer skills (M=6.16, SD=1.31) conditions; t (131) =-14.98, p=<.001. Student engagement (M=4.70, SD=1.28) and instructional strategies (M=5.74, SD=1.39) conditions; t (131) =-14.77, p=<.001 also revealed significant differences.

Table 3

Paired Samples t-Test

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference Lower	Upper			
Pair 1	Student engagement - Instructional Strategies	-1.039773	.808813	.070398	-1.179037	-.900508	-14.770	131	.000
Pair 2	Student engagement - Class Management	-.589015	.960644	.083613	-.754422	-.423608	-7.045	131	.000
Pair 3	Student engagement - Comp Skills	-1.461174	1.120393	.097518	-1.654087	-1.268261	-14.984	131	.000
Pair 4	Comp Skills - Instructional Strategies	.421402	1.024672	.089186	.244970	.597833	4.725	131	.000
Pair 5	Comp Skills - Class Management	.872159	1.142461	.099438	.675446	1.068872	8.771	131	.000
Pair 6	Class Management - Instructional Strategies	-.450758	1.085201	.094455	-.637611	-.263904	-4.772	131	.000

Hypothesis Findings

1. The data did not support a significant positive relationship between levels of online teaching efficacy and (a) years of online teaching experience and/or (b) number of online teaching experiences.
2. The correlation between taking an online AQ course and higher teacher efficacy for online teaching was significant for p<.05.
3. Teachers who reported taking online PD courses or seminars for online teaching had significantly higher levels of online teaching efficacy. However, the data did not support a significant difference between the number of courses taken and higher efficacy scores.
4. Using expert instructional help for online teaching also showed no significant relationship to higher efficacy for teaching online.
5. Teachers who reported using board-provided online teaching platform (D2L or EDSBY) prior to the transition to online had significantly higher p<.01 levels of online teaching efficacy.

6. Finally, the data supported a strong correlation $p<.01$ between teachers who reported using virtual technology support for online teaching and higher levels of online teaching efficacy.

Discussion

Studying teacher efficacy is challenging no matter the context. The particular context of this study further complicates the interpretation of the data. The rapid closure of Ontario schools and transition to online learning due to the COVID-19 pandemic in March 2020 offered an opportunity to study secondary teacher efficacy as they made the transition to online teaching in unique circumstances. This study surveyed teachers at the beginning of the transition (< 3 months) in order to better understand some of the initial difficulties and challenges secondary teachers faced with transitioning to online teaching environments. This exploratory study provides a base for larger randomized samples across Ontario that could help teachers and boards overcome obstacles associated with lower self-efficacy and negative experiences. As Ontario and other Canadian jurisdictions assess a 2020-2021 school year that is substantially or completely online or in a blended mode, a school year that may be more complex in the way in which students and teachers experience the learning environment,[2] understanding how teachers experienced the spring 2020 transition will provide opportunities to support teachers' sense of efficacy, thereby improving the effectiveness of instruction across all modalities.

The majority of respondents (96.2%) reported having 11 or more years of face-to-face teaching experience ($n=127$). However, this level of experience did not translate into efficacy for online teaching. The overall mean of TSEOT scores ($M=22.06$, $SD=4.38$) indicates a lower online teaching efficacy score for the survey sample in terms of teachers reporting they feel they could do between "very little" to "some" online instruction. There is no comparable sample of secondary teachers transitioning to online teaching in any literature reviewed. Yet, studies with nursing faculty reported experience teaching online showed correlation with higher self-efficacy. One of the major differences in the populations may be that similar samples across Ontario or elsewhere would have similar efficacy scores and there are a number of demographic limitations to studying just one school board. Access to internet and technology devices may not be the same across school boards in Ontario or even within the Greater Toronto region in

[2] To respond to the ongoing COVID-19 for a return to school in the fall, the Ontario Ministry of Education (2020) has outlined "three models of instruction for the 2020-2021 school year: conventional delivery, adapted instruction, and remote instruction, bolstered by live, dynamic synchronous learning" (Quick Facts section, para. 1).

which the population worked. The diversity of the population and rural versus urban differences may present very different access to required internet and technology devices.

While we hypothesized otherwise, the findings indicate that having taught online courses did not translate into significantly higher efficacy for teaching online ($n=54$, $M=23.21$, $SD=4.78$) compared to the sample ($n=132$, $M=22.06$, $SD=4.38$), $r=.086$, $p=.662$. Horvitz et al. (2015) reported future interest in teaching online was found to be a significant predictor of overall self-efficacy but only in the subscale of online student engagement. It would be worth investigating how many teachers had a future interest in teaching online prior to or at the time of transition to online due to the pandemic. In the same study, Horvitz et al. (2015) identified perception of student learning as a predictor of three of the four subscales. Although perception of student learning is unknown, given the highest variance result in this current study between the subscales of student engagement and computer skills and student engagement and instructional strategies there is the possibility that even though participants reported having experience teaching online courses that efficacy may have been affected by perception of student learning. During the transition to online learning, school boards across Ontario, guided by the Ministry of Education, employed measures such as cancelling final exams and marks that would not fall below reported midterm marks (Pringle, 2020). Although not supported in this study, the cyclical nature of efficacy presented by Tschannen-Moran et al. (1998) argues that more experience produces a greater sense of being capable and confidence in one's abilities. The added stress and anxiety on teachers due to an imposed transition to online could be responsible for lower positive intrinsic motivation as factors that were beyond the teachers' ability to control impacted self-efficacy for teaching online but would need to be investigated further. There is a possibility that some of the data may be influenced by other factors produced by the pandemic that are not yet understood.

The significant correlation ($p<.05$) between efficacy for teaching online and taking an online AQ course indicates that this is an area that could be explored further. The data did not show a relationship between efficacy for teaching online and the number of online AQ courses taken. This outcome could suggest that online AQ courses vary in their focus and design with regards to developing skills needed for online teaching and learning or that taking more AQ courses as a "student" does not develop skills needed to teach online. Although there is an AQ course that specifically deals with e-learning, this study did not explore whether respondents took that course and what the impact on teacher efficacy to teach online might be. All other online AQ courses could still emphasize subject content and face-to-face teaching pedagogy and assessment. The neutral satisfaction rating by teachers who were asked about the value of online AQ courses suggests more emphasis is needed to integrate and support online teaching and learning.

As hypothesized, teachers who reported taking PD seminars or courses for online teaching had significantly higher efficacy scores. Providing formal PD opportunities that are specific to instructional challenges and designed for online teaching or the integration of technology into teaching gives teachers the opportunity to inquire and collaborate with other teachers and develop skills that are unique to teaching and learning online. The community of inquiry (COI) model of online learning (Akyol & Garrison, 2010; Garrison & Akyol, 2013) would provide a platform for PD sessions that builds on teacher pedagogical and content knowledge and extend teaching presence into the digital space. Blayone et al. (2017) see the technical, informational, social, and epistemological/computational dimensions and associated competencies as part of the learning process. Teaching online is more than transferring classroom practice to video screens or chat rooms.

Supporting teachers' personalized learning needs with immediate and direct application to the classroom is necessary for sustained ongoing professional learning (Hall & Trespalacios, 2019; Koellner & Jacobs, 2015; Schnackenberg & Still, 2014). The survey data indicate that access to virtual technology support that is less formal and accessible immediately to teachers as they encounter challenges predicts higher efficacy for online teaching. Virtual technology support also allows learners to choose the support they need from the videos and examples provided, learn at their own pace, and go back and review areas of difficulty. Virtual support could include chat rooms and access to IT support in real time. Given that the overall efficacy for online teaching scores seemed somewhat low, it makes sense that immediate and accessible support that teachers can access as they encounter challenges and were able to overcome the challenge would contribute to a higher sense of cyclical efficacy identified by Tschannen-Moran et al. (1998). Since this study measured teachers' self-reported efficacy at the beginning of the imposed transition to online teaching, immediate and accessible support that could be accessed as teachers encounter challenges in the transition had a positive enabling effect. Further study on which virtual support materials were most helpful and could provide ongoing support for continued development of skills needed for effective online teaching is required.

The data support a strong correlation significant at $p<.01$ (2-tailed) for use of a learning management systems (LMS) prior to transitioning to fully online. There are several possibilities for this relationship. Teachers using the board-provided LMS would have already been working with students in an online environment, would have familiar routines, and had developed expectations that transferred to the fully online environment. Both teacher and student familiarity with the applications and expectations contributed to teachers' sense of efficacy for some of the subscale areas such as instructional strategies, online classroom management, and use of computer skills. Several teachers in the study, for example, indicated they had used the LMS for flip classroom and blended learning.

Finally, analyzing the data from the overall mean scores of subscales revealed the highest correlation and variation between student engagement and computer skills and student engagement and instructional strategies. This strong relationship suggests resources for online teaching professional learning for teachers should focus on strategies to develop and facilitate student engagement as well as support online computer skills and instructional strategies for teachers who are transitioning to teaching in an online teaching environment. Collaborative inquiry focuses on the needs of the learner and engages the learner by employing a learner-driven approach through collaborative knowledge construction (van Oostveen et al., 2018). According to Akyol and Garrison (2010), interaction and collaboration in an online learning environment are important elements in the learning process that supports a constructivist view of learning. van Oostveen et al. (2018) argue that a learner-centred collaborative online learning environment (COLE) model for teacher PD has the potential to change teachers' beliefs about learning by changing the online learning experience for teachers and facilitating constructivist aspects of learning and providing an opportunity to experience new pedagogies that challenge traditional notions of teaching and support the development of effective online teaching strategies. Tondeur et al. (2017) suggest long-term PD should build on pre-service teacher education and beliefs reinforced through ongoing collaborative inquiry.

Limitations

There are a number of limitations to this study that are important to note. The first and most obvious is the effect the pandemic had on teachers' and students' anxiety and stress levels as well as their reported sense of isolation and detachment from the familiar and supportive environment of a school community. Panisoara et al. (2020) studied the influence of emotional and motivational experiences on their *continuance intention* (CI) to teach online during the COVID-19 pandemic. The study highlighted significant links between cognitive-affective factors in an unstable work context including intrinsic motivation influences, occupational stress, CI for online teaching, burnout, and technostress. Panisoara et al. (2020) found that teachers used digital resources but were concerned with the content knowledge associated with their field in order to do their job. According to Panisoara and colleagues, teachers perceived teaching as an obligation rather than an intrinsic desire to teach. Given the uncontrollable workplace, teachers responded by controlling what they could regarding the stress of imposed online teaching. Further study on the impact stress and anxiety from imposed teaching online on teacher self-efficacy for online teaching needs to be explored.

Our results may not be generalizable beyond the sample population. The study sample of secondary teachers within one board may not be reflective of secondary teachers, let alone all teachers across Ontario or even more broadly. The primary researcher's relationship to other secondary teachers in the board as a fellow teacher may have contributed to respondent bias

already inherent to self-reporting. Although anonymity was provided for respondents, many respondents may know the researcher and participated for that reason rather than reflecting a true random sample.

The data collected reflect the initial stages of teachers' self-efficacy for teaching in a new online environment during a period of uncertainty and shifting direction from the Ministry of Education as the response to the pandemic unfolded. While it is unclear what teacher confidence for online teaching would be like as education resumes in whatever form it takes, the transition to using online learning environments will continue and teachers will have to be supported. Further study that measures efficacy for online teaching and considers teacher perception of student learning and desire to teach online would be useful in ongoing efforts to support teachers and student learning.

Conclusion

The need to develop online learning has become a priority for elementary and secondary schools in Ontario and internationally. Although many teachers hope for a return to the classroom and *normalcy*, the reality is that education has changed, and online learning will be an integral part of secondary education. Online skills for instruction and design of online learning environments are and will be an important aspect of teacher pre-service or initial teacher education and ongoing teacher professional learning. Understanding that in-service teachers need the resources and training to transition to online teaching can start with providing access to virtual tech support and ongoing support for using LMS as part of their day-to-day teaching. PD also needs to look long term, providing teachers with the means to design and provide meaningful and engaging learning experiences for students in online learning environments. Archambault and Kennedy (2014) and other researchers (e.g., Davis & Rose, 2007; Lowes, 2007) advocate for specific teacher preparation in the areas of online pedagogy and student support strategies. The authors point out the need for longitudinal studies of pre-service preparation for K-12 online learning programs. With the reality of a new need for designing and implementing effective online learning environments, teacher PD and ongoing professional learning will have to adapt to better support the new reality.

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