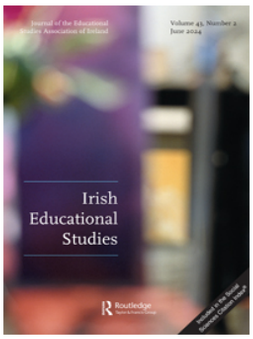


Irish Educational Studies

ISSN: (Print) (Online) Journal homepage: www.tandfonline.com/journals/ries20

# Illusions of online readiness: the counter-intuitive impact of rapid immersion in digital learning due to COVID-19

Jason Power, Paul Conway, Ciarán Ó Gallchóir, Ann-Marie Young & Michaela Hayes

**To cite this article:** Jason Power, Paul Conway, Ciarán Ó Gallchóir, Ann-Marie Young & Michaela Hayes (2024) Illusions of online readiness: the counter-intuitive impact of rapid immersion in digital learning due to COVID-19, Irish Educational Studies, 43:2, 263-280, DOI: 10.1080/03323315.2022.2061565

**To link to this article:** https://doi.org/10.1080/03323315.2022.2061565



Published online: 17 Apr 2022.

IRISH EDUCATIONAL STUDIES
2024, VOL. 43, NO. 2, 263–280
https://doi.org/10.1080/03323315.2022.2061565

Routledge
Taylor & Francis Group



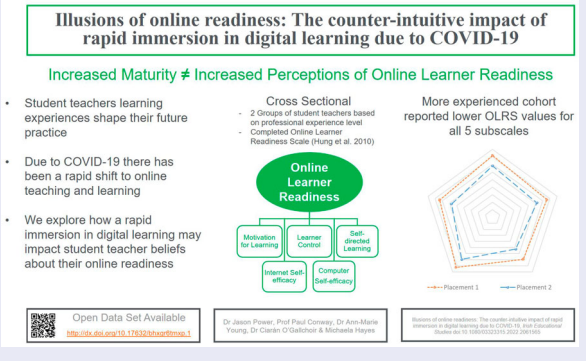
# Illusions of online readiness: the counter-intuitive impact of rapid immersion in digital learning due to COVID-19

Jason Power, Paul Conway, Ciarán Ó Gallchóir, Ann-Marie Young and Michaela Hayes

Faculty of Education and Health Sciences, School of Education, University of Limerick, Limerick, Ireland

**ABSTRACT**

Framed from a socio-cognitive perspective, and the contemporary increased salience of digital learning readiness and competence, the purpose of this study was two-fold: to validate Online Learner Readiness Scale in a new context and to explore potential variances in online readiness within a student-teacher population between less (pre-COVID) and more experienced (during COVID) groups. A CFA was used to examine the suitability of the OLRS in an Irish context, and variances between groups based on gender and professional experience were explored. Two cross-sectional datasets were gathered from student teachers from a university teacher education programme in the Republic of Ireland ($n_1 = 281$, $n_2 = 154$). The analysis demonstrated significantly lower perceived online readiness in the more experienced 'during COVID' cohort compared to 'pre-COVID' cohort. This counter-intuitive finding is in direct contrast to prior research, and potential influencing factors include the sudden immersion in an entirely digital learning environment. The more experienced cohort reported significantly lower online readiness across all five components of the OLRS. The findings are discussed in the context of a major shift in the student-teacher learning experience due to COVID-19. Implications for future research are explored in the context of increasingly digitised teaching and learning environments during and after the COVID-19 pandemic.




**ARTICLE HISTORY**
Received 4 November 2021
Accepted 17 February 2022

**KEYWORDS**
Online learner readiness; self-efficacy; teacher education; COVID-19; student teacher; digital competence

**CONTACT** Jason Power jason.power@ul.ie

## Introduction

As a response to the COVID-19 pandemic, universities and schools around the world have expedited their adoption of blended and online teaching (Watermeyer et al. 2020). We can say with some assurance that this has led to an unprecedented rise in the salience of digital learning readiness and competence around the world in education at all levels. Looking beyond the current crisis, it is highly likely that an increased use of online methods will remain after the pandemic has passed due to a number of factors including the significant learning globally from student teachers (OECD 2021) as well as the scalability and cost benefits of online delivery models (Bates 1997; Panigrahi, Srivastava, and Sharma 2018). 'The issue is no longer whether or not online learning is or should occur, but rather how it is implemented' (Hathaway and Norton 2012, 146). This change toward more systemic adoption of digital-based learning raises concerns relating to engagement and retention, which are now primary concerns, arguably not only for teacher education programmes but higher education institutions worldwide, especially during and after the pandemic (Rashid and Yadav 2020; Rapanta et al. 2021; Kara 2021). This is of particular concern to teacher educators as the direct effects on student teachers learning experience are clear. In addition, the secondary effects that these future teachers will have in increasingly digitised classrooms are likely influenced by their own online readiness (Hathaway and Norton 2012).

Online learner readiness has been a topic of interest for educators and developers since the initial creation of online learning systems (Warner, Christie, and Choy 1998). A key component of online readiness is the ability to self-regulate within an online learning environment. Zimmerman (1990) describes how learners can impact their own learning through meta-cognitive and behavioural mechanisms. This capacity to self-regulate should not be assumed, and educators should actively seek to develop this capacity in students in order to mitigate the previously outlined common limiting factors associated with online learning (Zimmerman, Bonner, and Kovach 1996; Lock, Eaton, and Kessy 2017). The increased requirement for students to self-regulate in online learning alters the teacher/student dynamic. The role of the teacher moves towards that of a facilitator who is periodically present to guide. This, in turn, emphasises the need for the learner to exert a level of control over how and what they learn (Lock, Eaton, and Kessy 2017). These concepts of self-regulation and learner control are closely linked to self-efficacy (Bates and Khasawneh 2007; Joo, Lim, and Kim 2013) and are compatible with the broader social cognitive theory within which self-efficacy was developed (Schunk 2001; Bandura 2005). Research suggests that considerable gender differences are evident in self-regulation constructs across numerous settings (MacPhee, Farro, and Canetto 2013). These gender-based differences have been observed in computer user self-efficacy (Cassidy and Eachus 2002) and in research specifically examining online learner readiness of University students (Chung, Subramaniam, and Dass 2020). However, findings related to the potential impact of gender remain inconsistent (Hung et al. 2010), and as such, it should be considered within study designs seeking to further understanding the development of online learner readiness.

He (2014) argues, based on a study of a teacher education module, that experience of well-designed online learning structures has been linked with increased student-teacher self-efficacy to learn, and subsequently teach, within online structures. This highlights

online readiness as being especially important for student teachers as it not only governs their learning within degree programmes but is also linked to their future practice within digital and blended learning environments. The issue of digital learning in teacher education has garnered considerable attention over the last decade (Dyment and Downing 2020), with Graziano and Feher (2016) suggesting that student teachers should experience wholly digital learning within university during their studies. They argue that this would have multiple meta-cognitive benefits and prepare student teachers for later design and development of learning experiences. The focus of the current study centres on the development of student online readiness throughout a period where they exclusively engage with their degree programme through digital learning.

The COVID pandemic has in less than one year made this desired immersion within a predominantly digital learning environment a reality for teacher education programmes around the world. Across Europe and the rest of the world, teacher educator institutions have rapidly adopted online and blended delivery models. However, this also raises concerns. The rapid adoption of these digital methods may result in less effective practices being used as third-level educators adapt to new systems. This again highlights the need to consider student-teacher beliefs surrounding their readiness to learn online and how it may relate to course design and learner experience (He 2014). As we strive to enhance self-regulation, teacher education programmes are recognising that '[e]fficacy beliefs about learning may be especially important for democratic teaching, which often suggests that teachers be model learners for their students' (Wheatley 2005, 750). This is doubly true for teacher educators as student teachers will inform their future classroom practice by their experience in teacher education programmes.

Muljana and Luo (2019) conducted a systematic review categorising factors that influence student retention in online learning structures at institutional level, instructor level and student level. Although the focus of the current study centres on student-level factors, this focus is designed to provide insight into how these may be influenced by changes at the institutional and instructor level. Of the multitude of factors studied, Muljana and Luo (2019) suggest that motivation, and associated constructs, can be considered the primary as it is linked to persistence and engagement (Shaw, Burrus, and Ferguson 2016; Eliasquevici, Rocha Seruffo, and Resque 2017). A meta-analysis conducted by Martin, Sun, and Westine (2020) outlines the consistent increase in research examining these student-level factors over the last two decades as researchers seek to tackle issues around engagement and performance in online learning environments. The authors of the current study align with the position of Wladis and Samuels (2016) who stress that the utility of measures of readiness, or similar student-level factors, is limited but can be used effectively for internal comparisons, such as between groups or within groups enrolled on the same programme. These can be particularly useful where major course redevelopments have taken place, or, as is the case in the current COVID-19 external factors have caused a significant change in the student learning experience and warrant further examination. Data gathered from this level will serve to inform future programme development and institutional policy, as outlined in Figure 1.

Broadly speaking, constructs associated with student motivation are considered to be the most important when considering student retention or performance in online learning (Muljana and Luo 2019). This is reflected in the volume of research examining related

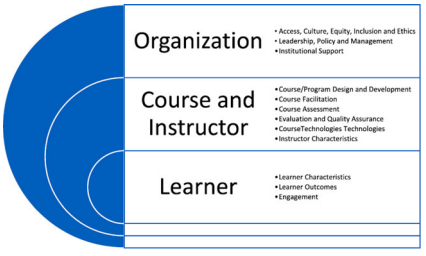



**Figure 1.** Interplay of levels taken from Martin, Sun, and Westine (2020, 2).

topics (Martin, Sun, and Westine 2020). However, it should be noted that no single variable can adequately represent student motivation, and there exists considerable debate surrounding attempts to measure such constructs (Pintrich, Schunk, and Meece 2013). Acknowledging debates around construct validity and scale design, it is worth noting the utility of these types of constructs in terms of predictive value when considering online engagement and performance (Means et al. 2009; Kauffman 2015; Wong et al. 2019). This broad consensus of predictive value, but also the need to incorporate multiple constructs prompted the selection of the Online Learner Readiness Scale (OLRS) (Hung et al. 2010) for this exploratory study. The OLRS was originally designed for use with university students in Taiwan. The scale is comprised of five components: Computer/Internet Self-efficacy, Self-directed Learning, Learner Control, Motivation for Learning and Online Communication Self-efficacy. Hung et al. (2010) utilise the definition of Online Learner Readiness originally proposed by Warner, Christie, and Choy (1998), who suggest that Online Learner Readiness is adequately represented by three components: (1) student's preferences for delivery medium, (2) student perceived competence and confidence to engage with the digital learning environment and (3) ability to self-regulate. This conceptualisation was later built upon by McVay (2000). This conceptualisation is compatible with broader self-regulation research and is particularly aligned with self-efficacy theory due to its domain-specific construction (Bandura 2012) within the Hung et al. (2010) scale. In establishing the broader theoretical foundation of this research, the remainder of the literature review has been structured to examine the components of the Online Learner Readiness Scale used in this study (Hung et al. 2010).

## Components of the Online Learner Readiness Scale

### *Self-directed learning*

A self-directed learner is an individual who takes responsibility to understand their own learning needs, identifies suitable learning supports and resources, creates their own learning goals, identifies suitable learning strategies, implements these strategies and evaluates their own learning (Knowles 1975). A meta-analysis by Edmondson, Boyer, and Artis (2012) suggests that self-directed learning is associated with academic performance as well as a host of other positive learner traits, including future aspirations, creativity and curiosity. Further links have been observed between self-directed learning, self-efficacy, locus of control and motivation (Boyer et al. 2014), each of which relates to latent variables within the Online Learner Readiness Scale (Hung et al. 2010).

### Motivation for Learning

Many models of motivation, as it pertains to student learning, have been proposed (Pintrich 1999; Lazowski and Hulleman 2016), and debate continues regarding its links to other widely studied constructs. Motivation has been strongly linked to learning performance and self-directed learning (Pintrich and Zusho 2002; Schunk and Zimmerman 2012; Pintrich 1999). While debate surrounding the theoretical distinctions between motivation and related constructs continues, the predictive value of the construct for performance remains relatively consistent (Cerasoli, Nicklin, and Ford 2014). Learners who report high levels of motivation are also likely to report increased self-efficacy, resilience and ultimately tend to perform to a higher level in a wide range of activities (Pintrich and Zusho 2002; Zimmerman and Schunk 2011).

### Learner Control

Through design, and the affordances of platforms used, online learning tends to provide greater flexibility for how a user chooses to engage in the learning process (Kauffman 2015). This can include time of engagement, sequence and review of challenging topics. An individual's sense of control over how they learn has positive links to persistence, self-efficacy and learner satisfaction (Joo, Lim, and Kim 2013; Panigrahi, Srivastava, and Sharma 2018). This freedom to engage with a platform as the user chooses has implications for self-efficacy vis-à-vis the platform itself, but also for self-efficacy related to online communication. These are the final two components of the OLRS.

### Computer and Internet Self-efficacy

Self-efficacy refers to an individual's belief in their capacity to complete actions successfully within a given domain (Bandura 1977). In the context of computer and internet self-efficacy, as characterised in this scale, this component focuses on an individual's belief that they can successfully utilise the primary functions of the relevant online learning platform. This has clear links with prior components as a lack of belief in an ability to navigate the online learning space would have obvious negative impacts on Learner Control, Self-directed Learning and Motivation for Learning (Honicke and Broadbent 2016; Usher and Pajares 2008). In the broader literature, a considerable amount of work has explored the relationship between self-efficacy and these components, from the seminal work of Bandura (1982) examining links between agency and self-efficacy to more recent focused meta-analyses examining self-efficacy's links to effective teaching (Klassen and Tze 2014; Talsma et al. 2018).

### Online Communication Self-efficacy

As distinct from the previous self-efficacy component, which considers an individual's belief in their ability to successfully navigate a system, Online Communication Self-efficacy refers to an individual's ability to successfully communicate with others using the inbuilt features of the platform. It is entirely possible that an individual could have low self-efficacy for platform use while exhibiting high self-efficacy for video-based

communication. This reflects the domain specificity of self-efficacy, and examination at this level of granularity is core to understanding its utility as a construct in various applications (Bandura 2006, 2012).

## Research method

Having established the theoretical suitability and value of the Online Learner Readiness Scale, this paper aims to (i) validate the OLRS in a new socio-cultural context and (ii) assess differences, if any, in OLR at two points of professional development. Our research questions are

(1) To what extent, if at all, is the Online Learner Readiness Scale valid in a student teacher population within an Irish cultural context?
(2) How, if at all, do reports of Online Learner Readiness vary based on point within programme?
(3) How, if at all, do reports of Online Learner Readiness vary based on programme type (Undergraduate/Postgraduate)?
(4) How, if at all, do reports of Online Learner Readiness vary based on gender?

### *Context and Participants*

Participants were drawn from teacher education programs within a University in the Republic of Ireland. These included undergraduate students who were enrolled in concurrent teacher education degree programmes across multiple disciplines (Technology, Sciences, Physical Education, Maths and Languages) and postgraduate students who were completing a Professional Masters in Education (PME) across multiple disciplines (Technology, Sciences, Physical Education, Maths, Music and Languages). Student teachers were invited to complete the Online Learning Readiness Scale (Hung et al. 2010) prior to their first school placement, resulting in a response rate of 70% ($n = 281$). The second group was invited to complete the same scale prior to their second school placement resulting in a response rate of 56% ($n = 154$). Sample sizes across the level of degree programme and gender are outlined in Table 1. Due to the condensed programme design of the Professional Master's course of study, postgraduate participants were drawn from

**Table 1.** OLR scores across gender and experience level.

| | Placement 1 | Placement 2 | Total |
|---|---|---|---|
| *Male* | | | |
| Undergraduate | 137 | 61 | 198 |
| Postgraduate | 13 | 23 | 36 |
| Total | 150 | 84 | 234 |
| *Female* | | | |
| Undergraduate | 109 | 36 | 145 |
| Postgraduate | 22 | 31 | 53 |
| Total | 131 | 67 | 198 |
| *Total* | | | |
| Undergraduate | 246 | 97 | 343 |
| Postgraduate | 35 | 54 | 89 |
| Total | 281 | 154 | 432 |

**Table 2.** Age categories.

| Program level | | | Cohort | | Total |
|---|---|---|---|---|---|
| | | | Placement 1 | Placement 2 | |
| Undergraduate | Age | 20–25 | 238 | 92 | 330 |
| | | 26–30 | 5 | 4 | 9 |
| | | 31–35 | 3 | 0 | 3 |
| | | 36–40 | 0 | 1 | 1 |
| | | 41–45 | 0 | 1 | 1 |
| | Total | | 246 | 98 | 344 |
| Postgraduate | Age | 20–25 | 19 | 28 | 47 |
| | | 26–30 | 10 | 15 | 25 |
| | | 31–35 | 4 | 5 | 9 |
| | | 36–40 | 0 | 2 | 2 |
| | | 41–45 | 1 | 2 | 3 |
| | | 46–50 | 1 | 2 | 3 |
| | Total | | 35 | 54 | 89 |

the same overall student population. As such, data from the same PME cohort of students was gathered in Spring and Autumn 2020; whereas in the case of the undergraduate students, two separate cohorts responded to the survey in the Spring and Autumn of 2020, respectively.

The age categories of participants are outlined in Table 2.

### *Instrument*

The Online Learning Readiness Scale (Hung et al. 2010) was deployed without modification. It consists of 18 items and is comprised of five latent variables (Self-directed learning, Learner Control, Motivation for Learning, Computer/Internet self-efficacy and Online Communication Self-efficacy). For each item, participants enter their level of agreement using a 5-point Likert scale (1: Strongly Disagree, 2: Disagree, 3: Neutral, 4: Agree, 5: Strongly Agree).

## Results

### *To what extent is the Online Learner Readiness Scale valid in a new context for the specified population and context?*

The dataset on which the following results are based is available on an open-access server for review or secondary use [Redacted for review, DOI provided on title page]. Confirmatory Factor Analysis was used to evaluate the model initially presented by Hung et al. (2010). While the chi-square value = 341.79 ($p < .001$) suggests a poor fit, this should be considered in light of the sample size (Schermelleh-Engel, Moosbrugger, and Müller 2003; French and Finch 2006). Given $X^2$/df is a more widely accepted expression of fit with values below five deemed acceptable and below three desirable, an $X^2$/df = 2.734 observed in this application suggests that the

**Table 3.** Model fit indices.

| $X^2$ | Df | $X^2$/df | RMSEA | CFI | TLI |
|---|---|---|---|---|---|
| 341.79 | 125 | 2.73432 | 0.063 | 0.93 | 0.904 |

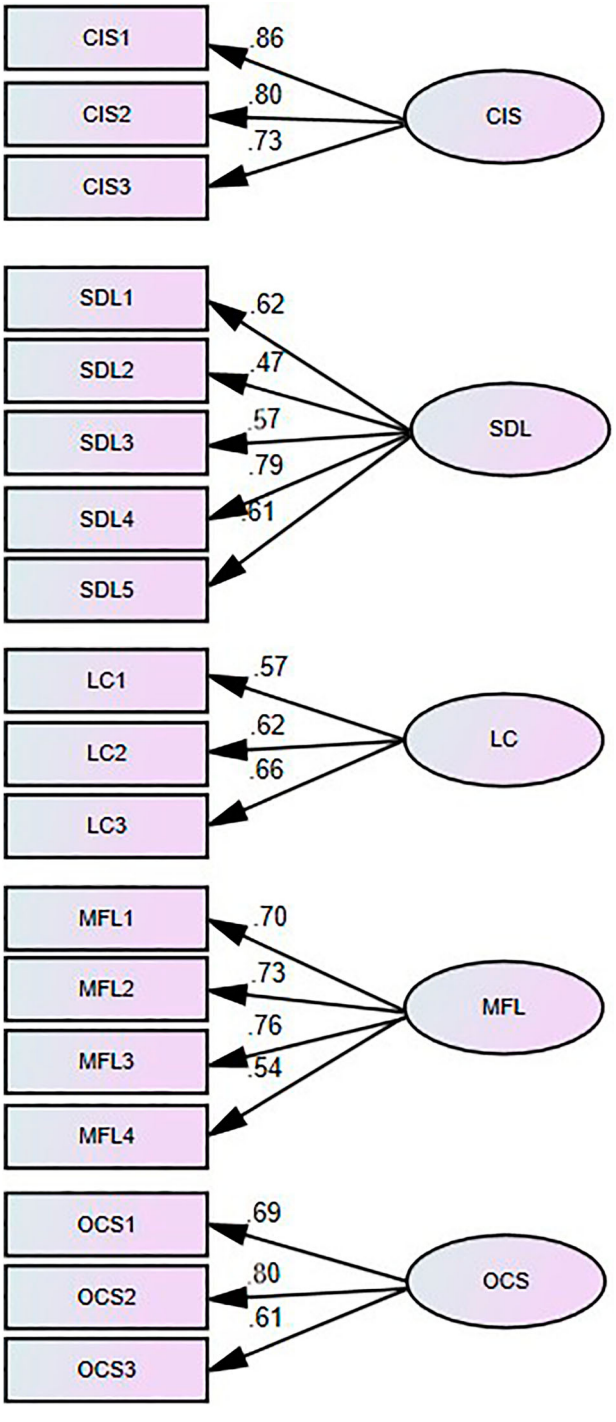



**Figure 2.** Standardised coefficient model for the online readiness scale.

model may be a suitable fit (Browne and Cudeck 1993; MacCallum, Browne, and Sugawara 1996). These evaluations are considered essential in the current application as previous deployments of this scale took place in markedly different populations and

contexts (Demir Kaymak and Horzum 2013; Hung et al. 2010). Additional indices for model fit are outlined in Table 3, and all fall within acceptable limits, further supporting the original model's structure as suitable for the current application.

As shown in Figure 2, each item demonstrated a loading between 0.47 and 0.84 on their respective factors with all loadings being statistically significant. The combined model testing results suggest construct validity in this application and align with values reported in the original development of the OLRS (Hung et al. 2010).

### How do reports of Online Learner Readiness vary based on program type (Undergraduate/Postgraduate)?

Between groups T-tests were used to examine possible differences between undergraduates and postgraduates at both time points. A between groups T-test examining reports of Online Learner Readiness prior to participant's first placement showed a significant difference between undergraduate ($M = 3.05$, SD = .301) and postgraduates ($M = 3.19$, SD = .264), $t(279) = 2.492$, $p = 0.013$. This should be considered alongside the relatively small difference in means, and a Cohen's $d$ effect size of 0.29. Similarly, a between groups T-test Online Learner Readiness prior to participant's second placement showed a significant difference between undergraduate ($M = 2.389$, SD = .453) and postgraduates ($M = 2.634$, SD = .28), $t(150) = 3.594$, $p < .001$, yielding a Cohen's $d$ effect size of 0.401.

### How do reports of online learner readiness vary based on point within programme?

Significant differences were observed in all five OLRS components when comparing student teachers who were about to complete their first placement and student teachers about to complete their second placement. Associated data, between groups T-test results and effect sizes are shown in Table 4.

The differences in each component of the OLRS between experience groups are also represented graphically in Figure 3.

A further breakdown of individual OLRS component at different experience points is presented in Table 5.

### How do reports of online learner readiness vary based on gender?

Noting established significant differences based on the experience level, gender comparisons are evaluated within each experience group using an independent samples T-test. A

**Table 4.** OLR scores across experience groups.

| | Experience | *N* | *M* | *D* | *t* | *p* | $\eta^2$ |
|---|---|---|---|---|---|---|---|
| Computer/internet self-efficacy | Placement 1 | 281 | 4.0991 | .56306 | 10.842 | .000 | .216 |
| | Placement 2 | 52 | 3.4189 | .72127 | | | |
| Self-directed learning | Placement 1 | 81 | 3.7877 | .44473 | 13.310 | .000 | .291 |
| | Placement 2 | 52 | 3.0961 | .62740 | | | |
| Learner control | Placement 1 | 81 | 3.4597 | .53206 | 13.863 | .000 | .311 |
| | Placement 2 | 52 | 2.6294 | .69641 | | | |
| Motivation for learning | Placement 1 | 81 | 4.1201 | .40118 | 14.026 | .000 | .315 |
| | Placement 2 | 52 | 3.4786 | .53900 | | | |
| Online communication self-efficacy | Placement 1 | 281 | 3.6904 | .57445 | 12.093 | .000 | .253 |
| | Placement 2 | 152 | 2.8553 | .85495 | | | |

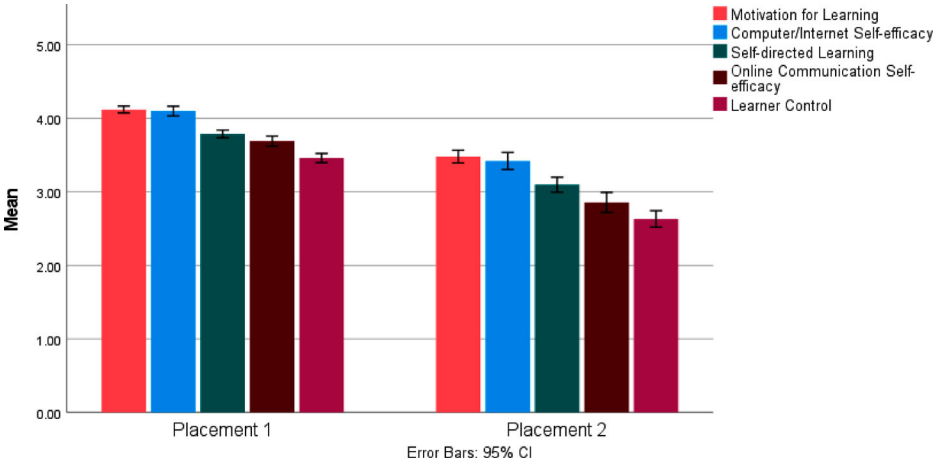



**Figure 3.** OLRS components across experience groups.

statistically significant difference in Self-directed Learning values was observed in the Placement 1 group between males ($M = 3.7647$, SD = .46763) and females ($M = 3.8141$ SD = 0.41719), $t(149) = 3.165$, $p = 0.002$, with an associated medium effect size ($\eta^2 = 0.063$) (Maher, Markey, and Ebert-May 2013). Similarly, a statistically significant difference in Motivation for Learning was observed in the Placement 2 group when comparing between Males ($M = 3.444$, SD = .56208) and Females (M = 4.2042, $SD = .38009$) with a small effect size ($\eta^2 = 0.052$) (Maher, Markey, and Ebert-May 2013). No other within-group comparisons across gender showed significant differences. Individual group means are presented within Table 6.

A graphical comparison of OLR reports based on two professional time points is presented in Figure 4.

## Discussion

Scale validation is important and often challenging across different national and socio-cultural contexts. Confirmatory Factor Analysis was identified as suitable and necessary to ensure the scale remained valid within this unique deployment (Boateng et al. 2018).

**Table 5.** Postgraduate comparisons of OLRS and experience.

| Experience | | Computer/internet self-efficacy | Self-directed learning | Learner control | Motivation for learning | Online communication self-efficacy |
|---|---|---|---|---|---|---|
| Placement 1 | *M* | 4.2952 | 3.9371 | 3.6476 | 4.2000 | 3.8095 |
| | *n* | 35 | 35 | 35 | 35 | 35 |
| | *SD* | .40237 | .48208 | .41178 | .45697 | .56178 |
| Placement 2 | *M* | 3.6235 | 3.2481 | 2.8272 | 3.6204 | 3.0988 |
| | *n* | 54 | 54 | 54 | 54 | 54 |
| | *SD* | .45808 | .55209 | .67523 | .41703 | .60615 |
| Total | *M* | 3.8876 | 3.5191 | 3.1498 | 3.8483 | 3.3783 |
| | *n* | 89 | 89 | 89 | 89 | 89 |
| | *SD* | .54575 | .62284 | .70891 | .51624 | .68200 |

**Table 6.** Subscale means across groups.

| Cohort | Gender | | Computer/ internet self-efficacy | Self-directed learning | Learner control | Motivation for learning | Online communication self-efficacy |
|---|---|---|---|---|---|---|---|
| Placement 1 | Male | *M* | 4.0989 | 3.7647 | 3.4644 | 4.0467 | 3.6789 |
| | | *n* | 150 | 150 | 150 | 150 | 150 |
| | | *SD* | .59047 | .46763 | .55246 | .40590 | .53828 |
| | Female | *M* | 4.0992 | 3.8141 | 3.4542 | 4.2042 | 3.7036 |
| | | *n* | 131 | 131 | 131 | 131 | 131 |
| | | *SD* | .53220 | .41719 | .50976 | .38009 | .61508 |
| | Total | *M* | 4.0991 | 3.7877 | 3.4597 | 4.1201 | 3.6904 |
| | | *n* | 281 | 281 | 281 | 281 | 281 |
| | | *SD* | .56306 | .44473 | .53206 | .40118 | .57445 |
| Placement 2 | Male | *M* | 3.4087 | 2.9548 | 2.6310 | 3.4494 | 2.9008 |
| | | *n* | 84 | 84 | 84 | 84 | 84 |
| | | *SD* | .70064 | .67617 | .62311 | .56208 | .88082 |
| | Female | *M* | 3.4229 | 3.2716 | 2.6169 | 3.5075 | 2.7960 |
| | | *n* | 67 | 67 | 67 | 67 | 67 |
| | | *SD* | .75340 | .51839 | .78336 | .51118 | .83071 |
| | Total | *M* | 3.4150 | 3.0954 | 2.6247 | 3.4752 | 2.8543 |
| | | *n* | 151 | 151 | 151 | 151 | 151 |
| | | *SD* | .72210 | .62943 | .69634 | .53910 | .85771 |

The Confirmatory Factor Analysis suggests that the OLRS is an appropriate scale to use in the Irish context in addressing online learning readiness. The scale construction along five sub-scales provides the basis for understanding online learning readiness in terms of higher education student self-regulation, motivation, learner control as well as perceived confidence/efficacy in relation to engagement with the Internet, computer use and communication in online environments. All these dimensions – as represented in the sub-

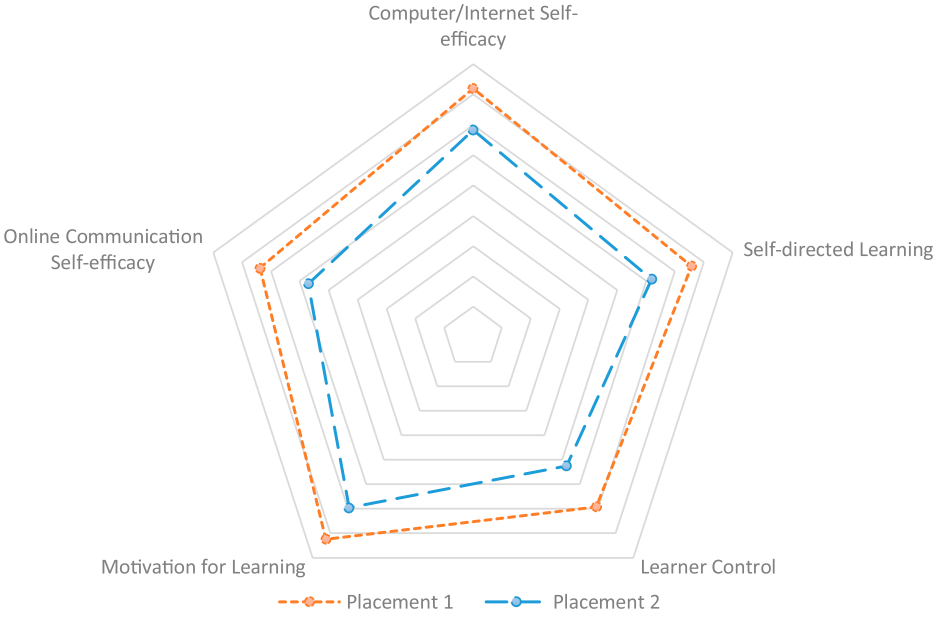



**Figure 4.** Comparisons of groups based on professional experience.

scales – provide important measures of online learning readiness as a multidimensional construct. In our case, it allowed us to compare between groups over time in the context of COVID-19, resulting in counter-intuitive findings with decrements rather than increments across all five sub-scales comparing the less experienced pre-COVID, in Spring 2020, with the more experienced cohort prior to placement during COVID in Autumn 2020. These differences between groups show significantly lower perceptions of online readiness for the more experienced group (see Figure 4).

This is in contrast to existing research that suggests that these perceptions should increase with maturity or experiences (Hung et al. 2010). Contrary to the findings of Hung et al. (2010), the current study does not support the supposition that 'maturity may play an important role in their monitoring, managing, control, and motivation relative to online learning' (p.1087). Or if it does play a role, it would appear to be less influential than the experience of online learning. Due to COVID-19, the more experienced group in this study completed one semester of all online learning within the university and was also aware of a rapid shift to online/blended learning in the second level, which they were about to enter. It is reasonable to assume that their rapid immersion in online learning spaces as a student prompted a re-evaluation of self-perceived competence or overall online readiness when confronted with advanced tasks across multiple platforms in an 'only digital' learning environment. Significantly, this aligns very well with self-efficacy theory and broader self-regulation research, which convincingly argues that increased experience within domains improves the accuracy of assessments of one's own capabilities (Burnette et al. 2013; Yokoyama 2019). In the case of 2020, the salience of digital learning, we think, has been altered in an unprecedented manner, and it is precisely this disruptive repositioning of digital learning's salience for learners that we believe explains this study's counter-intuitive findings in relation to perceived readiness. It is also possible that their knowledge of online and blended now being dominant delivery methods in the second level, which they were about to enter as part of their second placement, resulted in a more critical self-evaluation of readiness. Further research examining student-teacher experiences, relative to perceptions of competency, could provide valuable insight as teacher educators seek to optimise the design of teacher education programs. The optimisation of such structures has considerable potential benefit for the learner as links between teacher self-efficacy beliefs and teacher effectiveness have been noted in multiple studies (Klassen and Tze 2014).

The data from the current study identified no significant difference between postgraduate student teachers and undergraduate student teachers when compared at equivalent points of professional experience. There is a greater age gap between the postgraduate and undergraduate groups in this study when compared to Hung et al. (2010) contrast of Sophomore/Junior/Senior. Rather the data presented here suggests that the COVID19 induced disrupted learning experience of the student impacted the development of perceived online readiness to a greater degree. The consistent decrease across all components of the OLRS relative to professional experience groups is striking (see Figure 2). A statistically significant difference in Self-directed Learning values was observed in the Placement 1 group between females and males, medium effect size. Similarly, a statistically significant difference in Motivation for Learning, between genders,

was observed in the Placement 2 group, small effect size. These gender-based variances warrant further examination in future studies.

In contrast to the original work by Hung et al. (2010), the current study observed a significant difference across groups based on experience, with comparatively large effect sizes across all components (see Table 4) (Maher, Markey, and Ebert-May 2013). In addition, the standardised coefficient model suggests that the scale is suitable for use in this disparate socio-cultural context and retains a similar structure to that observed in its original use (Hung et al. 2010) (see Figure 2). Learner Control was the lowest reported component in both studies, and the relative ranking of each component was consistent across both studies. This should be a cause for concern as professional agency has been identified as essential for high performance within the complex role of the modern educator (Toom et al. 2017; Pietarinen et al. 2013) and is conceptually analogous to Learner Control. Similar to the findings of Hung et al. (2010), no significant differences in perceived online readiness were observed between genders. This is consistent with earlier research that did not identify differences in computer competency (Bunz, Curry, and Voon 2007) or online learning systems (Masters and Oberprieler 2004) across genders.

## Limitations and recommendations for future research

While the scale used in this study was adequately developed and demonstrated suitable reliability (Hung et al. 2010), these values should not be assumed when employing measures in contexts that are markedly different from their original application (Clark and Watson 2016). A more sophisticated design, including data related to student performance, would facilitate a closer examination of the Learner Control component, which demonstrates the lowest internal consistency of any of the components of the OLRS in this study and in the original validation study (Hung et al. 2010). Between groups comparisons provide valuable initial insight, but a repeated measures longitudinal study would provide further insight into the development of the various factors comprising the OLRS. A further benefit of this more sophisticated design would be the facilitation of comparisons between teacher disciplines. Comparisons between teacher disciplines were not possible in the current study due to sample size limitations and response rates. Future research could explore whether teachers from disparate disciplines report different perceived competencies. Further research using a longitudinal design that examines online learner readiness across participant's full degree path has the potential to provide further insight into the development of learner beliefs regarding readiness.

While significantly lower OLRS scores were reported by student teachers about to enter their second placement, compared to those about to enter their first placement, the current study cannot identify what factors are linked to this development. Further research using alternative designs and methods could shed light on whether these increases are due to altered learning experiences within their degree programme, knowledge of a second-level school teaching environment that was now drastically more digital in nature or, more likely, a combination of the two. Research that could examine self-estimates of online readiness, such as those reported in the current study, alongside measures of competency in the relevant online domains have the potential to provide data that could further enhance teacher education programme design. Solely quantitative

approaches have not provided answers regarding the nature of student-teacher efficacy development, suggesting that a mixed-methods approach may have increased utility for teacher educators (Wheatley 2005). This is especially important when considering the Learner Control component and its potential links with professional agency (Pietarinen et al. 2013).

While these limitations are noteworthy, the robust evidence outlining the validity and reliability of the OLRS suggests that it is a useful instrument as we continue to explore the implications of mass digital learning. The results suggest that the OLRS is a valid measure that is suitable for use in an Irish socio-cultural context. Teacher educators may see the findings of the present study as potentially informative and useful in providing insights on how best to support student teachers across a teacher education programme vis-à-vis digital learning. As outlined by Martin, Sun, and Westine (2020) (see Figure 1), these student factors exist within the domain of influence of the course and lecturer. As such teacher educators, in light of this study's findings, should consider online learning elements within initial teacher education modules and across broader programme structures. When combined with suitable capacity building, these changes have the potential to enhance student-teacher learning experiences within an increasingly digitised learning environment. Overall, the present study provides important evidence that digital learning readiness may follow a counter-intuitive learning trajectory. In addition, the study clarifies previous suppositions that age is a significant factor in OLR perceptions and instead suggests that experience is more critical when considering how individuals perceive their own capabilities when it comes to online learning.

## Statements on open data and ethics

The authors value open data and broader Open Science principles. The complete anonymised data set is referenced within the article and available through an open access server: https://doi.org/10.17632/bhxgr6tmxp.1

Ethical approval was awarded by the host institution.

## Disclosure statement

No potential conflict of interest was reported by the author(s).

## Notes on contributors

*Jason Power* currently leads a EU funded study that aims to enhance evidence based practice within third level STEM learning environments. Within this, and related nationally funded projects, he is leading an international team in the development of professional development programs, synthesised evidence bases and associated supporting resources. His previous research has focused on non-cognitive factors and their relationship to performance within STEM learning environments.

*Paul Conway* is a Professor in the School of Education at the Univerity of Limerick. His reserch interests are in: learning and development, teacher education, educational policy (in two areas: e-learning; teacher education) and teacher learning.

*Ciarán Ó Gallchóir* is a Lecturer in the School of Education at the University of Limerick. He teaches on the school's initial teacher education programmes and postgraduate programmes in educational leadership. His research interests are identity development, school placement and educational leadership.

*Ann-Marie Young* is the Academic Director of School Placement in the School of Education at the University of Limerick. Her research interests include initial teacher education with a focus on the development of the school placement process. Specifically looking at the role each of the key stakeholders play in the development of student teachers.

*Michaela Hayes* is the School Placement Research Assistant and PhD Candidate in the School of Education at the University of Limerick. Her research interests include initial teacher education, school placement and mentorship within teacher education.

## ORCID

*Jason Power* http://orcid.org/0000-0002-9082-7380
*Paul Conway* http://orcid.org/0000-0002-6513-7310
*Ciarán Ó Gallchóir* http://orcid.org/0000-0003-1423-947X
*Ann-Marie Young* http://orcid.org/0000-0003-1050-7924
*Michaela Hayes* http://orcid.org/0000-0002-3207-988X

## References

Bandura, Albert. 1977. "Self-Efficacy: Toward a Unifying Theory of Behavioral Change." *Psychological Review* 84 (2): 191–215. doi: 10.1037/0033-295X.84.2.191.

Bandura, Albert. 1982. "Self-Efficacy Mechanism in Human Agency." *American Psychologist* 37 (2), doi: 10.1037/0003-066X.37.2.122.

Bandura, Albert. 2005. "Evolution of Social Cognitive Theory." In *Great Minds in Management*, edited by Ken G. Smith and Michael A. Hitt, 9–35. Oxford: Oxford University Press.

Bandura, Albert. 2006. "Guide for Constructing Self-Efficacy Scales." In *Self-Efficacy Beliefs of Adolescents*, edited by Frank Pajares, and Tim Urdan, 307–337. Greenwich, CT: Information Age Publishing.

Bandura, Albert. 2012. "On the Functional Properties of Perceived Self-Efficacy Revisited." *Journal of Management* 38 (1): 9–44. doi: 10.1177/0149206311410606.

Bates, Tony. 1997. *Restructuring the University for Technological Change, What Kind of University?* London: Murdoch University.

Bates, Reid, and Samer Khasawneh. 2007. "Self-Efficacy and College Students' Perceptions and use of Online Learning Systems." *Computers in Human Behavior* 23 (1): 175–191. doi: 10.1016/j.chb.2004.04.004.

Boateng, Godfred O., Torsten B. Neilands, Edward A. Frongillo, Hugo R. Melgar-Quiñonez, and Sera L. Young. 2018. "Best Practices for Developing and Validating Scales for Health, Social, and Behavioral Research: A Primer." *Frontiers in Public Health* 6 (149), doi: 10.3389/fpubh.2018.00149.

Boyer, Stefanie L, Diane R Edmondson, Andrew B Artis, and David Fleming. 2014. "Self-Directed Learning: A Tool for Lifelong Learning." *Journal of Marketing Education* 36 (1): 20–32. doi: 10.1177/0273475313494010.

Browne, M. W., and R. Cudeck. 1993. "Alternative Ways of Assessing Model Fit." In *Testing Structural Equation Models*, edited by K. A. Bollen and J. S. Long, 136–162. Newbury Park, CA: Sage.

Bunz, Ulla, Carey Curry, and William Voon. 2007. "Perceived Versus Actual Computer-Email-Web Fluency." *Computers in Human Behavior* 23 (5): 2321–2344. doi: 10.1016/j.chb.2006.03.008.

Burnette, Jeni L, Ernest H O'Boyle, Eric M VanEpps, Jeffrey M Pollack, and Eli J Finkel. 2013. "Mind-Sets Matter: A Meta-Analytic Review of Implicit Theories and Self-Regulation." *Psychological Bulletin* 139 (3): 655–701. doi: 10.1037/a0029531.

Cassidy, Simon, and Peter Eachus. 2002. "Developing the Computer User Self-Efficacy (CUSE) Scale: Investigating the Relationship Between Computer Self-Efficacy, Gender and Experience with Computers." *Journal of Educational Computing Research* 26 (2): 133–153.

Cerasoli, Christopher P, Jessica M Nicklin, and Michael T Ford. 2014. "Intrinsic Motivation and Extrinsic Incentives Jointly Predict Performance: A 40-Year Meta-Analysis." *Psychological Bulletin* 140 (4): 980. doi: 10.1037/a0035661.

Chung, Ellen, Geetha Subramaniam, and Laura Christ Dass. 2020. "Online Learning Readiness among University Students in Malaysia Amidst COVID-19." *Asian Journal of University Education* 16 (2): 46–58.

Clark, L. A. and D. Watson. 1995. "Constructing Validity: Basic Issues in Objective Scale Development." *Psychological Assessment* 7 (3): 309–319.

Demir Kaymak, Zeliha, and Mehmet Baris Horzum. 2013. "Relationship Between Online Learning Readiness and Structure and Interaction of Online Learning Students." *Educational Sciences: Theory and Practice* 13 (3): 1792–1797. doi: 10.12738/estp.2013.3.1580.

Dyment, J. E., and J.J. Downing. 2020. "Online Initial Teacher Education: A Systematic Review of the Literature". *Asia-Pacific Journal of Teacher Education* 48 (3): 316–333. doi:10.1080/1359866X.2019.1631254.

Edmondson, Diane R, Stefanie L Boyer, and Andrew B Artis. 2012. "Self-Directed Learning: A Meta-Analytic Review of Adult Learning Constructs." *International Journal of Education Research* 7 (1): 40–48.

Eliasquevici, Marianne Kogut, Marcos César da Rocha Seruffo, and Sônia Nazaré Fernandes Resque. 2017. "Persistence in Distance Education: A Study Case Using Bayesian Network to Understand Retention." *International Journal of Distance Education Technologies (IJDET)* 15 (4): 61–78. doi: 10.4018/IJDET.2017100104.

French, B. F., and W. H. Finch. 2006. "Confirmatory Factor Analytic Procedures for the Determination of Measurement Invariance." *Structural Equation Modeling* 13 (3): 378–402. doi:10.1207/s15328007sem1303_3.

Graziano, Kevin J, and Lori Feher. 2016. "A Dual Placement Approach to Online Student Teaching." *Contemporary Issues in Technology and Teacher Education* 16 (4): 495–513.

Hathaway, Dawn, and Priscilla Norton. 2012. "An Exploratory Study Comparing Two Modes of Preparation for Online Teaching." *Journal of Digital Learning in Teacher Education* 28 (4): 146–149. doi: 10.1080/21532974.2012.10784695.

He, Ye. 2014. "Universal Design for Learning in an Online Teacher Education Course: Enhancing Learners' Confidence to Teach Online." *MERLOT Journal of Online Learning and Teaching* 10 (2): 283–298.

Honicke, Toni, and Jaclyn Broadbent. 2016. "The Influence of Academic Self-Efficacy on Academic Performance: A Systematic Review." *Educational Research Review* 17: 63–84. doi: 10.1016/j.edurev.2015.11.002.

Hung, Min-Ling, Chien Chou, Chao-Hsiu Chen, and Zang-Yuan Own. 2010. "Learner Readiness for Online Learning: Scale Development and Student Perceptions." *Computers & Education* 55 (3): 1080–1090. doi: 10.1016/j.compedu.2010.05.004.

Joo, Young Ju, Kyu Yon Lim, and Jiyeon Kim. 2013. "Locus of Control, Self-Efficacy, and Task Value as Predictors of Learning Outcome in an Online University Context." *Computers & Education* 62: 149–158. doi: 10.1016/j.compedu.2012.10.027.

Kara, Mehmet. 2021. "Revisiting Online Learner Engagement: Exploring the Role of Learner Characteristics in an Emergency Period." *Journal of Research on Technology in Education*, 1–17. doi: 10.1080/15391523.2021.1891997.

Kauffman, Heather. 2015. "A Review of Predictive Factors of Student Success in and Satisfaction with Online Learning." *Research in Learning Technology* 23, doi: 10.3402/rlt.v23.26507.

Klassen, Robert M, and Virginia MC Tze. 2014. "Teachers' Self-Efficacy, Personality, and Teaching Effectiveness: A Meta-Analysis." *Educational Research Review* 12: 59–76. doi: 10.1016/j.edurev.2014.06.001.

Knowles, Malcolm S. 1975. *Self-Directed Learning: A Guide for Learners and Teachers*. New Jersey: Prentice Hall.

Lazowski, Rory A, and Chris S Hulleman. 2016. "Motivation Interventions in Education: A Meta-Analytic Review." *Review of Educational Research* 86 (2): 602–640. doi: 10.3102/0034654315617832.

Lock, Jennifer, Sarah Elaine Eaton, and Elaine Kessy. 2017. "Fostering Self-Regulation in Online Learning in K-12 Education." *Northwest Journal of Teacher Education* 12 (2): 2. doi: 10.15760/nwjte.2017.12.2.2.

MacPhee, David, Samantha Farro, and Silvia Sara Canetto. 2013. "Academic Self-Efficacy and Performance of Underrepresented STEM Majors: Gender, Ethnic, and Social Class Patterns." *Analyses of Social Issues and Public Policy* 13 (1): 347–369.

Maher, J. M., J. C. Markey, and D. Ebert-May. 2013. "The Other Half of the Story: Effect Size Analysis in Quantitative Research." *CBE—Life Sciences Education* 12 (3): 345–351. doi: 10.1187/cbe.13-04-0082.

Martin, F., T. Sun, and C. D. Westine. 2020. "A Systematic Review of Research on Online Teaching and Learning from 2009 to 2018." *Computers & Education* 159: 104009. doi: 10.1016/j.compedu.2020.104009.

Masters, Ken, and Gudrun Oberprieler. 2004. "Encouraging Equitable Online Participation Through Curriculum Articulation." *Computers & Education* 42 (4): 319–332. doi: 10.1016/j.compedu.2003.09.001.

MacCallum, R. C., M. W. Browne, and H. M. Sugawara. 1996. "Power Analysis and Determination Of Sample Size For Covariance Structure Modeling." *Psychological Methods* 1 (2): 130.

McVay, Marguerita. 2000. *How to be a Successful Distance Learning Student: Learning on the Internet*. New York: Pearson Custom Pub.

Means, B., Y. Toyama, R. Murphy, M. Bakia, and K. Jones. 2009. *Evaluation of Evidence-Based Practices in Online Learning: A Meta-Analysis and Review of Online Learning Studies*. Retrieved from Washington, https://repository.alt.ac.uk/629/1/US_DepEdu_Final_report_2009.pdf.

Muljana, Pauline S, and Tian Luo. 2019. "Factors Contributing to Student Retention in Online Learning and Recommended Strategies for Improvement: A Systematic Literature Review." *Journal of Information Technology Education: Research* 18: 19–57. doi: 10.28945/4182.

OECD. 2021. *The State of Global Education: 18 Months into the Pandemic*. OECD Publishing, Paris. doi:10.1787/1a23bb23-en

Panigrahi, Ritanjali, Praveen Ranjan Srivastava, and Dheeraj Sharma. 2018. "Online Learning: Adoption, Continuance, and Learning Outcome—A Review of Literature." *International Journal of Information Management* 43: 1–14. doi: 10.1016/j.ijinfomgt.2018.05.005.

Pietarinen, Janne, Kirsi Pyhältö, Tiina Soini, and Katariina Salmela-Aro. 2013. "Reducing Teacher Burnout: A Socio-Contextual Approach." *Teaching and Teacher Education* 35: 62–72. doi: 10.1016/j.tate.2013.05.003.

Pintrich, Paul R. 1999. "The Role of Motivation in Promoting and Sustaining Self-Regulated Learning." *International Journal of Educational Research* 31 (6): 459–470. doi: 10.1016/S0883-0355(99)00015-4.

Pintrich, Paul R, and Akane Zusho. 2002. "Student Motivation and Self-Regulated Learning in the College Classroom." In *Higher Education: Handbook of Theory and Research*, edited by J. C. Smart, and W. G. Tierney, 55–128. Dordrecht: Springer.

Pintrich, Paul R, D. H. Schunk, and J. R. Meece. 2013. *Motivation in Education: Theory, Research, and Applications*. 4th ed. London: Pearson.

Rapanta, Chrysi, Luca Botturi, Peter Goodyear, Lourdes Guàrdia, and Marguerite Koole. 2021. "Balancing Technology, Pedagogy and the New Normal: Post-Pandemic Challenges for Higher Education." *Postdigital Science and Education* 3: 1–28.

Rashid, Shazia, and Sunishtha Singh Yadav. 2020. “Impact of Covid-19 Pandemic on Higher Education and Research.” *Indian Journal of Human Development* 14 (2): 340–343.

Schermelleh-Engel, K., H. Moosbrugger, and H. Müller. 2003. "Evaluating the Fit of Structural Equation Models: Tests of Significance and Descriptive Goodness-of-Fit Measures." *Methods of Psychological Research* 8(2): 23–74.

Schunk, D. H. 2001. “Social Cognitive Theory and Self-Regulated Learning.” In *Self-regulated Learning and Academic Achievement: Theoretical Perspectives*, edited by B. J. Zimmerman and D. H. Schunk, 121–151. Mahwah, NJ: Erlbaum.

Schunk, D. H., and Barry J Zimmerman. 2012. *Motivation and Self-Regulated Learning: Theory, Research, and Applications*. London: Routledge.

Shaw, Melanie, Scott Burrus, and Karen Ferguson. 2016. “Factors That Influence Student Attrition in Online Courses.” *Online Journal of Distance Learning Administration* 19 (3): 211–231.

Talsma, Kate, Benjamin Schüz, Ralf Schwarzer, and Kimberley Norris. 2018. “I Believe, Therefore I Achieve (and Vice Versa): A Meta-Analytic Cross-Lagged Panel Analysis of Self-Efficacy and Academic Performance.” *Learning and Individual Differences* 61: 136–150. doi: 10.1016/j.lindif.2017.11.015.

Toom, Auli, Janne Pietarinen, Tiina Soini, and Kirsi Pyhältö. 2017. “How Does the Learning Environment in Teacher Education Cultivate First Year Student Teachers’ Sense of Professional Agency in the Professional Community?” *Teaching and Teacher Education* 63: 126–136. doi: 10.1016/j.tate.2016.12.013.

Usher, Ellen L, and Frank Pajares. 2008. “Sources of Self-Efficacy in School: Critical Review of the Literature and Future Directions.” *Review of Educational Research* 78 (4): 751–796. doi: 10.3102/0034654308321456.

Warner, David, Gayre Christie, and Sarojni Choy. 1998. *Readiness of VET Clients for Flexible Delivery Including on-Line Learning*. Retrieved from VOCEDplus, http://hdl.voced.edu.au/10707/8522

Watermeyer, R., T. Crick, C. Knight, and J. Goodall. 2020. “COVID-19 and Digital Disruption in UK Universities: Afflictions and Affordances of Emergency Online Migration.” *Higher Education*, 1–19. doi: 10.1007/s10734-020-00561-y.

Wheatley, Karl F. 2005. “The Case for Reconceptualizing Teacher Efficacy Research.” *Teaching and Teacher Education* 21 (7): 747–766. doi: 10.1016/j.tate.2005.05.009.

Wladis, Claire, and Jason Samuels. 2016. “Do Online Readiness Surveys Do What They Claim? Validity, Reliability, and Subsequent Student Enrollment Decisions.” *Computers & Education* 98: 39–56. doi: 10.1016/j.compedu.2016.03.001.

Wong, Jacqueline, Martine Baars, Dan Davis, Tim Van Der Zee, Geert-Jan Houben, and Fred Paas. 2019. “Supporting Self-Regulated Learning in Online Learning Environments and MOOCs: A Systematic Review.” *International Journal of Human–Computer Interaction* 35 (4–5): 356–373. doi: 10.1080/10447318.2018.1543084.

Yokoyama, Satoru. 2019. “Academic Self-Efficacy and Academic Performance in Online Learning: A Mini Review.” *Frontiers in Psychology* 9: 2794. doi: 10.3389/fpsyg.2018.02794.

Zimmerman, Barry J. 1990. “Self-regulated Learning and Academic Achievement: An Overview.” *Educational Psychologist* 25 (1): 3–17. doi: 10.1207/s15326985ep2501_2.

Zimmerman, Barry J., Sebastian Bonner, and Robert Kovach. 1996. *Developing Self-Regulated Learners: Beyond Achievement to Self-Efficacy*. Washington: American Psychological Association.

Zimmerman, Barry J., and D. H. Schunk. 2011. “Motivational Sources and Outcomes of Self-Regulated Learning and Performance.” In *Handbook of Self-Regulation of Learning and Performance*, edited by Barry J. Zimmerman and D. H. Schunk, 49–64. New York: Routledge.