Influences on user engagement in online professional learning : A narrative synthesis and meta-analysis

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Abstract

The Internet has become the chosen medium for professional learning. Completing professional learning can improve work performance; however, many individuals who begin online courses do not complete them. It is not well understood which influences keep individuals engaged in online professional learning. We address these issues with a systematic review. Our review of 51 studies and 9583 participants includes a narrative synthesis and a meta-analysis which examined influences on user engagement in online professional learning. We found that course design and employers' provision of time to complete learning are key for engaging learners. Other important influences were learners' reasons for learning (e.g., intrinsic value and perceived usefulness), access to learning support, and opportunities for interaction during the learning experience.

Meta-analysis, Narrative Synthesis, Engagement, Professional Learning, Online Learning

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Offering the hope of flexible, accessible, affordable, and sustainable learning experiences (Kumar et al., 2011; Meyer, 2014), online professional learning has become a billion dollar industry aiming to future-proof individuals' livelihoods (Bartleby, 2018; Owsinski, 2015; Tepe, 2015). Thus far, research on online professional learning has predominantly focused on its feasibility (Elliott, 2017; Yu et al., 2007), with less attention paid to optimizing user engagement. Engagement is a key driver of student learning (Reeve & Lee, 2014). It is the key process that translates motivation into learning (Reeve et al., 2019). Engaged students are less likely to dropout, have better achievement, learn more, and are less bored than unengaged students (Abdul Jabbar & Felicia, 2015; Fredricks et al., 2004). Even controlling for ability and other demographic covariates, engagement predicts critical learning attainment variables (Reschly & Christenson, 2012).

While motivation and engagement are used interchangeably across disciplines to define learners' drive for certain behaviors, a distinction is made between these two constructs (Reeve et al., 2019). Motivation is a precursor to engagement, where engagement is the critical process that translates motivation into learning (Reeve et al., 2019). There is a consensus that engagement is a multidimensional construct that at least includes behavioral engagement. What components beyond behavioral engagement should be included varies across theories (i.e., emotional, cognitive, academic; Appleton et al., 2008; Fredricks et al., 2004). Following Fredricks et al.'s review (2004), we define engagement as "the emotional, cognitive, and behavioral connection that exists, at any point in time and possibly over time, between a user and a resource" (Attfield et al., 2011, p. 2).

Research on engagement in online professional learning is a nascent area of study. Yet there is an increasing need for a strong empirical base in this area. To keep up with technological changes, organizations spend billions of dollars on professional learning to ensure that employees are able to acquire the skills to remain competent in their fields and increasingly this is happening online (Bartleby, 2018; Owsinski, 2015; Tepe, 2015). Showing the growing importance of online learning, the professional networking website, LinkedIn, spent 1.5 billion dollars in 2015 to acquire Lynda.com, an online professional learning platform (Owsinski, 2015). In addition, universities and online learning platforms (e.g., Coursera, Udacity, General Assembly) have developed more on demand employment-focused courses to fulfil skill gaps that organizations lack and employees are looking to obtain ("The Role of Employers", 2017; TIME Staff, 2020). Given its growing importance, a systematic review on engagement in online professional learning provides particular promise in: (a) provide an overview of the current 'state-of-play' of the literature; (b) summaries the finding so far to identify avenues for future research; and (c) highlight what type of research is needed to push the field forward.

Online Professional Learning

While online learning can be described as any learning experience through the Internet, research on the topic must be sensitive to context (Lowenthal et al., 2009). This paper is focused on the context of professional learning. A profession is characterized by a requirement for specialized knowledge, with members often required to maintain a level minimum competency via ongoing professional development (Cruess et al., 2004; Tepe, 2015; Whitehurst et al., 2019). With the professionalization of more and more industries, the need for ongoing professional learning is growing. Online learning holds particular promise not only because technology is ubiquitous but also because it holds promise to be individualized and agile (Littlejohn & Anoush,

2014, Chapter 1). Despite its promise, much online learning fails to be engaging (Littlejohn & Anoush, 2014, Chapter 1). Thus, there is a need for a research base that can inform education system development so that it can meet the growing demand for online learning and best make use of its potential. The aim of this paper is to synthesis the available research base, while also identifying what sort of research is needed to strengthen the quality of evidence in this field. To carry out our review, we focus on empirical literature on online professional learning defined as the continuous process of education, training, and learning delivered via the Internet (Bakia, 2010; Clark & Mayer, 2008). Although professional learning may exist in many forms, we specifically examined online professional learning, structured as a course (i.e., a series of learning activities; Chtena, 2015).

Engagement in Online Learning

Despite the potential benefits of online learning, completion rates are often low (Diep et al., 2016; Green & Cifuentes, 2011; Sweeney et al., 2008). These low completion rates emphasize that the expanded delivery and reach of educational content is not enough to achieve better learning (McGowan, 2015). To maximize the potential of the Internet as a teaching and learning medium, it is necessary to understand what drives learners to engage with online courses.

Emotional engagement refers to online learners' feelings about their online learning experiences (e.g., their satisfaction and frustration within the learning environment). Cognitive engagement refers to the online learners' efforts to immerse themselves in an online learning experience (e.g., their intention, reflection, strategy use, and concentration devoted to the learning material and course content). Measures for this dimension are informed by goal theory (Fredricks et al., 2004). Finally, behavioral engagement in online learning refers to the actions a

learner makes on the online learning platform (e.g., the amount of time spent online, number of logins, course completion).

There is substantial evidence that engagement is associated with important positive outcomes including academic achievement, well-being, and attainment (e.g., academic achievement, well-being, attainment; King, 2015; Kizilcec et al., 2017; Marks, 2000). Only some of this literature specifically addresses professional learning contexts. This research has identified positive associations between engagement and knowledge acquisition (Joo et al., 2012; Shaha & Ellsworth, 2013), and between this learning and job performance (Joo & Lim, 2009; Kennedy, 2016; Rose et al., 2009). Thus, professional learners' engagement with online courses is an important construct to investigate because engagement is likely a crucial precursor to learning and performance (Fredricks et al., 2004; Lawson & Lawson, 2013).

Influences on Engagement in Online Professional Learning

By influences on engagement, we refer to both the things that learners bring with them to the learning environment—including their personalities and past experiences—and the environment in which the learning takes place. That is engagement is a result of person-environment fit (Fredricks et al., 2004). To identify what could influence engagement, Wang and Kang's (2006) cybergogy model delineates three major influences on engagement in online learning: cognitive, emotional, and environmental. Montgomerie, Edwards, and Thorn (2016) narrowed the focus from all online learning to the specific context of online professional learning. They identified three similar influences that impact learners' success in online professional learning: personal, interpersonal, and process (Montgomerie et al., 2016). Adapting Wang and Kang's (2006) framework to include Montgomerie et al.'s (2016) categories, we

identify three influences on engagement in the context of online professional learning as: individual, system, and environmental influences.

Individual influences are the online learner's characteristics, beliefs and perceptions of themselves (e.g., age, attitudes towards online learning, learner's technological self-efficacy). That is, the things the learner bring with them to the learning environment. System influences refer to the online learning platform and the online course components (e.g., design, ease of use, content quality). Finally, environmental influences pertain to the context around the online learner (e.g., organizational support, facilitator presence/absence, provision of time for training). It is important to note that individual influences differ from individual experiences of engagement. Individual influences refer to the prior experiences, personality traits, and other individual characteristics that, in combination with system and environment influences give rise to experiences of engagement within the learning context. For example, suppose a learner's previous experiences with technology have led them to believe they are competent with computers (an individual influence of high technology self-efficacy). They come into an online learning environment that has a well-designed user interface (a system influence) and they are given adequate time and resources by their work to complete the course (an environmental influence). This situation would likely give rise to enjoyment and flow (emotional engagement) during learning.

Rationale

Previous research on engagement in online learning has mainly focused on learners in primary to tertiary education sectors (Joksimović et al., 2018; Meyer & Gagné, 2008; Pellas, 2014). Fewer studies have considered individuals who participate in online learning for work-related reasons. Although many industries understand the need for professional learning, the

literature on online professional learning has mostly focused on feasibility, rather than optimization of online professional learning (Elliott, 2017). Moreover, many industries require their professionals to undergo formal continuing education to remain accredited, such as teachers (Lonsdale et al., 2019) and medical professionals (Filipe et al., 2018). Given the significant financial investment that industry has made in online learning (Meyer, 2014; Odden et al., 2002; Owsinski, 2015), there is strong incentive to construct engaging online learning to support and improve job performance.

Potential Moderators

An advantage of a meta-analysis is the ability to look at moderators that would rarely be possible in primary studies. Moderators are often included to explore generalizability across context or method. We identified several moderators that were worthy of investigation. These included: publication year, study type, region, industry, theoretical underpinnings of the study, and online learning format. Although we specify these moderators for consideration, we note that not all of them were possible to test due to too few studies at the different levels of the moderators.

Moderation by study type and publication year are common in meta-analysis. For study type, it is critical to determine if associations evident in lower quality studies replicate in higher quality studies. We considered publication year because technology and online learning formats are rapidly developing. As such, the association between, for example, the quality of user interface and engagement may have weakened over time as online learning platforms became ubiquitous (Littlejohn & Margaryan, 2014).

We considered the region where the study was conducted as a potential moderator. While globalization has allowed for online learning to be disseminated worldwide in a

standardized method, online educators have noted that students from different regions (e.g., Asia, Europe, North America) have varying responses to online learning given their individual socio-cultural experiences (Wilson, 2001). For this reason, region may be a critical moderator to consider.

Given the nature of different industries, the purpose of professional learning may dictate how courses are formatted and how important participants consider the courses. For example, professional learning for teachers tend to include reflective activities (Yang & Liu, 2004), whereas medical professions tend to have knowledge check activities such as tests or quizzes (Baia & Strang, 2016). This in turn could result in differences in engagement processes between industries (Khodakarami & Dirani, 2020).

As online learning has become more prevalent in the last three decades, research on how to create meaningful online learning experiences has grown. Since research in the area of online professional learning is multidisciplinary by nature, there was an expectation that studies tended to approach engagement from quite different theoretical positions (i.e., technology use, motivation, learning, behavioral, instructional design). For example, theories categorized under "technology use" all emphasize the importance of individuals adopting the use of technology (e.g., Technology Acceptance Model, Innovation Adoption Theory; Chang, 2015; Cheng, 2013). As such, it was necessary to identify whether results generalized across studies that employed different theoretical orientations.

Lastly, online professional learning has evolved along with advances in technology and increased accessibility to the Internet. As courses are often personalized for their organizations, the format of each course (e.g., number of modules, use of video or animation, course duration) is often catered for specific purposes (Visscher-Voerman & Gustafson, 2004). While the

idiosyncrasies between courses may not be comparable, perhaps larger course elements (e.g., online learning format, number of modules, use of discussion forums and other media) could moderate engagement.

Research Questions and Aims

Our review aimed to synthesize the available literature on engagement in online professional learning in order to (a) describe the quality of the current research base, (b) to synthesis the available evidence, and to (c) identify where future research is needed and what needs to be done to improve the quality of the evidence base. To do this, we addressed the following research questions:

1. Research Question 1: What is the current state of the literature and what is the general quality of research in this area?
2. Research Question 2: How is each influence category associated with *overall* engagement in online professional learning?
3. Research Question 3: How is each specific category of influences (i.e., individual, system, or environmental) associated with each *specific* dimension of engagement (i.e., emotional, cognitive, or behavioral)?
4. Research Question 4: Where sufficient data exist (see methodology section), are the relationships influences and engagement moderated by one or more of: publication year, study type (i.e., cross-sectional, randomized control trial), region (i.e., North America, Asia, Europe, Australia, Global), industry (i.e., blue-collar, health, education, civil, other white-collar), theoretical underpinnings of the study (i.e., technology related, learning, design, motivational, behavior), and online learning format (i.e., online asynchronous, online synchronous, blended learning).

Methods

Reporting of this systematic review complies with the Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA) guidelines (Moher et al., 2009) and the Reporting Standards for Research in Psychology (APA Publications and Communications Board Working Group on Journal Article Reporting Standards, 2008). We also adhered to recommended processes for high-quality systematic reviews of educational research (Alexander, 2020; Pigott & Polanin, 2020).

Inclusion and Exclusion Criteria

Studies were eligible for inclusion if they examined the relationship between individual (e.g., age, education, self-efficacy), system (e.g., content quality, ease of use, system design), or environment (e.g., cost, environmental support, rewards) influences and engagement within online professional learning courses. We included studies if:

1. the participants were employed, meaning pre-service professionals were excluded (e.g., pre-service teachers, interns, undergraduate students);
2. the participants were enrolled in an online professional learning course within their profession, meaning we excluded courses in which an individual signs up solely due to self-interest. We also excluded courses designed purely for orientation or induction purposes; and
3. the professional learning course was either fully or partially delivered through the Internet. Courses with no online components were excluded.

We included all study designs, both qualitative and quantitative, in this review. Only peer-reviewed studies that were published in English were included. Where there was

insufficient information to make a judgement on the eligibility criteria, we contacted the study authors for further clarification.

All studies which met the inclusion criteria were included in the narrative synthesis (Figure 2). Only eligible studies that reported quantitative associations of influences on user engagement were considered for the meta-analysis. If only one study looked at a particular association (e.g., the relationship between *usefulness* and *intention to participate in online learning*; Patterson & Resko, 2015), this study was not included in the meta-analysis because there would be no *pooled* estimate. However, studies excluded for this reason were still included in the narrative synthesis.

Search Strategy

To generate a database search strategy, we conducted preliminary scoping searches. Following these pilot searches, we grouped keywords under the context, intervention, and outcome of interest. Those search terms and groupings are outlined below. This list has been truncated here for simplicity, with full search strategy available in supplemental materials:

- **Context**: (("professional" *OR* "staff" *OR* "employee...) *AND* ("development" *OR* "learning" *OR* "education" *OR* "training" *OR* "improvement")) *AND*
- **Intervention**: (("internet" *OR* "on?line"…) AND ("learning" OR "course")) *AND*
- **Outcome**: ("engag*" *OR* "participat*" *OR* "interact*" *OR* "complet*" …)

To ensure searches were comprehensive (Alexander, 2020), we searched titles, abstracts, and keywords using the following electronic databases: Proquest Education, ERIC, Education Source, A+ Education, Scopus, Medline Complete, PsycINFO, Computers & Applied Sciences Complete, and Proquest Computing Database. As the Internet only became widely accessible to the general population in the 1990s (Ryan, 2010), searches were restricted to 1990 and onwards.

Searches were conducted in June 2018. Reference lists of eligible studies were hand-searched to identify any studies that our electronic searches might have missed (Pigott & Polanin, 2020).

Screening Process

To manage the screening process, we used Covidence (Veritas Health Innovation, Melbourne, Australia). We uploaded all records from each database to Covidence, which identified and removed duplicate records. To avoid the loss of eligible studies (Pigott & Polanin, 2020), two authors (JL, plus DA or RP) independently screened each title and abstract in duplicate. If either author deemed a record potentially eligible, it was moved to full-text screening. Full-texts were also reviewed independently and in duplicate. Discrepancies were resolved through discussion, and if we could not reach agreement, a third author (CL or TS) was consulted.

Data Extraction

Data Extracted for All Studies

For both the narrative synthesis and meta-analysis, one author (JL) extracted the demographic and study data into a standardized form. A second author (DA or RP) checked the data extraction form for errors. Extracted data included:

1. descriptive study information (e.g., study design, participant characteristics, explicit theoretical underpinnings);
2. online professional learning course information (e.g., duration of course, features of course);
3. hypothesized influences on engagement (i.e., individual, system, environmental);
4. measures of engagement (i.e., emotional, cognitive, behavioral); and
5. the relationships between hypothesized influences (#3) and measures of engagement (#4).

Process for Categorizing Influences on Engagement

We categorized influences based on Wang and Kang's (2006) and Montgomerie et al.'s (2016) work (i.e., individual, system, environmental influences). One author (JL) compiled all the influences identified from each study. JL then grouped these influences based on their definition into similar constructs. For example, all studies which examined any kind of *self-efficacy* were grouped together (Chang, 2015; Garavan et al., 2010; Joo et al., 2012). JL then assigned these groups to one of the three overarching categories (i.e., individual, system, environmental). For example, *self-efficacy* was assigned to the *individual influences* category. A second author (DA or RP) checked whether the grouping and categorization of influences was appropriate and consistent. Any disagreements were resolved through discussion with the team until consensus was reached.

Process for Categorizing Measure of Engagement

Measures of engagement were organized based on Attfield's (2011) definition of user engagement (i.e., emotional, cognitive, behavioral). Emotional engagement refers to the online learners' feelings about their online learning experiences (e.g., satisfaction, motivation, frustration). Cognitive engagement refers to the online learners' effort to immerse themselves in an online learning experience (e.g., intention, reflection). Finally, behavioral engagement in online learning refers to the actions a learner makes on the online learning platform (e.g., the amount of time spent on the online learning platform, number of logins, course completion).

To classify measures of engagement, JL repeated the procedure for categorizing predictors. For example, all *course completion* measures were grouped together (two studies used learning analytics to identify who completed the course; Patterson & Resko, 2015; Zha et al., 2017), and *course completion* was one of many groups categorized as *behavioral*

engagement. Again, a second author checked grouping and categorization, with disagreement resolved through discussion.

Narrative Synthesis

Data Extracted for Narrative Synthesis

Using an iterative reflexive approach, one author (JL) initially extracted verbatim all mentions of relationships between our included predictors and outcomes (Srivastava & Hopwood, 2009). A second author (DA or RP) also extracted all mentions of relationships between predictors and outcomes from 5 of included studies to ensure consistency of results extracted (Srivastava & Hopwood, 2009). There were no inconsistencies, so single-extraction was deemed sufficient for the rest of the papers.

Narrative Synthesis Methods

We used axial coding (Saldaña, 2012) to gain a more comprehensive understanding of the narrative findings. Based on the axial coding process, first-order themes represent the findings extracted verbatim from included studies. Second-order themes—the results of the narrative synthesis—represent our synthesis of the first-order themes into broader groupings (Thomas & Harden, 2008). Identifying second-order themes is an iterative process which requires multiple rounds of review and discussion between team members. First-order themes are analogous to the effect sizes extracted from studies in a meta-analysis, while second-order themes are analogous to pooled effect sizes. We considered both the effect of each influence on each dimension of engagement, but also considered relationships between any influence on overall engagement scores.

After reaching consensus on first-order themes, one author (JL) assessed these themes for similarities to create second-order themes (Thomas & Harden, 2008). These second-order

themes were initially reviewed by two other authors (CL and MN). Any discrepancies were discussed until consensus was reached. The remainder of the themes were co-coded by another author (DA or RP), with regular meetings to discuss discrepancies and calibrate interpretations. This iterative process followed qualitative coding procedures that are common in education (Greene et al., 2020; Liera, 2019; Parks, 2020) and consistent with the approach to coding qualitative text suggested by Saldaña (2012). A final version of the narrative synthesis results was agreed upon during collaborative discussions with all team members.

Meta-analysis

Additional Data Extracted for Meta-Analysis

Pearson's correlation coefficient (*r*) was the principal effect size in this review. Data reported as standardized regression coefficients (β) were transformed to correlation coefficients using the formula outlined by Peterson and Brown (2005). Standardized regression coefficients that lay between the range of -0.5 and +0.5 were converted to correlation coefficients, where the indicator variable (λ) is equal to 1 when the regression coefficient is nonnegative and 0 when the regression coefficient is negative (Peterson & Brown, 2005). Regression coefficients that lay outside the range of -0.5 and +0.5 were rounded to -0.5 and +0.5, respectively, before conversion to correlation coefficients, as recommended by Peterson and Brown (2005).

Data Analysis for Meta-Analysis

During data analysis, correlation coefficients were transformed to Fisher's Z to better estimate population parameters (Rosenthal, 1994) using the *Metafor* package in *R (R Programmer Core Team, 2018; Viechtbauer, 2010)*. We transformed the Fisher's Z score to correlation coefficients for presentation of results to use a more familiar metric. We conducted the main, subgroup, and moderator analyses with a multilevel, random effects model also using

metaphor (Viechtbauer, 2010) in *R* environment (R Programmer Core Team, 2018). When studies report more than one effect size, multilevel meta-analyses produce less biased results than averaging the multiple effect sizes (Van den Noortgate et al., 2015). We used these models to identify which influences were significantly associated with each dimension of engagement (i.e., behavioral, emotional, cognitive engagement) and overall engagement (i.e., all three dimensions together). The models accounted for variances at three levels: the variance around individual effect sizes (Level 1); the variance of multiple effect sizes within a single study (Level 2); and the variance between effect sizes from different studies (Level 3). Meta-analyses were conducted separately for each influence and each dimension of engagement (i.e., cognitive, emotional, behavioral).

All categorical variables were dummy coded, while continuous variables were centered around their respective means. Heterogeneity was assessed using I^2, and was classified as low (25%), moderate (50%), or high (75%; Knapp & Hartung, 2003). Publication bias was assessed via agreement between a funnel plot and Egger's test (Higgins et al., 2003; Nakagawa & Santos, 2012).

Moderators. We examined six potential moderators in the meta-analysis. These moderators were categorized as study characteristics (i.e., publication year, study design, theoretical underpinnings), participant characteristics (i.e., region, profession industry), and online learning characteristics (i.e., online learning type). We used meta-regression analyses to determine whether these moderating variables were significant modifiers of associations between each predictor and each outcome. In the results, we only analyzed moderators where there was sufficient information to do so. To ensure the moderation analysis would be meaningful, we only examined associations between predictor and an outcome where there were five or more

studies and an I^2 above 25%. Running moderation analyses on homogenous effects ($I^2 < 25\%$) or small samples (less than 5 studies) are likely to be underpowered (Hedges & Pigott, 2004).

Study Quality

To cater for different study designs included in the narrative synthesis and meta-analysis, we evaluated study quality using different tools for qualitative and quantitative studies.

For qualitative studies, we used the Critical Appraisal Skills Program (CASP) qualitative study checklist (CASP, 2018). This checklist included ten items, where each item was answered by either *'yes'* or *'no'*, with a total score counting the number of criteria met, out of ten. Each qualitative study was evaluated independently and in duplicate by JL and RP. In case of discrepancies, these reviewers discussed until consensus was reached, consulting a third or fourth reviewer (CL or PP) when needed.

For the quantitative studies, we used an adapted tool which combined the Cochrane Collaboration's bias domains (Higgins et al., 2011) and the CASP cohort study checklist (CASP, 2014; see Supplemental Materials S2). Items relating to selection bias, attrition bias, and reporting bias were used from the Cochrane tool. For all sections, we kept the intent behind the item while adapting the wording to the range of studies being included. Similarly, for remaining sections, performance bias and detection bias, we judged that these domains would display floor effects; preliminary evaluations of studies showed that none were likely to have blinded participants, personnel, and outcome assessors (Higgins et al., 2011). Items relating to classification, measurement, and confounding bias were used from the CASP tool (CASP, 2014). However, we omitted two sections that were related to reporting of results rather than potential biases (i.e., Section B, results, and Section C, use of results in local context; CASP, 2014). Each item on this tool was answered using either *'yes'*, *'no'*, *'unclear'*, or *'not applicable'*. An overall

assessment given based on the modal rating for that study. Where there was an equal proportion of answers, the study was assessed as *'unclear'*. Assessment for quantitative studies were completed independently and in duplicate by JL and DA. In the case of discrepancies, these reviewers discussed until consensus was reached, consulting a third or fourth reviewer (CL or TS) when needed.

Summary of analyses

Overall, in order to assess the influences on engagement, we conducted a narrative synthesis of all included studies and a meta-analysis of the quantitative studies. By using a mixed method approach to integrate results, the outcomes of this paper offer a more comprehensive understanding of influences on engagement in online professional learning. We grouped influences on engagement in online professional learning (i.e., individual, system, environmental; Montgomerie et al., 2016; Wang & Kang, 2006). We separately assessed the role of these influences on each dimension of engagement (i.e., emotional, cognitive, and behavioral; Attfield et al., 2011), as shown in Figure 1. We extracted these relationships from all eligible studies in the qualitative synthesis and used axial coding to identify second-order themes. We extracted effect sizes for a series of meta-analyses and assessed whether moderators explained variance in these relationships.

Results

Study Selection

The search identified 23,042 records (see Figure 2). Two hundred and sixty-nine studies were included for full-text screening, of which 218 were excluded for the following reasons: ineligible measures and outcomes (e.g., use of learning after training), ineligible setting (e.g., not an online professional learning course), ineligible population (e.g., graduate students), and not an

empirical study (e.g., opinion piece). For full details regarding the excluded studies, see supplemental Table S5. Fifty-one studies met the inclusion criteria and were included in the narrative synthesis. Twenty-three studies also had sufficient quantitative data to also be included in the meta-analysis.

Study Characteristics

Details of the included studies are summarized in Table 1 and references in Appendix A. One paper had two independent samples of participants and these were treated as separate studies (LoCasale-Crouch et al., 2016). All 51 studies were included in the narrative synthesis, and consisted of 27 quantitative studies, 16 qualitative studies, and 8 mixed-method studies. All mixed-methods studies only met inclusion criteria for their qualitative components. As such, they were only included in the narrative synthesis as qualitative studies. All of the quantitative studies were cross-sectional, and many (10/24) of the qualitative studies were case-studies. All of the quantitative studies used surveys, with some (3/27) also taking direct measures from the online platforms. Most of the qualitative studies used multiple methods to collect data, including interviews (13/24), focus groups (3/24), open-ended surveys (3/24), and data from the online platforms (6/24).

Participants in the included studies were mostly from high-income countries, except one study from China (Zhang et al., 2016), two studies from India (Balasubramanian et al., 2014; Swierczek, 2012), and one study from Indonesia (Burns, 2013). Participants in the included studies worked in varying industries and sectors, including banking, railway, media, health, nursing, pharmaceuticals, technology and electronics, education and academia, public and government, and corporate enterprises. Most studies (n = 47) examined learners who were enrolled in online-only professional learning courses. These courses ranged from several hours

to two years long. These online-only professional learning courses (n = 11) were structured as a series of five to fourteen modules on a dedicated online learning management system (e.g., Moodle, Blackboard, custom built), where each module consisted of a series of media items on the course content followed by a knowledge check or learning reflection activity.

Course structure differed by the target industry. Courses which included reflective or interactive activities through discussion forums were in the educational profession (e.g., Bonafini, 2017; Smith & Sivo, 2012; Zha et al., 2017). Alternatively, courses which included problem-based learning and knowledge tests were in the medical professions (e.g., Conte, 2012; Gagnon et al., 2007; Te Pas et al., 2016).

Only four studies examined professional learning in a blended learning environment (i.e., online and face-to-face components; Balasubramanian et al., 2014; Patterson & Resko, 2015; Shurville et al., 2007; Te Pas et al., 2016). In addition, one study included a mix of learners who were enrolled in blended learning courses and fully online courses despite being from the same organization (Balasubramanian et al., 2014). Here we only interpret results based on the online component. Of the 51 included studies, only seven provided details about the voluntary (n = 4) or mandatory (n = 3) nature of participation. Three studies identified that individuals were given time and space to complete online professional development during work hours, while ten studies mentioned rewards for individuals if they completed their online professional learning (e.g., continuing education credits, financial incentives). See full details of all studies in the supplementary material (https://bit.ly/3jf7BaR).

We identified 145 unique relationships between influences on engagement and measures of engagement which were summarized for the narrative synthesis. Of the 27 quantitative studies, 23 had sufficient information to be included in the meta-analysis. We identified 60

unique relationships between influences and measures of engagement, of which 48 appeared in more than one sample and were therefore included in the meta-analysis.

We grouped all influences and measures into similar constructs to conduct a meaningful analysis of the influences on engagement and measures of engagement identified from the literature. Wang and Kang's (2006) and Montgomerie's (2016) models provided a foundation for organizing the influences on engagement into three categories (i.e., individual, system, or environmental influences), while Attfield et al.'s (2011) definition was used to differentiate between the three dimensions of engagement (i.e., emotional, cognitive, and behavioral). All studies examined the relationship between at least one type of influence and one dimension of engagement. As shown in supplemental Tables S6 and S7, we identified 31 influence constructs (e.g., age, course design, environmental support) and 14 construct measures of engagement (e.g., course completion, satisfaction, flow). Please see the Meta-Analysis and Narrative Synthesis Supplemental spreadsheet for more details (https://bit.ly/3jf7BaR).

Study Quality

For qualitative and mixed-methods studies, we used the CASP qualitative checklist to evaluate the 24 studies. Prior to resolving disagreements, the interrater reliability was 89.58%. All included studies (24/24) provided a clear statement of findings, most studies had clear aims in their research (19/24) and collected data to answer these aims (21/24). Fewer studies provided justifications for the methods used to recruit participants (6/24) or the study design used (10/24). Less than half of the included studies mentioned ethical approval (8/24). Only half the studies gave a sufficient explanation on how data were analyzed (12/24) and very few (2/24) considered how the reflexivity of the researcher could potentially bias or influence participant responses.

Full coding of the CASP is available in the Narrative Synthesis Supplemental spreadsheet (https://bit.ly/3jf7BaR).

Using the adapted Cochrane risk of bias tool, we appraised the selection, classification, measurement, confounding, attrition, and reporting of each of the 27 quantitative studies. Prior to authors' discussions on disagreements, study quality ratings on the quantitative studies had an interrater agreement of 71.43%, with Cohen's kappa of $k = 0.46$, falling into the range of moderate agreement (Landis & Koch, 1977). All studies were judged to be high quality for selection, measurement, and reporting. For classification, most studies were rated as high quality for their use of validated tools (15/27). These tools were all self-reported, and generally had high levels of reliability ranging from $\alpha = 0.65 - 0.98$. All remaining studies that used non-validated tools were marked unclear (6/27) or not applicable for observational measures (6/27; details of the measurement tools and validity are available in the supplementary material https://bit.ly/3jf7BaR). Confounding was rated high quality for studies that clearly stated or conducted regression analyses to control for confounding variables (9/27), and was unclear for the remaining studies (18/27). In addition, as most of the quantitative studies were cross-sectional (19/27), attrition bias was inapplicable.

We analyzed publication bias by visually inspecting a funnel plot and conducting an Egger's test. We noted asymmetry in the funnel plot (see Figure 3). The scatter at the top of the plot is relatively symmetrical, despite the numerous effect sizes scattered beyond the 95% significance range. In the lower half of the plot, the scatter from smaller published studies were more likely to show weaker positive or even negative effects when compared with the scatter of larger published studies up top. This bias in data was further confirmed with the Egger's test ($z = -5.18$, $p < 0.0001$).

Influences on Engagement in Online Professional Learning

Across all study designs, behavioral engagement was the most studied form of engagement. Individual influences on engagement tended to focus on prior ability and perceptions, with the most frequently studied individual influences being prior technological self-efficacy (23/51 studies), with perceived usefulness of the course (14/51) and general self-efficacy (12/51) also commonly investigated. Demographic individual influences such as age (7/51) education (5/51), sex (5/51), and ethnicity (1/51) were less common. Within system influences, ease of use (17/51) was the most common influence, with course design (15/51) and system interaction (11/51) also commonly investigated. Finally, situational influences (13/51) were the most commonly studied environmental influence.

The narrative synthesis showed that learners enrolled in online professional learning were generally satisfied with their experience and intended to participate in and complete the courses. Influences that were important to overall engagement were the learners' technological self-efficacy, perception of course material usefulness to the learner, overall support, and provision of time to complete professional learning (see Tables 2–4).

In the meta-analysis, the overall multilevel random effects model showed that all identified influences (i.e., individual, system, and environmental) had a significant positive association with all measures of engagement ($r = 0.33$ [0.21, 0.47]). Results demonstrated a large amount of heterogeneity ($I^2 = 96.94\%$), with 67.38% of the total variation attributable to differences between studies and 29.56% due to within study differences. Each influence category was found to be significantly and positively associated with overall engagement (i.e., pooled effects across the dimensions of engagement): individual influences ($r = 0.35$ [0.20,

0.49]), system influences (r = 0.26 [0.09, 0.42]), and environmental influences (r = 0.33 [0.21, 0.44]).

Examining the narrative synthesis together with the meta-analysis findings, learners' technological self-efficacy facilitated their overall engagement in online professional learning. Particularly, learners' who felt they were particularly self-disciplined and understood how they learned were found to participate more and contribute to their learning of new knowledge (Lee, 2010; Montgomerie et al., 2016). Quality course design and the learning management system's ease of use also facilitated overall engagement. That is, a well-structured online course and high learner satisfaction with content design was correlated with increased learners' intention to keep taking online courses and achieve desired learning objectives (Andreu & Jáuregui, 2005; Hong et al., 2017). Environmental influences which supported overall engagement included organizational support and situational influences (e.g., being provided time to complete professional learning, access to learning support, lower workload; Annansingh & Bright, 2010; Yoo et al., 2012).

While the objective of categorizing influences and measures into the frameworks outlined earlier (Attfield et al., 2011; Montgomerie et al., 2016; Wang & Kang, 2006) aimed to enhance the manageability of the findings for the meta-analysis, the reflexive process for the narrative synthesis allowed for further insight. With the often flexible unsupervised nature of online professional learning, engagement in these courses often favor highly self-disciplined learners (Atack, 2003; Lee, 2010; Montgomerie et al., 2016). As one learner remarked in a study by Atack (2003, p. 294):

> "If you have a pre-determined time you have to be at a class, you just go and you do it. But when it's studying on your own, there is a gray area you can slip into, and you can

> get further behind than you would ever get behind in a classroom class. Because of your work life, you can allow that to infringe and suddenly you are not giving the attention that you should be giving to the class."

Even with rewards, busy schedules may often be a barrier to engagement or even reasons for dropout (Annansingh & Bright, 2010; Atack, 2003). Rather, if the internal influences such as learner interest or motivation to learn were high, learners could overcome barriers and set aside time for online professional learning (Annansingh & Bright, 2010; Garavan et al., 2010). As Garavan et al. (2010, p. 165) points out:

> "Organizations should target learners who have the appropriate motivation to learn. This motivation to learn can be enhanced by ensuring that e-learning activities are of value to employees. They should have value to the job, person or career needs of the learner."

Using the framework of this systematic review, this finding could suggest that individual influences influence on engagement could have a stronger effect than environmental influences.

Influences on Emotional Engagement

Twelve of the included 51 studies examined the relationship between influences and emotional engagement. Learners' technological self-efficacy (4/12), perception of course's usefulness (3/12), and ease of use of the online learning platform (3/12) were the most examined influences for emotional engagement. Only one study investigated if demographics (specifically education) was related to emotional engagement, with no studies investigating if age, sex, or ethnicity were important. Similarly, other individual influences such as intrinsic value and relevance (i.e., having value to the learner's profession) were also not investigated.

Most investigated influences had a positive effect on learners' emotional engagement (see Table 2). Learners' who came into a course with greater technological self-efficacy (r =

0.39 [0.19, 0.56]; LoCasale-Crouch et al., 2016; Weng & Tsai, 2015), who perceived the course as useful to their profession (r = 0.66 [0.61, 0.70]; Joo et al., 2013; Lee, 2010; Weng & Tsai, 2015), and who thought the online learning platform was easy to navigate (r = 0.46 [0.22, 0.65]; Lee, 2010; Weng & Tsai, 2015) were more likely to be satisfied with the course satisfaction (Bern et al., 2017). Aspects of course design (e.g., duration of course, mode of delivery, use of various media) did not influence learner's satisfaction (Rodriguez & Armellini, 2015). The two influences which had negative associations with emotional engagement were learners' education level and the online learning system's ease of use. Learners with less education were more satisfied with the online professional learning than more educated learners who felt the online courses were less useful for them. It is possible that more educated learners had already learned the course material, so "doing something that you know you can do already is not an effective use of your time, so you don't keep doing it" (Annansingh & Bright, 2010, p. 63). Examining the online learning system's ease of use, learners reported that courses with many abbreviations or jargon were frustrating to their learning experience (Conte, 2012).

As shown in Table 2, the meta-analysis found that emotional engagement was positively predicted by learners' technological self-efficacy (r = 0.39 [0.19, 0.56]), learners' perception of the online learning's usefulness (r = 0..66 [0.61, 0.70]), the online learning system's ease of use (r = 0.46 [0.22, 0.65]), environmental support (r = 0.38 [0.01, 0.66]), and facilitating situational influences (e.g., no time concerns, availability of resources, availability of assistance; r = 0.42 [0.26, 0.55]). These associations had moderate-to-strong correlations. For example, in a sample of 578 white-collar workers in telecommunications, banking and insurance, Weng (2015) found that learners' perceptions of the course's usefulness was correlated with how satisfied they were

with the online professional learning experience at r = 0.657. See supplemental Figure S1 for a detailed forest plot.

Influences on Cognitive engagement

Seventeen studies examined the relationship between influences on engagement and experiences of cognitive engagement. System influences were most commonly investigated. In particular, perceived usefulness of the course (9/17), and ease of use for the online system (8/17).

Similar to emotional engagement, most influences in the narrative synthesis had a positive effect on learners' cognitive engagement (see Table 3). Learners' perception of the course's usefulness (r = 0.57 [0.48, 0.65]; Hong et al., 2017), the online learning platform's ease of use (r = 0.42 [0.25, 0.57]; Becker et al., 2013; Chang, 2015; Cheng, 2013; Roca & Gagné, 2008; Smith & Sivo, 2012; Weng & Tsai, 2015), learners' self-efficacy (r = 0.32 [-0.19, 0.69]; Chang, 2015; Y. J. Joo et al., 2012; Lee, 2010; Roca & Gagné, 2008), technological self-efficacy (r = 0.55 [0.43, 0.65]; Hong et al., 2017; Roca & Gagné, 2008; Weng & Tsai, 2015), and environmental support (r = 0.49 [0.27, 0.66]; Lee, 2010; Roca & Gagné, 2008; Weng & Tsai, 2015; Yoo et al., 2012) were all positively associated with learners' intent to use or continue using online learning. Learners' age and test anxiety were the only influences negatively associated with cognitive engagement. Becker et al. (2013) found that older learners reported lower intentions to adopt online learning, and suggested that older learners may have heavier workloads or do not see that participating in online professional learning will benefit them in their job. General test anxiety appeared to prevent learners from making use of the learning material because they were more focused on doing well in the online course evaluations (Joo et al., 2012).

Results from the meta-analysis (Table 3) were similar to the narrative synthesis, although learners' self-efficacy was not significantly associated with cognitive engagement (r = 0.32 [-0.19, 0.69]). Overall cognitive engagement was significantly predicted by the overall individual influences (r = 0.49 [0.32, 0.64]), system influences (r = 0.30 [0.32, 0.49]), and environmental influences (r = 0.42 [0.27, 0.54]). For example, Yoo et al. (2012) found that intrinsic motivation predicted cognitive intention to use in a sample of 226 food service workers. See supplemental Figure S2 for a detailed forest plot.

Influences on Behavioral Engagement

Behavioral engagement was the most commonly investigated form of engagement across the studies, with 38 of the 51 studies including at least one association (see Table 4). Common influences of behavioral engagement included technological self-efficacy (16/38), course design (11/38), and opportunities for online interaction (8/38). The types of influences were also more diverse: there was at least one investigation of the association with behavioral engagement for all of the influences identified in this review, with the exception of test anxiety.

All system influences and all but one environmental influence positively affected behavioral engagement. The influence of learners being offered rewards for completing online professional learning had contradictory findings (LoCasale-Crouch et al., 2016; Zha et al., 2017). Burns (2013) and Joo (2013) identified several positive influences on learners' persistence in online professional learning. The ease of use of the online learning platform and usefulness of the course content facilitated persistence in online professional learning. In addition, having opportunities to interact with peers and the course facilitator were important in learners' persistence; without it, learners felt isolated (Burns, 2013). Learners were also more likely to complete professional learning when organizations provided time to complete professional

learning during work hours, or when learners had a lower workload and could prioritize professional learning (Blackmore et al., 2008; Conte, 2012; Maor & Volet, 2007; Patterson & Resko, 2015).

Behavioral engagement was positively related to several aspects of learners' perceptions towards online professional learning (i.e., attitude towards online learning, expectations, outlook on professional learning). Increases in learner expectations of online learning were not associated with increased course participation or completion (Zha et al., 2017). But, learners who had been surveyed about their expectations of what they would like to achieve at the beginning of the course were more likely to complete course activities (Sweeney et al., 2008). Person characteristics, such as age, gender, and education level, did not predict learners' participation and completion of online professional learning. However, Garavan et al. (2010) found that learners with fewer education qualifications were more behaviorally engaged with online professional learning. Garavan et al.(2010) suggest that these learners took advantage of these online professional learning opportunities to increase their job qualifications standing.

The three individual influences with contradictory effects were learners' technological self-efficacy, learners' expectations and work-related aspects. While we found that technologically proficient learners spent more time on the online learning management system than less technologically proficient learners, there was no strong relationship between learners' technological self-efficacy and their completion of online professional learning courses (Gagnon et al., 2007; LoCasale-Crouch et al., 2016; Maor & Volet, 2007; Zha et al., 2017). As LoCasale-Crouch et al. (2016, p. 115) suggest, "perhaps the minimal amount of discomfort participants reported might have provided enough tension to actively engage with but not interfere with course participation." For learners who had expectations from online professional learning, Zha

et al. (2017) found that learners were more likely to use the online learning system, but having expectations also could not explain whether learners completed courses. With work-related aspects, learners who had a smaller workload and had more tenure were more likely to spend time on the online learning system. In addition, learners with longer professional tenure were not correlated with spending more time on the online learning system (Brown, 2005).

In Table 4, the meta-analysis results showed that the associations between influence categories and behavioral engagement are weak and non-significant (r = 0.15 [-0.01, 0.30]). However, course design (e.g., duration of course, mode of delivery, use of various media; r = -0.21 [-0.39, 0.00]) and facilitating situational influences (e.g., no time concerns, availability of resources, availability of assistance; r = 0.14 [0.04, 0.24]) significantly predicted behavioral engagement. The relationship between good course design and behavioral engagement was the only significant negative association (r = -0.21 [-0.39, 0.00]). While behavioral engagement was one of the more investigated areas, associations were generally weak. For example, Brown et al. (2005) found that the association between workload and time spent using e-learning for university employees was only r = -0.13. A detailed forest plot can be seen in supplemental Figure S3.

Moderator Analysis

As the overall pooled random effects model showed a large amount of heterogeneity (I^2 = 96.94%), we conducted further analyses with the following moderators: publication year, study type (i.e., cross-sectional, randomized control trial), region (i.e., North America, Asia, Europe, Australia, Global), industry (i.e., blue-collar, health, education, civil, other white-collar), theoretical underpinnings (i.e., technology related, learning, design, motivational, behavior; see

supplemental table S4), and online learning format (i.e., online asynchronous, online synchronous, blended learning).

Although we had intended to identify whether other online course elements (e.g., number of modules, use of discussion forums and other media, length of course) moderated the associations between influences and engagement, the information provided in the included studies was sparse and inconsistently measured. Nineteen studies did not include any detail regarding online course elements. Some studies measured course length by the duration of availability to the learner (Andreu & Jáuregui, 2005; Bern et al., 2017; Smith & Sivo, 2012), while others measured it by the length of professional hours awarded to learners upon completion (Bonafini, 2017; Yoo et al., 2012).

To ensure the moderation analysis would be meaningful, we only examined associations between an influence and a dimension of engagement which included five or more studies and had an I^2 above 25%. Four associations met these criteria: learners' perception of the online learning's usefulness and cognitive engagement ($k = 9$; $I^2 = 93.38\%$), the online learning system's ease of use and cognitive engagement ($k = 8$; $I^2 = 96.76\%$), work support and cognitive engagement ($k = 5$; $I^2 = 91.40\%$), and learners' technological self-efficacy and behavioral engagement ($k = 7$; $I^2 = 88.20\%$). See supplemental Table S7 for complete moderator analyses results. After applying all six moderators on these four associations, only two were significant: industry moderated the association between learners' perception of the online learning's usefulness on cognitive engagement, and region moderated the association between learners' technological self-efficacy on behavioral engagement.

For learners' perceptions of online learning's usefulness on cognitive engagement, the industry in which participants worked in explained 13.51% of the variance in effect sizes. While

those who work in an education setting showed the strongest effect (r = 0.71 [0.46, 0.86]) in comparison to the reference category (i.e., represents learners from undisclosed professional backgrounds; r = 0.59 [0.47, 0.69]), all categories showed a similarly strong association: health industry (r = 0.59 [0.25, 0.80]); other white-collar occupations (r = 0.56 [0.28, 0.76]). The small differences between categories indicated that teachers who are interested in online learning are particularly likely to find it useful and thus engage with online professional learning more. However, individuals working in the health field (i.e., nurses, doctors, pharmacists) and other white-collar jobs (i.e., banking, business, corporate) were less likely to engage with online professional learning even if they found online learning to be useful.

For the association between learners' technological self-efficacy and behavioral engagement, 6.11% of the variance in effect sizes could be explained by the region the studies originated from. In all identified regions (i.e., North America, Asia, Europe), technological self-efficacy was not a predictor of behavioral engagement. However, when no region was identified, self-efficacy was a moderate predictor of behavioral engagement (r = 0.37 [0.09, 0.60]).

Discussion

Professional learning is often only seen by organizations as a means to maintain and enhance employees skills (Marriss, 2011). In addition, an increasing number of professions require employees to complete professional learning to comply with professional standards (Tepe, 2015; Whitehurst et al., 2019). However, in order for employees to get the most out of professional learning, there is a need to ensure learners are engaged in their professional learning experiences. Engagement is a critical outcome of interest because it is (a) a more proximate outcome than are direct learning outcomes like achievement (Reeve & Lee, 2014); (b) is a

critical mechanism that leads to learning outcomes (Reeve et al., 2019); and (c) has impacts on outcomes over-and-above ability and demographics like SES (Reschly & Christenson, 2012). Indeed, previous literature has shown clear evidence that learner engagement is associated with increased job performance (Althauser, 2015; Kim & Koo, 2017; Nipper et al., 2018).

Despite being a billion-dollar industry, research on how to engage employees in online learning is still a relatively new field. Perhaps because of this, much of the research in this area uses relatively low-quality designs like single-site case studies or cross-sectional quantitative designs. A systematic review in a nascent field is important however, due to the ability for reviews to "shape future research and practice" Murphy, Knight, and Dowd (2017, p. 4). Thus, the aim of the current research was to evaluate the current state of the literature base and synthesis existing findings in order to outline promising avenues for future research.

State of the Literature Base

Of the 51 studies which were eligible for the systematic review, the majority of studies were cross-sectional quantitative and case-study qualitative in nature. As a result of these study designs, very few were evaluated high quality (15/51). From a quantitative perspective, we found few studies that were well positioned to provide evidence of causality. In particular, we only located one experimental study (LoCasale-Crouch et al., 2016). Even here, data was only reported from the treatment group. There were also no longitudinal studies identified in our search. Clearly there is a need for studies that are better able to provide causal inference. Nevertheless, there was also considerable variance in the quality of the cross-sectional studies under investigation. Perhaps one of the best examples of research in this area was Lee (2010). Although cross-sectional, Lee used high quality measures that were well validated and piloted. Further, research questions were based on a strong theoretical foundation. Future research will

need to move toward longitudinal and/or experimental designs. However, Lee (2010) provides a good foundation as an example study to build from.

Another defining feature of the literature was the over-reliance on subjective measures. Thus, a further advance needed in the quantitative literature is the use of both objective and subjective measures of engagement. Some aspects of engagement (e.g., aspects of emotional engagement) may only be appropriately measured by subjective assessments given their inherent subjective nature. Other aspects of engagement (e.g., course completion) make more sense to be measured using objective data alone. Where possible, however, it would be best to use both quality subjective and objectives measures. Currently, too much data in studies on online learner engagement uses subjective measures alone.

The qualitative research base was also relatively low quality. Only five of 24 studies were coded as high-quality. A particular concern was that most studies were single site case-studies. Perhaps the best example of research in this area was Atack (2003). Atack (2003) collected focus group data from participants at three distinct time-points covering experiences in the course, post course, and after participants had time to reflect on their experiences. Atack's (2003) study also included participants from multiple sites allowing for a deeper exploration of context. It would be valuable for more research in this area to use this research as a template for new research endeavors.

The need to create more engaging online will continue to grow as more professions and more businesses move to online learning spaces to cut costs and provide a more unified experience for their employees. Our research has highlighted the need for a dramatic increase in the quality of the research base that can inform this literature. Although we highlight some exemplar papers here, even these are limited in their ability to provide causal inference and deep

insight into the conditions that lead to engaging online learning. Nascent fields do often start with lower quality studies in order to identify promising lines of enquiry for future research. For this reason, we synthesized the available evidence to highlight common findings that could serve as a basis for future research.

Despite the inherent weaknesses of the current literature, online professional learning experiences will continue to become more ubiquitous (Littlejohn & Anoush, 2014). For future research to be more robust, a primary issue to address is validating and integrating subjective and objective measures of each dimension of engagement; where possible. This would provide a more comprehensive understanding of how the different dimensions of engagement are affected in different circumstances. In addition, increasing industry and academic collaboration could make future research more experimental if data collected from similarly structured online professional learning courses could be compared against each other.

Finally, research on online professional learning should make better use of existing theoretical frameworks present in research on engagement in other areas of education. Much is known about engagement for student learning in primary, secondary, and university education. In addition, there are broad theories encompassing the origins of, influences on, differences between types of, and outcomes of engagement (Eccles, 2016). For example, research in this area could draw on the review of engagement by Fredricks et al. (2004). In addition, research in this area would likely benefit from a greater focus on engagement as a product of person-environment fit (Eccles, 2016). Using the person-environment fit perspective (Eccles & Roeser, 2009), we may be able use this to identify what influences are necessary to create an environment for engaging online professional learning for different sorts of individuals. A focus on person-environment fit also focuses attention on developing contexts which allow learners to

feel competent, socially attached, and have autonomous control of their lives (Deci & Ryan, 2002; Eccles & Roeser, 2009). Previous research has found support for this perspective in primary school reforms (Eccles & Roeser, 2009) and for lifelong learning in older adults (Yasuzato & Katagiri, 2019).

Synthesis

The meta-theoretical framework underlying our synthesis was that of person-environment fit (Fredricks et al., 2004). Here, engagement was considered to be related to the experiences of the learner within the learning environment, where these engagement experiences were considered to be products of both what individuals brought with them to the learning environment (e.g., technology self-efficacy based on their past experiences) and the context of the learning environment itself including both aspects of the online learning environment itself (e.g., user design) and the workplace context in which the learning takes place (e.g., the time set aside for online learning). Here we discuss the findings as they relate to emotional, cognitive, and behavioral engagement.

Emotional engagement was most frequently measured as learners' satisfaction of their online professional learning experience. While learners' frustration (Conte, 2012) was also examined, it was examined rarely. Some aspects of emotional engagement were not studied at all (e.g., boredom). Studies tended to focus on the individual influences on emotional engagement (e.g., technological self-efficacy, perception of course usefulness, expectations and attitudes towards course) more than system or environmental influences. Despite the focus on individual influences, we identified that learners were more likely to enjoy their learning experience and enjoy the course when they found the online platform easy to navigate. Other key influences which facilitated participants' enjoyment of online professional learning were

their perception of the course's usefulness and whether they had work support (i.e., managerial, peer, organizational).

Cognitive engagement was mostly identified as either learners' intention to use online professional learning or learners' ability to enter a state of learning flow. Although measures like learner effort and strategy use are important elements of cognitive engagement, none of the studies we identified examined this component of cognitive engagement. Similar to emotional engagement, individual influences on cognitive engagement were examined more often than system and environmental influences. While a supportive environment both online and offline can influence learners' intentions to continue using online learning, more specific influences, such as the effect of differences in course structure on cognitive engagement were not explored. Learners' technological self-efficacy and learners' perceptions on the usefulness of the course content positively influenced learners' intentions to use online professional learning. In addition, the ease of navigating the online learning management system and having opportunities to interact with peers had *a positive* influence on learning flow.

In terms of behavioral engagement, completion of the course or course activities was the most common measure, while other measures included time spent on the learning platform and number of logins. However, these frequently employed cross-sectional measures may not adequately capture the full complexity of behavioral engagement. Perhaps without multiple measures at different timepoints could explain why although many influences were examined within the literature, no strong relationships were identified to explain what could influence learners' behaviors of online professional learning courses. Compared with behavioral engagement, our review identified stronger relationships between influences and emotional and cognitive engagement. Furthermore, these measures may not capture learner interactions that

occur outside of the online learning platform (e.g., offline interactions with colleagues working on the same online course or behavioral engagement with online material that is outside the course platform). Alternatively, the processes that influence behavioral engagement may be more complicated than those influencing cognitive and emotional engagement, and further research may be needed to better understand driving forces behind this engagement component.

Exploring the general engagement research on professional development, we identified several influences which were similarly important in influencing engagement in not only online professional learning, but across all professional development. A study by Brekelmans' (2013) which focused on registered nurses' engagement with professional development found that the relevance and usefulness of the course material, and work support were also influences that were identified as having a positive influence on engagement. Although Gaytan's (2013) study focused on tertiary students' engagement in online learning, similar influences identified between their study and our review were the importance of having opportunities to interact in order to engage in online courses.

While most influences were positively associated with engagement, an unexpected finding in our meta-analysis was how good quality course design (as perceived by participants) was negatively associated with learners' behavioral engagement. The meta-analysis for that relationship included two studies, one of which found no significant relationship. The other study, by LoCasale-Crouch et al. (2016), found that, compared with a non-interactive version, participants rated an interactive course as having better design, but their participation in core course tasks (i.e., behavioral engagement) was lower. One possible explanation for LoCasale-Crouch et al.'s (2016) finding is that learners interact more with each other in the better designed course (as the developers intended), and thus, felt less motivated to complete core course

elements - perhaps because they felt they had already learned enough through the interactions with other participants. Nevertheless, given the contributions of so few studies to this finding, we suggest more research is likely needed to determine the specific elements of course design that influence behavioral engagement. This research might also consider a greater diversity of behavioral outcome measures (e.g., video viewing patterns, login consistency, proactive posting on forums). It may be that some aspects of course design (e.g., interactivity) positively influence certain aspects of behavioral engagement (e.g., interaction between participants), but not others (e.g., course completion).

Within the systematic review, learner's technological self-efficacy was the most examined influence. Findings showed that it was positively significant in influencing emotional ($k = 3$, $r = 0.39[0.19,0.56]$) and cognitive engagement ($k = 3$, $r = 0.55[0.48,0.65]$), but non-significant for behavioral engagement ($k = 7$, $r = 0.07[-0.11,0.24]$). A possible explanation for these findings might be that self-efficacy, emotional engagement, and cognitive engagement were typically measured using self-report and thus common method variance is a potential concern. However, the narrative synthesis results showed that increased technological self-efficacy had a definitive positive influence on learners' intention and satisfaction of using online professional learning (Bern et al., 2017; LoCasale-Crouch et al., 2016; Weng & Tsai, 2015). Yet, when examining behavioral engagement, poor technical self-efficacy increased learners' likelihood to drop out in some studies (Annansingh & Bright, 2010; Atack, 2003), but high technical self-efficacy did not have a strong effect on increasing course completion in other studies (Blackmore et al., 2008; LoCasale-Crouch et al., 2016).

Strengths and Limitations

While a recent review by Nortvig, Peterson, and Balle (2018) also identified some salient influences on engagement in professional higher education (i.e., "social presence" and "opportunity for interaction"), their primary focus was comparing influences of online learning with those impacting traditional face-to-face methods of teaching and learning. As Nortvig et al.'s (2018) paper was a qualitative literature review of 44 studies, our review builds on their findings as it was conducted systematically with specific inclusion and exclusion criteria. Our updated search resulted in 51 studies included in our narrative synthesis, with 23 of these studies included in the meta-analysis. These results build Nortvig et al.'s (2018) review by confirming the importance of learner interactions, and highlighting additional influences which promote professional learning engagement (e.g., ease of use on learning management system, peer and organizational support). The findings from this paper are important in understanding how online training can be optimized. Educators and developers of online learning can directly make use of the results in this paper when designing new courses and modifying existing ones by considering individual, system and environmental influences.

Some limitations should also be noted. We restricted our searches to the English language, which may have narrowed the number of studies that could have been identified. In addition, while we did not exclude any study designs, studies in our meta-analysis were mostly cross-sectional in nature (19/23 studies). As such, common method variance may have affected the associations seen between influences and measures of engagement. To ensure the data was manageable, the lead author categorized the numerous influences and measures identified throughout the literature using three frameworks (Attfield et al., 2011; Montgomerie et al., 2016; Wang & Kang, 2006). Although other authors critically evaluated the results of this

categorization process, the inherent subjectivity of this process could limit internal validity. In addition, as presented in the funnel plot and confirmed by Egger's test in the meta-analysis, publication bias existed in the academic literature such that studies with smaller sample sizes may have been published only if they produced significant results. Furthermore, as most studies identified in this systematic review were case studies and cross-sectional in nature, most qualitative and mixed-methods studies were evaluated to have a medium study quality (13/24) and a majority of the quantitative studies had an unclear level of risk of bias (18/27). In addition, we could not conduct moderator analyses on different aspects of course elements (e.g., course structure, course duration). Although we could identify that the professional learning course examined in each study had an online component, many studies did not elaborate further on how these courses were structured. As such, these limitations prevent us from drawing causal inferences about influences on user engagement in online professional learning.

Engagement is a critical outcome to focus for online learning if it is to live up to its potential. Yet, engagement is an instrumental outcome. Ultimately, the goal of all online learning is learning itself. Thus, future reviewers could consider the degree to which online learning in professional development ultimately increases participants' skills, knowledge, and abilities. Further, such a review should consider the conditions under which learning takes place. Given its role in producing learning (see Fredricks et al., 2004), we believe engagement will be one of the most crucial predictors in such an analysis.

Conclusions

While online learning is lauded for its capability to cater flexibly to its learners (Campbell, 2016; Chesney & Marcangelo, 2010) and completing professional learning has shown to improve work performance (Desimone, 2009; Kumar et al., 2011), many learners who

enroll in online professional learning courses do not finish. Research on online professional learning has predominantly focused on its feasibility (Elliott, 2017; Yu et al., 2007), with less attention paid to optimizing user engagement. We found that individual influences which prepare and orient learners on what to expect in online professional learner courses had positive effects on their emotional and cognitive engagement throughout the courses. System influences designed for intuitive navigation could also peak learners' emotional and cognitive engagement to facilitate their learning. However, weaker evidence was found on what could influence learners to actually complete online learning courses. From the findings, we can suggest three levels of support within an organization to encourage learner engagement with online professional learning: 1) what organizations can provide; 2) what online educators can do; and 3) what learners should consider. Our research shows that, in order to support learner engagement, organizations need to provide time for their employees and access to learning support to engage with professional learning. Online educators need to design well-structured and interactive online learning experiences where the learning material is relevant to the learners' overall professional growth. And, for the learners themselves, their reasons for enrolling in online professional learning (e.g., intrinsic value and perceived usefulness) will likely influence the degree to which they engage with the course.

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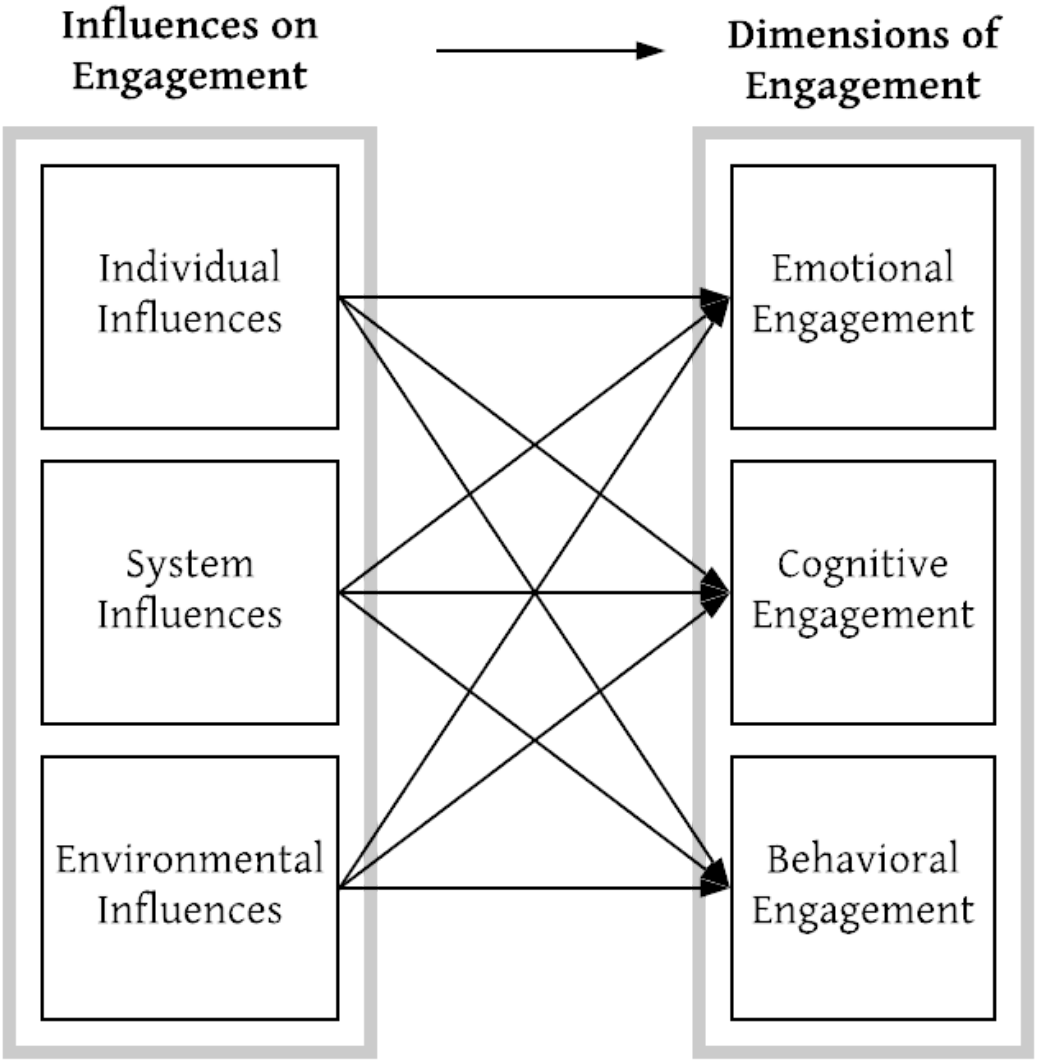

Figure 1. Diagram of associations explored between influences on and dimensions of engagement.

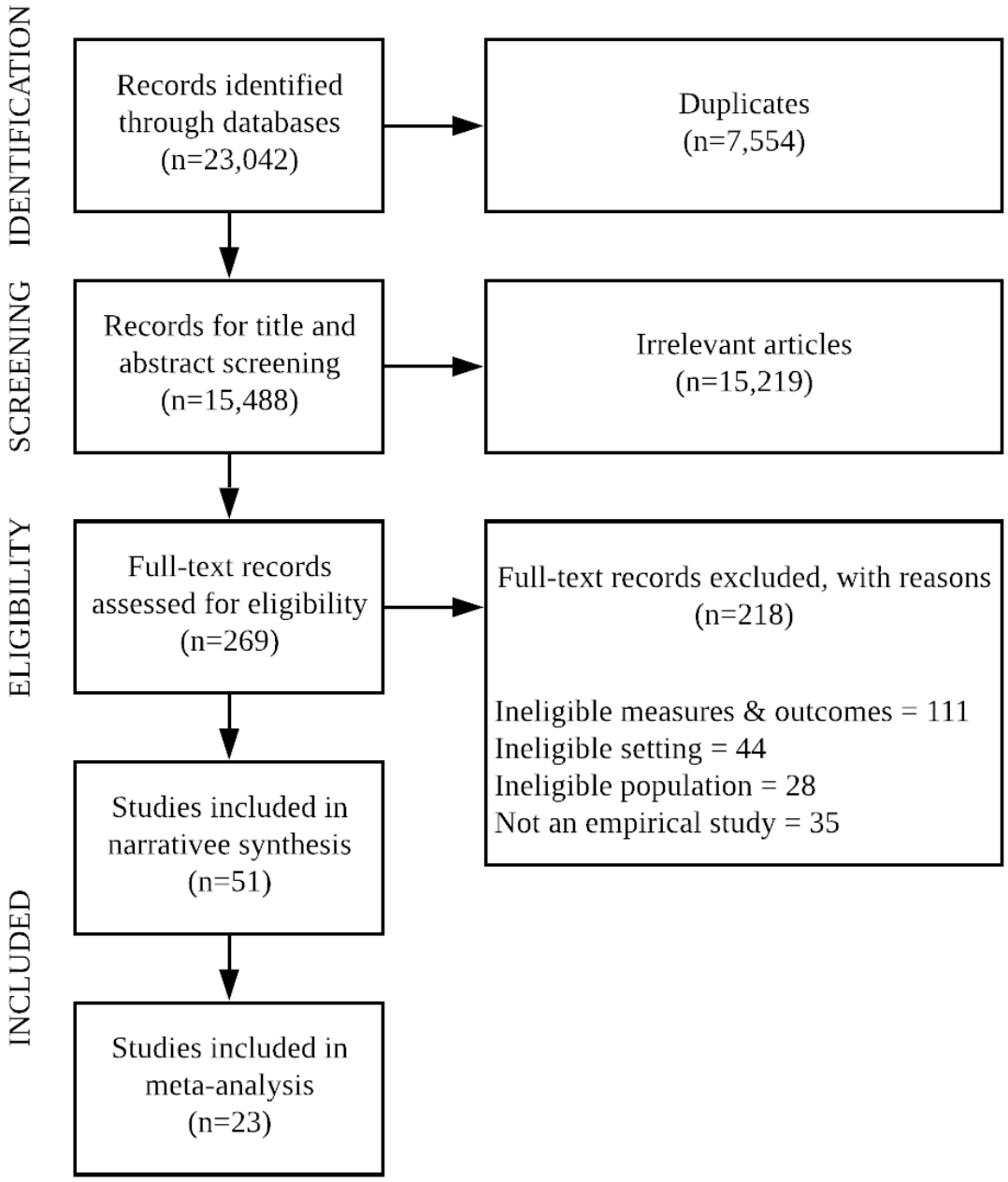

Figure 2. PRISMA diagram.

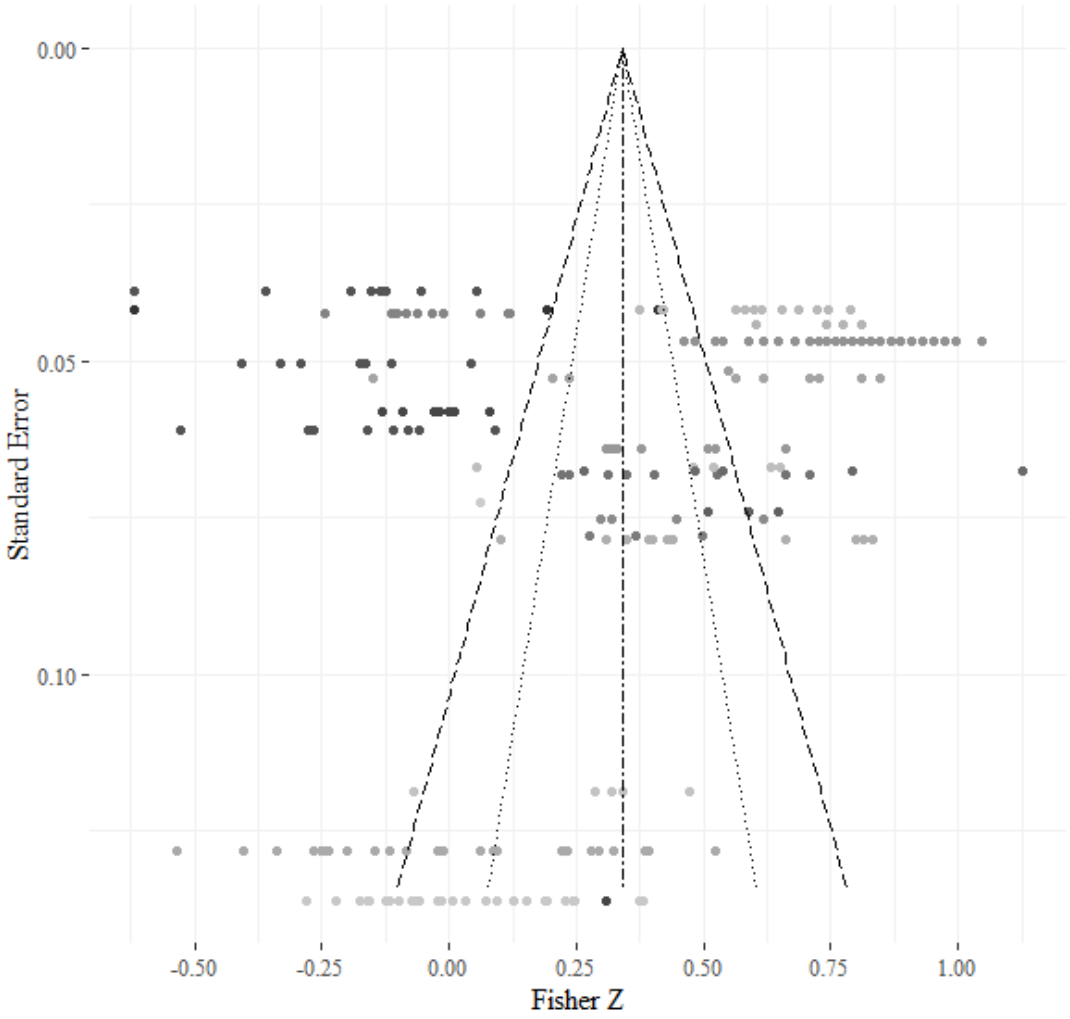

Figure 3. Funnel plot of effect sizes of included studies. Effect sizes are not pooled, thus multiple effects from the same sample will have the same standard error (Rosenthal, 1994). Each "line" or shade represents a different sample included in the meta-analysis.

Table 1

Characteristics of Included Studies in Meta-analysis and Narrative Synthesis

Reference [a]	**Participants**	**Online Professional Learning Notes** [b]	**Types of Theories Assessed**	**Categories of Influences Explored** [c]	**Dimensions of Engagement Explored** [d]
Andreu and Jáuregui (2005)	21 Spanish employees working in banking	Fully online	None used	Individual, System, Environmental	Behavioral
Annansingh and Bright (2010)	25 UK employees working in public sector	Fully online; provided time to complete during work hours; certificate given for certain number of modules completed	None used	Individual, Environmental	Behavioral
Atack (2003)	20 Canadians working in nursing	Fully online	Learning	Individual, System	Behavioral
Baia and Strang (2016)	192 Americans working as pharmacy educators	Fully online	Technology Use	Individual, System, Environmental	Behavioral
Balasubramanian, Badrinath, Vijayabanu, and Vijayanand (2014)	130 Indians working in the IT sector	Mix of fully online and blended learning	None used	Individual, System, Environmental	Behavioral
Barratt-Pugh, Bahn, and Scholz (2011)	16 Australians working in the public sector	Fully online; mandatory	None used	Individual, Environmental	Behavioral
Beach and Willows (2014)	11 Canadian K-12 teachers	Fully online	None used	Individual, System	Behavioral
*Becker, Newton, and Sawang (2013)	683 Australians working in the railway industry	Fully online; to be completed at workplace	None used	Individual, System, Environmental	Cognitive
Bern, Schulmann, and Bastiaens (2017)	48 German employees in health and nursing	Fully online	Design, Technology Use, Motivational	Individual, System	Emotional
Blackmore, Tantam, and Deurzen (2008)	167 European psychotherapists	Fully online	None used	Individual, System, Environmental	Behavioral

Bonafini (2017)	817 global sample of K-12 teachers	Fully online	Learning	Individual	Behavioral
Brosnan and Burgess (2003)	16 UK professionals in the health, education, pharmacy and social work sectors	Fully online; opportunity to gain credit for taking course	Learning	System, Environmental	Behavioral
*Brown (2005)	311 Americans working in academia	Fully online; voluntary	None used	Individual	Behavioral
Burns (2013)	60 Indonesian primary school teachers	Fully online	None used	System, Environmental	Behavioral, Cognitive
Carr and Chambers (2006)	13 Australian K-12 teachers	Fully online; participants received school funding	None used	Individual, System, Environmental	Behavioral
*Chang, Liang, Shu, and Chiu (2015)	670 global participants working in the business sector	Fully online	Technology Use	Individual, System, Environmental	Cognitive
*Chen and Kao (2012)	185 Taiwanese working in high-tech manufacturing	Fully online	Technology Use	Individual, System, Environmental	Behavioral
*Cheng, Wang, Moormann, Olaniran, and Chen (2012)	222 mainland Chinese working in enterprises, education and public sectors	Fully online	Technology Use, Motivational	Individual, Environmental	Cognitive
*Cheng (2013)	218 Taiwanese working in nursing	Fully online	Technology Use, Behavioral	Individual, System, Environmental	Cognitive
*Chiu, Liang, Mao, and Tsai (2016)	164 Taiwanese working in pharmacy	Fully online; opportunity for gaining credit for taking course	None used	Individual	Behavioral
Conte (2012)	20 Puerto Rican employees working in the pharmaceutical industry	Fully online; participants achieving above 70% receive continuing education credits	None used	Individual, System, Environmental	Behavioral, Emotional, Cognitive

Gagnon, Légaré, Labrecque, Frémont, Cauchon, and Desmartis (2007)	40 Canadian physicians	Fully online	Behavioral	Individual, System, Environmental	Behavioral
Gallop and Ballantyne (2003)	5 Australian employees working in the finance sector	Fully online	Learning	System, Environmental	Behavioral, Emotional
*Garavan, Carbery, O'Malley, and O'Donnell (2010)	557 Irish working in the business sector	Fully online; voluntary	Behavioral	Individual, System, Environmental	Behavioral
Henderson (2007)	9 UK and Australian secondary school teachers	Blended learning	Learning	Individual, System, Environmental	Behavioral
Holmes, Signer, and Macleod (2010)	95 Canadian K-12 teachers	Fully online; receive credit on completion	Learning	Individual, Environmental	Behavioral, Emotional, Cognitive
*Hong, Tai, Hwang, Kuo, and Chen (2017)	150 Taiwanese working in government	Fully online	None used	Individual, System	Cognitive
*Joo, Joung, and Kim (2013)	462 South Koreans working in chemistry & communication services	Fully online; mandatory	None used	Individual, System, Environmental	Emotional, Cognitive
*Joo, Lim, and Kim (2012)	248 South Korean workers in electronics	Fully online	None used	Individual, System	Cognitive
*Joo, Lim, and Park (2011)	379 South Korean corporate workers	Fully online	None used	Environmental	Emotional, Cognitive
Lebec and Luft (2007)	7 American secondary school teachers	Fully online	Learning	Individual, System, Environmental	Behavioral
*Lee (2010)	363 Taiwanese taking continuing education at National Pingtung University	Fully online	Technology Use	Individual, System, Environmental	Emotional, Cognitive

Lin (2015)	83 Australian K-12 teachers	Fully online	Motivational, Learning	Individual, System, Environmental	Behavioral
*LoCasale-Crouch, Hamre, Roberts, and Neesen (2016) (group 1)	64 Americans working in education	Fully online; opportunity for gaining course credit	None used	Individual, System, Environmental	Behavioral, Emotional
*LoCasale-Crouch, Hamre, Roberts, and Neesen (2016) (group 2)	57 Americans working in education	Fully online; opportunity for gaining course credit	None used	Individual, System, Environmental	Behavioral, Emotional
Long, DuBois, and Faley (2008)	107 American employees working in landscaping	Fully online; voluntary	None used	Individual, Environmental	Behavioral
Maor and Volet (2007)	30 global professionals in media	Fully online	None used	Individual, System, Environmental	Behavioral
Montgomerie, Edwards, and Thorn (2016)	20 New Zealand professionals	Fully online	None used	Individual, System, Environmental	Behavioral
*Patterson and Resko (2015)	198 American nurses	Blended learning; course application needed	None used	Individual, System, Environmental	Behavioral
Prestridge and Tondeur (2015)	12 Australian Catholic primary school teachers	Fully online	None used	Individual, Environmental	Behavioral, Cognitive
*Roca and Gagné (2008)	174 global participants working in United Nations agencies	Fully online; to be completed at workplace	Technology Use, Behavioral	Individual, System, Environmental	Cognitive
Rodriguez and Armellini (2015)	146 Mexicans sales supervisors	Fully online	Learning	System	Behavioral, Emotional
*Smith and Sivo (2012)	517 Americans working in k-12 education	Fully online	Technology Use	Individual, System, Environmental	Cognitive
Sweeney, Saarman, Flagg, and Seidman (2008)	473 American nurses	Fully online; receive continuing education credit	None used	Individual, Environmental	Behavioral

Swierczek, Bechter, and Chankiew (2012)	110 Indian employees in Engineering	Fully online	None used	Individual, Environmental	Behavioral
tePas, Meinema, Visser, and Dijk (2016)	170 Dutch physicians	Blended learning	None used	Individual, System, Environmental	Behavioral, Emotional
Thorpe and Gordon (2012)	15 UK social workers	Fully online	Technology Use	Individual, System	Behavioral, Cognitive
*Weng, Tsai, and Weng (2015)	578 Taiwanese working in telecommunications, banking & insurance sectors	Fully online	Technology Use, Motivational	Individual, System, Environmental	Emotional, Cognitive
*Yoo, Han, and Huang (2012)	226 South Koreans working in food service industry	Fully online; expectation to complete	Technology Use	Individual, Environmental	Cognitive
*Zha, Adams, Calcagno-Roach, and Stringham (2017)	74 employees in academia	Fully online; voluntary; financial incentive for completion	Learning	Individual, Environmental	Behavioral
Zhang, Lin, Zhan, and Ren (2016)	218 Mainland Chinese middle school English teachers	Fully online	Learning	Environmental	Behavioral

Note. [a] Full reference list of included studies in the systematic review available in Appendix A.
[b] Details extracted: professional learning format, requirement to take course, provision of work hours for professional learning, and rewards for completing professional learning.
[c] Based on Cybergogy for Engaged Learning model (Wang & Kang, 2006) and Montgomerie et al.'s (2016) work.
[d] Based on Attfield's (2011) definition of 'user engagement'.
* References marked with an asterisk indicate studies included in both the narrative synthesis and meta-analysis. All other studies are included in the narrative synthesis.

Table 2

Integrated Results: Effects of Influences on Emotional Engagement [a]

Influence	Number of Narrative Synthesis Studies	Narrative Synthesis Findings [b]	Number of Meta-Analysis Studies	I^2	Meta-Analysis Findings (r[95%CI])	Integrated Results
Individual Influences						
Age			2	52.82	0.15 [-0.12,0.39]	
Attitude towards Online Learning	1	• High positive correlation between learner acceptance of e-learning and their learning motivation • Exposure to new ideas and concepts enhanced social interaction between participants resulting in higher satisfaction				
Education	1	• Less educated participants were more satisfied with the course than more educated participants	2	69.68	-0.10 [-0.41,0.23]	**Learners with less education may find online professional learning more satisfying.**
Expectations	1	• Increases in confirmation were positively associated with satisfaction with e-learning				
General Self-Efficacy	1	• Participant's cognitive presence (the ability to restructure meaning from content) had a positive impact on participant's satisfaction with the course.	2	99.18	0.52 [-0.15,0.86]	**Learners who are able to make sense of the course content are more likely to be satisfied with their learning experience.**
Technological Self-Efficacy	4	• Participants which were more comfortable with technology were more likely to be satisfied at the end of the course • Participants' level of technological self-efficacy did not influence learners' motivation to learn	3	73.18	0.39 [0.19,0.56]*	**Learners who are able to use the online learning management system are more likely to be satisfied with their learning experience.**

Perceived Usefulness	3	• Usefulness of the content is significantly positively correlated with satisfaction • The perceived usefulness of an e-learning system is positively related to the e-learners' satisfaction with the e-learning.	3	49.49	0.66 [0.61,0.70]*	**Learners who find or believe course content to be useful to them are likely to be satisfied with their learning experience.**
System Influences						
Course Design	2	• Medium positive correlation between learner ratings on course design and its effect on learning motivation • No significant findings between course design and learner satisfaction	2	17.5	0.09 [-0.07,0.24]	**While course design can have a positive impact on learner motivation, it may not have as much impact on their online professional learning satisfaction.**
Ease of Use	3	• Ease of use of content and the online learning management system positively associated with learners' satisfaction with learning • Courses with many abbreviations/poorly written test questions made participants feel frustrated, disoriented and distracted from following course content	3	96.35	0.46 [0.55,0.65]*	**Learners' perceived ease of use of the online learning management system during the online professional learning experience shows a medium positive association with learner satisfaction.**
System Interaction	1	• Having opportunities to interact with other learners allowed learners to gauge their learning, and was positively related to learner satisfaction on the online learning platform				
Environmental Influences						
Environmental Support	1	• Perceived family support positively related to learner satisfaction	2	97.14	0.38 [0.01,0.66]*	**Perceived environmental support (e.g., parental or spousal) has a positive social impact on learner satisfaction.**
Interactive Environment	3	• facilitator/instructor presence positively impacts learners' motivation and satisfaction with online learning experience				

Situational Influences			4	87.24	0.42 [0.26,0.55]*
Work Support	2	• Perceived organisational/peer/managerial support are important in learners' satisfaction in online professional learning experiences			

Note. [a] Emotional engagement refers to learners' feelings about their online professional learning experiences
[b] Quantitative findings that were not eligible for the meta-analysis were qualitatively extracted into the narrative synthesis
*Significant effect ($p<0.05$)

Table 3

Integrated Results: Effects of Influences on Cognitive Engagement [a]

Influence	Number of Narrative Synthesis Studies	Narrative Synthesis Findings [b]	Number of Meta-Analysis Studies	I^2	Meta-Analysis Findings (r[95%CI])	Integrated Results
Individual Influences						
Age	1	• Older learners reported lower intention to adopt online professional learning				
Attitude towards Online Learning	3	• Learners who perceived that learning was play had higher intentions of continuing with online professional learning • Learners who felt more anxious about online learning had less intentions of using it	3	78.54	0.54 [0.43,0.65]*	**The more positive learners' attitudes were towards online professional learning, the greater their intention to use online professional learning courses.**
Education	1	• Learners with tertiary degrees were slightly more likely to adopt online learning				
Expectations	1	• Learner expectations to put in effort and to perform well on the job was positively associated with more intention to use online learning	2	19.65	0.48 [0.41,0.54]*	
General Self-Efficacy	6	• Learners who were aware of their how they learn and perceive themselves to be more self-disciplined to go through with online professional learning were able to get into a state of flow and rated that they were able to expand on previous knowledge	4	99.12	0.32 [-0.19,0.69]	**Learners who perceived that they were capable of taking an online professional learning course may positively influence their own intentions to use, be in a flow state, and expand on their previous knowledge.**
Intrinsic Value	2	• Learners' interest in a course topic has a positive effect on learning flow				**Despite disliking the medium of online learning, if learners have a strong interest in the professional learning topic, this will positively impact their learning flow and**

		• Even if learners do not like learning online, they will be willing to take online professional learning on topics they are interested in				**willingness to take online professional learning courses.**
Relevance	1	• Learners who perceive that professional learning is relevant to themselves have more intention to use online professional learning				
Sex	1	• Males were slightly more likely to adopt online professional learning than females				
Technological Self-Efficacy	3	• Learners rated their technological capabilities higher also had higher intentions of using and continuing to use online learning platforms	3	86.87	0.55 [0.43,0.65]*	**The higher learners rated their technological self-efficacy, the more intention they had to use and continue to use online professional learning platforms.**
Test Anxiety	1	• Learners who were more anxious of course assessments had difficult getting into a state flow for learning.				
Perceived Usefulness	9	• Learners who perceive that the online professional learning would be useful had more intention to use and continue to use online professional learning platforms • Learners who perceive that online professional learning would be useful were more likely to experience learning flow	9	93.38	0.57 [0.48,0.65]*	**Learners' perceived usefulness of online professional learning courses were positively and significantly associated with experiencing learning flow and had higher intentions of using online learning platforms.**
Work-related Aspects	1	• Learners who worked in an organization longer had lower intentions to adopt online professional learning				
System Influences						

Content Quality	1	•	No association was found between the content quality on learners' intention to take online professional learning courses.	3	95.44	0.00 [-0.28,0.27]	
Course Design	1	•	Careful thought of what media type to use to convey certain course materials leads to good cognitive load management on the learner				
Ease of Use	8	•	Learners found that it was easier to get into a state of learning flow if the online learning platform was easy to navigate • More learners had the intention of taking online professional learning courses if they rated the online platform easy to use	8	96.76	0.42 [0.25,0.57]*	**Online learning platforms that are rated as easy to use have a positive and significant effect on learners' intentions to take online professional courses and positively influence learners' ability to get in a state of learning flow.**
System Design	3	•	Learners' satisfaction with the design of the online learning platform may influence their intentions to continue using online professional learning.	3	99.40	-0.09 [-0.66,0.55]	**Learners' rating of the online learning platform do not have a strong positive or negative influence on whether they continue to use online professional learning courses.**
System Interaction	2	•	Learner to learner or learner to system feedback has a positive effect on learners experiencing a state of flow while one the online learning platform				
Environmental Influences							
Environmental Support	4	•	Learners' perceived autonomy and family support positively influenced learners' intentions to take online professional learning courses • If learners perceive themselves to more susceptible to others influence, then they would take online professional learning courses if others also too	4	95.8	0.49 [0.27,0.66]*	**Learners' intentions to take and continue with online professional learning courses are positively influenced by family support and learners' susceptibility to be influenced by others**

Interactive Environment	3	• Watching how other learners make use of the online learning platform allowed learners to think of how they would use it for themselves over time • Learners have more intention to use when they do not feel that they are learning alone.	4	98.4	0.42 [0.08,0.68]*	**When learners do not feel alone in their learning experience, they have more intention to use the online learning and draw from how others navigate the course as well.**
Situational Influences	2	• Having time constraints could make it hard to prioritise and focus on online professional learning				
Work Support	4	• Learners' perceived organisational support has a positive effect on learning flow in the online professional learning platform • Learners' perceived managerial and peer support positively influence their intentions to use online professional learning courses	5	91.40	0.37 [0.25,0.47]*	**Learners who have managerial and peer support have significant and positive intentions to use online professional learning courses. With organisational support, learners experience more learning flow on the online professional learning platforms.**

Note.[a] Cognitive engagement refers to the learners' efforts to immerse themselves in an online learning experience
[b] Quantitative findings that were not eligible for the meta-analysis were qualitatively extracted into the narrative synthesis
*Significant effect ($p<0.05$)

Table 4

Integrated Results: Effect of Influences on Behavioral Engagement [a]

Influence	Number of Narrative Synthesis Studies	Narrative Synthesis Findings [b]	Number of Meta-Analysis Studies	I^2	Meta-Analysis Findings (r[95%CI])	Integrated Results
Individual Influences						
Age	6	• There was no significant relationship between a learner's age and how much they participated or completed online professional learning courses	4	40.55	-0.03 [-0.13,0.06]	**Age is not significant in whether a learner participates in course activities or completes online professional learning courses.**
Attitude towards Online Learning	4	• Learners who preferred independent learning rather than interacting with their peers were more likely to use and complete online professional learning courses				
Education	3	• Learners with less educational qualifications participated more because it was seen as a way to improve their qualifications in the workforce	4	49.27	0.00 [-0.11,0.10]	**Learners with less educational qualifications may be slightly more likely participate in online professional courses more.**
Ethnicity	1	• Learners that were not Caucasian and not Hispanic were more likely to complete online learning				
Expectations	2	• Learners who had expectations of themselves and what they would achieve with online professional learning participated in the course more				
General Self-Efficacy	5	• Learners who imposed more self-discipline methods were more likely to access or complete online professional learning.	2	0.00	-0.05 [-0.12,0.01]	**There is no significant relationship between learners' belief in their capability to use online learning and their participation and completion of online professional learning courses.**
Intrinsic Value	7	• Learners who had an internal drive to learn from the online course rather than just completing it for the sake of completing were more likely to spend time on the online course and complete it	2	88.20	0.04 [-0.03,0.45]	**Whether an online professional learning course has significant value to the learner does not influence whether learners complete course activities. However, learners who are**

		• Individual accountability was not significant in getting learners to participate; however learners felt more accountable to participate when doing group/interactive activities				**interested in the professional learning course are likely to spend more time on the online learning platform.**
Job Relevance	8	• Learners were more likely to participate in courses where content was related to their jobs or aligned with their career goals • However, learners were more likely to drop out of professional learning that was relevant to their job if the courses covered content they already knew				
Positive Outlook	3	• Learners who have had positive experiences/having positive online learning experiences are more likely to spend time doing online professional learning				
Requirement	4	• Mandatory courses were more likely to be completed (though met with resistance), while learners who volunteered to take online learning used it more willingly				
Sex	4	• Learners' sex had little influence in whether they spent more or less time on the online learning platform • No relation between learners' sex and whether they were more likely to drop out of online professional learning	2	0.00	0.04 [-0.03,0.11]	**There is no significant relationship between learners' sex and their participation or completion of online professional learning**
Social Status	1	• Learners who rated themselves as more affluent were more likely to participate in the online professional learning courses.				
Technological Self-Efficacy	16	• Less proficiency with technology was a barrier to participation and completion • Technologically proficient learners spent more time on the online learning platforms	7	88.20	0.02 [-0.17,0.21]	**While learners who rated themselves as more proficient with technology were more likely to spend more time on online learning platforms, there were no strong relationship between learners' technological self-efficacy and the completion of online professional learning courses.**

Perceived Usefulness	2	• Learners who thought course material was useful for them were more likely to participate and persist in online professional learning courses.				
Work-Related	8	• Learners with heavy workloads find it hard to prioritize time for online learning	2	88.20	0.02 [-0.17,0.21]	**There is no significant relationship between learners' workload or their seniority within an organization and how much they participated or completed online professional learning courses.**
		System Influences				
Content Quality	6	• The quality of the content and resources on an online learning platform affected learner's confidence and their participation and completion of online professional learning courses • Course content that was rated as more difficult by learners impeded their completion of online professional learning courses	2	98.72	0.34 [-0.11,0.67]	**Course content that uses trustworthy material inspires learners' confidence and participation in online professional learning although course material and assessment that are difficult to the learner impedes their completion of online professional learning courses.**
Course Design	11	• Including opportunities for learners to interact with peers offline (i.e., blended learning) decreased learners' online interaction marginally • Well-timed release and well-structured online professional learning encouraged learners' participation and completion of courses	2	52.29	-0.21 [-0.39,-0.00]*	**Having interactive opportunities outside the online professional learning courses impeded learners' participation within the course. However, timing and structure of online professional learning courses positively influences learners' completion of professional learning.**
Course Workload	4	• learners preferred not to have deadlines or evaluations as these impeded their use and completion of online learning • The amount of work that needed to be done within online learning was important in whether learners participated more or completed the online professional learning				
Ease of Use	6	• A logical, structured layout for learners to navigate intuitively is important for				

		learners' continued use of the online learning ● Making things more difficult or requiring many steps before learners can access content impedes learners' use and participation of online professional learning				
Reputation	1	● Learners were indifferent about the reputation of the online professional learning provider and this did not affect whether they participated in online learning or not.				
System Design	6	● There was no difference in learners' participation in online professional learning courses even if they prefer or do not prefer the online learning medium of professional learning delivery.				
System Interaction	8	● Feedback from facilitators and peer interaction (a mechanism for relationship building thereby decreasing feelings of boredom or isolation) have a positive influence on learner participation and retention.				
Environmental Influences						
Access	2	● Having access to necessary technology for online professional learning positively influenced learners' participation and completion of courses.				
Cost	3	● Learners who seek funding for their courses are more likely to complete. ● When there are no costs, learners feel there are no consequences to not participate or complete courses.				
Environmental Support	4	● Learners found that having the social support of peers encouraged them to stay in the course and participate and complete online professional learning.	2	98.72	0.26 [-0.44,0.76]	**Most studies found that having the support of online professional learning peers have a positive influence in continuing and completing courses**

Interactive Environment	8	• Tutor/facilitator/instructor/other learner instigated and supported interaction is important for all learners to feel comfortable to participate in interacting and spend time using the online learning • Social presence and interaction in online learning helps learners feel less isolated during the learning experience and thus encourages their participation on online learning; interaction helps learners to have a sense of who their other peers are in online professional learning				
Rewards	7	• Incentive availability (i.e., continuing education credit, financial) motivated learners to use online learning and complete more online learning activities/content	4	93.33	0.17 [-0.12,0.44]	**Incentives may have some positive influence on learner completion of online professional learning activities and courses.**
Situational Influences	13	• Time constraints did not preclude learners from using online professional learning although it was difficult to prioritize time for learning • Learners who lived in rural areas were more likely to complete online professional learning than learners living in an urban location	4	69.55	0.14 [0.04,0.24]*	**Facilitating Influences (e.g., having free time, no family commitments) and where access to professional development is usually scarce (i.e., living in rural areas) have a positive influence on learners' participation and completion of online professional learning courses.**
Work Support	7	• Organizations enforcing online professional learning impeded learners' participation • Managerial support and adaptive culture encouraged learners to use online learning more and plan for the learning				

Note. [a] Behavioral engagement refers to the actions a learner makes on the online learning platform
[b] Quantitative findings that were not eligible for the meta-analysis were qualitatively extracted into the narrative synthesis
*Significant effect ($p<0.05$)