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Online Learning Empirical Research on the Learning Process and Its Impact on Learning Outcomes: Review of Literature and a Future Research Direction

Completed Research Paper

Abstract

Research on e-learning has been conducted over the past several decades. The most common e-learning empirical research streams have been studies that examine potential predictors of course learning outcomes. Building a holistic success model with a system's view is a critical issue that must be tackled to make progress toward building robust e-learning theories. The purpose of this research is to further investigate the critical issue raised by Eom and Ashill (2018) to guide future empirical research in building robust e-learning theories. The majority of e-learning empirical research studies of critical success factors over the past decade built models of a set of disconnected constructs. We conclude that it is imperative for future e-learning empirical research to focus on building a holistic success model of a set of interconnected constructs with a system's view.

Keywords: e-learning empirical research, critical success factors, the learning process, a holistic success model

Introduction

Research on e-learning and distance learning originated more than 40 years ago (Hiltz and Turoff 1978). Since then, the most common e-learning empirical research streams have been studies addressing the students' performance relative to the face-to-face courses as well as examining the potential predictors of course learning outcomes (Arbaugh et al. 2009; Arbaugh et al. 2010; Eom and Arbaugh 2011; Eom and Ashill 2018). Some meta-analytical studies (Means et al. 2009; Sitzmann et al. 2006) suggest that e-learning outcomes are equal to or, in some cases, better than those of face-to-face learning. Meanwhile, many researchers also expressed their concerns regarding the effectiveness of e-learning systems (Keller et al. 2009; Morgan and Adams 2009). As such, many studies during the past several decades attempted to identify the e-learning critical success factors (CSFs) that must be managed to increase the effectiveness of e-learning systems. Eom and Ashill (2018) asserted that building a holistic success model with a system's view is a critical issue that hampers the progress toward building an e-learning success model and robust theories.

Kerlinger (1986, p. 9) defined a theory as:

A theory is a set of interconnected constructs (concepts), definitions, and propositions that present a systematic view of phenomena by specifying relations among variables, with the purpose of explaining and predicting the phenomena.

Two distinctive groups of e-learning empirical research on CSFs were identified (Eom and Ashill 2018). The first group deals with the direct relationships between each success factor and learning outcomes and/or the students' satisfaction. However, these studies ignored the synergistic effects of CSFs interacting together (Arbaugh, 2005; Barbera, Clara, & Linder-Vanberschot, 2013; Eom & Ashill, 2016; Eom, Ashill, & Wen, 2006; Johnson, Hornik, & Salas, 2008; Kim, Kwon, & Cho, 2011; Mashaw, 2012; Peltier, Drago, & Schibrowsky, 2003; Sun, Tsai, Finger, Chen, & Yeh, 2008). The second group of research deals with modeling several CSFs that consider the interdependence of the CSFs that affect e-learning outcomes (LaPointe & Gunawardena, 2004; Peltier, Schibrowsky, & Drago, 2007; Young, 2005; Wan, 2010; Wan, Wang, & Haggerty, 2008; Wilson, 2007). However, these studies examined the relationships between a

subset of CSFs and learning outcomes and/or satisfaction, using only part of the key predictors of e-learning outcomes.

The purpose of this research is to further investigate the critical issue raised by Eom and Ashill (2018) to guide future empirical research in building robust e-learning theories. An e-learning system is an open system of human entities (students and instructors) and nonhuman entities (learning management systems as well as information and communication systems) to maximize the e-learning outcomes and student satisfaction (Figure 2). An e-learning system as a purposeful system is synergistic. There is a dynamic relationship among student motivation and academic engagement, cognitive and metacognitive learning processes, course design quality, the instructor's facilitating roles, and information and communication technologies. The total effects of the synergistic interdependent entities working together are more than the sum of the individual effects. The majority of e-learning empirical studies failed to model and realize the total effects of synergistic interdependent entities.

The holistic e-learning success model should incorporate the interdependent (not independent) process nature of e-learning success research to build robust e-learning theories. Specifically, the interdependent learning process is a vital element of the e-learning success model we are focusing on. In doing so, the next section presents the theoretical foundation of this research: the system's view of e-learning success model. This is followed by a review of the prior empirical studies on CSFs to assess whether they include the interdependent learning process as a critical element of their model. This is important in that the learning process variables is the glue that holds the other input variables (student entity as well as the instructor entity, and learning management systems and information and communication technologies) and outcome variables together. The final section discusses the conclusion, limitations, and future work.

Theoretical Foundations

Technology-Mediated Learning Research Framework

Two decades ago, Alavi and Leidner (2001) called for the new direction to explicitly include the psychological learning process as a mediating variable in technology-mediated learning (TML) research. This is necessary because learning outcomes cannot be affected without influencing the learning process. The original idea of building an e-learning success model that emphasizes the roles of the cognitive learning process dates back to 2001. According to Alavi and Leidner (2001), the majority of distance learning empirical research were based on "a static view" and "an outdated stimulus-response perspective." Consequently, the TML research model utilized a direct cause-effect relationship between each variable and the learning outcomes, and it lacked a vital missing link of the learning process. The most important missing link was the internal psychological process through which learning outcomes are produced (Fig. 1). The suggested framework allows the TML research to move from the simple investigation of the surface to a deeper and wider level of empirical research where all of the constructs are logically linked to show the dynamic process and their interactions.

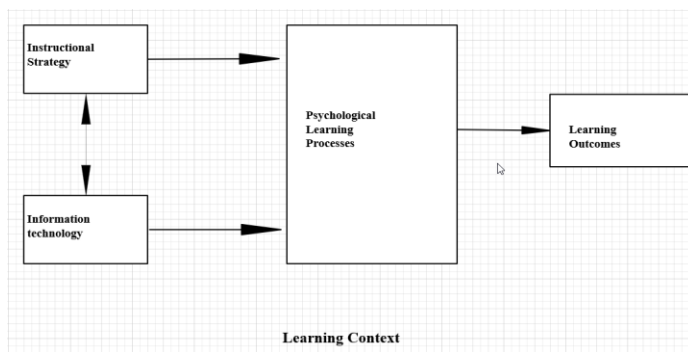


Figure 1. A Framework For TML Research (Alavi and Leidner 2001)

Psychological Learning Processes

Psychological learning processes are described by Alavi and Leidner (2001, p.4) as

states within the learner that are involved in learning. They include the learner's cognitive and information processing activities, motivation, interest, and cognitive structures (memory). Cognitive and information processing activities in this context refers to a range of mental processes that the learners use to select, encode, and comprehend the information presented externally through the instructional model.

These psychological learning processes are based on a global view of the cognitive architecture (Stillings et al. 1995). As noted by Wan et al (2007), due to the complexity of human's psychological processes, few studies have investigated the learner's cognition and cognitive structures. Consequently, the framework of Alavi and Leidner was not widely applied to e-learning empirical research due to the highly restricted and narrow definition of learning processes. It ignored the broader areas of learning processes utilized in distance learning, including meta-cognitive learning processes. Furthermore, the learners' cognitive and information processing activities are not controllable by learners. For example, Robert Gagné (1977) explained learning as the process of nine interconnected, successive steps to produce learning outcomes. The first step is capturing the attention of the student. In doing so, the instructor starts each lesson with a thought-provoking question or interesting fact delivered by multimedia programs that stimulates the senses with auditory or visual stimuli. This in turn creates curiosity to learn. In distance learning, the instructor may use multimedia course material that creates stimuli, which activate the sensory receptors of the students (Kruse 2009). This process is executed unconsciously and involuntarily. All other mental processes such as moving information from short-term memory to long-term memory are executed unconsciously and involuntarily.

A System's View of E-Learning Success Model

Nearly two decades later, a system's view of the e-learning success model has emerged to overcome the shortcomings of TML research framework and to advance our understanding of the effective management of e-learning CSFs (Eom and Ashill 2018). This system's view is the extension of Eom, Wen, & Ashill's (2006) study, which examined the predictive factors that affect the perceived learning outcomes and student satisfaction in asynchronous online learning environments. The model of Eom and Ashill incorporated the interdependent (not independent) process nature of e-learning success (Figure 2). It is a learning theory-based integrated and comprehensive e-learning success model that depicts a dynamic interdependent set of CSFs interacting together. Applying structural equation modeling, their model empirically validated a comprehensive model of e-learning success at the university level. Furthermore, their research advances the existing literature on CSFs of e-learning and provides a basis for comparing existing research results as well as guiding future empirical research to build robust e-learning theories. The results indicated that the e-learning success model satisfactorily explains and predicts the interdependency of six CSFs of e-learning systems (course design quality, instructor, motivation, student-student dialogue, student-instructor dialogue, and self-regulated learning) and perceived learning outcomes.

Three types of intertwined learning processes

There are two characteristics that set this system's view apart from other e-learning empirical models:

- the significant reduction of the number of independent and dependent variables as well as
- the interdependence of the CSFs with inputs, processes, and outputs.

There are three types of intertwined learning processes involved in creating the learning outcomes:

- the cognitive learning process
- self-regulatory learning (SRL) processes

- dialogical processes (student-student and Instructor-student)

The students' learning/cognitive process: The cognitive learning process refers to the way that learning data and information is internally processed by the human mind and how the mind works during the learning process. Alonso, et al. (2005) proposed a psycho-pedagogical instructional model to guide the transformation of the information received by the learner in the sensory memory into structured knowledge that is stored in the long-term memory. The cognitive process consists of a series of phases (perception, attention, cognitive load, coding, retrieval/transfer, and metacognition) in human cognition processes and each phase is supported by the different types of memories (sensory memory, working memory, and long-term memory) (Alonso et al. 2005).

The self-regulatory learning process: the constructivist paradigm is a pillar of distance learning theories. It believes that knowledge is constructed individually and independently and that students learn better when they discover knowledge themselves at their own time and pace. Therefore, it is necessary and essential for distance learners to become self-regulated learners. There are two core attributes of self-regulated learners. Students who exhibit a high level of SRL behavior are “meta-cognitively, motivationally, and behaviorally active participants in their own learning process” (Zimmerman 1986). As Fig. 2 shows, SRL behavior includes three indispensable elements: motivation, management of meta-cognitive learning processes, and learning strategy selection to achieve the learning goals and desired outcomes.

The dialogical process: Another school of thought, collaborativism, assumes that knowledge is socially and collaboratively constructed through sharing. Therefore, the involvement, interaction, and dialogue between students (SSD) as well as between students and the instructor (SID) are viewed as being critical ingredients to the success of e-learning systems. One thing that sets e-learning apart from traditional face-to-face learning is the psychological and communication space (transactional distance) between the instructor and students (Moore, 1993). The transactional distance in e-learning can be reduced by many types of interactions: learner-content, student-instructor, student-student, student-technology interaction (Hillman, Willis, & Gunawardena, 1994; Moore, 1989).

The system's view assumes that three distance learning entities (students, instructors, and information technology/learning management systems) influence the intertwined mediating process, which in turn affects the perceived learning outcomes as well as the learners' affective reactions to e-learning (satisfaction). This study expands the scope of learning processes in addition to the psychological learning process to include the meta-cognitive learning process (Anthonysamy 2021; Johnson et al. 2009) as well as learning strategy selection (self-regulated learning) (Hardy et al. 2019; Santhanam et al. 2008; Wan et al. 2012). In addition, the interaction/dialogue is an essential component of the collaborative learning process that affects the learning outcomes (Kim et al. 2014). The social interdependence theory that is rooted in collaborative learning has been an important way of learning in education, as demonstrated by Johnson and Johnson (2009). Using more than 1,200 studies, they demonstrated that collaboration and cooperation, rather than competitive and individualistic efforts, resulted in higher achievement and greater productivity (Johnson and Johnson 2009; Laal and Ghodsi 2012).

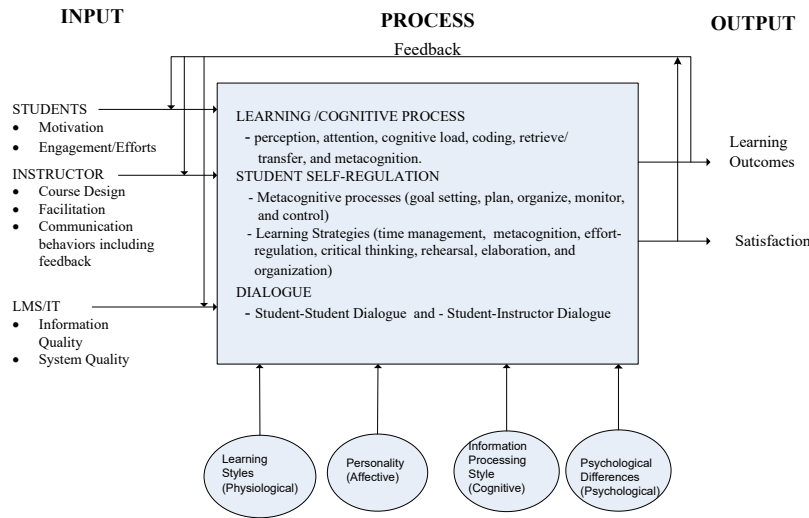


Figure 2. A System's View of E-learning Success Model (Eom and Ashill 2018)

The past several decades of e-learning empirical research on critical success factors (CSFs) can be broadly categorized into two distinctive groups of research modeling approaches.

Two Approaches of E-Learning Empirical Study Modelling

The Simple Cause-Effect Relationship Model Approach

This approach deals with the direct relationships between each success factor and learning outcomes as shown in Figure 3. Many e-learning empirical research studies (Johnson et al. 2008; Marks et al. 2005; Peltier et al. 2003) ignore the synergistic effects of success factors interacting together (Arbaugh 2005; Barbera et al. 2013; Eom and Ashill 2016; Eom et al. 2006; Johnson et al. 2008; Kim et al. 2011; Mashaw 2012; Peltier et al. 2003; Sun et al. 2008).

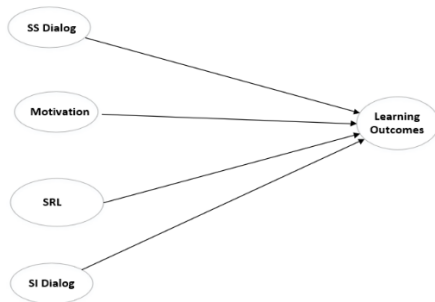


Figure 3. The Simple Cause-Effect Relationship Model

The Complex Cause-Effect Relationship Model Approaches

The second group of research deals with modeling several CSFs that consider the interdependence of the CSFs that affect e-learning outcomes (LaPointe & Gunawardena, 2004; Peltier, Schibrowsky, & Drago, 2007; Young, 2005; Wan, 2010; Wan, Wang, & Haggerty, 2008; Wilson, 2007).

Unlike Figure 3, Figure 4 exhibits the complex cause-effect relationship model in which all three mediator variables (SI Dialogue, SS Dialogue, and SRL) connect the criterion variables and the outcome variables. This model considers the dynamic and systemic nature of the e-learning success factors. A dynamic model can be defined as an interactive system with a defined sequence of inputs, processes, and outputs over time

(e.g., a semester). The students' perceived learning outcomes and satisfaction are results of the systemic process of e-learning over time: input, process, and output.

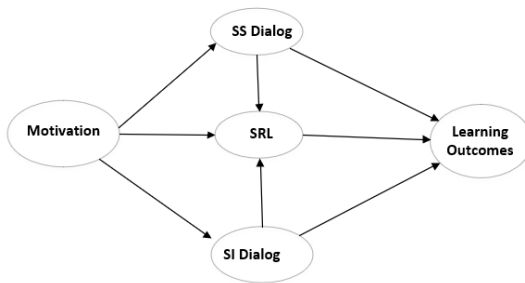


Figure 4. The Complex Cause-Effect Relationship Model with Mediating Variables

Nevertheless, the same data processed by each of the two approaches could produce misleading and inconsistent results. Therefore, it could hamper progress toward building robust distance learning theories.

Different research models (Eom and Ashill 2016; Eom and Ashill 2018) that used the same data produced two different conflicting outcomes (Eom 2020). For example, to explain the effect of SRL on learning outcomes, Eom and Ashill (2016; 2018) tested the same hypothesis, “students with a higher level of SRL in online courses will report higher perceived learning outcomes,” using two different models. This resulted in different outcomes. The first model (Figure 3) failed to support the hypothesis, while the second approach (Figure 4) supported it.

Review of E-Learning Empirical Research On CSFs

This review of prior empirical studies builds on Yunusa and Umar (2021) as a sample. Their studies provided an extensive overview of the factors that affected the effectiveness of the e-learning systems using student satisfaction and perceived learning outcomes as dependent variables. It also presented a variety of factors in predicting the effectiveness of the e-learning systems, based on a scoping review (Dijkers 2015; Munn et al. 2018) over the period of 2000 and 2019.

Results of their study identified a taxonomy of predictive factors of student satisfaction and learning outcomes (Fig 5).

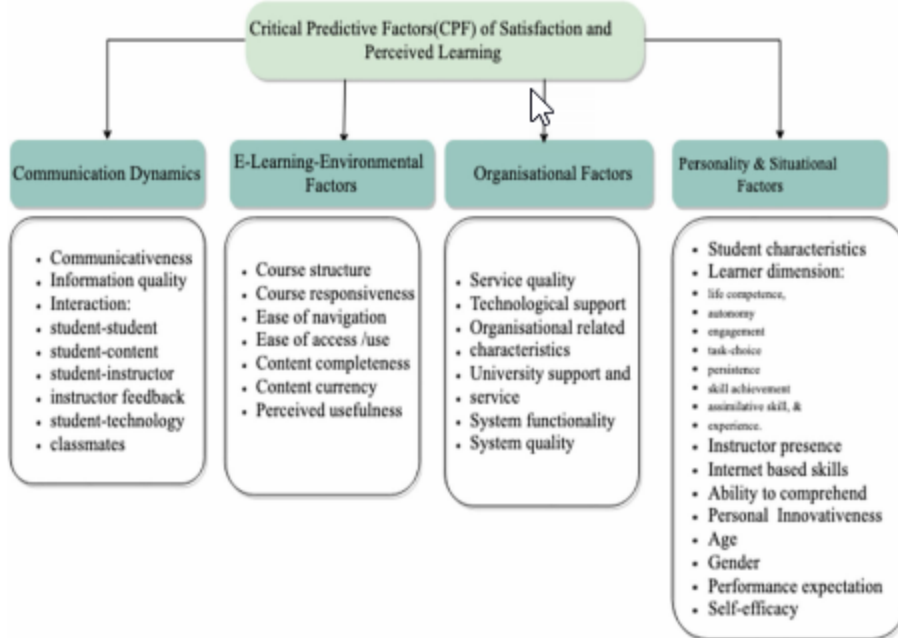


Figure 5. A Taxonomy of Predictive Factors of Student Satisfaction and Learning Outcomes (Source: (Yunusa and Umar 2021))

As introduced earlier, Eom and Ashill (2018) asserted that building a holistic success model with a system’s view is a critical issue that hampers the progress toward building an e-learning success model and robust theories. Although the taxonomy of predictive factors (Figure 5) provides us with the summary of a scoping review, it failed to show how the survey of empirical studies incorporated the interdependent process nature of e-learning success research to build robust e-learning theories. A theory is a set of interconnected constructs (concepts), definitions, and propositions. The arrows connecting the four factors do not necessarily indicate that the communication dynamics influence or correlate the environmental factors. By the same token, the taxonomy failed to prove that the environmental factors simultaneously affect subsequent factors (organizational as well as personality and situational factors). Even more critically, these factors do not include any of the learning process variables (the cognitive learning processes as well as metacognitive learning processes).

Because of the critical short-comings of the empirical studies of Yunusa and Umar (2021), we further analyzed and specifically focused on the use of the learning process variables (cognitive learning processes, meta-cognitive learning processes, and interaction) as an important construct in e-learning empirical studies. Any study that does not include the learning process variables were excluded in our analysis. Table 1 summarizes the 8 studies that included the learning process variables. The rest of the 45 studies do not include any of the learning process variables. The eight studies we analyzed is a sample representing a population of 2133 articles with the following attributes: published between 2000 and 2019, peer reviewed English language journals and Ph.D. theses, studies in higher education involving e-learning.

Authors	Input (independent)	Mediating	Output (dependent)	Finding
1.(Chow and Shi 2014)	learning process, SII, SSI, and CD	none	PS Continuous Intention (CI).	Of these four factors, learning process and CD are the only two factors that have a direct influence on both PS and CI.

				SII, SSI do not play a role to predict students' SAT with and CI of e-learning.
2.(Eom and Ashill 2016)	student motivation (intrinsic and extrinsic), SRL , SSI, SII, CD.	none	PLO PS	The strongest predictors of PLO and PS are CD, instructor, and SSI and SII.
3. (Kuo 2010)	SSI, SII, SRL, SCI ISE, Metacognitive strategies	none	PS	SCI,SII, SRL were found to be significantly related to PS. SSI correlated least to PS.
4.(Kuo et al. 2013)	SII, SSI, SCI, ISE SRL.	none	PS	SII, SCI, & ISE were good predictors of PS, but not SSI & SRL.
5. (Nguyen 2016)	SII, Collaboration Technology, Assessment form (peer, self, test activities, etc.).	none	PS	SII, Collaboration and Assessment have a significant influence on PS.
6. (Paechter et al. 2010)	CD, SII, SSI, SRL, Instructor (expertise & support), collaborative learning.	none	PS PLO	The instructor (expertise and support) was the best predictors for PS and PLO. SRL and collaborative learning were related to PLO.
7. (Rienties and Toetenel 2016)	CD activities and choices <i>Assimilative</i> (read, watch, listen, etc.) <i>Info. Processing</i> (Communicate, discuss, collaborate, etc.) <i>Productive</i> (actively constructing knowledge) <i>Experiential</i> (applying learning in a real world setting).	none	PLO (Learning performance)	LD choices made by the instructor influence subsequent learning processes and learning performance over time.
8. (Sahin 2007)	Instructor Support, SSI, Collaboration, Authentic Learning, Active Learning (Selecting Own Learning Strategies), Student Autonomy.	none	PS	Instructor support, authentic learning, active learning were significantly/positively correlated to PS

Table 1. Review Of Empirical Research On Online Learning Critical Success Factor With Learning Process Variables

Notes:

1. Following abbreviation is used in Table 1.

SCI (student-content interaction), SSI (student-student interaction), SII (student-instructor interaction), CD (course design), SRL (Self-Regulated Learning), ISE (Internet Self Efficacy), LMSs (Learning Management Systems), PLO (Perceived Learning Outcomes) and PS (Perceived satisfaction).

2. Absence of mediating variables in the column 3 of Table 1 as denoted “none”.

It refers to “the inclusion of mediating variables” in the research model. For an example, as shown in Figure 2 and Figure 4, student-student dialogue, student-instructor dialogue, and self-regulated learning are used as mediating variables. A mediating/mediator variable explains the relation between the predictor variable and the dependent (criterion) variable. It explains how a mediator (e.g., student-instructor dialogue) can be a facilitator by which a predictor variable (e.g., motivation) can produce changes on a dependent variable (e.g., perceived learning outcomes). The eight studies in Table 1 did not use the complex cause-effect relationship model in which all mediator variables such as SI Dialog, SS Dialog, and SRL connect the criterion variables and the outcome variables.

Summary and Synthesis

There are three preliminary conclusions to be drawn from this review.

Input variables and learning process variables

Only 15% of the study of Yunusa and Umar include the learning process variables as a critical part of the e-learning success model. As briefly discussed earlier, the holistic e-learning success model should incorporate the interdependent (not independent) process nature of the e-learning success model. Because the learning process variables are the glue that holds the other input variables (students entity and the instructor entity, as well as leaning management systems, ICT, and outcome variables) together. The majority of the e-learning empirical studies of Yunusa and Umar failed to incorporate the interdependent process nature of the e-learning success model. Also, it is important to emphasize that including the learning process variables does not necessarily mean that e-learning systems are fully functioning as an interdependent system. In other words, e-learning empirical researchers should build a research model that represents the dynamic and systemic system that combines all of the e-learning CSFs. A dynamic model can be defined as an interactive system with a defined sequence of inputs, processes, and outputs over time (e.g., a semester). The students' perceived learning outcomes and satisfaction are results of the systemic process of e-learning over time: input, process, and output.

Outcome variables

Learning outcomes are the output of e-learning systems, such as academic performance, satisfaction, actual or perceived learning, student skills acquired, etc. Learning outcomes are rooted in Bloom's taxonomy of educational objectives (Bloom, Engelhart, Furst, Hill, & Krathwohl, 1956; Anderson & Krathwohl, 2001), which is a set of three hierarchical models to classify the learning objectives for evaluating the learning outcomes. Bloom's taxonomy provides a range of the possible learning goals and objectives in cognitive (Bloom et al., 1956), affective (Krathwohl, Bloom, & Masia, 1964), and sensory domains (Simpson, 1966).

The majority of distance-learning empirical studies include the learning outcomes in the cognitive and affective domains. However, the learning outcomes are produced by these two domains of learning in tandem. For example, the learning perceptions are created by the active participation of forum activities (affective domain) and applying all or some of the six cognitive sub-processes. Another issue is how to measure the learning outcomes. There have been two major criterion (dependent) constructs in distance learning empirical research: perceived learning outcomes (cognitive domain) and satisfaction (affective domain). The student perceptions of the learning outcomes are much more effective. They are also more reliable indicators of instructional effectiveness in college courses than actual course grades, and the perceived learning outcomes are highly correlated with the overall ratings of teaching effectiveness (Cashin & Downey, 1992; Ryan & Harrison, 1995; Centra & Gaubatz, 2000; Kuhn & Rundle-Thiele, 2009). Table 1 illustrates that there are some differing views of outcome variables including PS and PLO. However, uniform outcome variables may be necessary to measure and compare research outcomes by different research projects.

Modeling approach

Surprisingly, all 8 studies are based on the simple cause-effect relationship model (Figure 3). The two different research models (Eom and Ashill 2016; Eom and Ashill 2018) using the same data could produce two different and conflicting outcomes. In this example, our discussion is limited only to student self-regulation (SRL). The same hypothesis, “students with a higher level of SRL in online courses will report higher perceived learning outcomes,” is tested using two different models and resulted in different outcomes. Using the simple cause-effect relationship model, student self-regulation has no impact on learning outcomes. The second modeling approach with mediating variables led us to conclude the opposite findings that demonstrate the importance of SS dialogue, SI dialogue, and SRL as mediating variables positively affecting perceived learning outcomes. A direct cause-effect relationship model between each variable and the learning outcomes have produced suboptimal and often inaccurate conclusions.

Conclusion, Limitations, and Future Work

Conclusion

The majority of e-learning empirical studies (Yunusa and Umar 2021) **as well as our review** are based on the simple cause-effect relationship model, which only depicts the relationship between each of the disintegrated elements of distance learning systems and its effect on learning outcomes and students satisfaction. An e-learning system as a purposeful system is synergistic. There is a dynamic relationship among student motivation and academic engagement, cognitive and metacognitive learning processes, course design quality, the instructor’s facilitating roles, and information and communication technologies. The total effects of the synergistic interdependent entities working together are more than the sum of individual effects. The majority of e-learning empirical studies failed to model and realize the total effects of synergistic interdependent entities.

The system’s view of the e-learning success model provides a better understanding of the dynamic relationships among CSFs of e-learning. Eom and Ashill (2018) provided an empirically tested, holistic model of e-learning success that demonstrates that learning outcomes critically depend on two pivots—dialogue and self-regulatory behaviors—and these processes facilitate higher student learning outcomes. All input variables such as students (engagements, efforts, and motivation), the instructor (course design, facilitation, communication behavior, etc.), information and communication technologies, and learning management systems influence subsequent learning processes (cognitive and metacognitive process), which in turn affect both student satisfaction and learning outcomes over time.

A substantial amount of distance learning empirical research has been conducted to investigate the direct relationship between independent variables and dependent variables over the past couple of decades (2000-2019) (Yunusa and Umar 2021). This prevailing research approach has examined the direct relationship between motivation and the students’ achievements. For example, many authors (Castillo-Merino and Serradell-López 2014; Eom and Ashill 2016; Herath 2015; Lin et al. 2003), who examined the direct relationships between motivation and learning outcomes without the mediating variables, found that motivation has the most direct, positive, and significant effect on students’ achievements. Nevertheless, this approach using the simple cause-effect relationship model does not reflect the learning theories. Therefore, it may often lead to misleading and false conclusions, as it ignores the mediating effect that is a sequence of multiple direct effects.

Limitations

A limitation of this research includes the sample used. As part of building a cumulative research tradition, the sample of 53 empirical research was taken from Yunusa and Umar (2021). In our opinion, expanding the sample to include more empirical studies may not alter the core conclusions we reached, including the fact that “the majority of e-learning empirical studies failed to model and realize the total effects of synergistic interdependent entities” due to the simple cause effect modeling method.

Future Work

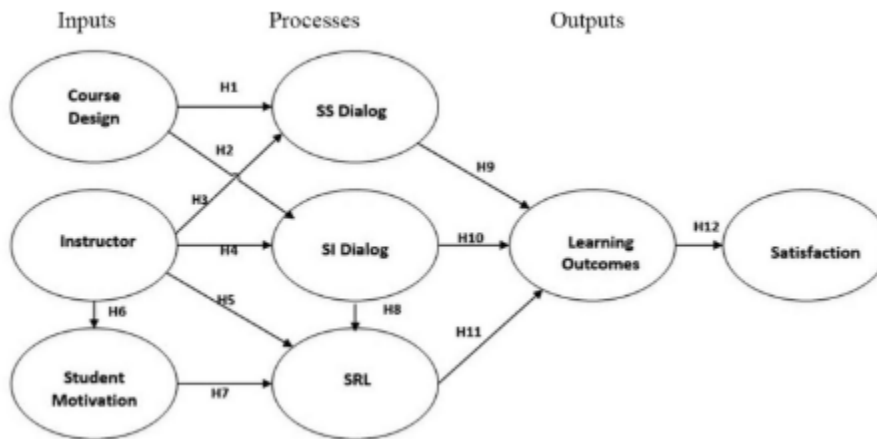


Figure 6. An Integrated Interdependent Process Oriented Predictive View of Student Satisfaction and Learning Outcomes (Source: (Eom and Ashill 2018, p.46))

Fig. 6 is an example that can be a useful framework for building future research models. However, it is not a perfect example of a dynamic and interdependent process model. The figure presents input entities (students, the instructors, and LMS/ICT) and learning process variables (cognitive and metacognitive learning processes, and interaction and dialogues) and outcome variables. The center of the system's view of e-learning success model is student self-regulation. The positive associations between both student motivation and SII on SLR are reported (Eom and Ashill 2018). The self-regulation behavior of distance learners and the socioemotional interaction among distance learners are converged to create a positive and synergistic collaborative learning environment in which a group of learners planned, monitored, and evaluated their learning (Isohätälä et al. 2020).

Further research is needed to examine all of the possible relationships between each of the input variables (course design, instructor, and student motivation) and each of the mediating variables (SS Dialogue, SI Dialogue, and SRL), which were not tested in previous research. The previous research included the relationship between course design and SRL, and relationships between student motivation and each of the mediating variables (SS Dialogue, SI Dialogue, and SRL). However, the important conclusion of this research is clear. The majority of e-learning empirical research studies of CSFs over the past decade built models of a set of disconnected constructs. We conclude that it is imperative that future e-learning empirical research should focus on building a holistic success model of a set of interconnected constructs with a system's view.

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Review 1

General comments

The paper does not deliver on its promise. It is not clear whether the objective set for the paper, "further investigate the critical issue raised by Eom and Ashill (2018) to guide future empirical research in building robust e-learning theories." is achieved. Given the fact that only 8 papers were reviewed, one would expect a more detailed discussion and explanation of the findings of the papers.

Responses: It is an inaccurate statement that only 8 papers were reviewed. We added the following on page 7. The eight studies we analyzed is a sample representing a population of 2133 articles with the following attributes: published between 2000 and 2019, peer reviewed English language journals, and Ph.D. theses, studies in higher education involving e-learning.

Below are some remarks:

1. On page 5, paragraph 4, "For example, to answer the question of the effect of SRL on learning outcomes, we tested the same hypothesis," You mean Eom and Ashill tested the same hypothesis.

Response: The term "we" was replaced by Eom and Ashill (2016; 2018).

2. Figure 5 is taken from Yunusa and Umar 2020, please add reference there.

Response: The reference was added.

3. In your paper you refer to Yunussa (2020) whereas it is Yunusa and Umar 2020. Please rectify.

Response: This has been corrected.

4. The methodology is not very clear. Not sure where and how you got the 48 studies from which you drew the 8 studies in your review.

Response: We added a new paragraph on page 5 for clarification.

The eight studies we analyzed is a sample representing a population of 2133 articles with the following attributes: published between 2000 and 2019, peer reviewed English language journals, and Ph.D. theses, studies in higher education involving e-learning.

5. In table 1, none of the studies report a mediating variable yet in the discussion part you talk about mediation variable. There is a clear disconnection between what you reported in table 1 and the summary section of the paper. One would expect an explanation of the findings related to the papers reviewed.

Response: I added a note under table 1.

1. Absence of mediating variables in the column 3 of Table 1 as denoted "none".

It refers to "the inclusion of mediating variables" in the research model. For an example, as shown in Figure 2 and Figure 4, student-student dialogue, student-instructor dialogue, and self-regulated learning are used as mediating variables. A mediating/mediator variable explains the relation between the predictor variable and the dependent (criterion) variable. It explains how a mediator (e.g., student-instructor dialogue) can be a facilitator by which a predictor variable (e.g., motivation) can produce changes on a dependent variable (e.g., perceived learning outcomes). The eight studies in Table 1 did not use the complex cause-effect relationship model in which all mediator variables such as SI Dialog, SS Dialog, and SRL connect the criterion variables and the outcome variables.

6. In the conclusion, you mention that most papers studied cause-effect relationship whereas most

looked at correlation rather than causality. Additionally, you did not refer to the findings of your review but rather the findings of other authors' reviews.

Response: I added "as well as our review".

The majority of e-learning empirical studies (Yunusa and Umar 2020), as well as our review, are based on the simple cause-effect relationship model.

7. E-learning system is defined in the conclusion whereas such definition should be in the introduction.

Response: I moved the definition on page 2.

8. The paper can benefit from some editing. There are several grammatical mistakes throughout the paper.

Response: It has been proofread.

Review 2

----- REVIEW 2 -----

SUBMISSION: 19

TITLE: Online Learning Empirical Research on the learning process and its impact on Learning Outcomes: Review of Literature and A Future Research Direction

AUTHORS: Sean Eom

----- Overall evaluation -----

the paper is well written and presented a literature review for Online Learning Empirical Research on the learning process and its impact on Learning Outcomes.

however, the paper considered in not recent and there are a lot of paper published in the some area the last and this year

the analysis methodology is poor and have to take on account more dimensions.

Response: Thank you for your thoughtful comments. I will consider them in my future research.