



Investigating a Relationship between Learner Control and Self-efficacy in an Online Learning Environment

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Abstract

In both traditional face-to-face and online learning contexts, self-efficacy has been shown to be a key contributor to learner success. Once established, self-efficacy can be generalised to other learning situations, with the strongest effect occurring with learning activities that are closest to those in which self-efficacy has been improved. Self-efficacy is not only a good predictor of learners' academic outcomes, but efficacious learners also tend to persist, cope, and adapt well, even when they have no prior experience. Learners who have low confidence in their ability to study can become frustrated, overwhelmed, and demotivated—they are more likely to achieve low grade point averages, and in some cases drop out.

When people become online learners, especially for the first time, they may feel less confident, despite being familiar with day-to-day computer and technology usage. They may still lack essential learning and technology skills for tertiary education and online learning. To support these learners, online courses should be designed to foster learners' efficacy. Research findings have shown that embedded learner control in online modules can enhance learning, improve attitudes, and increase self-efficacy. However, little research has been done to examine self-efficacy of online learners with different levels of learner control in a real online class setting. Therefore, this paper describes current research that focuses on this gap in research, and uses a quantitative research design to investigate the relationship between learner control and learner self-efficacy. Online learning self-efficacy scales and a set of questionnaires were developed and validated. In a pilot study, 31 postgraduate online learners were asked to assess their own self-efficacy and experience with different levels of learner control. Preliminary results show a positive relationship between learner control and online learning self-efficacy.

Keywords: online learning; learner control; online learning self-efficacy

Introduction

The term *self-efficacy* was coined around 40 years ago by Albert Bandura (1977a). Since then, research in this area has been growing steadily. Bandura (1997) defines self-efficacy as “beliefs in one’s capabilities to organize and execute the courses of action required to produce given attainments” (p. 3). It is a judgement of confidence about the performance of a specific task (Lorsbach & Jinks, 1999). Self-efficacy is not the same as ability or motivation, but they are strongly related (Kozlowski & Salas, 2010). Indeed, self-efficacy is the personal determination of one’s own ability to deal with a certain task. Notably, this determination is not based entirely on

actual past experience or existing ability and skills, but also on learners' perceptions of their own knowledge and ability relative to the task or situation (DeTure, 2004). However, self-efficacy is specific to the context of a situation, and when a situation changes, one's efficacy is also altered (Hodges, 2008). For example, the transition from secondary school to university is challenging for learners. A change in learning approach, such as from traditional face-to-face learning to online learning, might affect learner self-efficacy (Maathuis-Smith et al., 2011).

In education, self-efficacy is a key contributing factor to learners' success, because self-efficacy "influences the choices learners make and the courses of action they pursue" (Pajares, 2002, p. 116). Generally, self-efficacy is influenced by four main sources: enactive mastery experience—that is, hands-on experience; vicarious experiences—that is, other people's experience; social persuasion—that is, appraisal or feedback from others; and physiological and affective states—that is, stress, emotion, mood, pain, and fatigue (Hodges, 2008). Mastery experiences are considered to be the most significant source of efficacy (Bandura, 1977a). Once self-efficacy is established, it can be applied to similar learning situations. The closer these situations are to those in which self-efficacy has been improved, the stronger the effect (Bandura & Adams, 1977).

Self-efficacy influences several aspects of performance that are important to learning in terms of the effort put forth and persistence in accomplishing a task (Multon, Brown, & Lent, 1991; Zimmerman, Bandura, & Martinez-Pons, 1992). Bandura (1997) argues that individuals develop particular beliefs about their ability to handle a specific situation. Multon, Brown, and Lent (1991) specify that self-efficacy can alter learners' perceptions of their learning environment. In other words, efficacious learners can perceive their learning environments positively or negatively. Learners who have low self-efficacy are more likely to give up easily when faced with frustration and difficult tasks. Indeed, Lorschach and Jinks (1999) noted that "low self-efficacy probably leads to less effort, which in turn leads to lower success, resulting in even lower self-efficacy" (p. 160). However, self-efficacy and persistence increase when learners accomplish activities or tasks. Despite this, efficacious learners still might not be motivated to put forth their effort if they feel that little has been learnt about the topic, or what is left to learn has little value compared with what is already known (Nilsen, 2009). Although Multon et al. (1991) found a positive relationship between self-efficacy and academic performance and persistence, they advocate for more research to understand how self-efficacy influences academic outcomes.

Despite the fact that they may be using computers and technology in their daily life, learners might feel less confident to attend online classes, especially for the first time. They may not have enough of the necessary learning and technology skills for university and online learning (Kennedy, Judd, Churchward, Gray, & Krause, 2008; Mandernach, Donnelly, & Dailey-Hebert, 2006; Ratliff, 2009; Wojciechowski & Palmer, 2005). Therefore, online courses should be designed to support these learners so that their self-efficacy is improved and maintained. Some studies suggest that embedded learner control in online modules can enhance learning, increase positive attitudes, and raise self-efficacy (e.g., Chang & Ho, 2009; Ebner & Holzinger, 2007). However, few studies have inspected the self-efficacy of online learners with different levels of learner control in a real online class setting. Therefore, this study in progress is needed to explore this missing piece of knowledge.

Literature review

Since research has focused on learners' self-efficacy in learner-controlled online learning courses, reviewed literature in relation to this area is described in the following sections.

Online learning self-efficacy

In online learning, self-efficacy is considered to play a significant role in learners' performance and persistence (Pajares, 1996, 2002). Self-efficacy is not only a good predictor of learners' academic outcomes, but efficacious learners also tend to adapt, persist, and cope well, even when they have little prior online experience (Swan, 2004). Learners who think that they have low ability to study are more likely to get low grades, and in some cases give up their study (Kekkonen-Moneta & Moneta, 2002; Lim, 2004). They can also become discomfited, demotivated, and overwhelmed. However, the relationships between self-efficacy, academic outcomes, and other variables are complex. Like learner self-efficacy in traditional face-to-face setting, Bates and Khasawneh (2007) found that self-efficacy in online contexts is influenced by previous success with online learning systems, online learning technology anxiety, instructor feedback, and pre-course training. These influences align with Bandura's (1997) sources of efficacy information—enactive mastery experience, social persuasion, and affective states (Table 1).

Table 1 The sources used to describe self-efficacy of learners in online learning

Bandura (1997)	Bates and Khasawneh (2007)
Enactive mastery experience	Previous success with online learning technology pre-course training
Vicarious experience	N/A
Social persuasion	instructor feedback
Physiological and affective states	Online learning system anxiety

Learner control

Learner control is found to be of direct benefit to online learning. Research by Means, Toyama, Murphy, Bakia, and Jones (2009) found that online learning can be enhanced by giving learners control of their interactions. This finding is supported by Mayer's (2003) pacing principle, one of the 12 principles for multimedia learning, which posits that learners can learn better if they are allowed to have control over the pace of their own learning. Aligned with this principle, Mayer and Chandler (2001) found that a group of learners with learner-controlled animation understood presented concepts better than another group with linear animation (Tabbers & Koeijer, 2009). Thus, learner control can "promote a deeper or more long-lasting effect on memory" (Williams, 1996, p. 960). Although learner control has been studied for more than 50 years, no clear definition and theory has been established because it is multidimensional (DeRouin, Fritzsche, & Salas, 2005). In general, learner control is the extent to which learners can choose what, where, when, and how to learn (Kraiger & Jerden, 2007).

The concept of learner control was previously employed in the classroom to enhance the learning process by allowing learners to choose the way they learnt, or how they expressed what they had learnt. This concept was later implemented with technology-assisted instruction. The nature of online learning makes it possible to provide learners with the opportunity to make their own choices and put them in charge of their learning pace, sequence, and content (Milheim & Martin, 1991). Learner control differs, depending on the technique used and the background theory applied. The concept is also changing as technology develops. As reviewed by DeRouin et al. (2005), there are several types of learner control, including "sequence, pacing, content, context, method of presentation, optional content, task difficulty, and incentives" (p. 185). Many of these learner controls use hypermedia.

Hypermedia are computer-based documents composed of hyperlinks and media in various symbol sets, including texts and graphic icons, to give information and serve as an index that allows users to access further information in a non-linear fashion (Jaffe, 1997). They can be seen as the product of hypertext and multimedia (Scheiter & Gerjets, 2007). With hypermedia, online learners can easily access learning content and interact with their peers and instructors. Researchers have found that hypermedia can also give learners a sense of control, which in turn affects their level of confidence and motivation (Chou & Liu, 2005). Online learning with learner control and hypermedia is unique in the sense that learners can not only navigate through their learning environment as they wish, but they can also interact more. Therefore, high levels of learner control are embedded in the design of online courses to enforce learners' interactivity.

Learner control and online learner self-efficacy

Previous studies have shown that the sense of control learners gain while interacting with instructional media and content can result in increased satisfaction, enjoyment, and confidence (Luskin & Hirsén, 2010). However, the effects of user-controlled online environments on learner self-efficacy are not consistent. On the one hand, findings show no differences in learner self-efficacy between non-interactive multimedia and interactive multimedia classes. For example, Maag (2004) found that learners in an interactive multimedia online lesson showed no knowledge and self-efficacy gain compared with a control group, but they were more satisfied with the interactive tools. In the same way, Jaffe's findings (1997) show that the degree of interaction does affect learner self-efficacy. However, these effects are not significantly different. This discrepancy between findings may be because the online learning environment is complex and dynamic, and the increase in learner self-efficacy can be a result of many influences other than levels of learner control.

However, other research reports an improvement in learner self-efficacy in user-controlled online environments. Ebner and Holzinger (2007), for instance, found that games enhanced learning, motivation, and self-efficacy due to a factor that they called 'joy'. Likewise, Chang and Ho (2009) found that students with the learner-controlled version of their web-based interactive instructional language programme had higher test scores and self-efficacy levels than those in the programme-controlled version. Having established the lack of consistency in the findings of previous research and the complexity of the concept of self-efficacy, the next section introduces a theoretical framework for the present study.

Theoretical framework

This section describes the theoretical framework that informs this study. It is based on the premise that, in order to support learners by enhancing their efficacy, an online course should be designed to help learners improve their self-efficacy. Lawless and Brown (1997) indicate that the ability to control one's instructional sequence can enhance learning, improve attitudes and increase self-efficacy. Kay (2001) reports that:

Constructivists further emphasize the learner's role in actively constructing their own understanding of a learning domain. It seems that we can improve learning effectiveness by giving the learner control over, and responsibility for, their own learning. (p. 114)

Some researchers attest that high levels of learner control can improve learners' performance (e.g., Chou & Liu, 2005). At higher levels of learner control, learners are engaged in greater levels of interaction. These interactions, especially with others, including their classmates and instructors, can make learners feel more efficacious due to activities they and their classmates have accomplished, as well as the feedback received from peers and instructors, leading to emotional states such as satisfaction and a sense of belonging (Piccoli, Ahmad, & Ives, 2001).

As research on online learning concentrates its focus on the creation and support of effective online courses, learner support has emerged as an important consideration (Thorpe, 2002), and has become an important aspect in the design of online courses. A few studies have looked into the effect of learning design, especially the concept of learner control, on learners' self-efficacy in an authentic context.

As noted earlier, this study has been framed by Bandura's self-efficacy theory (Bandura, 1977a, 1977b). Building on previous research in this area, a quantitative approach has been adopted to address the research questions and to establish whether there is a statistical significance in the relationship between learner control, the independent variable; and online learning self-efficacy, the dependent variable. Taking the contextual nature of this proposed study into consideration, a correlational survey is the most appropriate research design, since randomisation presents a great difficulty (Punch, 2009). In addition, manipulation of the independent variable is inappropriate and could cause risk or harm to participants.

Methodology

The methodology was strengthened by the process of piloting the survey that would inform the later study. This pilot study had two phases: the construction of the data collection tools, and the data collection. In the first phase, the extraneous variables (age, gender, computer skills, and previous online experience) were identified, as they can influence the observed variables. The questionnaires were constructed to measure both independent and dependent variables, including these extraneous variables, using items generated from the reviewed literature and validated tools. It comprised four sections: (1) demographic data; (2) a self-report of learners' computer skills for academic purposes (CSAP), computer skills for social purposes (CSSP), previous experience in online learning environments, and experience with learner control (LC) while studying in the recent online programme; (3) an online learning self-efficacy scale (OLSE); and (4) open-ended questions for qualitative data.

For this study, the population frame was online learners in an online programme at a tertiary institution in New Zealand. The purposive sample group was learners in an online programme where levels of learner control are embedded within the course design. Students studying for a graduate diploma in an initial teacher-education programme were selected as the pilot group, since this programme had three compulsory online papers that met the research criteria. More importantly, these online papers were intentionally designed to maximise the learner-control approach. For example, learners are encouraged to do a group project in their own way, or they are allowed to complete different tasks, choosing their own order within a flexible timeframe.

Ethical approval was obtained, following the ethical requirements and guidelines of the chosen tertiary institution. After the questionnaire was constructed and validated, it was distributed online to the pilot group at the end of Semester 2, 2011. They were invited to participate in this research by accessing it through a link posted on their online learning website. A clear explanation of research objectives and research instructions was given to all participants in the letter of invitation and in the questionnaire. Within 3 weeks, the pilot data were gathered and the data collection was closed.

The quantitative data were analysed using statistical analysis software. Descriptive statistical analysis was used to calculate descriptive data, such as means, medians, and ranges of the sample. In order to see whether there was a correlation between these two variables, a scatter plot was used first to get a general view of the relationship. Then, a bivariate correlation—Pearson's product-moment correlation coefficient (r)—was calculated to confirm the direction of this relationship and the size of effect. The statistical significance of the coefficient determines whether the relationship between the observed variables is unlikely to happen by chance and, in

this case, indicates whether learner control in online courses correlates with learners' online learning self-efficacy.

Results

Of the 112 students in the programme, 31 students responded to the pilot questionnaire, making the response rate just under 30 percent. The sample group (n = 31) comprised seven males and 24 females, and approximately 75 percent were between 25 and 45 years old (Table 2).

Table 2 Characteristic of the sample group by age and gender

Age	Gender		Total (%)	
	Male (%)	Female (%)		
16-24	0 (0.00)	3 (9.68)	3	(9.68)
25-34	3 (9.68)	8 (25.81)	11	(35.48)
35-45	3 (9.68)	8 (25.81)	11	(35.48)
46-54	1 (3.23)	5 (16.13)	6	(19.36)
Total	7 (22.58)	24 (77.42)	31	(100.00)

N=31

Seventy-five percent reported that they had intermediate information technology skills and the rest regarded themselves as advanced users (Figure 1).

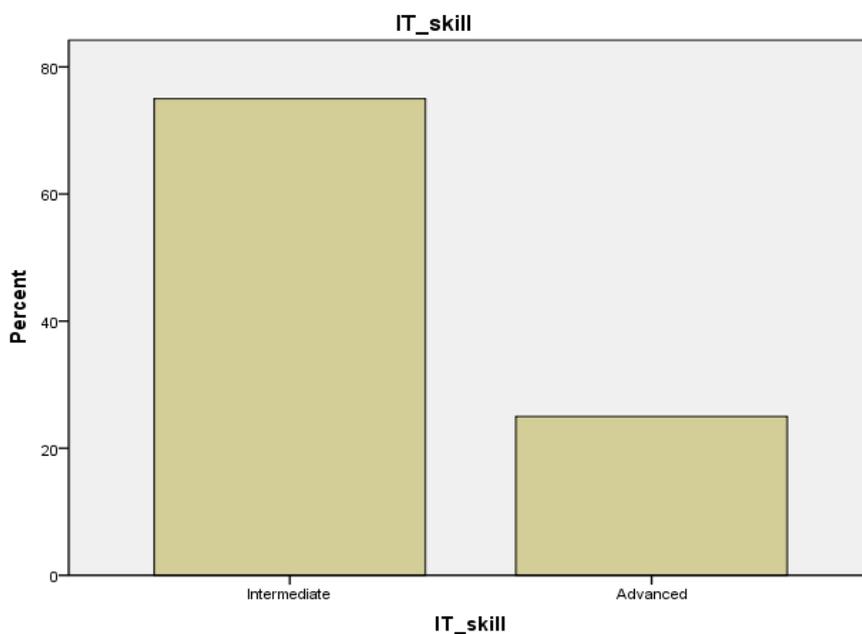


Figure 1 Perceived computer and information technology skills

Results showed that around 16 percent of participants had a basic CSAP level and half had intermediate skills, while almost half of the responses indicated a basic CSSP level. Only 10 percent had an advanced level (Table 3).

Table 3 Actual computer and information technology skills measured by CSAP and CSSP

Skill levels	CSAP		CSSP	
	Frequency	%	Frequency	%
Basic	5	16.1	15	48.4
Intermediate	16	51.6	13	41.9
Advanced	10	32.3	3	9.7
Total (n)	31	100.0	31	100.0

About 84 percent described themselves as having some or a lot of online experience, whereas two participants had no online experience at all (Table 4). Half of the participants reported that they had attended a short online course, an online diploma programme, or an online undergraduate programme before they enrolled in this recent online programme.

Table 4 Previous experience in online learning environments

Gender	Online Level (%)				Total
	None	A little	Some	A lot of	
Male	0.00	3.2	12.9	6.5	22.6
Female	6.5	6.5	35.5	29.0	77.4
Total	6.5	9.7	48.4	35.5	100.0

N=31

Participants were asked to report how often they were exposed to online activities with different levels of LC. Scores from each item were added to be LC scores. Results showed that participants scored in the range of 124–204, with a mean of 166.31 and a standard deviation of 25.26 (Table 5).

Table 5 Experience with different levels of learner control in the recent online programme

LC	Statistics
Mean	166.31
Minimum	124.00
Maximum	204.00
Range	80.00

N=29

The dependent variable, OLSE, was also calculated from scores given to each item on the scale. For the group, the mean of online learning self-efficacy was 74.89, with a range score of 46.84–100. No outliers were found.

A scatter plot was used to determine the relationship between the observed variables. An upward trend was revealed, suggesting that a positive relationship between the variables did exist (Figure 2).

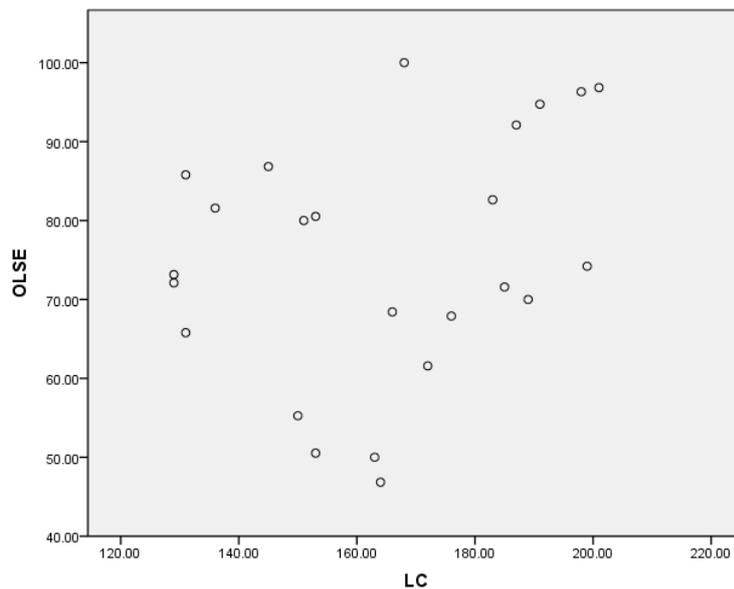


Figure 2 Scatter plot showing learner control and online learning self-efficacy scores

A visual presentation, a histogram, and the normal Q-Q plot were used to test the assumption for using the inferential statistics, Pearson's product-moment correlation. OLSE, the dependent variable, appeared to be normally distributed (Figure 3) and linear (Figure 4).

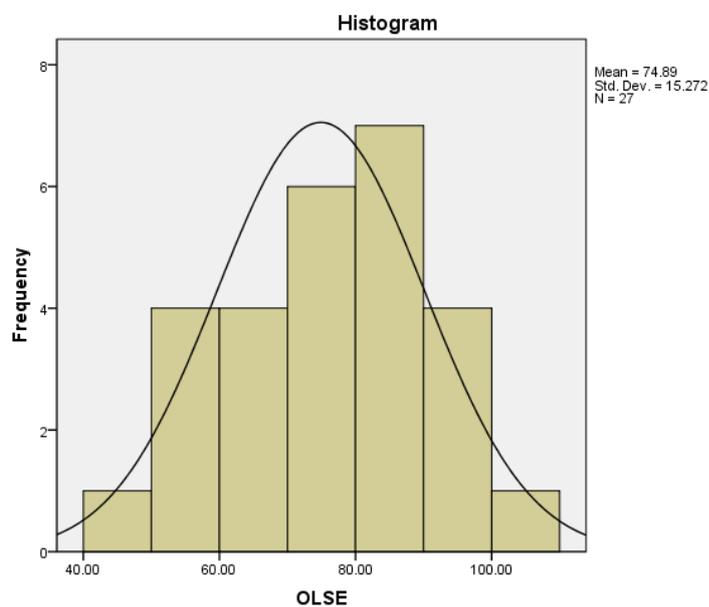


Figure 3 Histogram of online learning self-efficacy score with a normal distribution curve

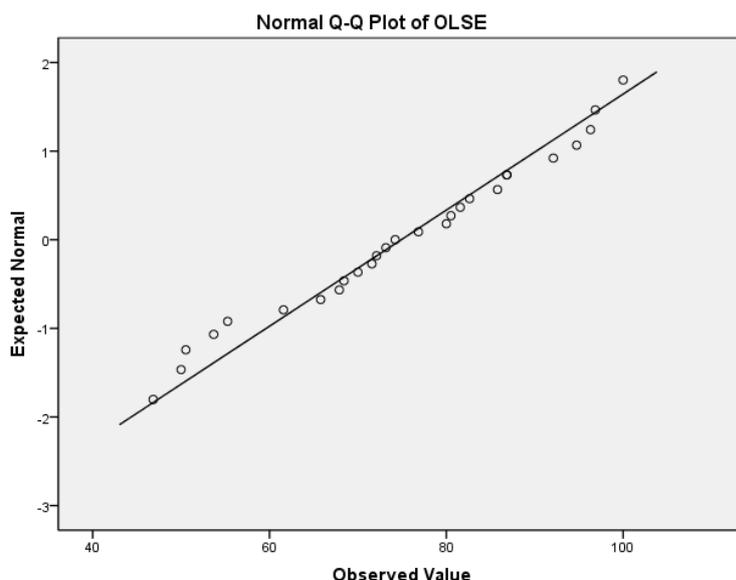


Figure 4 Normal Q-Q plot of online learning self-efficacy scores

Since the assumptions were met, the Pearson’s product–moment correlation coefficient (r) was calculated to assess the size and direction of the linear relationship. This coefficient showed that two variables were positively and moderately correlated with: $r(27) = 0.287$.

Qualitative data demonstrated that most participants were confident about their online learning programme, as they expressed their answers as “confident”, “very confident”, “pretty confident”, or “very successful”. On the other hand, some participants found the programme hard, and felt less confident about finishing. They described it as “hard”, “difficult”, or “overwhelming”; and their feeling as “less confident”, “not 100% certain”, or “I don’t feel confident”. Some would rather not take the online programme again.

Discussion

Most participants in the sample group were aged between 16 and 45, which meant they would be familiar with digital technology. Consequently, they tended to report themselves as intermediate or even advanced users. No one reported that they had basic computer skills. However, findings specified that 16 percent of participants had a basic CSAP level and half the responses had a basic CSSP level. When comparing computer skills from the participants’ self-report with CSAP and CSAP scores, around 53 percent of participants estimated their levels correctly, but 42 percent overestimated their computer and information technology skills. This occurrence agrees with previous research which found that the perceived computer skills of students are higher than their actual abilities (Baim, 2004; Jurica & Holmes, 2008).

The preliminary results of the pilot showed that a correlation between levels of learner control and online learning self-efficacy does exist, though the value of the coefficient (r) is moderate to weak. Furthermore, Pearson’s product–moment coefficient is suitable only for a linear relationship. However, there is the possibility that these two variables are not linearly correlated. This would explain why Pearson’s coefficient value is small.

While this preliminary result is inconclusive, a larger sample and the use of a range of other statistical analysis techniques may provide more conclusive results. In line with this, another collection of data is planned for a more diverse sample of learner control experience and level of

self-efficacy. Students in a 4-year online bachelor's degree programme embedded with learner control in the same college will be purposively selected as the sample group. The main data collection will be started after the questionnaire is adjusted and validated.

In addition, in the larger study an independent t-test will be performed to determine whether the online learning self-efficacy of learners in high and low levels of learner control is significantly different. An analysis of variance (one-way ANOVA) will also be used, to determine whether mean differences between subgroups are statistically significant.

In the main study the relationship between other variables, such as age, gender, computer skills, and prior experience in online learning and online learning self-efficacy, will be examined to see if these variables have an effect on the investigated relationship. It is possible that the investigated relationship might be more complex than the design for the preliminary study allowed for. As the coefficient of determination (r^2) is 8.7 percent, this value indicates that other variables are having an effect on the measures. The analysis of covariance (ANCOVA) will be used to remove the influence of these extraneous variables and get a clearer picture of the investigated relationship.

As with the pilot study, qualitative data will be used to complement the findings from the quantitative analysis. Thematic analysis will be employed to identify specific themes that are consistent with the concept of learner control and Bandura's self-efficacy. Open coding will be used to organise and identify some of the emerging themes. The result of this analysis will be triangulated with the results from the quantitative analysis of this research.

Conclusion

This paper describes a pilot of a larger study (in progress) that focuses on the relationship between learner control and the online learning self-efficacy of adult learners participating in a tertiary-level programme. A correlational research design was employed, based on Bandura's self-efficacy theory. After preliminary data were gathered and analysed, results showed a moderate correlation between learner control and online learning self-efficacy. It is anticipated that a more conclusive result will be reported with a larger sample for the main study. Given the identified gap in the research on learner control and self-efficacy, it is important that we continue to learn more about this relationship. The main study will look closely at whether time experiencing learner control affected learners' self-efficacy. Extraneous variables will also be observed to see their influence over the studied relationship.

It is hoped that findings from this research will benefit online learners, educators, and developers, and that it will shed some light on how to make online learners more comfortable and confident in an unfamiliar and complex environment, feel motivated and engaged during their study, and get them to persist until they complete their online classes. Novice and inexperienced online learners, who possess low confidence in their ability, might find it easier to interact, collaborate, and thus succeed in online courses when learner control is integrated into the online learning environment from the beginning as part of the course design.

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