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# CHANGES IN STUDENT MOTIVATION DURING ONLINE LEARNING

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**ABSTRACT**

Self-directed e-learning (SDEL) refers to electronic learning environments where there are often no peer learners or instructors regularly available. Past studies suggest that lack of time and lack of motivation are primary causes of learner attrition *in online settings*. However, little is known about what influences motivational change during SDEL. We surveyed 368 adult learners from both higher education and corporate settings who had used commercial SDEL products. Results from stepwise regression analysis indicated that the best predictors of *motivation to begin* SDEL were perceived relevance, reported technology competence, and age. The best predictors of *motivation during SDEL* were perceived quality of instruction and learning (e-learning is right for me) and motivation to begin. Motivation during SDEL was the best predictor of *positive change in motivation*, which in turn predicted learner satisfaction with SDEL. Instructional design principles for sustaining learner motivation in SDEL are identified from the findings of the present study.

E-learning has become an increasingly popular delivery method for education and training. Christensen, Johnson, and Horn (2008) have identified online learning as a "disruptive innovation." Research on disruptive innovations indicates that,




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initially, such innovations fill a niche for those who are not served well or at all by the present system, even though in early phases the quality of such innovations is often poor. However, as demand grows over time and as the quality of such disruptive innovations is improved, their adoption increases—following a logistic curve, or s-curve (Christensen et al., 2008; Rogers, 2003). Based on data on the growth of online learning from the North American Council of Online learning and U.S. Department of Education statistics, Christensen et al. (2008) predict that 50% of high school courses will be offered online by 2019.

In parallel with the e-learning boom, there has been understandable concern about the quality of e-learning. In particular, the relatively *high attrition rate* of online learners is an important issue for economic reasons (Aragon & Johnson, 2008; Carr, 2000; Chyung, 2001; Diaz, 2002). Past studies have found that *lack of time* and *lack of motivation* are the main factors associated with learner attrition in online courses (Aragon & Johnson, 2008; Serwatka, 2005; Visser, Plomp, Amirault, & Kuiper, 2002).

Fostering motivation to learn is one of the key principles for effective instruction (American Psychological Association, 1993; Bransford, Brown, & Cocking, 2000). Numerous research studies have indicated positive correlations between learner motivational levels and academic achievement (Fyans & Maehr, 1987; Uguroglu & Walberg, 1979; Walberg, 1984). Student motivation is further important with respect to use of *cognitive strategies* necessary for effective learning (Pintrich & De Groot, 1990). Perhaps most important, learning experiences which are highly motivating can foster one's propensity for lifelong learning (Wlodkowski, 1998). Furthermore, if students are more motivated to learn, then we would expect them to be less likely to drop out of online courses. This raises the question about how the design of online courses might be improved so as to increase student motivation to learn. The present study investigates factors which influence student motivation in self-directed e-learning.

## REVIEW OF THE LITERATURE

By reviewing past studies of factors that influence learner motivation primarily in computer-based instruction and distance education settings, we developed a theoretical framework for influences on the learner's motivation in self-directed e-learning. These factors can be organized into three major categories of motivational influences in Web-based instruction (e.g., internal, external, and personal factors), as suggested by Song (2000). Internal factors are related to the features of the course itself that can influence the learner's motivation. External factors refer to aspects of the learning environment that can influence the learner's motivation. Personal factors refer to motivational influences caused by the learner. The theoretical framework for motivational influences in online learning is described below.

## Internal Factors

Keller's (1983) model of motivational design of instruction has been applied in many education and training settings. Keller's ARCS model addresses four components of student motivation: attention, relevance, confidence and satisfaction. According to the ARCS model, instruction will be more motivating if it:

1. results in greater student *attention* (task engagement);
2. includes content and learning activities that students perceive as being more *relevant*;
3. increases student *confidence* (self-efficacy); and
4. results in greater student *satisfaction* with what they have learned.

Keller and Suzuki (2004) posit that the components of effective motivational design of instruction in the ARCS model can be applied to e-learning settings as well.

Similar to the confidence factor in the ARCS model, self-efficacy is an important component of learner motivation from a social-cognitive theory perspective. Studies have found that computer or Internet self-efficacy is an important factor influencing the learner's satisfaction with and participation in online learning (Hill & Hannafin, 1997; Joo, Bong, & Choi, 2000; Lim, 2001). In Keller's ARCS model, *confidence* is one of the components. Confidence and self-efficacy appear to be closely related constructs.

It is also important to consider factors that may *decrease* learner motivation. Cognitive load theory suggests that cognitive overload can interfere with students' motivation to learn by inhibiting their attention to the instructional material (Hartley, 1999). This is consistent with the contention that motivation is adversely affected when students feel overwhelmed by the mental effort necessary to learn (Pintrich & Schunk, 2001). In particular, studies have shown that cognitive overload is likely to contribute to high attrition rates in the first few weeks of an online course, especially among first-time online learners (Tyler-Smith, 2006), and that students who take an online course for the first time are also more likely to exhibit a sense of anxiety and fear, as well as excitement (Conrad, 2002).

In addition to cognitive overload, the perceived difficulty of course learning tasks can increase student anxiety and adversely affect student motivation to learn in online settings (Reinhart, 1999). From the perspective of social learning theory, such learning tasks are beyond the student's zone of proximal development (Vygotsky, 1978).

Fisher et al. (1978) and Rangel and Berliner (2007) have identified academic learning time (ALT) as an important predictor of student academic achievement. In the Fisher et al. (1978) study, tasks were rated as high, medium, and low difficulty, based on direct classroom observations of how well students performed those learning tasks. The amount of time students spent attempting to do high difficulty tasks was negatively associated with student learning achievement,

whereas more time spent on medium and low difficulty tasks (i.e., more successful engagement) was positively correlated with achievement. Rangel and Berliner (2007) define ALT as ". . . the amount of time that students spend on rigorous tasks at the appropriate level of difficulty for them" (p. 1) when those students are ". . . engaged in tasks relevant to curriculum expectations and assessments" (p. 1). That is, those tasks need to be in a student's zone of proximal development (Vygotsky, 1978), which means that the tasks cannot be done by a student alone but can with assistance or guidance, and that those tasks are sequenced to lead toward curriculum goals, not just repeatedly doing the same tasks successfully. Numerous studies have found significant positive correlations between ALT and student achievement (Berliner, 1990; Brown & Saks, 1986; Kuh, Kinzie, Buckley, Bridges, & Hayek, 2007). Student attention is necessary for student engagement, and *attention* is one of the elements of the ARCS model (Keller, 1983).

Frick, Chadha, Watson, Wang, and Green (2009) studied teaching and learning quality in both face-to-face and online instruction through student course evaluations. They investigated student ratings of their own ALT, teacher use of First Principles of Instruction (Merrill, 2002, 2008), student satisfaction, learning progress, and overall course quality. Measures of these scales were highly reliable and were significantly correlated positively and very highly. About one-third of the Frick et al. (2009) sample was from students in online courses, and there were no significant differences between online and face-to-face classes on any of the rating scales. In particular, when students agreed that ALT and First Principles of Instruction occurred, they were about 3.6 times more likely to agree that they were *satisfied* with the course and instructor, when compared with students who did not agree that ALT and First Principles occurred. Student *satisfaction* is one of the elements of the ARCS model. Two of the five First Principles of Instruction pertain to *relevance* in the ARCS model:

1. authentic or real-world learning tasks; and
5. student integration of what they have learned into their own lives.

In a follow-up study, Frick, Chadha, Watson and Zlatkovska (2010) found that if students agreed that they experienced ALT, then they were about five times *more* likely to be independently judged at a *high* level of mastery of course objectives by their instructors. Perhaps more important, they were 10 times *more* likely to be assessed as *low* masters of course objectives by their instructors if they did *not* agree that they experienced ALT. Again, students need to be paying *attention* if they are to be engaged successfully in course activities (ALT), and attention is one of the components of the ARCS model.

Several studies suggest that the convenience and flexibility of online learning have a paramount influence on the learner's motivation for online learning. In a study of students in continuing professional education, McCall (2002) found that flexibility, convenience, and control (i.e., the freedom to work at one's own pace) were the primary factors that influenced their participation and perseverance

in online distance courses. In another study of factors that motivate high school and community college students to choose online or traditional course formats, Roblyer (1999) found that control over pace and timing of learning was more important for those who chose the online course format, whereas interaction with the instructor and peers was paramount to those who chose the traditional course format.

Research also indicates that *learner control* in computer-mediated learning affects student motivation. According to Clark and Mayer (2003), learner control can be summarized into three categories in computer-mediated learning settings:

1. sequencing;
2. pacing; and
3. access to learner support.

Nonetheless, research findings are mixed about how much learner control should be given to motivate learners in a computer-mediated learning setting (Alessi & Trollip, 2001).

In the *affective* domain, research indicates that instructional approaches which promote flow and playfulness can lead to positive learner experience and engagement in multimedia learning environments (Kiili, 2005; Reid, 2004). Such positive affect can be conductive to sustaining learner motivation (Custers & Aarts, 2005). This is also likely to be related to confidence in the ARCS model. Additionally, students can experience some distress in their online courses due to *technical difficulties and communication breakdowns* (Essex & Cagiltay, 2001; Hara & Kling, 2000). Clearly, if technology problems provide obstacles to student access to course resources, activities and tasks, the instructor, and other students, this would likely be very discouraging. The technology is the *only* connection that students normally have in an online context, and if this "lifeline" is broken it would not be surprising that students would be unmotivated to learn and more likely to drop out of an online course.

Some researchers posit that *social presence* can influence the learner's satisfaction with and motivation for online learning (Frith, 2011; Visser, Plomp, & Kuiper, 1999). Styer (2007) reported that *social interactions* in online settings can have mixed impacts on the motivation of online learners, indicating that the impact of the presence or the absence of social interaction in on the online learning environment may differ depending on the individual needs or preferences.

Computer-mediated learning invokes a type of interaction that is distinctive from face-to-face interaction; i.e., human-computer interaction (McIsaac & Gunawardena, 1996). Thus, interface design needs to be considered as an important factor that influences online learners' motivation. A website that is effectively designed tends to be appealing and to attract user attention; therefore, users are more likely to revisit that website (Arnone & Small, 1999; Small, 1997). Additionally, some researchers contend that the level of interaction with

learning materials is significantly associated with learner motivation in online learning environments (Gao & Lehman, 2003).

## External Factors

Several motivation theories underscore environmental influences on human motivation. In particular, learner support appears to affect students' satisfaction with web-based instruction. A case study of adult students in a graduate-level distance education program by Chyung, Winiecki, and Fenner (1998) found that nearly half of the students who dropped out of an online graduate course expressed dissatisfaction with the learning environment as the reason. Hudson, McCloud, Buhler, Cramer, Greer, and Paugh (1998) also reported that learner support for technical difficulties and for the challenges that adult learners had (e.g., lack of time and family demands) were important to serve non-traditional adult learners in their persistence in online courses. Additionally, Schramm, Wagner, and Werner (2000) found that student satisfaction with their online classes was considerably higher when students felt they had received adequate training to use the necessary technology.

The overall climate of the learner's instructional and organizational setting also appears to influence his or her motivation. Dennen and Bonk (2007) suggest that motivational strategies need to be incorporated in online courses to stimulate a positive climate for learners' active participation in the learning process. The organizational climate is also an important mediator of motivation for learners in workplace settings (Bachrach & Mitchell, 1992; Bonk, 2002). In a study of barriers to e-learning for corporate employees, Mungania (2003) found that organizational support was a critical factor for the employees to engage and sustain in e-learning.

## Personal Factors

Past studies of motivation suggest that one's learning and motivation can be affected by personal variables. Learning styles have garnered attention from researchers of online learning because of the potential of the Internet to deliver instruction that meets the needs of students' different learning styles. Yet, past studies are not conclusive about the effects of an individual's learning style preference on his or her motivation in online learning. Some studies indicate that learning styles have bearings on learners' motivation, thereby suggesting the importance of matching instructional strategies with the individual's preferred learning style or learning approaches in order to have a positive influence on the online student's motivation (Cuneo & Harnish, 2002; Katz, 2002; Mitchell, 2000; Sankaran & Bui, 2001). Yet, some other studies indicate that the effects of students' different learning styles on student satisfaction or motivation with online learning are not significant (Klingner, 2003; Stokes, 2003; Terrel & Dringus, 1999).

Past studies suggest that learners can have different preferences when it comes to instructional media. Learners' media preferences can differ depending on the individual's temperament (Sherry, 2001), gender (Ley & Klein, 1993), and age (Mundorf & Brownell, 1990). Additionally, past studies have shown that learners' perceptions of the difficulty of a medium and their prior experience with the medium influenced their preferences for the medium (Cragg, 1999; Krendl, 1986; Salomon, 1984).

In summary, from a review of relevant literature, we identified a conceptual framework of internal, external, and personal factors that appear to contribute to learner motivation in online learning. This conceptual framework guided the development of the research instrument for the present study, which is described in the following section.

## THE PRESENT STUDY

The present study investigated learner motivation in self-directed e-learning courses (SDEL). Here, SDEL courses refer to those in which learners go through instructional materials delivered via the web at their own pace—typically without the presence of an instructor. SDEL is a form of instruction that is readily available to adult learners in various education and training settings (Dolezalek, 2004; Driscoll, 2002). Despite the wide availability of SDEL for adult learners, very little extant research has been conducted on what influences motivation in SDEL environments and most past studies of motivational issues for online learners have focused on formal educational settings (e.g., web-based distance courses in post-secondary institutions). Therefore, there is a need for research on motivational issues that are related to learners in SDEL settings, since there are now millions of adults who are learning in this kind of instructional format.

In SDEL, a human instructor is normally not available to answer questions and to provide feedback or encouragement for the student. In SDEL, students typically do not enroll in a formal course with a schedule and timeline for completing course activities; rather, as adults they are working with SDEL at their own pace. In SDEL, it may not be easy to find student peers for interaction—whether positive or for commiseration.

The purpose of the present study was to investigate how learner motivational levels change as they go through SDEL courses and to identify factors related to motivational change, if that occurs. The research questions addressed in the present study were:

- Which factors best predict learner motivation in the beginning, during, and end of self-directed e-learning (SDEL)?
- Does learner motivation change as he or she goes through instruction in SDEL?
- What factors are related to learner motivational change during SDEL?

## METHOD

### Learning Context

The courses that the study participants took were offered by a major U.S. e-learning vendor, who provides comprehensive e-learning solutions to millions of learners per year worldwide. The present authors have no affiliation with this e-learning vendor. While the vendor cooperated with the authors in helping to identify learners who have used their products, the vendor was unwilling to allow the authors to disclose its name in any publications. Those courses are offered to learners in various education and training settings (e.g., colleges, universities, business, and industry organizations), usually purchased by the organization and made available to its members. The course format is stand-alone, typically 6-8 hours long, self-paced instruction delivered via the web. The topics covered in those courses include various subjects in information technology (e.g., desktop applications, computer and Internet programming) and soft skills development (e.g., coaching skills, consulting skills). In many cases, no instructor is available for these e-learning courses, although the e-learning vendor provides an option to make instructors available with additional fees.

### Participants

The sample for the present study was drawn from the population of adult learners who had taken a self-directed e-learning course in various education and training contexts. A sample of approximately 800 adult learners was selected from working adults and adult students across the United States who had taken or were taking e-learning courses developed by the e-learning vendor selected for this study. A purposive sampling method was used to draw a sample of learners with diverse backgrounds and contexts. About 400 learners of SDEL courses were selected from those who were undergraduate or graduate students enrolled in universities in the United States. Additionally, about 400 learners of SDEL courses were selected from working professionals in various workplace settings (e.g., business, non-profit, and government organizations).

Of 368 respondents to this survey, 43% took the e-learning course as college students and 52% took the course as working professionals. These working professionals belonged to organizations of various types: business organization (45%), college or university (39%), and not-for-profit or government organizations (13%). Among the college students who participated in this survey, 30% ($n$ = 47) of them were undergraduate students and 70% ($n$ = 111) were graduate students. Gender was distributed fairly evenly among the respondents to this survey: 46% were female and 54% were male. In terms of age, 18.2% of the respondents were 24 or younger, 43.5% were between 25 and 34 years of age,

21.7% were between 35 and 44 years of age, and 16.6% were 45 or older. Over 70% of the respondents said they were using the Internet more than 20 hours per week, and 87% of them reported that they were using at least 3-5 software programs on a regular basis. These findings indicate that most of the survey respondents had moderate to high levels of competency in computer and Internet technologies.

## The Research Instrument

A questionnaire was constructed to collect quantitative data in this study. The survey instrument was developed by undergoing the following three steps to ensure its reliability and validity. First, a preliminary survey instrument was designed based on the theoretical framework that was developed from the review of literature, which was described earlier. Second, the preliminary instrument was modified after a qualitative inquiry that was conducted prior to the present study in order to include additional motivational factors that were identified from the results of this qualitative study (Kim, 2009). Third, the survey instrument went through another modification after a pilot study was conducted to improve the reliability of the instrument.

The resulting survey instrument has 60 questions, which is comprised of 59 multiple-choice questions and one open-ended question. This survey instrument is divided into sections as follows:

1. questions about respondent backgrounds (items 1-13);
2. Likert-type questions to measure respondent perceptions of motivational influences in their self-directed e-learning (items 14-46);
3. Likert-type questions regarding their motivation to persist in their self-directed e-learning and to continue self-directed e-learning in the future (items 47-59); and
4. an open-ended question for general comments about the respondents' perceptions of the self-directed online learning environment (item 60).

## Data Collection and Analysis

A message was sent to listservs or e-mail mailing lists to which prospective survey participants belonged to invite them to participate in the survey. The message included information about the study and the URL to the survey site. There were 368 individuals who completed the survey, yielding approximately a 46% response rate. The respondents took the surveys on the web anonymously and their responses were stored on a web server. The data were analyzed using a statistical analysis program, SPSS 12 for Windows.

## RESULTS

### Participants' Backgrounds in and Motivation for e-Learning

Respondents to this survey study took SDEL courses on various topics: 48% responded that they took a SDEL course on desktop applications; 30% took a course on computer programming; and 22% took a course on soft skills. The time that respondents spent in the e-learning course also varied: 10% of those surveyed reported that they spent less than an hour taking the e-learning course; 62% spent 1-6 hours in the course; and 19% spent 7 hours or more in the course. In addition, 30% responded that they had had no prior online learning experience and the other 70 percent responded that they had taken 1-7 or more online courses, including college online courses and SDEL courses. Results of a chi-square test revealed that the respondents in corporate training settings had more experience with online learning than did those in formal education settings [$\chi^2$ (1, 366) = 12.770, $p < .05$]. When asked about the frequency of interaction with an instructor or technical support staff while they had taken an e-learning course, 31% of the respondents indicated that they never had such interactions and 60% responded that they rarely or occasionally interacted with an instructor or technical support staff.

When asked for reasons for choosing online training, 94.2% of the respondents indicated that classroom training did not fit their schedules or was unavailable, or because online training was convenient and flexible. The remaining reasons were selected very infrequently: interest in use of technology for learning; lower cost when compared with classroom instruction; better fit to one's learning style; or better fit to one's personality.

### Factor Analyses and Scale Formation

An exploratory factor analysis of the 33 Likert-scale items on motivational influences in SDEL was conducted using the image factoring extraction method with varimax rotation. Four scales were identified and named according to items which loaded most strongly and maximized their reliabilities: *E-learning is not for me*, *E-learning is right for me*, *I don't want to be all by myself*, and *Relevance*. Items that decreased reliabilities were removed from the scales (see Table 1 for items included in these scales and reliability coefficients for each scale).

The *E-learning is not for me* scale consisted of nine items. These items appear to be related to cognitive overload, disruptions and technical difficulty, and negative feelings about the e-learning experience. The *E-learning is right for me* scale consisted of 10 items. These items are related to First Principles of Instruction (Merrill, 2002; Merrill, Barclay, & van Schaak, 2008), especially item 30 (real-world problems), item 36 (demonstration), items 29 and 40 (application), and item 42 (integration). Also, it appeared that cognitive load was not too

great (item 17) and that there was institutional support for e-learning (item 45) which would come from the university or the corporate setting in which the learner was embedded. The *I don't want to learn by myself* scale consisted of three items. This scale is contrary to the notion of SDEL, indicating that the respondent would prefer to interact with people in the same course, including a live instructor and peers. Finally, a *Relevance* scale was formed that consisted of two items. Relevance is one of the four components of the ARCS model (Keller, 1983).

## Learner Motivational Change during Self-Directed e-Learning

The respondents' self-reported overall initial motivational level was relatively high ($M = 4.95$, $SD = 1.272$, where 1 = "very low" and 7 = "very high") and their motivational level after they went through some lessons in the course was also relatively high ($M = 4.95$, $SD = 1.333$) on the same 7-point scale. When asked how their motivational levels changed as they went through the self-directed e-learning course, the modal response of those surveyed was neutral (40% indicated no change in motivation), as shown in Figure 1. It can be seen that about 34% of the respondents reported that their motivation increased, and that nearly 26% indicated that their motivation decreased.

## Factors Associated with the Learner's Motivational Change

Spearman correlations indicated that the best predictor of *positive change in learner motivation* ($\rho = 0.43$) was the respondent's motivation *during* the e-learning course (item 47—How would you rate your level of motivation to learn after you went through some lessons in this course?). The best predictor of motivation *during* the e-learning course was learner motivation when she or he *started* the course ($\rho = 0.50$) (item 12—How would you rate your level of motivation to learn when you began taking this course?). Moreover, the best predictor of motivation when *beginning* a course was its perceived relevance ($\rho = 0.34$) (items 35 and 44).

These correlations were statistically significant at $p < 0.0005$. These relationships suggested an analytic approach that would attempt to predict learner motivation when beginning a course, motivation during the course, and change in motivation during the course. A stepwise multiple regression analysis was first performed in order to predict learner motivation when beginning the self-directed e-learning course (item 12). Independent variables for this analysis included all demographic variables (gender, type of organization (university vs. corporate), status (university student vs. working professional); perceived relevance, and prior computing experience). The multiple $R$ was 0.457 ($p < 0.0005$, $R^2 = 0.209$). Significant predictors of motivation at the beginning of an e-learning course were: relevance ($\beta = 0.313$); item 6—number of software programs used on a

Table 1. Factor Analysis and Reliability Analysis Results

| Factor | Items | Reliability coefficient |
|---|---|---|
| 1. E-learning is not for me. | 16. I did NOT have enough technical skills to be successful in e-learning.* | $\alpha = .84$ ($N = 368$) |
| | 19. Some learning tasks in the course were too challenging for me.* | |
| | 43. I was overwhelmed with the amount of information presented in this course.* | |
| | 28. I experienced too many disruptions to get through the course.* | |
| | 31. I would prefer to use other medium for a self-paced course.* | |
| | 23. Technical difficulties that I encountered while I took this course frustrated me.* | |
| | 26. I felt anxious or frustrated when I had to take tests or quizzes in this course.* | |
| | 32. This course format was not sited for my learning style.* | |
| | 22. I often forgot to go back to the course when I took this e-learning course.* | |
| 2. E-learning is right for me. | 36. Multimedia presentations in this course stimulated my interest. | $\alpha = .82$ ($N = 368$) |
| | 34. Taking a self-directed e-learning course was worthwhile. | |
| | 30. The course simulated real-world situations. | |
| | 17. The difficulty level of the course content was just right for me. | |
| | 46. It was important for me to complete this course. | |
| | 45. My institution was supportive of my e-learning. | |

Table 1. Cont'd.)

| Factor | Items | Reliability coefficient |
|---|---|---|
| | 29. Hands-on activities in this course helped me engage in learning. | |
| | 40. I received enough feedback on my performance in this course. | |
| | 42. I was interested in learning through technology as a way to enhance my technical skills. | |
| | 41. The course website was easy to navigate. | |
| 3. I don't want to be all by myself. | 33. I wanted to get answers to my questions from an instructor.* | |
| | 38. I would prefer to interact with peers rather than to learn on my own in an online course.* | $\alpha$ = .65 ($N$ = 368) |
| | 39. I needed to be under a deadline to complete this course.* | |
| 4. Relevance | 35. The course content was useful to me. | $\alpha$ = .64 ($N$ = 368) |
| | 44. The course content was relevant to my interests. | |

*These items were negatively loaded on a factor and were reverse-coded when computing scale scores and reliability coefficients.

regular basis ($\beta = 0.163$); age ($\beta = 0.202$); and item 5—time spent per week using the Internet ($\beta = 0.136$). Remaining factors did not significantly increase the multiple *R*. Items 5 and 6 are associated with technology self-efficacy (Koh, 2008). Thus, it appears that the most important predictors of motivation to learn when beginning self-directed e-learning are perceived relevance of the course, reported technology competence (i.e., self-efficacy), and age.

Next, a stepwise multiple regression analysis was performed to attempt to predict motivation after completing some parts of the self-directed e-learning course (item 47). Independent variables included the three factors (e-learning is right for me, *e-learning is not for me, I don't want to learn by myself),* level of motivation when beginning the course (item 12), and item 13 (How often did you interact with an instructor or technical support staff while taking this course?).

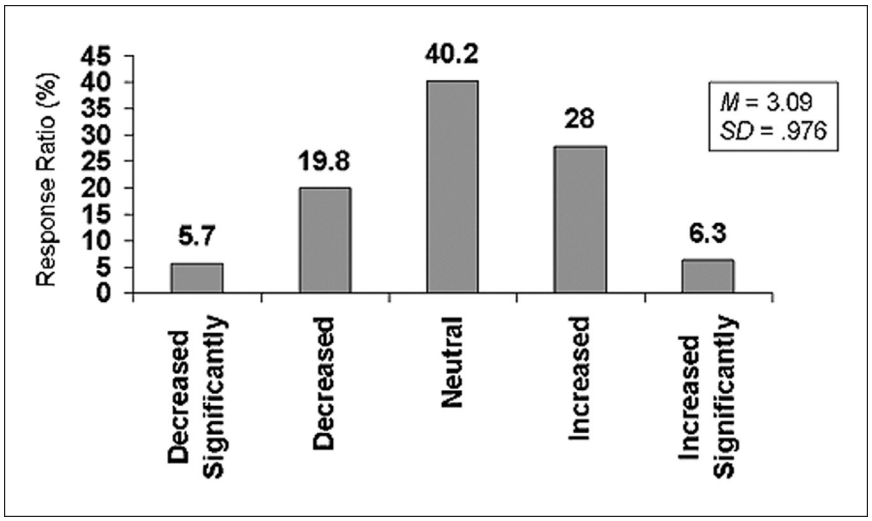


Figure 1. Percent of respondents according to reported type of motivational change during self-directed e-learning.

The multiple $R$ was 0.694 ($p < 0.0005$, $R^2 = 0.399$) with two strong predictors: *e-learning is right for me* ($\beta = 0.549$) and level of motivation when beginning the course ($\beta = 0.298$). None of the remaining independent variables significantly increased the $R$ value when added.

Finally, the prediction of change in motivation during a course is best predicted by motivation during the course ($\beta = 0.386$, $p < 0.0005$, $R^2 = 0.149$). Satisfaction with the course (item 52) is predicted by change in motivation during a course ($\beta = 0.327$, $p < 0.0005$, $R^2 = 0.107$).

In summary, Figure 2 represents the relationships among the factors associated with motivation in SDEL.

## DISCUSSION AND CONCLUSIONS

The findings in this study make practical sense and are consistent with instructional and learning theory, as well as with motivational theory. People appear to choose self-directed e-learning when face-to-face classroom instruction is unavailable or not possible due to scheduling conflicts, or because of the convenience and flexibility of online training. They are more likely to be more motivated when they *begin* self-directed e-learning if they perceive the learning goals to be more relevant, and their competence in use of technology is higher.

Relevance is one of the four factors in Keller's ARCS model of motivation (attention, relevance, confidence, and satisfaction). If students are more motivated

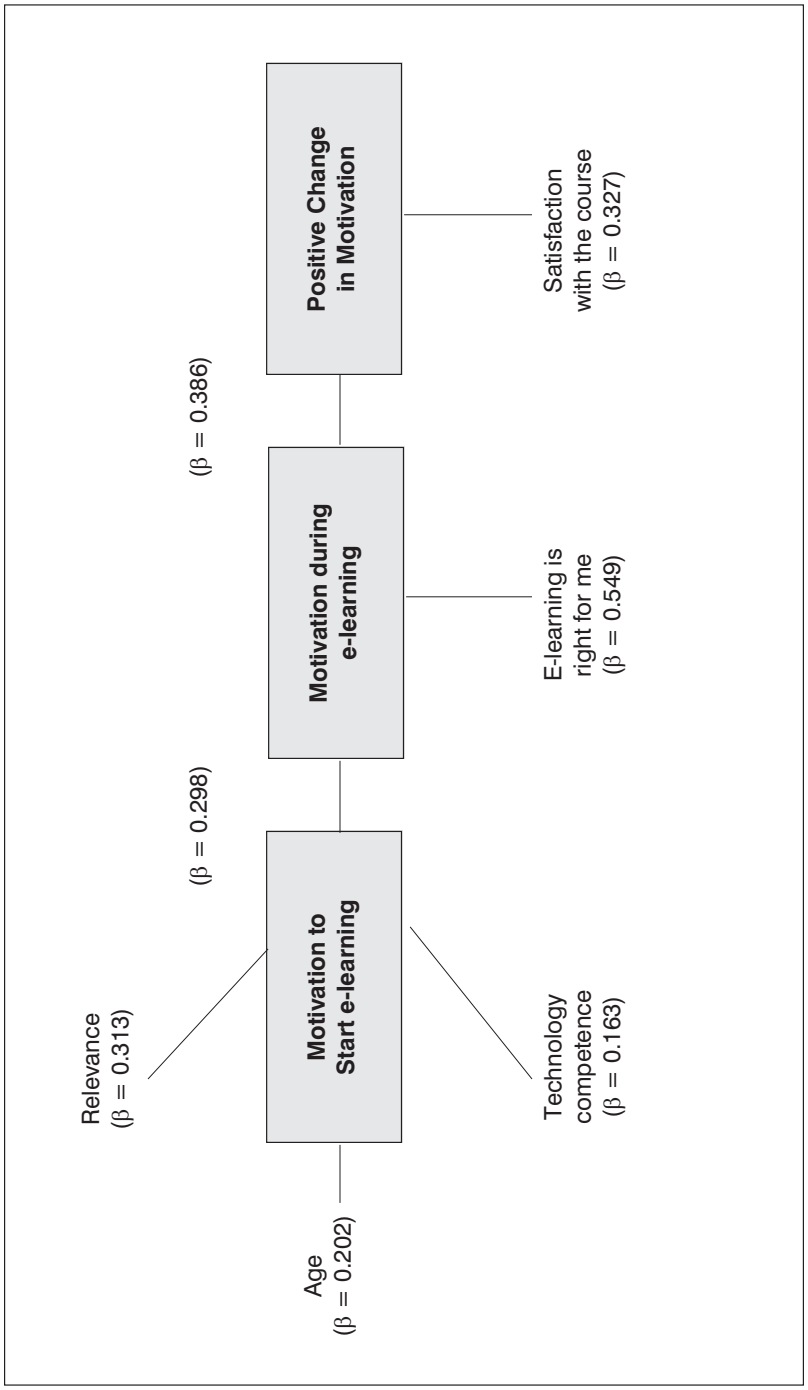


Figure 2. Relationships among factors associated with learner motivation in self-directed e-learning.

to learn, then they are more likely to be engaged; and if they are engaged and engaged successfully, they are more likely to achieve the learning objectives (Frick et al., 2008; Kuh et al., 2007; Rangel & Berliner, 2007). Relevance is also important with respect to First Principles of Instruction (Merrill, 2002, 2008)—in particular the *integration* principle, which has to do with learner's incorporating what they learn into their own personal lives. Merrill (2008) argues that learning is promoted when First Principles of Instruction are used. Students are more likely to be motivated when they solve real-world problems or do authentic tasks (problem-centered principle) and when they are able to incorporate what they have learned into their lives (integration principle).

Competence in using technology is often indicated by the number of different software applications with which one is fluent. Obviously, some degree of technological competence is necessary to even use self-directed e-learning. Moreover, automaticity in the use of the technology itself is important in order to reduce extraneous cognitive load—e.g., see van Merriënboer and Sweller (2005). Extraneous cognitive load can interfere with learning—students are faced with learning how to use the technology when they should be devoting their attention to what it is they are expecting to learn.

The other factor that predicts initial motivation in our study is age. Older learners are more likely to be motivated to learn when beginning self-directed e-learning. Age is also correlated with several other variables. Older learners are more likely to be working professionals, compared with younger college students. These older learners may also be more likely to know what they need to learn for their jobs, and so they are also more likely to be concerned with *relevance* of the e-learning course.

In our study, the best predictor of an overall increase in motivation during a course is being more motivated after finishing several lessons during a course. This interim level of motivation is best predicted by motivation for e-learning at the beginning of a course and the *e-learning is right for me* scale. Many of the items on this scale are consistent with First Principles of Instruction. Item 36 indicates that multimedia presentations were used in the e-learning product (demonstration principle—students are provided with modeling or examples what they are expected to learn or do). Item 30 indicates that the e-learning course consists of simulations of real-world problems (problem-centered principle). Items 29 and 40 indicate that students have opportunities to try out what they have learned and receive feedback to correct errors (application principle). Furthermore, item 17 on this scale suggests that cognitive load is not too high (the difficulty of the course was not too high), thus allowing students to be more successful in their attempts to learn.

The scales *e-learning is not for me* and *I don't want to be alone during e-learning* were not correlated with change in motivation. Not only were the correlation coefficients not statistically significant, they were very close to zero.

The *e-learning is not for me* scale was significantly correlated negatively with *e-learning is right for me* and positively with *I don't want to be alone during e-learning.* Furthermore, the *e-learning is not for me* scale was significantly *negatively* correlated with: level of motivation when beginning an e-learning course; level of motivation after a few lessons into the course; satisfaction with the course; and likelihood of taking another e-learning course in the future. Thus, it would appear that learners who score highly on the *e-learning is not for me* scale are not likely to benefit from self-directed e-learning and will be more motivated and satisfied with a course in which they are not alone in their learning (i.e., there is an instructor and peers with which to interact). To these students, self-directed e-learning is more likely to be frustrating and disrupted by technical problems, and they may be more likely to experience cognitive overload.

In summary, data from our study suggest that learners are more likely to experience increased motivation and satisfaction in self-directed e-learning when they: a) perceive the content to be relevant to their lives; b) are technologically fluent; c) are more highly motivated both at the beginning and during the e-learning course; and d) perceive the e-learning experience to be "just right" for them (meaning that the e-learning product embodies first principles of instruction, difficulty level is a good match, and they receive institutional support for learning this way). On the other hand, learners for whom e-learning is "not right" for them and who do not want to learn alone are not likely to be motivated either to begin or continue self-directed e-learning or to do so in the future. These learners prefer to work with instructors and peers while they are learning, and thus self-directed e-learning is a poor match for them. These learners tend to be younger and students in university settings, compared with older learners who are not in school and are working professionals.

The findings from the present study indicate that the *e-learning is right for me* factor is significantly related to the learner motivation during e-learning, which has implications for learner attrition. As discussed earlier, it is important that courses are designed in ways to meet instructional principles helping learners motivated to stay in the course. Table 2 summarizes instructional design principles recommended for sustaining the learner's motivation in self-directed e-learning based upon the findings from the present study.

It should be acknowledged that there are some limitations to this study. First, a non-random sampling method was used in this study because we had neither information about nor access to every participant in the population. To address this issue, we made efforts to collect data from a large sample as the representativeness of a sample drawn with a non-random sampling method can be improved with a large sample size (Fraenkel & Wallen, 2000). Also, we tried to select the sample carefully so that learners from diverse demographics and backgrounds were included in the sample. Second, since this study examined

Table 2. Instructional Design Principles for Sustaining Learner Motivation in Self-Directed e-Learning

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|---|
| 1. Provide learners with content that is relevant and useful to them. |
| 2. Incorporate multimedia presentations that stimulate learner interest. |
| 3. Include learning activities that simulate real-world situations. |
| 4. Provide content at a difficulty level which is in a learner's zone of proximal development. |
| 5. Provide learners with hands-on activities that engage them in learning. |
| 6. Provide learners with feedback on their performance. |
| 7. Design the website so that it is easy for learners to navigate. |
| 8. If possible, incorporate some social interaction in the learning process (e.g., with an instructor, technical support staff, or an animated pedagogical agent). |

the self-directed e-learning course format, readers should take caution when generalizing our findings to other types of online learning environments (e.g., distance education programs). Future research is recommended to see whether the instructional design principles drawn from the present study are applicable to learners in other types of online learning.

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