Age Difference in Research Course Satisfaction in a Blended Ed.D. Program: A Moderated Mediation Model of the Effects of Internet Self-Efficacy and Statistics Anxiety

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Abstract

This study identified the moderated mediation relationship among age, Internet self-efficacy, and statistics anxiety on student satisfaction after controlling for demographics and technology experiences in research methods courses in a blended professional doctoral program. One hundred and thirty-one students in a three-year Ed.D. Program participated in the study. The results show that after controlling for gender, ethnicity, and technology experiences, age was negatively associated with Internet self-efficacy and Internet self-efficacy mediated the relationship between age and course satisfaction as well. Although the moderation effect of statistics anxiety between self-efficacy and student satisfaction was not supported, there was still partial evidence that the group with statistics anxiety behaved differently from the group without statistics anxiety in terms of the conditional indirect effect of age on course satisfaction. The authors call for future studies to focus on online or blended research courses in professional doctoral programs and test the proposed conceptual model.

Introduction

There has been a rapid growth of online and blended doctoral programs in education (Perry, 2012). While distance and online learning cannot replace the traditional classroom, it appeals to a growing number of students for a variety of reasons including flexible delivery and convenience (Bolliger & Halupa, 2012). One of the key benefits of online or blended doctoral studies is the ability to accommodate students who have employment, family, and/or other responsibilities and are unable to attend a residential program (Henriksen, Mishra, Greenhow, Cain, & Roseth, 2014). The integration of e-learning and online components into the doctoral curriculum has encouraged institutions to search for ways to ascertain empirical data on doctoral students' perceptions and levels of satisfaction within the context of blended and online education doctoral programs (Erichsen, Bolliger, & Halupa, 2014). Moreover, research shows that student attrition rate among Ed.D. programs is as high as 70 percent, and the attrition rate for programs offered online are even higher (Rockinson-Szapkiw, Spaulding, & Spaulding, 2016). Student satisfaction, which reflects how students perceive their learning experiences, is an important indicator of student success (Chang & Smith, 2008). Most researchers agree that highly satisfied students are more likely to remain in, and ultimately, graduate from college (Ali & Ahmad, 2011; Astin, 1993).

While there is a plethora of student satisfaction and retention research, the issue of doctoral student satisfaction in online courses or programs has not been given proper attention (Bolliger & Halupa, 2012). Student retention and persistence can be particularly challenging for online doctoral research

methods courses (Ni, 2013). Therefore, there is a need to examine factors impacting doctoral student satisfaction with online research courses. There are many individual variables that impact student satisfaction in online learning (Herbert, 2006). Researchers argue that adult students pursuing online education doctorate programs might find the distance learning technology challenging (Chyung, 2007), which in turn, can impact their course satisfaction. Moreover, students in online research courses might feel higher statistics anxiety (Onwuegbuzie & Wilson, 2003), which can also have a negative influence on student performance and satisfaction. On the other hand, self-efficacy, a key concept in social cognitive theory concerned with a person's belief of his/her capabilities to perform a specific behaviour, can be a strong predictor to student performance and satisfaction and can mediate the other factors associated with student satisfaction (Adeyemo, 2007; Bandura, 1986). While age, self-efficacy, and statistics anxiety have been examined as predictors of student satisfaction, no research investigated the impact of those variables on the student satisfaction in doctoral research methods courses delivered online or more importantly the complex mediating and moderating relationship among the variables on the student satisfaction. To better inform instructional design, practice, and further investigation regarding online research methods courses, this study has the aim of examining how student age, Internet self-efficacy, statistics anxiety, and student satisfaction are related.

Literature Review

Relevant literature was reviewed to (a) identify factors associated with student satisfaction, (b) identify major methodological and theoretical issues embedded in previous research, and (c) better inform the study.

Student satisfaction

Learning satisfaction is defined as "an affective learning outcome indicating the degree of learner reaction to values and quality of learning, and motivation for learning" (So & Brush, 2008, p. 323). Higher education institutions consider student satisfaction as a critical measure of learning outcome and the success of online educational system implementation (Yukselturk & Yildirim, 2008). Several studies investigated the factors that contribute to student satisfaction in online learning environments (e.g., Dziuban, Moskal, Kramer & Thompson, 2013; Ke and Kwak, 2013; Santhanam, Sasidharan, & Webster, 2008; So & Brush, 2008). Findings from the literature indicate that student satisfaction in online learning environments is associated with a number of factors such as interaction, types of support, student autonomy, technology, student demography, cultural background, self-efficacy, and self-regulation (Artino, 2007; Bangert, 2006; Bolliger & Martindale, 2004; Kuo, Walker, Belland & Schroder, 2013; Reinhart & Schneider, 2001; Sahin, 2007; Yukselturk & Yildirim, 2008). Of these factors, age, Internet self-efficacy, and statistics anxiety are the focus of this study. The combination of these three factors and demographic variables is assumed to be predictive of student satisfaction. It is important to note that, despite the proliferation of literature on online learning, there is a relative scarcity of empirical research dedicated to examining online learning satisfaction in the doctorate in education programs.

Self-Efficacy

Self-efficacy is defined as individuals' beliefs, confidence, and expectations in their ability to accomplish or perform a specific task (Bandura, 1986). Self-efficacy can be broad and generalized, but it can also be approached by focusing on a specific context and activity domain (Bandura, 1982). Boswell (2013) indicated that people can have different beliefs about themselves in different contexts. He used an example of context specificity that an individual can high self-efficacy for art but low self-efficacy for athletics. Beas and Salanova (2006) noted self-efficacy in different domains explains more variance than broad, generalized self-efficacy. Studies indicated that online learners with high self-efficacy tend to be more persistent in their learning and more confident in their ability to use the system (Tsai & Tsai, 2003). Artino (2008) found that students with higher self-efficacy for computer-based learning are more likely to experience learning satisfaction than students with low self-efficacy.

In an online learning environment, Internet self-efficacy is a commonly used variable. Internet self-efficacy describes people's perceptions about their own abilities to use Internet-related actions required to accomplish assigned tasks in an online course (Eastin & LaRose, 2000; Tsai & Tsai, 2003). Online

learning relies on Internet delivery through which various types of activities take place such as group discussions, collaborative projects, synchronous and asynchronous communication with instructor or classmates, online simulations, etc. (Roach & Lemasters, 2006). Direct research regarding the relationships between Internet self-efficacy and satisfaction in web-based learning is not conclusive. A study based on community college students showed Internet self-efficacy partially mediated learners' perceived satisfaction (Chu & Chu, 2010). A study based in a University in Taiwan showed that Internet self-efficacy is correlated with but not predictive of student satisfaction (Kuo, Walker, Belland, Schroder, & Kuo, 2014). Puzziferro (2006) examined a predictive model of satisfaction of online adult learners, in which Internet self-efficacy was not a significant predictor. On the contrary, Lim (2001) found that Internet self-efficacy in a class correlate positively with student satisfaction in online education. Hodges (2008) rightfully claimed that "research on self-efficacy in online environments is in its infancy" (p. 10). More research is needed to examine the role of Internet self-efficacy for student satisfaction in online synchronous learning (Kuo, Walker, Belland, Schroder, & Kuo, 2014).

Age

Age can influence student satisfaction in online courses because of the variety of experiences of each generation. Bandura (1995) suggested that age does not correlate with efficacy, as there is much variance in the way people manage their lives. An empirical study by Beas and Salanova (2006) examined Bandura's suggestion and found no association between age and self-efficacy.

In the context of online learning, prior research seems to indicate that the effect of age on online learning can be contextually dependent on another learner variable, such as learner self-efficacy. A study by McFarland (2001) found that age has a direct effect on computer efficacy. Other studies also found that older people have low self-efficacy in use of technology (e.g. Czaja et al., 2006). That is, older students have less confidence that they could use Internet and computer technology well (Morris & Venkatesh, 2000; Tarhini, Hone, & Liu, 2014).

Statistics Anxiety

Statistics anxiety refers to the apprehension that occurs when a student is exposed to statistics in any instructional content (Onwuegbuzie, 2004). Onwuegbuzie and Wilson (2003) posited that about 80% of graduate students experience some form of "statistics anxiety". Some studies show that there is a negative relationship between statistics anxiety and student performance (e.g. Tremblay, Gardner, & Heipel, 2000) while the other studies found that it negatively affects students' performance in both statistics and research classes (Balo?lu, 2003; Lalonde, & Gardner, 1993).

In the context of online learning, research shows that students in statistics course reported no difference between the face-to-face and web-based learning. However, they were less satisfied with the online delivery as compared to face-to-face instruction (Summers, Waigandt, & Whittaker, 2005). A study by DeVaney (2010) showed the online delivery of a statistics course is likely to lead to higher levels of statistics anxiety and less positive attitudes toward statistics at the beginning of the course. However, the anxiety and attitudinal levels of online students at the end of the course were similar to those in a face-to-face format. The study by Finney and Schraw (2003) found that there is an inverse relationship between statistics anxiety and self-efficacy. Similarly, Perepiczka, Chandler, and Becerra (2011) found significant relationship between statistics anxiety and self-efficacy. However, current literature does not take into account online and adult students, providing justification for further investigations.

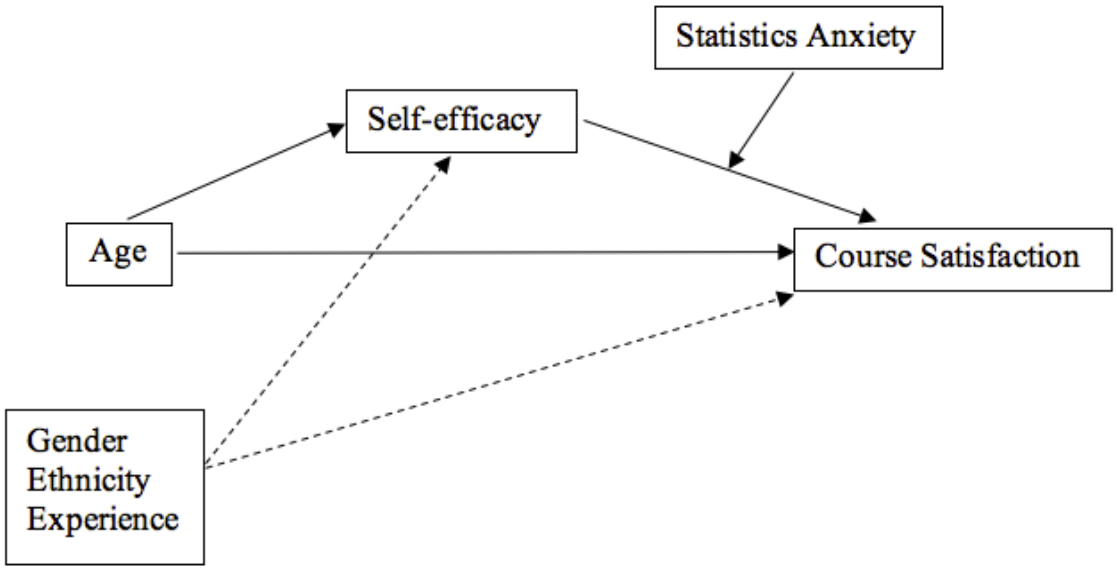
Conceptual Framework

Bean and Metzner's (1985) nontraditional student attrition model and Bandura's (1986, 1989) social cognitive theory provide the conceptual framework and guide the selection of variables to predict student satisfaction in online learning environments. The nontraditional student attrition model indicates that a decision to leave or continue in college is directly influenced by four sets of variables: background and defining characteristics (e.g. age, gender, race, etc.), academic variables,

environmental variables, and social integration variables on academic and psychological outcomes. Out of the four sets of variables, the environmental variables including finances, hours of employment, family responsibilities, etc. are especially important for the attrition of the nontraditional students. In this study, every student in the Ed.D. program faces similar environmental adversities such as full-time employment, large load of family responsibilities, and financial burden. Therefore, it is important to note that the environmental adversities would increase these students' stress level, reduce their satisfaction level, and consequently increase their chance to drop out.

Bandura's (1986, 1989) social cognitive theory, on the other hand, emphasizes the role of human agency in controlling one's thoughts and actions. Central to being a human agency, self-efficacy refers to a person's capacity to deal with different situations. It mediates the effect of background characteristics, academic variables, and environmental variables on one's emotions and behaviors. The higher one's self-efficacy, the higher one's chance to be satisfied or perform well. In the meantime, Bandura pointed out the interactive relationship between self-efficacy and emotional arousal including fear, stress, anxiety, perceived difficulty, etc. Depends on one's self-efficacy levels, his or her capacity to deal with anxiety is different. Therefore, based on the combination of the two theories, the mediating role of self-efficacy between background characteristics and student satisfaction and the interaction of self-efficacy and statistics anxiety within the mediating relationship were tested in the study. See Figure 1 for the proposed conceptual model.

Figure 1. Conceptual model of the moderated mediation relationship among age, technology self-efficacy, statistics anxiety, and course satisfaction



Hypotheses

Age Difference in Internet Self-Efficacy

Hypothesis 1: Age will be negatively associated with Internet self-efficacy while controlling for gender, ethnicity, and technology experiences.

The Mediating Role of Internet Self-Efficacy

Hypothesis 2: Internet self-efficacy will mediate the relationship between age and course satisfaction while controlling for gender, ethnicity, and technology experiences.

The Moderating Role of Statistics Anxiety

Hypothesis 3: The relationship between Internet self-efficacy and course satisfaction will be moderated by statistics anxiety while controlling for gender, ethnicity, and technology experiences. In detail, high statistics anxiety will result in a stronger negative mediating relationship between age and course satisfaction through Internet self-efficacy.

Methods

Sample

A three-year Ed.D. Program in Southern California was chosen because it is a typical professional doctorate program in educational leadership and with many older adult students. The participants were first year and second-year students in the program. As part of the program requirements, the students were required to enroll in a total of four research methods courses with two each year during the first two years of the program. All the research courses were taught in a blended format with the combination of face-to-face meetings and online webinars. A total of 145 students who enrolled in the courses were invited to participate in the study. Out of the 145 students, 131 of them signed the consent form and participated in the study.

Measures

Gender. Gender is a dichotomous variable with two groups: male and female.

Ethnicity. Ethnicity is measured by several categories including American Indian or Alaska Native, Asian, Black or African American, Hispanics of any race, Native Hawaiian or Other Pacific Islander, White, Two or more races, and Other. Due to the small number of participants in some categories, the variable was reduced to two groups in the data analysis: White and Non-White.

Experiences. Regarding the students' level of experiences with technology, online learners were often asked to rank their online technology experiences such as using a web browser and online learning experiences such as previous participation in self-paced online learning (Artino, 2007). Accordingly, two 7-point Likert-scale questions asking the participants to rank their experiences using online computer technologies and self-paced online learning were used to measure this variable.

Age. Age is a dichotomous variable with two groups: younger than 50 years old and 50 years old or over.

Course satisfaction. The course satisfaction was measured in many ways in the past literature. For example, students' overall satisfaction with the online courses such as the 21-item Course Satisfaction Questionnaire (CSQ) (Frey, Yankelov, & Faul, 2003); students' satisfaction with online interaction (Arbaugh, 2000); students' satisfaction with skills learned in the course (Alavi, 1994); students' course satisfaction in multiple dimensions such as pedagogies, resources, and delivery strategies (Hosie, Schibeci, & Backhaus, 2005).

To better measure the students' course satisfaction with blended research methods courses which were not measured in the previous literature, a 17-item satisfaction questionnaire was developed in the study. It is composed of 14 Likert-scale questions and three open-ended questions. The 14 Likert-scale questions asking participants' general satisfaction in the hybrid research method courses using questions such as "I look forward to taking more hybrid research courses in the future", "This hybrid research course met my needs as a learner", "Overall, I was satisfied with my learning experience via the hybrid setting", etc. The three open-ended questions ask participants their general opinions about the advantages, challenges, and further improvement of the hybrid courses.

To examine the internal consistency reliability of the scale, Cronbach's alpha and the corrected item-

to-total correlations were conducted. Based on each item's corrected item-to-total correlation, two items in the satisfaction questionnaire (#9 "It was easy to follow class discussions", and #11 "The extra learning resources provided to you <e.g., handouts, online resources, online discussion groups, online assessments> were helpful") were deleted as their correlations were less than 0.40 (Cronbach, 1951). The resulted 15-item satisfaction scale has a Cronbach's alpha value of 0.91.

Self-efficacy. Similarly, students' Internet self-efficacy was measured in many ways as well. For example, the Online Technologies Self-efficacy Scale (OTSES) was used to measure technology self-efficacy of online learners (Miltiadou & Yu, 2000); The Computer Attitude Scale (CAS) was used to measure students' comfort level with computers (Loyd & Gressard, 1984); In this study, two 7-point Likert-scale questions asking the participants to rank their level of agreement with the following statements: "Learning to operate web-based learning systems such as Blackboard was easy for me" and "I found it easy to get a web-based learning system such as Blackboard to do what I want" were used to measure this variable. The scale has a Cronbach's alpha value of 0.87.

Statistics anxiety. Statistics anxiety is the perceived difficulty in studying statistics. The participants were asked to rank the difficulty of the subjects such as research problem, purpose statement, theoretical or conceptual framework, literature review, research design, statistics, writing, etc. covered in the research courses. When a participant ranked statistics as the most difficult subject to learn in all the subjects, the student was coded as high statistics anxiety; otherwise the student was low statistics anxiety.

Data Analysis

Baron and Kenny's "causal steps" approach has been the most commonly used method to test mediation (Baron & Kanny, 1986). In this approach, four conditions must be satisfied to confirm a mediating relationship: (1). The independent variable affects the dependent variable; (2). The independent variable affects the mediator; (3). The mediator affects the dependent variable while controlling for the independent variable; (4). The total effect of the independent variable on the dependent variable is greater than the direct effect between them. However, there are several disadvantages in applying this method in testing mediation. For example, the indirect effect is not directly tested but rather inferred in this approach (Fritz& MacKinnon, 2007; Hayes, 2009; Preacher & Selig, 2012). In the meantime, satisfying all four conditions may not be necessary for confirming a mediating relationship as demonstrated in several research studies (e.g. Cerin & MacKinnon, 2009; Lebreton, Wu, & Bing, 2009). Also, when significance test is conducted as an additional step to confirm the indirect relationship, the Sobel test (1982) is based on the normality assumption which may not be true either (Edwards & Lambert, 2007).

To better deal with the above issues in this study, the mediation analysis (hypotheses 1 & 2) and moderated mediation analysis (hypothesis 3) were conducted using the SPSS PROCESS macro developed by Preacher and Hayes (2004). Based on the framework of the ordinary least squares-based path modeling, the PROCESS macro can be used to test the direct and indirect effects directly. The indirect effect is estimated through the bootstrapping method in PROCESS when the sampling distribution of the indirect effect is achieved through resampling (e.g. n=10,000). Thus, the confidence interval can be used as a form of hypothesis testing (Hayes, 2013). On top of that, PROCESS can also be used to test complex models which include multiple mediators, multiple moderators, and a mixed of mediators and moderators such as the moderated mediation models. Therefore, the PROCESS macro was chosen for this study.

Results

Table 1.
Descriptive Statistics and Correlations

			r		
Variables	M	SD	1	2	3
1. Experience	5.77	0.95	-		
2. Self-efficacy	6.08	0.82	0.57**	-	
3. Course satisfaction	5.69	0.74	0.32**	0.31**	-
4. Age	0.19				
5. Gender	0.69				
6. Ethnicity	0.49				
7. Statistics anxiety	0.42				

Note. n=131. Age is coded 0=<50, 1=50+; Gender is coded 0=male, 1=female; Ethnicity is coded 0=White, 1=Non-White; Statistics anxiety is coded 0=low, 1=high. **p<0.01

Table 1 reports the descriptive statistics for all the variables and correlations among the continuous variables. Among the participants, about two-thirds were female (69%), half were White (49%), around 20% were age 50 or older, and 42% were in the high statistics anxiety group. In the meantime, experiences, self-efficacy, and course satisfaction are all positively and significantly correlated.

Test of Mediation

Table 2.
Results for the Mediation Model Among Independent Variable (X), Mediator (M), and Dependent Variable (Y)

	Consequent								
	M (self-efficacy)					Y (course satisfaction)			
Antecedent	b	se	t	p		b	se	t	p
X (Age)	-0.42	0.16	-2.57	0.01		0.30	0.17	1.72	0.09
M (Self-efficacy)	-	-	-	-		0.16	0.10	1.65	0.10
Gender	0.18	0.13	1.35	0.18		0.01	0.14	0.07	0.94
Race	-0.04	0.12	-0.33	0.73		-0.07	0.13	-0.51	0.61
Experience	0.52	0.07	7.82	<0.001		0.17	0.09	1.97	0.05
	R^2=0.41, F(4, 113)=19.21, p<0.001					R^2=0.13, F(4, 113)=4.20, p=0.003			
Indirect effect of X on Y though M									
Effect	Boot SE			Boot LLCI 95%			Boot ULCI 95%		
-0.07	0.046			-0.20			-0.01		

Note. n=118. Bootstrap n=10,000. LLCI=lower limit confidence interval. ULCI= upper limit confidence interval. Bootstrap CI method=Bias Corrected.

Table 2 reports the mediation model among the independent variable age, the mediator self-efficacy, and the dependent variable course satisfaction after controlling for gender, race, and experiences. Regarding to the hypothesis 1 that age will be negatively associated with self-efficacy while controlling for gender, ethnicity, and experiences, this hypothesis is supported by the results (b= -0.42, t= -2.57, p= 0.01). Since age is a dichotomous variable with younger than 50 as the reference group, the result means that the older age group (50 or over) on average had about half a point less Internet self-efficacy than the younger age group when holding all the other variables constant. In the

meantime, previous technology experiences were positively associated with Internet self-efficacy as well (b=0.52, t= 7.82, p< 0.01) while gender and race were not.

In the meantime, the hypothesis 2 that Internet self-efficacy will mediate the relationship between age and course satisfaction while controlling for gender, ethnicity, and technology experiences is supported by the result as well. The indirect effect of age on course satisfaction was negative (-0.07) and significant with the 95% bootstrap CI between -0.20 and -0.01. Relative to the younger age group (less than 50), therefore, the older age group (50 or over) were on average 0.07 unit lower in course satisfaction through the effect of Internet self-efficacy. The direct effect between age and course satisfaction was not significant (*b*= 0.30, *t*= 1.72, *p*= 0.09).

Test of Moderated Mediation

Table 3.
Results for the Moderated Mediation Model Among Independent Variable (X), Mediator (M), Moderator (V), and Dependent Variable (Y)

	Consequent								
	M (self-efficacy)					Y (course satisfaction)			
Antecedent	b	se	t	p		b	se	t	p
X (Age)	-0.40	0.17	-2.34	0.02		0.34	0.17	2.04	0.04
M (Self-efficacy)	-	-	-	-		0.11	0.11	1.01	0.31
V (Stat. Anxiety)	-	-	-	-		-1.13	0.96	-1.18	0.24
M*V (Interaction)	-	-	-	-		0.14	0.16	0.88	0.38
Gender	0.18	0.14	1.27	0.21		-0.02	0.14	-0.16	0.87
Race	-0.04	0.13	-0.33	0.74		-0.06	0.13	-0.50	0.62
Experience	0.51	0.07	6.87	<0.001		0.17	0.09	1.97	0.05
	R^2=0.37, F(4, 107)=15.34, p<0.001					R^2=0.18, F(7, 104)=3.30, p=0.003			

Direct effect of X on Y			
Effect	Boot SE	t	p
0.34	0.17	2.04	0.04

Conditional indirect effect of X on Y at values of the moderator			
Effect	Boot SE	Boot LLCI 95%	Boot ULCI 95%
-0.04[1]	0.05	-0.18	0.03
-0.10[2]	0.07	-0.33	-0.01

Index of Moderated Mediation			
Index	Boot SE	Boot LLCI 95%	Boot ULCI 95%
-0.05	0.07	-0.28	0.04

Note. n=112. Bootstrap n=10,000. LLCI=lower limit confidence interval. ULCI= upper limit confidence interval. Bootstrap CI method=Bias Corrected.

1. Non-Statistics Anxiety Group
2. Statistics Anxiety Group

Table 3 reports the moderated mediation model among the independent variable Age, the mediator self-efficacy, the moderator statistics anxiety, and the dependent variable course satisfaction after controlling for gender, race, and experiences. The hypothesis 3 that the relationship between Internet self-efficacy and course satisfaction will be moderated by statistics anxiety while controlling for gender, ethnicity, and technology experiences was not fully supported. The results show that the interaction effect was not significant (*b*= 0.14, *t*= 0.88, *p*= 0.38). Also, the index of moderated mediation showed that the indirect effect (-0.05) is not significantly moderated based on the 95% bootstrap CI between -0.28 and 0.05. Therefore, the simple mediation model in the last section is

preferred over the moderated mediation model.

However, it is evident that the group with statistics anxiety behaved differently from the group without statistics anxiety regarding the conditional indirect effect of age on course satisfaction. In detail, the indirect effect of age on course satisfaction through Internet self-efficacy is significantly negative among the statistics anxiety group (effect= -0.10, 95% bootstrap CI from -0.33 to -0.01) but not significant among the group without statistics anxiety (effect= -0.04, 95% bootstrap CI from -0.18 to 0.03). Therefore, it seems that high statistics anxiety resulted in a stronger negative mediating relationship between age and course satisfaction through Internet self-efficacy even though the moderated mediation effect is not statistically significant.

Also, the direct effect between age and course satisfaction was significant (b= 0.34, t= 2.04, p= 0.04) in the moderated mediation model, which is contrary to the non-significant direct effect in the mediation only model. In the previous mediation only model, the direct effect between age and course satisfaction was not significant (b= 0.30, t= 1.72, p= 0.09).

Discussions

The current study is one of the first to identify the complex moderated mediation relationship among age, Internet self-efficacy, and statistics anxiety on student satisfaction after controlling for demographics and previous technology experiences in online doctoral research methods courses. Considering the growing trend in online and blended doctoral programs and the high attrition rate among these programs, it is critical to examine the factors impacting student satisfaction which in turn will contribute to retention and academic attainment. As such, the study results have several unique contributions to the online learning literature by demonstrating the age group differences and the special roles that self-efficacy and statistics anxiety play in improving student satisfaction.

First of all, research on blended or online research methods courses in an Ed.D. Program has rarely been conducted, but it is in urgent need (Liu & Haque, 2015). Although research courses are critical in helping the doctoral students to progress into the dissertation stage, and to complete their dissertations (Henson, Hull, & Williams, 2010; Llamas & Boza, 2011), there is a smaller number of research courses in an Ed.D. Program compared to a Ph.D. Program (Leech & Goodwin, 2008). Research shows that acquiring research skills in an online environment is especially challenging for students in a professional doctoral program because of their general lack of familiarity in reading academic journals and evaluating research studies, lack of knowledge about research skills, and fear of statistics (Bailie, 2009; Ewing et al., 2012). Consequently, graduate students were less satisfied with research courses compared to the courses with non-research based content, even when the same instructor taught both courses (Coleman & Conrad, 2007). Thus, it's critical to investigate the interconnection among several key student characteristics that can impact student satisfaction for online or blended research courses in a professional doctoral program.

Age is an important issue to consider in studying student satisfaction in a doctoral program as the student body is composed of adult learners. Because the Ed.D. programs are designed for full-time working professionals in leadership roles at educational or other professional organizations (Zambo, 2014), a large number of students are middle-aged or older adults. Based on the data from the National Postsecondary Student Aid Study (NPSAS), the Ed.D. program has the highest average age of students in comparison to other doctoral programs (e.g. mean age=42.3 in 2007) (Bell, 2009). While the past literature agreed on the benefits of the accessibility and flexibility offered by the online programs, how age impacts the Internet self-efficacy and course satisfaction is not clear. This study shows that age is negatively associated with Internet self-efficacy when controlling for gender, ethnicity, and technology experiences. It means that the age 50 or over group on average had less Internet self-efficacy than the under 50 age group when holding all the other variables constant. This result matches with the past literature in that the digital divide has been found in technology use between older adults and younger adults with the former group less engaged in technology-mediated learning than the latter group (Shea & Bidjerano, 2008; White & Selwyn, 2012) and older adult students have less confidence in the use of

Internet and computer technology (Morris & Venkatesh, 2000; Tarhini, Hone, & Liu, 2014), although it is contrary to other studies which found no age differences in Internet self-efficacy or student satisfaction (Kuo & Belland, 2016; Willging & Johnson, 2004). Regarding the age difference in student satisfaction, this study found no direct effect of age difference on course satisfaction as demonstrated in the mediation model. Such difference is only mediated through the Internet self-efficacy. Therefore, this could be one of the reasons explaining the argument in the past literature when self-efficacy was not treated as a mediator in the relationship.

The mediating effect of self-efficacy on student behavior has been demonstrated in Bandura's social learning theory (Bandura, 1986) and many studies applying the theory (e.g. Puzziferro, 2008). Since self-efficacy could be a context-specific term (Boswell, 2013), Internet or technology self-efficacy which focuses on one's perception of their own ability in learning online was chosen for this study. The mediation model shows that Internet self-efficacy mediated the relationship between age and course satisfaction while controlling for gender, ethnicity, and technology experiences. The indirect effect of age on course satisfaction was negative and significant with the 95% bootstrap CI. Therefore, the 50 or over age group were lower in course satisfaction through the effect of Internet self-efficacy than the under 50 age group. This mediating effect of Internet self-efficacy is consistent with the past literature as well. For example, in studying mathematics achievement, Spence and Usher (2007) found that technology self-efficacy predicted course engagement and achievement. Kuo and Belland (2016) concluded that Internet self-efficacy was positively associated with different types of interaction in online learning, which strongly influence student satisfaction. However, it's still interesting to point out that the effect of age on course satisfaction was only mediated through self-efficacy not directly.

Also, the moderation effect of statistics anxiety between self-efficacy and student satisfaction was tested in the study. The test revealed some interesting results. Generally speaking, the moderated mediation effect was not supported.

Therefore, there was no interaction between statistics anxiety and self-efficacy on student satisfaction. However, the indirect effect of age on course satisfaction through Internet self-efficacy is significantly negative among the statistics anxiety group but not significant among the group without statistics anxiety. That means the there is still partial evidence that the group with statistics anxiety behaved differently from the group without statistics anxiety regarding the conditional indirect effect of age on course satisfaction. It seems that high statistics anxiety resulted in a stronger negative mediating relationship between age and course satisfaction through Internet self-efficacy. To our knowledge, this study result was not discussed in the past research. The past literature has reported the negative relationship between statistics or math anxiety and self-efficacy (Benson, 1989; Finney & Schraw, 2003; Hanna & Dempster, 2009; Hsu, Wang, & Chiu, 2009; Zeidner, 1991), however, none of them tested the joined effect of anxiety and self-efficacy on the indirect effect of age on student attitude, behaviours, or outcomes. Also, few studies have focused on online learning or adult learners even when student anxiety from research-related coursework is more severe in an online learning environment (DeVaney, 2010). Therefore, further research in the moderated mediation model in online or blended research courses is warranted.

Implications and Recommendations

Since this study is focused on a unique student population, the students in the Ed.D. program, and a unique subject, factors influencing the student satisfaction in online or blended research courses, it has several implications for the literature and the practices for this student population and research subject. However, the implications can be expanded to other professional doctoral programs and similar research subjects as well.

First of all, it's very important to consider the culture of Ed.D. program. The online and blended doctoral programs generally attract non-traditional students who are unable to attend face-to-face classes (Bolliger & Halupa, 2012; Henriksen et al., 2014). These students are usually middle-aged or older and full-time working professionals. In pursuing their doctoral degrees, they have many

challenges in comparison to the younger full-time on-campus students. These may include balancing between work and family, unfamiliarity with research and theory, lack of confidence, lack of online learning skills, fear of statistics, etc. (Bailie, 2009; Ewing et al., 2012; Zambo, 2014). All of them have contributed to the high attrition rates for these programs (Rockinson-Szapkiw, Spaulding, & Spaulding, 2016). To help these students persist and attain their degrees, we need to know the factors impacting their satisfaction in learning online, especially in online and blended research courses in this case.

From a research perspective, this study emphasized the importance of Internet self-efficacy and statistics anxiety in improving student satisfaction. Since after controlling for gender, ethnicity, and previous technology experiences, age was associated with self-efficacy negatively and there was only a significant indirect effect from age to student satisfaction through self-efficacy. How to help the students in the 50 or over age group to improve their Internet self-efficacy is an important research topic for the further research.

In the meantime, although the moderated mediation model with the statistics anxiety added as the moderator was not fully supported by this study, the indirect effect of age on course satisfaction through Internet self-efficacy is significantly negative among the statistics anxiety group but not significant among the group without statistics anxiety. That seems to point to the amplifying effect of statistics anxiety in deepening the gap in the course satisfaction between the two groups through the mediating effect of Internet self-efficacy. In other words, considering the relatively lower self-efficacy and higher statistics anxiety among the older group, these two factors are the double threats to the lower course satisfaction to these students. Therefore, how to help the students in the 50 or over age group to reduce their statistics anxiety is an important research topic for the further research as well. A couple of recent studies have illustrated the benefits of supplementary mathematical and statistical support beyond regular instruction and collaborations to foster a closer student-faculty relationship in reducing statistics anxiety in math and research courses (Chamberlain, Hillier, & Signoretta, 2015; Waples, 2016). These strategies could be further tested in research and practices as well.

Further recommendations are also built upon the several limitations of this study. In this study, the data were collected from one university with 100 plus students. The research courses have relatively high course satisfaction and self-efficacy scores. Also, the statistics anxiety was measured by the ranking of the difficulty of the subjects covered in the courses. We would recommend further studies to replicate the study by utilizing a large sample from multiple doctoral programs with more diverse self-efficacy and course satisfaction scores and with better measurement of the key variables such as the statistics anxiety and also include more age groups besides using the age 50 as the cut-off point. Additionally, since the data were collected at the beginning of the research courses, the students' Internet self-efficacy, statistics anxiety, and satisfaction could change during or at the end of the research courses. For example, DeVaney (2010) showed there was a change in the anxiety and attitudinal levels of online students from the beginning to the end of the course. Therefore, it will be beneficial to conduct longitudinal studies to track the changes among the variables and further check if the conceptual model proposed in the study still upholds for the longitudinal data.

In the meantime, we also recommend more studies to focus on online or hybrid research courses and adult learners in professional doctoral programs in general. As pointed out by the literature review, this is a largely unexplored area. Besides the recommendation to test the conceptual model proposed in this study, we also recommend the inclusion of the academic variables proposed in Bean and Metzner's (1985) nontraditional student attrition model. The knowledge of the effects of other factors such as faculty efficacy, student interactions, student engagement on top of the moderated mediation effect of Internet self-efficacy and statistics anxiety will help us further improve the student satisfaction and performance in the online or blended research courses and doctoral programs which is the ultimate goal of this line of research.

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