



**DOCTORAL PROGRAM DESIGN BASED ON TECHNOLOGY-
BASED SITUATED LEARNING AND MENTORING:
A COMPARISON OF PART-TIME AND FULL-TIME
DOCTORAL STUDENTS**

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ABSTRACT

Aim/Purpose	Most programs are designed with full-time doctoral students' characteristics and needs in mind; few programs consider the unique needs of part-time doctoral students, including time restrictions, experiences during the program, identity development, and different professional aspirations. The purpose of this study was to evaluate the potential differences between part-time and full-time doctoral students in their scholarly development, and how technology may serve as a communication and organization tool for individual and program support.
Background	Built on the application of communities of practice, information and communication technology, and situated learning theory, this study sought to evaluate the potential differences among full-time and part-time doctoral students associated with their scholarly development in a traditional doctoral program at a large research-intensive university.
Methodology	This study used independent samples t-test to evaluate the potential differences between part-time and full-time doctoral students in their scholarly development. Data were collected from 98 doctoral students via a survey. This

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study also employed two hypothetical cases that described the issues and solutions related to the program pursuant to scholarly development, which further illustrated the quantitative results and provided more meaningful discussions and suggestions.

Contribution	This study provided insights into part-time doctoral students' scholarly development and provided suggestions for designing doctoral programs and differentiated mentoring for both full-time and part-time doctoral students. Further, additional multifaceted mentoring approaches including peer mentoring and e-mentoring were evaluated.
Findings	Significant differences were found in four aspects of doctoral students' scholarly development: the opportunities to do research related to grants with faculty, support for scholarly work in addition to advisor's support, involvement in the teaching/supervision activities, and goals for scholarly development.
Recommendations for Practitioners	Program designers, faculty, and especially mentors should appreciate the differences between part-time and full-time doctoral students. Potential program redesigns should include judicious applications of technology as essential components to address limited accessibility and opportunities for part-time students. An Individual Development Plan (IDP) should be used to mentor doctoral students to enhance the effectiveness of mentoring regarding academic goals, actions, and related roles and responsibilities.
Recommendations for Researchers	Future research can further evaluate and develop the instrument to better measure more domains of doctoral students' scholarly development. Additionally, qualitative methods may be used to further provide the emic description of the process of part-time students' engagement with the program, mentors, and peers.
Impact on Society	With consideration of the unique needs of part-time students and the application of technology-based learning community, opportunities are provided for mentors and doctoral students to engage in scholarship and develop a sense of belonging to their doctoral program.
Future Research	Future research can examine the differences between male and female doctoral students, different race groups, and disciplines.
Keywords	situated learning, mentoring, technology, part-time doctoral student, program design

INTRODUCTION

Part-time doctoral students often differ in their approach, experiences, and goals in their doctoral programs compared to their full-time counterparts. These potential differences may give way to issues regarding scholarly and identity development. Studies in the field of education have revealed a significant increase in the number of part-time doctoral students (Gardner & Gopaul, 2012) which may further exacerbate these potential issues. Unfortunately, most programs are designed with full-time doctoral students' characteristics and needs in mind; while few programs consider the unique needs of part-time doctoral students as nontraditional students, including time restrictions and different career aspirations (Offerman, 2011). Work and time constraints for part-time doctoral students often prohibit them from being meaningfully integrated into the learning community and pursuing opportunities to be fully immersed in scholarly activities (Holm et al., 2015; Watts, 2008). Similarly, typical training approaches may not be the most ideal or effective strategies for part-time doctoral students. By extension, mentors may also overlook or fail to adjust mentoring practices in a way that aligns with this group's needs. Therefore, it may take part-time doctoral students considerably longer

time in programs, well beyond an anticipated plan or timeline. As a result, this population of students may feel prolonged stress, disconnected, and a sense of isolation or otherness (Watts, 2008). Researchers have argued that this alienation and marginalization mitigate students' opportunities for collegial investment, professional involvement, and knowledge acquisition (Weidman et al., 2001). Ultimately, the limited opportunities to engage in scholarship and the lack of sense of belonging may negatively influence students' academic self-concept and self-efficacy (Ostrove et al., 2011).

Although scholarly development are salient considerations for all doctoral students, research is limited regarding the shared understanding and supportive protocols between mentors and mentees and how that may vary between part-time and full-time doctoral students. Scholarly development includes professional experiences of research and teaching, and professional identity development with scholarly goals. Fuhrmann (2016) suggested that in doctoral education, doctoral students' development of career goals should be an important component of the doctoral program. Further, students and mentors should work to set career goals at the beginning of the program and the mentoring should be adjusted as the goals evolve (Fuhrmann, 2016). Understanding students' desired career paths and the factors that influence their career decisions allows mentors to support students more effectively (Fuhrmann et al., 2011). However, in practice, mentors and part-time doctoral students often do not share a common understanding of scholarly goals. As a result, students do not develop the specific knowledge and skills that would be appropriate for their interests and aspirations. Unfortunately, little research has examined the differences between part-time and full-time doctoral students in their scholarly development.

The purpose of this study was to evaluate the differences between part-time and full-time doctoral students in their scholarly development. Specifically, this study examined the research question: What are the differences between part-time and full-time doctoral students in their scholarly development? The present study was framed through the theories of community of learning (Lave & Wenger, 1991; Wenger, 1998), situated learning (McLellan, 1996), and the application of these theories using technology (Dennen, 2004; Kafai et al., 2008; Lisa & Paula, 2015; Nistor et al., 2014; Skierkowski & Wood, 2012; Squire, 2002). Built on the theoretical framework, we designed the study, discussed the findings, and provided suggestions on doctoral program design that attends to both part-time and full-time doctoral students.

REVIEW OF LITERATURE

A literature review was conducted to examine the potential differences between part-time and full-time doctoral students and the subsequent interventions and frameworks required to support the unique needs of part-time doctoral students, particularly using technology as communication and organization tools. A search of literature was conducted using scholarly databases including Google Scholar, ERIC, ProQuest, and PsychINFO with varied combinations of the search terms "situated learning", "part-time doctoral students", "mentoring", "peer mentoring", "e-mentoring", "education communication technology", and "information and communication technology". Articles included in the literature review met the following inclusion criteria: (1) articles that investigated the issues and/or solutions for part-time doctoral students' success; and (2) articles that included applications of technology, communities of practice, situated learning, and mentoring regarding doctoral students. The first part of the review focused on doctoral students' scholarly goals and identity. The second part of the review included mentoring and self-efficacy. The third part of the review addressed apprenticeship and communities of practice. The fourth part of the review focused on part-time doctoral students' research and teaching.

SCHOLARLY GOALS

The success of doctoral programs is often appraised based on students' research achievements and the pursuit of a tenure track faculty position. This is a limited view because it grants insufficient attention toward students with other goals. Further, doctoral students' goals may evolve over time

(Hoskins & Goldberg, 2005), which may also lead them to a path that varies from this paradigm. Golde and Dore (2001) found that 35% of students reported becoming *less* interested in the typified career path (i.e., tenure-track research position), while only 21% reported becoming *more* interested in the faculty career as their career plan. Moreover, Fuhrmann et al. (2011) found that one-third of doctoral students in a science program changed their career aspirations from research-focused career plans to non-research career related career plans after beginning their programs. This study also reported that students' confidence level decreased during the transition from the first to the second year and decreased more from the second to the third year. This study also explored factors that influenced the changes such as negative perceptions related to research-focused career, inadequate quality-of-life or work-life balance, and competitive or stressful academic positions that involves publication and grant writing. Based on the findings, Fuhrmann et al. (2011) insisted that role modeling has a positive or negative impact on students' perceptions of academic careers (Paglis et al., 2006) across all disciplines (Austin, 2002). These reviewed studies suggested that mentors or peers' role modeling may influence doctoral students' decision making about their academic career choice. Thus, it is important to investigate doctoral students' mentoring as it relates to their career plan.

MENTORING AND SELF-EFFICACY

Effective mentoring enhances doctoral students' success and satisfaction (Heath, 2002; Zhao et al., 2007) and helps with the identification and pursuit of scholarly goals (Nyquist et al., 1999). Mentoring, both from faculty and peers, is an integral component of a successful doctoral program. This forms a team-based platform that involves both faculty mentors and peer mentors facilitate student success (Holley & Caldwell, 2012). Faculty mentors primarily play more roles regarding academic development and peer mentors provide social support and advice (Webb et al., 2009). Peer mentors' activities positively impact doctoral students' involvement at the beginning of their program, and these activities included introductions of the program, providing information about coursework, faculty's research, program requirements, opportunities for involvement, social support, etc. (Bowman et al., 1990).

Studies show that doctoral students' mentoring and learning environment influence self-efficacy (Hollingsworth & Fassinger, 2002; Overall et al., 2011; Paglis et al., 2006). Overall and colleagues (2011) found that doctoral students exhibited increased self-efficacy associated with research skills when they received direct help from their supervisors to complete research tasks. Paglis et al. (2006) also documented the positive impact of mentoring and found that mentoring improves students' research activity and self-efficacy. Similarly, Hollingsworth and Fassinger (2002) evaluated 194 doctoral students' research training environments and self-efficacy, and they found that doctoral students' learning environments influenced mentoring experiences and students' research self-efficacy.

COMMUNITIES OF PRACTICE AND APPRENTICESHIP

A well-developed community can bolster communication, understanding, production, and instill a sense of support and belonging for individuals. Lave and Wenger characterized the nature of communities of practice (Lave & Wenger, 1991; Wenger, 1998). In the community of practice, "legitimate peripheral participation provides a way to speak about the relations between newcomers and old-timers, and about activities, identities, artifacts, and communities of knowledge and practices" (Lave & Wenger, 1991, p.29). This applies to doctoral studies where doctoral students work with faculty on research to gain research skills, content area expertise, and the ability to generate new knowledge and theory. For example, Green (2006) designed instructional strategies based on communities of practice theory. The course is characterized by "a supportive environment, shared goals, collaboration among all members, respectful inclusion of different perspectives, progressive discourse toward knowledge building, and distribution of learning through participation" (p.176). Thus, it is possible to explore the application of communities of practice in full-time and part-time doctoral students.

One form of mentorship in doctoral education, it a traditional apprenticeship model (Shulman, 2004). The paradigm, characterized by a traditional “one-to-one, top-down, master-to-apprentice learning approach,” is expanding to accommodate new concepts influenced by globalization and national policies (Nerad, 2012). Doctoral education may benefit by including an apprenticeship approach where “department-level activities for professional socialization, formal and informal partnerships for peer learning, skills-oriented workshops in central (post)graduate schools, and learning acquired by way of national and international conferences and multicultural learning communities” (Nerad, 2012, p.68).

PART-TIME DOCTORAL STUDENTS: OPPORTUNITIES FOR RESEARCH AND TEACHING

Part-time students often maintain jobs or attend to familial obligations, which makes it difficult for them to connect with faculty, mentors, and peers. Researchers have found that part-time doctoral students tend to be less engaged and committed to their scholarly pursuits when compared to full-time doctoral students (Biegel et al., 2006; Curran, 1987; Davis & McCuen, 1995; Gardner & Gopaul, 2012; Nora & Snyder, 2007). In particular, Gardner and Gopaul (2012) found that part-time doctoral students reported a lack of support and close relationships with their advisors, faculty, and peers, which resulted in a sense of exclusion. This contrasts sharply with full-time doctoral students, who have multiple opportunities for teaching, research, and interaction with faculty and peers (Gardner & Gopaul, 2012).

Lack of time is one factor that restrains part-time doctoral students from being as engaged in scholarly work as full-time doctoral students. A direct consequence of the demands on part-time doctoral students’ time is the fact that they often fail to complete programs within an anticipated timeframe (Watts, 2008). A secondary consequence is that part-time doctoral students often feel disconnected and experience a sense of isolation or otherness (Watts, 2008). Due to this sense of alienation and marginalization, it may not be reasonable to expect that part-time doctoral students would seek opportunities for their academic investment, involvement, and knowledge acquisition (Weidman et al., 2001).

In addition to students’ social and academic experiences, teaching serves as instrumental in many doctoral programs (Holt, 1999; Nyquist et al., 1999). Doctoral programs in education (e.g., teacher education and curriculum and instruction) require students’ teaching internship. The experiences in teaching in higher education improve students’ candidacy when searching university-level academic positions. Unfortunately, restrictions on part-time doctoral students’ schedules and their continued teaching in K-12 schools for financial support prevent most from having meaningful opportunities to teach at the college level. Therefore, part-time doctoral students’ often lack the opportunity to acquire teaching experience in education programs.

THEORETICAL FRAMEWORK

SITUATED LEARNING

The situated learning framework provides a structure that may facilitate a direct and positive influence on learning community building. Situated learning (McLellan, 1996) assumes that knowledge is contextualized and gradually constructed through the activity nested within context and culture. Further, knowledge must be learned in an authentic context where it is used and through interactions among individuals (Brown et al., 1989; Lave & Wenger, 1991; McLellan, 1996; Orgill, 2007; Wenger, 1998). Based on these assumptions, McLellan’s (1996) situated learning framework included several components that would be beneficial to mentoring and doctoral education program design, particularly addressing the needs of part-time doctoral students. These components include cognitive apprenticeship, coaching, collaboration, multiple practice, and reflection.

According to McLellan (1996), students learn through a *cognitive apprenticeship* with intensive interaction and feedback. In this perspective, part-time doctoral students should be given opportunities to interact with both their mentors and other full-time or part-time peers with multiple sources of feedback. An important aspect of cognitive apprentice is the act of *reflection*. For part-time doctoral students, the reflection should specify their academic tasks and be closely related to their long- and short-term scholarly goals. When reflection is purposefully aligned with an individual development plan (i.e., statement of goals and a process to continually evaluate progress), programs allow both mentors and part-time doctoral students to engage with reflection more effectively. Further, students should be *coached* to gain the necessary knowledge and skills while working on multiple projects that challenge their current ability. *Collaboration* emphasizes the social construction of knowledge through shared activities (e.g., in-class interactions with instructors and peers, discussion of experiences, and knowledge construction) (McLellan, 1996). *Multiple practices* emphasize knowledge and skill acquisition through cycles of repetition (McLellan, 1996). In multiple practices, feedback provides reinforcement and allows students to gain confidence and mastery, at which point a new task is possible. Throughout the process, part-time doctoral students collaborate with faculty and peers, accumulate knowledge about research and methods, hone their research skills through practice, and apply those skills to novel situations.

TECHNOLOGY AND SITUATED LEARNING THEORY

The prominent features of situated learning highlight culture and context, which in the modern education setting often include technology (Squire, 2002). Technology applications framed within situated learning are complementary and may be used for support in doctoral education programs (Nistor et al., 2014). They especially include common communication tools such as texting, social media, email, or cloud computing (Lisa & Paula, 2015; Skierkowski & Wood, 2012). Using technology, mentors can maintain consistent contact with mentees to ensure ongoing support and further develop a more personal relationship (Kafai et al., 2008) and facilitate timely interventions that will aid in improving the mentee's workflow and output (Dennen, 2004).

Learning environments that include appropriate applications of technology may positively impact students' experiences by supporting supplementary methods to engage in significant activities: research opportunities, facilitating further engagement in the program, and creating channels of communication to bolster the relationships between mentees and their peers and mentors (Hill & Hanafin, 2001). Further, the asynchronous affordances of these technologies allow part-time doctoral students to access, consume, and contribute to the conversation and information at their convenience. Technology application in this context forms a virtual community of practice which may bolster the interactions between students and faculty (Nistor et al., 2014). This may be particularly useful for part-time doctoral students to have opportunities of interaction on campus and additional emotional support and mentoring. For instance, mobile technologies can be used to access cloud storage or create a text chain for collaboration and interaction; feedback from professors can be given via an assortment of communication technologies; and socialization with peers and mentors can occur through social media.

SUMMARY

Situated learning theory contextualized in a technologically-enhanced learning environment provides a theoretical lens for discussing the program design and mentoring, and a frame to discuss the mentor and the part-time doctoral student in the hypothetical case. The components of situated learning theory including cognitive apprenticeship, coaching, collaboration, multiple practice, and reflection are considered in developing a virtual community of practice with information and communication technologies pursuant of additional live and asynchronous support for doctoral students.

METHODOLOGY

This study examined potential differences between full-time and part-time doctoral students using two hypothetical cases and an independent samples t-test. The two hypothetical cases included a full-time doctoral student named Emma, and a part-time doctoral student named Alissa. These cases were developed by the authors of the present research based on previous experience in teaching, mentoring, and research in the context of this study. Further, the two hypothetical cases were developed based on the literature and findings of the present study related to the difference between full-time and part-time doctoral students regarding scholarly development. The two hypothetical cases described the prototypically distinct characteristics of full-time and part-time doctoral students in terms of their scholarly development.

For the independent samples t-test, the dependent variable was doctoral students' scholarly development, which was measured by the Doctoral Student Development Survey with 32 items (see Appendix A). The independent variable was the type of doctoral students (i.e., full-time and part-time doctoral students). In the context of this study, having graduate assistantship (GAship) was the criterion to differentiate full-time and part-time students. Those who had GAship were full-time students, otherwise, they were part-time students. Although in certain contexts, some doctoral students do not have neither a GAship nor a full-time job, this is not the case in the present study.

CASE OF THE PROGRAM AND HYPOTHETICAL CASE SCENARIOS

In this section we provide a hypothetical case with information about the studied institution including the admission criteria and procedures, how doctoral students are mentored regardless of full-time or part-time status, and the use of technology. We provide further context via the mentor, Dr. A, and her two students: Emma, a full-time doctoral student, and Alissa, a part-time doctoral student. Based on the quantitative findings and discussion, we re-portrayed them in the section, Dr. A and Alissa Revisited.

CASE OF THE PROGRAM

As identified by de Valero (2001), many issues surround doctoral students' success in their programs including "lack of training for conducting independent research, lack of orientation in preparing for comprehensive examination, style of advising while writing the dissertation, attitudes toward students, student participation in departmental academic and social activities, and peer support" (p. 344). In this section, we described two hypothetical cases regarding the admission process, the development and application of a doctoral program plan, advising, and communication between the department and the students: a full-time doctoral student named Emma, and a part-time doctoral student named Alissa. The description of these two cases was based on the authors' teaching, mentoring, and research experience in the context of the present study.

The department in the present study provides three doctoral programs: Ph.D. in Curriculum and Instruction, Ph. D. in Teacher Education, and Ed. D. in Curriculum and Instruction. These programs graduate students in seven different areas. Although there are different requirements for each program, Emma and Alissa live in the same institutional culture and follow the same mentoring requirements. The department has a doctoral coordinator, who takes responsibilities for the whole department and works with faculty on the doctoral admission. He also leads the doctoral committee which meets once a month to discuss different topics of program design or redesign, implementation, evaluation, admission, and graduation. A department office specialist manages paperwork and communication with current students and prospective students who plan to apply for the programs.

Doctoral students attend one or two colloquia each semester. Faculty and students discuss conference proposals, comprehensive exam, dissertation proposal, dissertation, their progress of the pro-

gram, or job searching. Students meet with their peers more often in their classes. Some faculty organize the meetings among students in the same program for social gatherings. Students receive emails from the coordinator or faculty for announcements regarding colloquia and other information.

The programs in the department use typical technological tools indicative of similar programs and other institutions. Online or hybrid courses, email, digital library resources, etc. are used extensively throughout programs; however, exceptional technology use is not an evident feature of the programs for doctoral students. There is no department-level technological platform that allows full-time and part-time doctoral students to meet and interact virtually or obtain information regarding the program, students, faculty, and academic activities on campus.

For admission to the program, Emma and Alissa met the requirements for GRE and GPA, and provided their transcripts from their previous institutions, three letters of recommendation, and a personal statement. After passing the application documents review and an interview, they were admitted. The interview focused on the work experiences they had in their fields, their research experiences and interests, and their tentative plans for the completion of the program. Questions were asked about whether the candidate would be full-time or part-time and their future career goals. Emma decided to quit her full-time teaching job and was admitted as a full-time doctoral student. She also applied for the graduate assistantship and became an assistant who works 20 hours each week for teaching and/or research. Although she recognized the potential and opportunities to work with faculty on campus and the possibilities to make more rapid progress in research and teaching in higher education, Alissa chose to be a part-time doctoral student and maintain her teaching position that supported her family.

DR. A AND HER STUDENTS: EMMA AND ALISSA

Before they began their program, a professor, Dr. A, was assigned to Emma and Alissa as an academic advisor by the content coordinator. She advises courses based on the program plan, the selection of a dissertation committee, the work for the comprehensive exam, the dissertation proposal, and the dissertation.

Although students are encouraged to work with their advisors, there are no specific requirements for academic products on each stage of the program. Individual student's personal academic goals and perceptions of the program influence their interactions with their advisors. Dr. A's experiences with Emma and Alissa greatly differ. Emma meets with Dr. A formally and informally on campus. She is teaching an undergraduate course under Dr. A's supervision. She is also integrated into Dr. A's research project and begins to attend academic conferences and write articles with Dr. A in her second year. Through attending academic conferences with Dr. A, Emma is introduced to her professors' former colleagues, classmates, and professors from several universities. Through these experiences, she gains information regarding publishing articles, achieving tenure, and other information about academia. The information encourages Emma to pursue a career as a professor of education when she finishes her doctoral program. She takes three courses a semester and will be ready for her comprehensive examination at the end of the second year.

Emma also has opportunities to hear and see other doctoral students' academic conference proposals, preparation and defense of the comprehensive exam, dissertation proposal, dissertation, and job searching. When the graduate college, college of education, and the department organize any academic activities, she attends and receives information and appropriate training for academia. She is also an active member and organizer of the doctoral meetings. She often invites Alissa to the academic activities on campus, but Alissa cannot attend due to conflicts with her work schedule. Emma also feels that the communication between her and Alissa is degrading over time.

Alissa meets with Dr. A formally on campus once every semester through appointments. Although Alissa often experiences stress regarding her coursework, she manages to finish two courses each semester. She has no opportunities to do research with Dr. A. She increasingly feels frustrated and disconnected, although she sees students and professors in class. In the middle of her program, she becomes unsure about her endeavors. She feels unconfident in conducting research and bereft of opportunities to explore research outside of class. Although Dr. A is kind to her, Alissa does not have a rapport with her, and the relationship between Dr. A and Alissa becomes strained and uncomfortable. When observing Emma prepares her comprehensive exam, Alissa feels she is falling behind.

Alissa attends the colloquia each semester but does not know people well except those who take courses with her. She does not see the administrators and other faculty outside the colloquia. Alissa sees Emma knows professors and the program well. Although she feels Emma is willing to share information when they meet, she continues to feel disconnected with the program and unaware of possible opportunities that would aid her in her scholarly and personal pursuits.

Dr. A believes she is a good mentor and has much experience in her domain. She loves students like Emma who are committed and motivated. She believes that students must take responsibility for their learning and she is quick to assist students she perceives as hardworking. Dr. A was a full-time student when she was a doctoral student, which may exacerbate her limitations of preparing or providing research opportunities to part-time doctoral students like Alissa. Dr. A is worried about Alissa when she sees that Emma has made significant progress while Alissa is struggling. She is concerned that Alissa may have challenges in the coming comprehensive exam and the completion of the program.

QUANTITATIVE DESIGN

Independent samples t-test was used in this study to compare the means of two independent groups (full-time and part-time doctoral students) to determine whether there is a statistically significant difference between the full-time and part-time doctoral students in their scholarly development.

PARTICIPANTS

Participants of this study were full-time and part-time doctoral students from the Department of Teaching and Learning in a southwestern public urban university in the United States. Although part-time and full-time doctoral students potentially possess differences in their scholarly development, they both follow the same program requirements. Part-time doctoral students need to fulfill their obligations to keep their work positions and they do not play the roles as graduate assistants to teach or do research at the university level. In contrast, full-time doctoral students work as graduate assistants to teach or conduct research on campus. Thus, part-time students spend less time communicating and interacting with faculty and peers on their scholarly activities and development. This is particularly evident in education contexts. Part-time students' obligations and duties required by their job make them usually not come to campus unless they are required to attend the classes. Thus, the part-time doctoral students in the department in the present study have the characteristics that may cause the difference from full-time doctoral students.

The number of doctoral students was 60 in 2016, and 72 in 2017. Participants enrolled in eight doctoral programs including Career & Technical Postsecondary Education (N=9 in 2016; N=9 in 2017), Interaction and Media Sciences (N=3 in 2016; N=9 in 2017), Literacy Education (N=6 in 2016; N=6 in 2017), Mathematics Education (N=9 in 2016; N=5 in 2017), Science Education (N=5 in 2016; N=7 in 2017), Teacher Education (N=3 in 2016; N=3 in 2017), Educational Technology (N=5 in 2016; N=4 in 2017) and Culture and Education (N=20 in 2016; N=29 in 2017). Participants were encouraged to respond to the survey voluntarily. In 2016, 54 participants responded to the survey with a response rate of 90%. In 2017, 44 participants responded to the survey with the response rate of 61%.

INSTRUMENT

The Doctoral Student Development Survey with 32-item scale under six constructs (see Appendix A) was designed to measure doctoral students' scholarly development. The six constructs included educational theories (e.g., I have developed an understanding of the importance of educational theories to research), literature review (e.g., I have developed an understanding of the importance of the literature review in educational research), research methods (e.g., I understand the importance of educational research methods), professional experiences (e.g., I have opportunities to do research related to grants with faculty), professional (scholarly) identity development (e.g., My professional identity is being changed), and doctoral program information (e.g., I felt well prepared to conduct research before I was admitted to the doctoral program). A seven-point Likert-type scale was used to measure doctoral students' development on a scale from (1) "Strongly disagree" to (7) "Strongly agree."

DATA COLLECTION AND DATA ANALYSIS

Participants were notified the survey was anonymous and not obligatory in the letter of consent. The researchers received the exempt of Institutional Review Board for this study. The study used an online survey (Qualtrics) which was distributed through a doctoral student listserv email administered by the department for the department evaluation at the end of the academic year. The data were anonymously collected, no time limit was set for the survey completion, and no identifiable personal information was mandatorily collected. The office of the department chair was in charge of the survey data and deidentified all students' records before sending them to the authors of the present study in order not to disclose participants' information.

An independent samples t-test was employed to explore if any statistical difference existed between the studied outcomes in each group of doctoral students regarding their scholarly development. SPSS version 25 was used to perform the independent samples t-test statistical analysis. The p -value of less than or equal to .05 was used to identify statistical significance. Eta squared η^2 was used to measure the proportion of the variation in the dependent variable (i.e., doctoral students' scholarly development) accounted for by the group membership defined by the independent variable (i.e., the type of doctoral students including full-time and part-time doctoral students) (Lakens, 2013). For example, an η^2 of .15 indicates that 15% of the variance in the dependent variable can be explained by the group membership (Lakens, 2013). The benchmarks of eta squared η^2 (i.e., small effects: $\eta^2 = 0.01$; medium effects: $\eta^2 = 0.06$; and large effects: $\eta^2 = 0.14$) were used in the present study (Cohen, 1988). All relevant statistical information (e.g., means, standard deviations, sample size, etc.) is reported in the results section.

RESULTS

The descriptive statistics for the survey are shown in Table 1. The statistically significant results of the independent samples t-test are presented in Table 2. The nonsignificant results of the independent samples t-test are described in Appendix B and Appendix C. As shown in Table 2, 4 of the total 32 items in the survey had statistically significant differences between full-time and part-time doctoral students. For the 2016 survey, significant differences were found between full-time and part-time doctoral students. Full-time doctoral students ($M = 5.53$, $SD = 1.81$) performed significantly difference from part-time doctoral students ($M = 3.92$, $SD = 1.98$) on "*Professional Experiences-I have opportunities to do research related to grants with faculty*", $t(39) = 2.67$, $p < .05$. The magnitude of the differences in the means (mean difference = 1.61, 95% CI: .39, 2.84) was large (eta squared = .15). As shown in Table 1, full-time students ($M = 5.53$, $SD = 1.81$) had higher scores than part-time students ($M = 3.92$, $SD = 1.98$) on this item.

Further, full-time doctoral students ($M = 5.94$, $SD = 1.34$) were also found to have a statistically significant difference from part-time doctoral students ($M = 4.39$, $SD = 2.35$) on "*Doctoral Program Information-I have sufficient support for my scholarly work in addition to my advisor's support*", $t(35.88) =$

2.61, $p < .05$. The magnitude of the differences in the means (mean difference = 1.55, 95% CI: .34, 2.75) was large (eta squared = .16). As shown in Table 1, full-time students ($M = 5.94$, $SD = 1.34$) had higher scores than part-time students ($M = 4.39$, $SD = 2.35$) on this item.

In 2017, a significant difference was also found between full-time and part-time doctoral students. Full-time doctoral students ($M = 5.59$, $SD = 1.81$) were found to have a significant difference from part-time doctoral students ($M = 4.12$, $SD = 2.42$) on “*Profession Experiences*-I have been involved in the teaching/supervision activities”, $t(40) = 2.13$, $p < .05$. The magnitude of the differences in the means (mean differences = 1.47, 95% CI: .07, 2.86) was medium (eta squared = .10). In Table 1, it showed that full-time students ($M = 5.59$, $SD = 1.81$) had higher scores than part-time students ($M = 4.12$, $SD = 2.42$) on this item.

Additionally, full-time doctoral students ($M = 6.12$, $SD = .99$) also performed differently from part-time doctoral students ($M = 5.24$, $SD = 1.45$) on “Professional (Scholarly) Identity Development-I have clear goals for my scholarly development”, $t(40) = 2.17$, $p < .05$. The magnitude of the differences in the means (mean differences = .88, 95% CI: .06, 1.70) was medium (eta squared = .11). In Table 1, it demonstrated that full-time students ($M = 6.12$, $SD = .99$) had statistically significant higher scores than part-time students ($M = 5.24$, $SD = 1.45$) on this item.

Table 1: Descriptive Statistics of Full-Time (FT) and Part-Time (PT) Doctoral Students

		N	Mean	Std. dev.	Std. error	95% Confidence interval for mean	
						Lower bound	Upper bound
<i>Professional Experiences (2016)</i> -I have opportunities to do research related to grants with faculty.	FT	17	5.53	1.81	.44	4.60	6.46
	PT	24	3.92	1.98	.40	3.08	4.75
	Total	41	4.59	2.05	.32	3.94	5.23
<i>Doctoral Program Information (2016)</i> -I have sufficient support for my scholarly work in addition to my advisor's support.	FT	16	5.94	1.34	.34	5.22	6.65
	PT	23	4.39	2.35	.49	3.38	5.41
	Total	39	5.03	2.12	.34	4.34	5.71
<i>Professional Experiences (2017)</i> -I have been involved in the teaching/supervision activities.	FT	17	5.59	1.81	.44	4.66	6.52
	PT	25	4.12	2.42	.48	3.12	5.12
	Total	42	4.71	2.29	.35	4.00	5.43
<i>Professional (Scholarly) Identity Development (2017)</i> -I have clear goals for my scholarly development.	FT	17	6.12	.99	.24	5.61	6.63
	PT	25	5.24	1.45	.29	4.64	5.84
	Total	42	5.60	1.35	.21	5.18	6.01

DISCUSSION

Using statistical analysis informed by the survey instrument, the study examined the differences between full-time and part-time doctoral students in the following four aspects: the opportunities to do research related to grants with faculty, support for scholarly work in addition to advisor's support, involvement in the teaching/supervision activities, and goals for scholarly development. Regarding the opportunities to do research related to grants with faculty, the results of the 2016 survey suggested that full-time doctoral students had more opportunities to conduct research related to grants with faculty (see Table 2). In terms of involvement in the teaching/supervision activities, the results of the 2017 survey indicated that full-time doctoral students were more involved in teaching/supervision activities (see Table 2). These findings confirm the previous research that part-time doctoral students need more opportunities for teaching, research, and interaction with faculty and peers (Gardner & Gopaul, 2012; Holt, 1999; Nyquist et al., 1999).

Table 2: Independent Samples t-test Results for Full-Time and Part-Time Doctoral Students

	t	df	Sig.	Mean difference	95% CI of the difference		Eta squared
					Lower	Upper	
<i>Professional Experiences (2016)</i> -I have opportunities to do research related to grants with faculty.	2.67	39	.011*	1.61	.39	2.84	.15
<i>Doctoral Program Information (2016)</i> -I have sufficient support for my scholarly work in addition to my advisor's support.	2.61	35.88	.013*	1.55	.34	2.75	.16
<i>Professional Experiences (2017)</i> -I have been involved in the teaching/supervision activities.	2.13	40	.040*	1.47	.07	2.86	.10
<i>Professional (Scholarly) Identity Development (2017)</i> -I have clear goals for my scholarly development.	2.17	40	.036*	.88	.06	1.70	.11

Note. 1. * $p < .05$

2. Small effects: $\eta^2 = .01$; medium effects: $\eta^2 = .06$; large effects: $\eta^2 = .14$ (Cohen, 1988)

3. Four of the total 32 items in the survey had statistically significant differences between full-time and part-time doctoral students.

Regarding support for scholarly work in addition to advisor's support, the 2016 results indicated full-time doctoral students received sufficient support for their scholarly work in addition to advisors' support, while part-time doctoral students did not receive adequate support. This finding shows that the program failed to establish mechanisms that ensure part-time doctoral students access the resources for their scholarly development; and that the program may favor full-time doctoral students. This may produce alienation and marginalization that mitigate students' learning opportunities for part-time doctoral students as found in Weidman and colleagues' study (2001) because they are not fully able to interact with full-time doctoral students and faculty, and access other university-wide resources.

In addition to the program issues, the conventions of mentorship may also contribute to the results that part-time doctoral students lack support. Research in the last 15 years suggests that effective mentoring has many benefits including increasing students' research self-efficacy (Overall et al., 2011; Paglis et al., 2006) and satisfaction (Zhao et al., 2007). More antiquated approaches to mentorship may be inadequate in addressing modern issues and thus potentially miss out on these benefits. These programs still follow the one-on-one and top-down mentoring model without engaging doctoral students in "professional socialization, formal and informal partnerships for peer learning, skills-oriented workshops in central (post) graduate schools, and learning" (Nerad, 2012, p.68).

Regarding goals for scholarly development, the 2017 results showed that full-time doctoral students feel they had clearer goals for their scholarly development than part-time doctoral students. This finding highlights the importance of discussing and clearly understanding goals between the student and mentor. Further, without a mentor's role modeling and support, doctoral students may change their career aspirations from research-focused to non-researched career plans (Fuhrmann et al., 2011). This is not necessarily detrimental, but students may miss out on opportunities as they are unaware due to a lack of exposure. This is particularly salient for part-time doctoral students' goals regarding their scholarly development. This reflects Fuhrmann's (2016) suggestion that students and mentors should work to set career goals at the beginning of the program and that the mentoring

should be adjusted as the goals evolve. As a result, students' confidence level will be increased and established.

The findings suggest that doctoral program design and implementation should consider part-time doctoral students' unique needs for research and teaching, scholarly goals that prepare their career development, and support beyond mentors' advising. These findings reinforce and extend with perspectives and research supporting part-time doctoral students found by previous studies (Gardner & Gopaul, 2012; Weidman et al., 2001). Gardner and Gopaul (2012) suggested that part-time doctoral students need multiple opportunities for teaching, research, and interaction with faculty and peers. Further, Weidman and colleagues (2001) found that part-time doctoral students need more social and emotional support to avoid alienation and marginalization.

With the lack of time and an absence from the campus, sporadic actions or interventions may not be sufficient for part-time doctoral students. Individually tailored approaches should be used to solve the problems that result from time limitations and absence from the campus to encourage part-time doctoral students' success.

SUMMARY

The quantitative results showed that part-time doctoral students should be given more opportunities in teaching and the research process as part of their scholarship. Part-time doctoral students must be given strong support for their scholarly development and be guided to establish their goals, which may differ from full-time doctoral students. This evidence reflects part-time doctoral students' needs for effective mentoring and strong support. To address these needs, we provide implications for program design and mentoring with the synthesis of the related literature and theoretical framework in the following section.

IMPLICATIONS FOR PROGRAM DESIGN AND MENTORING

If one-to-one, top-down, and master-to-apprentice learning approaches are to be transformed, what is the nature of those changes and what programs should be designed to ensure effective mentoring? Built on the literature of doctoral education and the theoretical framework of situated learning and technology, we created hypothetical cases of a mentor and two students. To address the issues the part-time doctoral student and her mentor have experienced, we used situated learning theory and the application of technology as significant guidance to examine and redesign doctoral programs and mentoring. The redesign should include judicious applications of technology as essential components to address limited accessibility and opportunities for part-time doctoral students. Among the assortment of technologies, communication tools should especially be examined for potential use. These tools will create a virtual community of practice (Nistor et al., 2014) and facilitate further conversations between students and their mentors and peers. Thus, in this section, viable suggestions are provided based on the communities of practice, situated learning theory, and the application of technology.

MENTORING, PEER MENTORING, AND E-MENTORING

Mentors should understand part-time doctoral students' challenges and needs in the program. Their mentoring approaches should motivate part-time doctoral students to achieve their goals and be flexible in changing their goals based on their needs. One possible method to accommodate part-time doctoral students is to create an Individual Development Plan (IDP). An IDP is a mentoring tool for the effectiveness of mentoring, depending that mentors and mentees know their academic goals, actions, and related roles and responsibilities. Fuhrmann et al. (2011) suggested providing an IDP allows mentors and students to communicate without confusion and with accountability. In an IDP, doctoral students identify their long-term and short-term goals (for specific semesters) and explain how to achieve them along with possible impediments.

Complementary to IDP and peer mentoring, e-mentoring uses electronic communication to mentor doctoral students (Doyle et al., 2016). One advantage of e-mentoring is it can be applied to the mentoring between faculty and a cohort of doctoral students and make mentees engage in the community of practice. For instance, a mentor may invite students to a seminar using a video conference. Virtual attendees can participate as they might in person by opening their microphones and speaking, and questions and comments can also occur simultaneously via the integrated chat interface. These technology implementations may aid in addressing the high frequency of interactions that are essential between mentors and mentees (Doyle et al., 2016). They may be particularly useful for part-time doctoral students who simply do not possess the opportunities for a high level of engagement while maintaining full-time jobs or familial obligations. Another advantage is that e-mentoring can facilitate a learning community in which peer mentoring enhances doctoral students' social support.

CAREER GOALS AND TECHNOLOGY INTEGRATED INTERACTIVE LEARNING CONTEXT

To provide part-time doctoral students with sufficient support, it is important to align doctoral students' career goals with courses, mentoring, and co-curricular activities organized by the department, graduate college, university, or professional associations. Programs should be designed to prepare part-time doctoral students with a variety of career paths and courses to allow students to have more options to take courses and select related research projects or learning tasks. Additionally, programs should provide doctoral students with the necessary training or assignments that enhance skills beyond scholarship.

Interactive communication technologies such as online or blended learning systems (Levy, 2017), mobile devices (Skierkowski & Wood, 2012), and cloud computing (Lisa & Paula, 2015) can address many of the current issues for doctoral students. These technologies provide support, flexibility, and accessibility for doctoral students, and form a virtual community of practice (Nistor et al., 2014). Virtual communities of practice leverage technology to bolster communication in the community beyond the traditional face-to-face means typically described in situated learning theory (Nistor et al., 2014). Collaboration via cloud computing (Lisa & Paula, 2015) allows contributors to read and edit the materials at their convenience, which is helpful for students with families or full-time jobs.

The deployment of social media may enhance interactions between part-time doctoral students and peers within each program and between programs. This may be particularly useful as social media, blogs, and other communication tools are widely used by doctoral students for social interactions (Aydin, 2012; Greenhow & Gleason, 2014). For example, Group Me, a messaging application, allows mentors to monitor group interactions and messages while allowing students to communicate with each other. Students may be "invited" to individual groups via their email accounts and can communicate via the Group Me website or by downloading the free application. The use of Group Me for interactions will allow a more rapid response to students' questions and concerns and encourage students to share achievements and academic successes, engage in productive discussions of classwork, etc.

To conclude, the situated-learning-based and technology-based program benefits both part-time and full-time doctoral students and encourages the program and mentors to facilitate clear expectations for students. Through program resources and mentoring, part-time doctoral students are clear about what efforts they must make to achieve their goals. Results indicated part-time and full-time doctoral students differed in views regarding the opportunities to do research related to grants with faculty, support for scholarly work in addition to advisor's support, involvement in the teaching/supervision activities, and goals for scholarly development. Doctoral program supervisors, mentors, and faculty should be aware of these specific differences and possibly adjust or redesign the program to mitigate these issues. The implementation of technology, frameworks such as situated learning or communities of practice, or other similar protocols should not be viewed as a panacea for these issues. Careful consideration of the institution's culture, infrastructure, and practices should inform the adjustments

for the program. Further, the inclusion of technology will not likely be a turnkey endeavor and support and formal training should be provided to encourage best practices.

DR. A AND ALISSA REVISITED

Revisions according to the results and implications may aid both Dr. A and Alissa. Dr. A would account for the salient differences between two types of students, especially regarding Alissa's unique scholarly goals and the structure and mechanisms used to support her. Having a deeper appreciation and understanding of Alissa's situation, Dr. A assists her to develop a specific course of action (e.g. IDP) that adequately addresses Alissa's interests and needs. The plan helps to scaffold Alissa's progress which includes regular communication and mentoring in both physical and technological environments. Dr. A also identifies research opportunities and extracurricular activities that are suitable for Alissa's post-doctoral endeavors. Through the virtual community of practice (Nistor et al., 2014), Dr. A connects Alissa with her peers and can engage her in the program's research initiatives.

Alissa's experience varies from the first vignette in a manner that allows her to complete her program. Before she is admitted into the doctoral program, she is prompted by her future mentors to describe her goals and identify potential difficulties in maintaining a full-time job and personal obligations. After a mutual plan to address these issues is developed, Alissa commences her program with specific procedures to support her. She checks in regularly with Dr. A via email, text message (Skierkowski & Wood, 2012), blended learning systems (Levy, 2017), or cloud computing (Lisa & Paula, 2015). Although she often misses her program's research meetings, she can access the discussion via a video recording or notes on a shared document in cloud computing. Occasionally, the research team plans the meeting during Alissa's break and she attends through video conference software. Perhaps most importantly, Alissa maintains confidence and a high level of self-efficacy in her academic pursuits and feels supported and meaningfully connected with her program.

LIMITATION AND FUTURE RESEARCH

This study is not without limitations. Although the survey was constructed based on several major components of doctoral education, one limitation was that the reliability was not validated. Future research can develop the quantitative survey with added factors and items so that a confirmatory factor analysis can be conducted to see whether the data fit a hypothesized measurement model.

A convenience sample was used in this study and the samples were limited to an education doctoral program. Thus, the results of this study may not provide the ability to generalize to other populations. Additionally, the small sample size of this study may have contributed to only 4 of the 32 survey items producing statistically significant differences between full-time and part-time doctoral students in the context of this study. Future research should endeavor to increase the sample with participants from diverse doctoral programs with multiple disciplines to shed light on doctoral students' scholarly development.

Additionally, although the hypothetical cases provided the emic view to address the research questions, future research can include focus group or individual interviews into the research design to provide the thick description in a natural situation.

Future research can further examine the differences between male and female doctoral students, different race groups, and disciplines. Finally, qualitative methods may further describe and explain the description of the process of part-time doctoral students' engagement with the program, mentors, and peers. Mixed methods may also be employed to evaluate the effectiveness of the program taking advantage of both quantitative and qualitative data.

CONCLUSION

According to the findings, statistically significant differences between full-time and part-time doctoral students were found regarding the opportunities to do research related to grants with faculty, support for scholarly work in addition to advisor's support, involvement in the teaching/supervision activities, and goals for scholarly development. Part-time doctoral students' insights may be utilized when designing doctoral programs and mentoring doctoral students toward a more effective and inclusive experience for all students. This study provided suggestions on how programs can be (re)designed and mentoring can be performed for full-time and part-time doctoral students. This study not only further called attention to issues of part-time doctoral students and program design, but also explored more multifaceted mentoring approaches regarding mentoring, peer mentoring, and e-mentoring. Future research can investigate how these aspects can be combined and applied effectively. In addition, this study is also an exploration extending situated learning theory to include a thoughtful use of technology. This innovative perspective will allow future researchers to further examine the effectiveness of situated learning and technology-based doctoral programs.

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A Comparison of Part-Time and Full-Time Doctoral Students

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APPENDICES

APPENDIX A: A DOCTORAL STUDENT DEVELOPMENT SURVEY

I. Demographic Information

Name _____

Years in the XXX doctoral program _____

Are you currently employed (outside the university) ___ Yes ___ No

II. Educational Theories

1. I have developed an understanding of the importance of educational theories to research.
2. I have developed satisfactory knowledge of educational theories.
3. I have learned how to apply educational theories to research.
4. I have challenges in applying educational theories to research.

III. Literature Review

5. I have developed an understanding of the importance of the literature review in educational research.
6. I have developed satisfactory knowledge of literature review.
7. I have learned how to review literature.
8. I have challenges in conducting a literature review.

IV. Research Methods

9. I understand the importance of educational research methods.
10. I have developed satisfactory knowledge of educational research methods.
11. I have learned how to conduct educational research methods.
12. I have challenges in conducting educational research methods.

V. Professional Experiences

13. I have opportunities to do research related to grants with faculty.
14. I have opportunities to write grants for my research with faculty.
15. I have opportunities to work with faculty on research.
16. I have presented at the national academic conferences.
17. I have submitted articles to a peer-reviewed journal.
18. I have been involved in teaching/supervision activities.
19. I have been involved in the services in my doctoral programs.

VI. Professional (Scholarly) Identity Development

20. My professional identity is being changed.
21. I am developing a scholarly identity.
22. I understand the scholarly expectations of me in my program.
23. I have clear goals for my scholarly development.
24. I understand the gap between my goals and my current development.

VII. Doctoral Program Information

25. I felt well prepared to conduct research before I was admitted to the doctoral program.
26. I feel that my doctoral program has prepared me well to become a researcher.
27. I feel that my doctoral program has prepared me well to become a teacher educator.
28. I feel that my doctoral program needs to be improved.
29. Peer support helps me make significant progress in the program.
30. I have sufficient support for my scholarly work from my advisor.
31. I have sufficient support for my scholarly work in addition to my advisor's support.
32. I am satisfied with my learning environment.

APPENDIX B: NONSIGNIFICANT RESULTS OF INDEPENDENT T-TEST (2016)

Item	t	df	Sig.	Mean dif- ference	95% confidence interval of the difference		Eta squared
					Lower	Upper	
1	.54	41	.59	.19	-.52	.91	.007
2	-.86	41	.40	-.34	-1.14	.46	.018
3	.33	41	.75	.15	-.76	1.05	.003
4	.44	41	.66	.25	-.90	1.39	.005
5	.69	39	.50	.25	-.48	.97	.012
6	-.72	39	.47	-.33	-1.25	.59	.013
7	.47	39	.64	.20	-.67	1.07	.006
8	.06	39	.96	.03	-1.18	1.25	.000
9	-.56	39	.58	-.28	-1.27	.72	.008
10	-.47	39	.64	-.25	-1.32	.82	.006
11	.80	39	.43	.42	-.64	1.48	.016
12	.43	39	.67	.23	-.86	1.33	.005
14	.41	39	.69	.26	-1.02	1.53	.004
15	1.72	39	.09	1.14	-.20	2.47	.071
16	.14	39	.89	.11	-1.50	1.72	.000
17	-.64	39	.53	-.47	-1.97	1.03	.010
18	1.99	39	.05	1.37	-.02	2.75	.092
19	1.22	39	.23	.80	-.53	2.13	.037
20	-.12	38	.90	-.06	-1.12	.99	.000
21	.51	38	.61	.23	-.68	1.14	.007
22	.80	38	.43	.48	-.74	1.69	.016
23	.97	38	.34	.44	-.47	1.35	.024
24	-.04	38	.97	-.02	-1.16	1.12	.000
25	-.33	37	.74	-.21	-1.51	1.09	.003
26	.97	37	.34	.57	-.62	1.77	.025
27	.25	37	.80	.17	-1.17	1.50	.002
28	.46	37	.65	.27	-.94	1.49	.006
29	.87	37	.39	.44	-.59	1.47	.020
30	.95	37	.35	.63	-.71	1.96	.024
32	1.51	36	.14	.95	-.32	2.22	.003

Note. Please refer to APPENDIX A for survey item content.

APPENDIX C: NONSIGNIFICANT RESULTS OF INDEPENDENT T-TEST (2017)

Item	t	df	Sig.	Mean dif- ference	95% confidence interval of the dif- ference		Eta squared
					Lower	Upper	
1	-.31	41	.76	-.12	-.88	.64	.002
2	-.60	41	.56	-.24	-1.07	.59	.009
3	-.04	41	.97	-.02	-.95	.91	.000
4	.75	41	.46	.41	-.69	1.51	.013
5	.40	41	.69	.12	-.48	.71	.004
6	.71	41	.48	.25	-.46	.95	.012
7	.49	41	.63	.18	-.58	.95	.006
8	.12	41	.90	.07	-1.12	1.26	.000
9	.70	41	.49	.22	-.42	.86	.012
10	.41	41	.69	.16	-.64	.97	.004
11	.48	41	.63	.20	-.62	1.01	.006
12	.28	41	.78	.14	-.89	1.17	.002
13	-.28	40	.78	-.18	-1.50	1.14	.002
14	-.12	40	.91	-.07	-1.21	1.08	.000
15	1.56	40	.13	.87	-.26	2.00	.058
16	1.24	40	.22	.91	-.57	2.40	.037
17	1.84	40	.07	1.27	-.12	2.66	.078
19	1.24	40	.22	.86	-.54	2.26	.037
20	.51	40	.61	.25	-.75	1.25	.006
21	1.29	40	.21	.55	-.31	1.40	.040
22	1.64	40	.11	.64	-.15	1.44	.063
24	.40	39	.69	.16	-.65	.98	.004
25	.47	40	.64	.26	-.86	1.38	.006
26	.60	40	.55	.27	-.64	1.18	.009
27	-.67	38	.51	-.35	-1.43	.72	.012
28	.79	39	.44	.40	-.62	1.42	.016
29	.56	40	.58	.25	-.66	1.16	.008
30	-1.71	40	.10	-.81	-1.76	.15	.068
31	-.17	40	.87	-.09	-1.11	.94	.001
32	.27	40	.79	.11	-.71	.93	.002

Note. Please refer to APPENDIX A for survey item content.

BIOGRAPHIES



Dr. Shaoan Zhang is an Associate Professor of Teacher Education at the Department of Teaching and Learning, University of Nevada, Las Vegas. In 2007, Dr. Zhang received his Ph. D. in Urban Education from Old Dominion University, Norfolk, Virginia, and joined the Department of Teaching and Learning, University of Nevada, Las Vegas. His research interests include pre-service and in-service teacher development and curriculum design. He has published a number of research articles in teacher self-disclosure, teacher education pedagogy, preservice teacher development, new teachers' professional development, secondary curriculum development, and comparative education.



Ms. Chengcheng Li is a Ph. D. student in the Department of Teaching and Learning of College of Education at University of Nevada, Las Vegas. She obtained her master's degree of Applied Linguistics from Beijing Normal University in China with an emphasis on Preservice Teachers' Identity Construction in 2017. Currently, her research interests focus on in-service teachers' self-efficacy and constructive teaching practices, constructivist learning environment, and situated learning theory. As an evaluator, she has evaluated STEM Summer Camp, Summer Bridge Program, and the first-year engineering undergraduates' learning experience course. As a co-author, one paper was accepted for publication and three papers are under review. She is the award winner of the Graduate Research Fellow in 2019 at UNLV.



Mr. Mark Carroll is a Ph. D. student and Administrative Faculty at the University of Nevada, Las Vegas. He maintains a position as the Director of Assessment and College Effectiveness for the College of Education. Mark has 20 years of experience in the education sector in the southern Nevada area and 15 years of teaching experience in the secondary and post-secondary settings. His research includes evaluating behavior and Human-Computer Interactions in complex environments and data science techniques for learning sciences.



Dr. P.G. Schrader is a chair of the Department of Teaching and Learning, professor of Interaction and Media Sciences, and research scientist in the Center for Research, Evaluation, and Assessment at UNLV. Dr. Schrader completed his degree in Educational Psychology with a focus on Cognition and Instruction at the University of Connecticut. His work has broached the topic of learning in technology rich, immersive environments across disciplines and he has examined the exchange of information within hypertext, multimedia, and massively multiplayer online games. Dr. Schrader's research has addressed a variety of contexts, methodologies, and content areas. Current projects include the examination of

digital games and virtual environments from a Human-Computer Interaction perspective. Dr. Schrader has published a wide range of studies that cover inter- and intratextuality, navigation, and learning. Dr. Schrader has received awards honoring his commitment to academics, the community, and higher education in general.