UNDERSTANDING STUDENTS' PERCEPTION DIFFERENCES ON BLENDED LEARNING: AN EXPLORATIVE STUDY AMONG COLLEGE STUDENTS

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ABSTRACT

Blended learning, which aims to combine the advantages of both the traditional, face-to-face instruction and e-learning, has recently become popular in higher education. Gaining a better understanding on students' perceptions of blended learning could help ensure the success of student learning in this environment. Along this line, in this study, we adopted a wide range of assessment measures from multiple theoretical perspectives based on existing literature on blended learning as well as computing education in general, to measure students' perceptions. Specifically, we examined and compared perception differences on blended learning across different groups of students based on their social and demographical traits, including gender, whether they are international students, and whether they are first generation college students. The results showed that, in most cases, female students, international students, or first generation college students tended to have more positive views on blended learning than male students, domestic students, or non-first generation college students, respectively.

Keywords: Blended Learning, Assessment Measures, Gender Comparison, International Students, First Generation College Students.

INTRODUCTION

Considered as the third wave of evolution in higher education (So & Brush, 2008), following face-to-face instruction and e-learning, blended learning has attracted a lot of attention among educators and researchers recently. Over past years, face-to-face instruction and e-learning were the dominant instructional methodologies used in college classes. However, each of them has been observed with certain drawbacks (Kulkarni et al., 2013; Liaw et al., 2007; Sun et al., 2008). For example, face-to-face instruction offers less flexibility on students' learning processes, in which students typically need to conduct and perform class activities and tasks together based on the same schedule, no matter what their backgrounds or prior levels of course topical knowledge. On the other hand, e-learning may provide too much *"flexibility"* for students to conduct activities by themselves using online systems, and lacks opportunities for them to physically interact with their instructor and other classmates. Another major concern about e-learning is that it is more likely to fit students with high levels of motivation and self-esteem. For students who are less motivated, it is easy for them to fall behind the class (eLearner Iowa State University, 2014).

With the purpose of combining the advantages of both face-to-face instruction and e-learning, as well as trying to avoid the drawbacks associated with each of them, blended learning

was created, which contains both the offline (i.e., face-to-face) and online components. In a blended class, students have the opportunity to physically interact with their instructor and other classmates in a regular classroom; they also have the flexibility to conduct a considerable amount of learning-related activities and tasks independently, at their own pace, on their own schedule, and in their own place of choice. In general, existing research on blended learning can be put into two major groups: the assessment and adoption of advanced learning systems that are used to support the online portion of blended classes (e.g., Khan, 2014; Padilla-Meléndez et al., 2013), and the introduction and discussion of the designs of components and activities utilized in blended classes (e.g., Basogain et al., 2017; Hoic-Bozic et al., 2009). However, relatively less effort has been made to empirically investigate potential perception differences on blended learning across students with different social and demographical traits.

To address the gap, this study aims to assess and compare the perception differences toward blended learning from various groups of students based on three important social and demographical traits, including gender, whether they are international students, and whether they are first generation college students. Specifically, we statistically compared the two groups of students based on each trait, using a set of nineteen assessment measures related to the blended learning environment from five dimensions, including individual, social, technology, adoption, and impact dimensions. Significant differences were found on some of the assessment measures. Detailed results and findings are reported and discussed in the Data Analysis and Results section of the article.

LITERATURE REVIEW

To assess student perceptions of blended learning, we turn to multiple theories from information systems (IS) and related areas, as well as look into existing literature on blended learning and computing education in general. As a result, we identify and include nineteen specific measures in this study, based on the nature of which, can be grouped into five dimensions, including: individual, social, technology, adoption, and impact dimensions. When empirically assessing each assessment measure used in this research, we utilize multiple items adopted or adapted from existing literature sources. Table 1 summarizes the related theoretical perspectives, as well as sources of the measurement items, for each dimension of the assessment measures.

Table 1
ASSESSMENT MEASURES, RELATED THEORIES, AND MEASUREMENT ITEM SOURCES

Dimension	Assessment Measure	Related Theory/Literature Source	Measurement Item Source
Individual	Computer Self-Efficacy	Technology Acceptance Model (TAM) 3 (Venkatesh & Bala, 2008)	(Selim, 2007)
	Internet Self-Efficacy	One of the earliest studies on it (Nahl, 1996)	(Liang et al., 2011)
	Motivation	Theory of Motivation (Ryan & Deci, 2000)	(Gomez et al., 2010)
	Cognitive Absorption	First IS study on it (Agarwal et al., 1997)	Self-developed
Social	Social Influence	Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh et al., 2003)	(Venkatesh et al., 2003)
	Social Presence	Social Presence Theory (Short et al., 1976)	(Johnson et al., 2008)

	Social Interaction	Social Interaction Theory (Turner, 1988)	(Chen, 2014)
Technology	Information Quality	IS Success Model (DeLone & McLean, 1992, 2003)	(DeLone & McLean, 2003)
	System Quality	IS Success Model (DeLone & McLean, 1992, 2003)	(DeLone & McLean, 2003)
	Task-Technology Fit	Task-Technology Fit (Goodhue & Thompson, 1995)	Partially from (Lin & Wang, 2012) with self-development
	Media Richness	Media Richness Theory (Daft & Lengel, 1986)	Partially from (Lan & Sie, 2010) with self-development
Adoption	Perceived Enjoyment	Technology Acceptance Model (TAM) 3 (Venkatesh & Bala, 2008)	(Cheng, 2012)
	Attitude	Technology Acceptance Model (TAM) (Davis, 1989)	(Cheng, 2011)
	Learning Climate	One of the earliest computing education studies on it (Chou & Liu, 2005)	(Chen, 2014)
	Frustration Level	NASA Task Load Index (Hart & Staveland, 1988)	(Hart & Staveland, 1988)
Impact	Intention to Use	Technology Acceptance Model (TAM) (Davis, 1989), Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh et al., 2003)	(Venkatesh et al., 2003)
	Use	Technology Acceptance Model (TAM) (Davis, 1989), Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh et al., 2003)	(Islam, 2013; Venkatesh et al., 2003)
	Perceived Academic Performance	Definition provided in (Islam, 2013)	(Islam, 2013)

All the assessment measures used in this study have been either theoretically discussed or empirically examined (but not all together) in different existing literature on either technology-supported learning or adoption of learning-related systems. We include all of them because of the common features they share, including: the strong theoretical foundation, literature support, relativeness, and appropriateness to be applied to this study.

Individual Dimension

Students play the central role in the education process, thus their own self-related factors could be important in influencing their learning. In this study, we adopt four important, self-related factors that have been reported in existing literature, either on blended learning specifically or more generally on computing education. These factors are computer self-efficacy, Internet self-efficacy, motivation, and cognitive absorption.

Computer self-efficacy is defined as an individual's own belief about his/her ability to use computers effectively (Chen, 2014). It is a very important theoretical construct in the theory of Technology Acceptance Model 3 (i.e., TAM 3) (Venkatesh & Bala, 2008), which is the second extension on the original Technology Acceptance Model (i.e., TAM) (Davis, 1989). In TAM 3, it is stated that computer self-efficacy is one of the determinants of perceived ease of use, which in turn influences behavioral intention, followed by use behavior, in the adoption of information technology and systems. Previous literature on computing education has found

computer self-efficacy to be an important factor in student learning. For example, Roca et al. (2006) found that students' computer self-efficacy could significantly influence their perceived ease of use and satisfaction with the e-learning system. As to blended learning, Chen (2014) found that students' computer self-efficacy had a significant, positive impact on their own expectations about their learning outcomes in the blended class.

Internet self-efficacy is defined as an individual's own belief about his/her ability to conduct actions by using the Internet (Chiu & Tsai, 2014). In other words, it is about what a person believes he/she can accomplish online. This theoretical construct was introduced after Internet technology became available to the general public in the 1990s. Although (unlike computer self-efficacy) it is not included in a well-known theory in the IS or related areas, one of the earliest studies on examining it as a theoretical concept is done by Nahl (1996), who found that Internet self-efficacy was positively related to task performance. In computing education, it was found that basic Internet self-efficacy played a significant role in influencing students' perceived ease of use, usefulness, and affection toward the online learning system (Chiu & Tsai, 2014).

Motivation is a complex concept, and can be either intrinsic or extrinsic (Ryan & Deci, 2000). The whole idea of motivation is about how to move oneself, or sometimes others, to act. Intrinsic motivation means that an individual is motivated from within, by interest and his/her own value system, while extrinsic motivation is typically associated with external factors such as reward and evaluation (Ryan & Deci, 2000). A comprehensive overview on the Theory of Motivation can be found in (Ryan & Deci, 2000). In the context of education, motivation refers to the incentive that propels students to work hard and actively on the assigned learning activities and tasks (Wu & Hwang, 2010). Previous research in education found that motivation could significantly influence student learning (Law et al., 2010).

Cognitive absorption is defined as a state of one's deep involvement in performing certain actions (Agarwal et al., 1997). The first study to examine it as a theoretical construct in the IS area was done by Agarwal et al. (1997), and they found cognitive absorption to be a determinant of perceived usefulness which, in turn, influenced behavioral intention to use. When applying it to the context of blended learning, we define cognitive absorption to be a state when a student gets deeply involved in conducting and performing his/her learning-related activities and tasks by using the supporting information technology and systems provided in the blended class.

Social Dimension

Several social-related assessment measures are used in this research, including social influence, social presence, and social interaction.

According to the Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh et al., 2003), social influence is defined as the degree to which an individual perceives that important others believe he/she should take a certain action, such as using an information system. As stated in UTAUT, social influence is a significant determinant on users' behavioral intention, which in turn influences actual usage behavior. When applying it to the context of blended learning, we define it as a student's perception about the degree to which his/her instructor and other classmates (who are supposed to be the *"important others"* in such a context) believe that it's better to use the blended learning instructional method in the class.

Social Presence Theory (Short et al., 1976) states that different communication media can provide different levels of awareness of others (as well as the environment) in the communication interactions that occur by using those media. According to this theory, to make

the communication effective, a medium that has enough social presence needs to be chosen in order to fit the interpersonal involvement as required for performing tasks (Chiu & Tsai, 2014). Previous literature on computing education has examined the impact of social presence on students' e-learning effectiveness, and found that social presence could significantly influence students' perception on course instrumentality and their learning satisfaction (Johnson et al., 2008).

Social interaction is believed to be the most basic unit of sociology (Turner, 1988), and is defined as a situation in which an individual's behaviors are reorganized by others, as well as be able to influence others' behaviors. A comprehensive review on the development of and discussions on, the Social Interaction Theory can be found in (Turner, 1988). In the context of computing education, social interaction typically means students' perception of the level of interaction they can have with their peers and instructors during their learning process (Liu et al., 2010). Previous research found that social interaction had a significant impact on students' intention to use an online learning community (Liu et al., 2010), and could also influence students' perceived course performance and course satisfaction (Johnson et al., 2008).

Technology Dimension

Since blended learning typically leverages advanced Internet technology and learning management systems, particularly to support students' conduction and performance on various online, out-of-classroom activities and tasks, it is essential to assess blended learning from the technology perspective. According to the DeLone & McLean IS Success Model (DeLone & McLean, 1992, 2003), three system-related aspects are important to consider when assessing the success of information systems adoption, including information quality, system quality, and service quality. Based on this theory, information quality is defined as the quality of information that the system is able to store, deliver, and/or create; system quality is about the overall quality of the system itself; and service quality refers to the quality of services that the system can provide to its users (DeLone & McLean, 1992, 2003). The theory states that all three types of qualities are determinants of usage (either usage intention or actual usage behavior) and satisfaction, both of which can then influence the net benefits the system can produce.

Applying the theory to the computing education-related area, previous research found that all three types of qualities had significant impacts on users' intention to use the e-learning system (Ramayah et al., 2010). In blended learning, previous studies also assessed the impacts of system-related factors on student learning. For example, Wu et al. (2010) found that system functionality had a significant impact on students' expectations on their class performance. In another study, Chen (2014) reported a similar finding, that is, system characteristics had a significant impact on students' expectations on their learning outcomes in the blended class. In addition, Chen (2014) also found system characteristics to be able to influence students' learning satisfaction and their perception on the learning climate around the blended class.

In addition to the three qualities adopted from the DeLone & McLean IS Success Model (DeLone & McLean, 1992, 2003), our study also looks into two other important theories that focus on other essential aspects of information technology and systems, which are the Theory of Task-Technology Fit (Goodhue & Thompson, 1995) and Media Richness Theory (Daft & Lengel, 1986). Thus, two related assessment measures, task-technology fit and media richness, are included in our study accordingly.

Derived from the Theory of Cognitive Fit (Vessey, 1991), the Theory of Task-Technology Fit (Goodhue & Thompson, 1995) focuses on the fit between tasks to be performed

and the supporting technology. Specifically, it states that users' task performance will increase if there is a match between the tasks they need to perform and the technology and systems that they utilize to perform those tasks. In the context of computing education, previous literature found that users' perceived task-technology fit had a significant impact on their satisfaction toward, and intention to use, the virtual learning system adopted in the e-learning class (Lin, 2012). As to blended learning, it was found that task-technology fit could significantly influence both students' acceptance and perceived usefulness of the online system used in the blended class (Lin & Wang, 2012).

Media Richness Theory (Daft & Lengel, 1986) is one of the most well-known theories on the choice of communication media. The theory views different types of communication media in terms of their levels of richness. For example, face-to-face is considered the richest communication medium, followed by phone calls, and then computer-mediated communication media such as emails (Daft & Lengel, 1986; Markus, 1994). In general, when conducting communication, richer media are preferred, because they can lead to less ambiguity between the message sender and recipient (Markus, 1994). In the context of education, media richness is defined as using multiple, and the most appropriate, media to deliver and present learning-related contents (Wu & Hwang, 2010). Previous research on blended learning found that media richness could significantly influence students' usability of the online system used to support the blended class (Wu & Hwang, 2010).

Adoption Dimension

Information systems adoption is one of the major research areas in the IS field. When talking about adoption in the context of computing education, it typically means either the adoption of an advanced system that is used to support a certain class, or the adoption of an innovative instructional methodology and/or course design. In our study, we focus on the latter one, which is about the adoption of the overall blended learning methodology/environment. By reviewing related literature, we choose to include four assessment measures in the adoption dimension, including perceived enjoyment, attitude, learning climate, and frustration level.

Perceived enjoyment is an important theoretical construct from the theory of TAM 3 (Venkatesh & Bala, 2008). The theory states that perceived enjoyment is one of the direct determinants of perceived ease of use. Perceived enjoyment is defined as the level of pleasure associated with one's intrinsic reward system derived from the use of the information technology or systems (Davis et al., 1992). In our context, we define perceived enjoyment as the level of pleasure students perceive intrinsically about the blended leaning environment. Previous research found that students' perceived enjoyment had significant impacts on their perceived usefulness and ease of use toward the blended learning system (Padilla-Meléndez et al., 2013).

According to TAM (Davis, 1989), perceived usefulness and ease of use can influence one's attitude toward using an information system. When applied to the context of blended learning, a consistent result was found in previous literature, that is, students' perceived usefulness and ease of use on a blended learning system could significantly influence their attitude toward using such a system (Padilla-Meléndez et al., 2013). In our study, the assessment measure of attitude is about students' attitude toward using the blended learning environment in the class.

Learning climate is defined as the atmosphere associated with student learning in a class or around a certain supporting platform (Chen, 2014). One of the earliest studies on learning climate in the computing education area was done by Chou & Liu (2005), who found that

students in the technology-supported virtual learning environment had more positive feelings on the learning climate compared with those in the traditional learning environment. In our context, learning climate is about the atmosphere toward the blended learning environment. Previous research found it to be a significant factor in influencing students' intention to use the blended learning system (Chen, 2014).

Frustration level is a theoretical dimension from the NASA Task Load Index (Hart & Staveland, 1988), which is a well-known multidimensional rating scale used to assess the effectiveness of a physical device or system from people's cognitive perspective. NASA Task Load Index has been used to evaluate different types of systems, such as aviation systems (Averty et al., 2004), healthcare and clinical systems (Saleem et al., 2007), and mobile communication systems (Kamvar & Baluja, 2008). Frustration level is measured as how insecure, discouraged, irritated, stressed, and annoyed an individual feels during performing a task by using the assigned system (Hart & Staveland, 1988). In our context, it is about the degree of those types of feelings a student perceives toward the blended learning environment.

Impact Dimension

When studying the adoption of an information system, the ultimate goals are to ensure that people (1) are willing to use the system, and (2) actually use it. The majority of existing research models on information systems adoption treat both of these aspects as dependent variables (Chen, 2014; Padilla-Meléndez et al., 2013; Tselios et al., 2011). In our context, we define intention to use as students' willingness to take more blended classes in the future when available, and use as students' actual usage behavior toward the blended learning environment in supporting their learning of the course topics.

As a concept that is specific to the context of education, perceived academic performance is defined as students' own perceptions of their achieved academic performance (Islam, 2013). Previous research on e-learning found that both perceived learning assistance and community building enabled by the e-learning system could significantly influence students' perceived academic performance (Islam, 2013).

METHODS

Study Site

The blended class introduced in this research is a freshman-level, introduction to computer information systems course, offered at a major public university located in the United States. It is a required course for numerous majors across the university, with hundreds of students enrolled each semester. Multiple sections of the course are offered, and they are tightly coordinated, using exactly the same design of class structure and teaching methods. The course incorporates both fundamental concepts related to information systems and hands-on Microsoft Office skills instruction (including Word, Excel, Access, and PowerPoint).

Adopting the blended learning instructional methodology, the class has both the offline (face-to-face) and online parts. For the offline part, students meet their instructor and other classmates in a regular classroom once a week to discuss the week's assigned course topics and course-related current events. Each face-to-face class session ends with a group quiz related to the week's topic and online readings to reinforce the learning expected outside of class. For the online part, the course employs an online user-interactive textbook, an online project assessment

system, and a learning management system. Students need to utilize these supporting technology and systems to complete class projects and other related activities outside of class time independently. They have the flexibility to use the technology and systems to complete their learning tasks at their own pace, on their own schedule, and in their own place of choice. The specific designs of the activities and methods used to support student learning in the class are described as follows.

Digital Textbook: The class uses an online user-interactive textbook. The book contains the traditional chapter components, as well as embedded YouTube videos on each page that relate to the page's contents. In addition, each chapter of the book also has RSS feed links to current events and news stories that are updated each week, which can help ensure the readings remain current. At the top of each page, there is a *"self quiz"* link which students can click on to open a pop quiz to test their knowledge on that page's contents before moving on to the next page.

Video Tutorials: In addition to chapter readings, the online textbook also has a particular section with video tutorials that walk users through techniques in the Microsoft Office package, including Word, Excel, Access, and PowerPoint. Students are required to watch those video tutorials and follow them to create several projects independently.

Multiple quizzes with Multiple Attempts: Each week, students are given three quiz opportunities to demonstrate their knowledge of the assigned online chapter readings, including: an individual pre-class quiz, an in-class group quiz, and an individual after-class quiz. Both individual quizzes need to be done via the learning management system, and two attempts are offered for each of them. After the first attempt on a quiz, the system will do the grading automatically and show the grade to the student instantaneously. If the student is not satisfied with the grade, he/she can work on a second attempt of the quiz, with questions randomly picked from the test bank (most likely to be different from questions shown in the first attempt). Then, the higher score between the two attempts is recorded for grade purposes. The in-class group quiz provides an opportunity for students to work with their team members to earn class points together.

Online Project Assessment System: In addition to the video tutorials in which step-by-step instructions are provided, students also need to complete more challenging projects to further improve their technical abilities in the use of Microsoft Word, Excel, Access, and PowerPoint. Specifically, they need to use an advanced online project assessment system to complete several projects for each of the Microsoft applications. This time, the instruction file for each project includes only the specific requirements, instead of step-by-step instructions on how to complete the project. Once completed and submitted through the system, the project file is graded automatically, and the system returns the grade and detailed comments (if points are deducted) back to the student.

Learning Management System: In addition to the quiz tool that students need to use to complete their two individual quizzes each week, the learning management system used in this class also provides other functions. Particularly, it is an integrated access to various course-related resources, where students can find the links to the digital textbook and the online project assessment system. It is also the place where instructors post lecture slides, discussion questions, and class-related reading materials. Students can also check the progress on their own class performance via the gradebook tool.

RESEARCH METHOD AND DATA COLLECTION

The research method used in this study is survey. The survey invitation was sent to students who enrolled in the class a few weeks before the end of the semester. Extra credit (1% of total course points) was provided as an incentive for students' voluntary participation. Upon agreement to participate, a set of questionnaire items related to the assessment measures was sent to the participants. The 7-point Likert scale was used for all items in the questionnaire, with 1 being *"strongly disagree,"* 4 being *"neither disagree or agree"* (i.e., neutral), and 7 being *"strongly agree."* In total, 699 students completed the survey. Among them, there are 297 male students and 402 female students. In addition, 60 of them are international students, while the other 639 are domestic students. Further, 288 of them are first-generation college students, and 411 are non-first generation college students.

RESULTS

To examine perception differences on blended learning between the two groups of students based on each social and demographical trait, we conducted two-sample t-tests on all nineteen assessment measures used in this research.

As shown in Table 2, between male and female students, significant results were identified on nine assessment measures. Except for computer self-efficacy and frustration level, in which male students rated themselves significantly higher than female students did, significantly higher values were found on female students than males on the other seven measures. In detail, the results showed that female students had a higher level of Internet self-efficacy; they also treated the levels of social presence and social interaction provided by the blended class more positively. In addition, they had significantly higher levels of positive feelings on the information quality and system quality associated with the learning systems used to support the blended class. Also, they had a more positive view toward the level of media richness on those systems. Furthermore, female students expressed a more positive feeling on the overall learning climate associated with the blended class. For frustration level, the significantly lower ratings from female students indicate that they were less frustrated in taking the blended class, and this once again shows their more positive perceptions on the blended class. Based on these results, overall, it seems that female students tended to like blended learning better than their male counterparts.

Table 2
T-TESTS ON MALE VS. FEMALE STUDENTS

Measure	p-Value	Result
individual dimension		
Computer Self-Efficacy	0.005*	Male > Female
Internet Self-Efficacy	0.011*	Male < Female
Motivation	0.295	
Cognitive Absorption	0.239	
social dimension		
Social Influence	0.130	
Social Presence	<0.001*	Male < Female

Social Interaction	0.024*	Male < Female
technology dimension		
Information Quality	0.033*	Male < Female
System Quality	0.031*	Male < Female
Service Quality	0.186	
Task-Technology Fit	0.287	
Media Richness	0.017*	Male < Female
adoption dimension		
Perceived Enjoyment	0.406	
Attitude	0.275	
Learning Climate	0.044*	Male < Female
Frustration Level	0.039*	Male > Female
impact dimension		
Intention to Use	0.263	
Use	0.120	
Perceived Academic Performance	0.053	

Note: * statistically significant.

As to the comparison between international and domestic students, Table 3 shows that significant differences were found on ten assessment measures. Specifically, it was found that domestic students had a significantly higher level of Internet self-efficacy compared with international students. However, the results on all of the other nine measures indicate that international students had significantly higher levels of positive feelings toward blended learning. Specifically, they had a stronger motivation to learn in the blended class, and perceived a higher level of cognitive absorption during their learning process. In addition, they found a better fit between the supporting systems used in the class and the learning activities and tasks that they needed to perform by using those systems. Further, they believed the blended class to be more enjoyable; possessed an overall more positive attitude toward it; and experienced less frustration on the blended learning environment. They also expressed more positive feelings on: (1) their intention to take more blended classes in the future, (2) their actual use of the blended learning environment in the current class to support their learning of class topics, and (3) their expectation of their own class performance. From what we found, it appears that international students generally tended to favor blended learning more than domestic students.

Table 3
T-TESTS ON INTERNATIONAL VS. DOMESTIC STUDENTS

Measure	p-Value	Result
individual dimension		
Computer Self-Efficacy	0.438	
Internet Self-Efficacy	0.012*	International < Domestic
Motivation	0.020*	International > Domestic
Cognitive Absorption	0.019*	International > Domestic
social dimension		
Social Influence	0.580	
Social Presence	0.063	
Social Interaction	0.168	
technology dimension		
Information Quality	0.662	
System Quality	0.881	
Service Quality	0.053	
Task-Technology Fit	0.017*	International > Domestic

Media Richness	0.545	
adoption dimension		
Perceived Enjoyment	0.039*	International > Domestic
Attitude	0.010*	International > Domestic
Learning Climate	0.055	
Frustration Level	0.005*	International < Domestic
impact dimension		
Intention to Use	0.015*	International > Domestic
Use	0.008*	International > Domestic
Perceived Academic Performance	0.035*	International > Domestic

Note: * statistically significant.

As shown in Table 4, the comparison between first generation and non-first generation college students revealed statistically significant results on ten assessment measures. All of them indicate that first generation college students had significantly more positive feelings toward blended learning than non-first generation college students. Specifically, we found that first generation students had higher levels of motivation to learn in the blended class and cognitive absorption associated with the blended learning environment. In addition, they perceived significantly higher levels of social influence and social interaction in blended learning. As to the supporting technology and systems utilized in the blended class, first generation college students had more positive feelings toward their information and service qualities. Further, they enjoyed the blended learning class more, and were less frustrated with this new learning environment. They also were more positive about the actual use of the blended learning environment in the current class to support their learning of the course topics, and had more positive expectations on their own class performance. Overall, these results reveal that first generation students tended to have more positive views on blended learning in general, compared with non-first generation college students.

Table 4
T-TESTS ON FIRST GENERATION VS. NON-FIRST GENERATION COLLEGE STUDENTS

Measure	p-Value	Result
individual dimension		
Computer Self-Efficacy	0.248	
Internet Self-Efficacy	0.406	
Motivation	0.032*	First Generation > Non-First Generation
Cognitive Absorption	0.012*	First Generation > Non-First Generation
social dimension		
Social Influence	0.023*	First Generation > Non-First Generation
Social Presence	0.131	
Social Interaction	0.046*	First Generation > Non-First Generation
technology dimension		
Information Quality	0.020*	First Generation > Non-First Generation
System Quality	0.078	
Service Quality	0.041*	First Generation > Non-First Generation
Task-Technology Fit	0.125	
Media Richness	0.057	
adoption dimension		
Perceived Enjoyment	0.008*	First Generation > Non-First Generation
Attitude	0.059	
Learning Climate	0.073	
Frustration Level	0.017*	First Generation < Non-First Generation

impact dimension		
Intention to Use	0.107	
Use	0.003*	First Generation > Non-First Generation
Perceived Academic Performance	0.017*	First Generation > Non-First Generation

Note: * statistically significant.

DISCUSSION

This paper makes several contributions to the blended learning research. The first contribution is the inclusion of a wide range of assessment measures on student learning toward the blended environment. To identify a group of relatively comprehensive assessment measures to use in this research, we turn to various leading theories in the IS and related fields, including TAM (Davis, 1989), TAM 3 (Venkatesh & Bala, 2008), UTAUT (Venkatesh et al., 2003), DeLone and McLean IS Success Model (DeLone & McLean, 1992, 2003), Theory of Motivation (Ryan & Deci, 2000), Social Presence Theory (Short et al., 1976), Social Interaction Theory (Turner, 1988), the Theory of Task-Technology Fit (Goodhue & Thompson, 1995), Media Richness Theory (Daft & Lengel, 1986), and the NASA Task Load Index (Hart & Staveland, 1988). In total, we include nineteen assessment measures, which are grouped into five dimensions, including: individual, social, technology, adoption, and impact dimensions.

In addition, we conduct a large-scale, explorative study to empirically examine students' perception differences based on three important social and demographical traits, including: gender, whether they are international students, and whether they are first generation college students. To the best of our knowledge, little existing research has specifically considered or compared all three of these social and demographical traits in order to better understand students learning and/or performance in the blended learning environment. Our between-group statistical analysis results revealed some interesting patterns. For the comparison based on each trait, significant results are found on around ten out of the nineteen assessment measures, and, in general, consistent results are observed on those measures with statistical significance. Specifically, we find that, in general, female students tend to favor blended learning more than male students; international students tend to like blended learning better than domestic students; and first generation college students tend to have more positive feelings on blended learning, compared with non-first generation college students.

These findings could be of importance and may provide some insights to educators and researchers who are adopting and interested in the blended learning instructional method. For example, when designing or promoting a blended class, the educator may need to keep a closer eye on how the male students think about it, and potentially hold an expectation on getting relatively fewer negative opinions from the female student body. In addition, the educator may need to keep in mind that compared with international students and first generation college students, the domestic students and non-first generation students could be more picky toward the blended class in general. Thus, including and providing sufficient support to meet the needs from each group of students could be very important to ensure the success of the blended class.

Because of the nature of blended learning, students are supposed to have more flexibility in their own educational process in this setting. They could work on some class activities at their own pace and in their own place of choice, with the support of modern information technology and systems. In the meanwhile, the face-to-face portion of a blended class can help ensure that students won't feel isolated from their instructor, classmates, and the community at large. However, students with different background may have different views on such flexibility. Some

of them may possess a highly positive view on it, while others maybe not that much or even have concerns. Also, blended learning may not be the best setting for every single college course. Depending on the nature of a particular class, it might be more effective if the traditional, face-to-face method is adopted, or making it pure online. For example, it might be better to adopt the face-to-face method when teaching students how to conduct advanced medical procedures in a medical school class. Therefore, to ensure the success of student learning, educators need to assess both the characteristics of the student body and the nature of the class itself, in order to decide which instructional method could fit the best.

There are some directions that future research could follow to further extend and improve the current research. First, we only included one blended class for data analysis. Although we conducted a large-scale data collection, the students in the class were mostly freshmen and sophomores. Future study can further validate the results on other classes with other student bodies. Second, when comparing international vs. domestic students, the numbers of data points associated with the two groups were unbalanced. However, although the number of international students in our study was much smaller than that of the domestic students, it was good enough for conducting the t-tests. In addition, it is common, and in most cases inevitable, to have such unbalanced numbers of international vs. domestic students in an undergraduate-level, liberal studies class. But, in order to better address this issue, as well as to conduct more in-depth analyses on students with different cultural backgrounds, future research could consider conducting a multicultural study by including students from blended classes offered at universities across different countries.

CONCLUSIONS

In this study, we investigated students' perception differences on the blended learning instructional methodology based on three important social and demographical traits, including gender, whether they are international students, and whether they are first-generation college students. To conduct a relatively comprehensive comparison, we leveraged important constructs based on various theoretical lens. Specifically, a set of measures from five dimensions were utilized, including individual, social, technology, adoption, and impact dimensions. Detailed comparisons were conducted on all those measures across the three types of comparisons. Some interesting patterns on students' perceptions toward blended learning were identified. In general, the results indicated that, in most cases, female students, international students, or first generation college students tended to have more positive views on blended learning than male students, domestic students, or non-first generation college students, respectively. We hope these findings could provide some insights for educators, and potentially provide some help for them to develop specific strategies focusing on students with different social and demographical characteristics, with the purpose of improving student engagement and willingness to learn, and ultimately increased student success in blended classes.

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