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SITUATEDNESS AND VARIATIONS IN STUDENT ADOPTION OF TECHNOLOGY PRACTICES: TOWARDS A CRITICAL TECHNO-PEDAGOGY

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ABSTRACT

Aim/Purpose: The effective adoption of an ICT across every segment of the student population may occur where the design, implementation and supports recognize and adjust for variations in adoption practices across the student population and the situatedness of the promoted ICT adoption. The goal of this study was to demonstrate methods to explicate variations in perceptions and meanings associated with the adoption of a technology; facilitate the segmentation of the population based upon these variations and sociodemographic variables; constitute agents' practice, within a respective segment, based upon their behaviors and beliefs; and compare these agents' adoption of a specific technological practice relative to their adoption of the critical practice of effectively selecting and using technologies.

Background: Students emerge into a world infused with ICT where the critical technological practice of effectively selecting and using ICT affects students' participation in a network society and information economy. Education policies and practices, regarding technology use for instruction and learning, often assume student populations are homogenous in their perceptions and practices concerning a given technology and do not account for how *situatedness* influences students' perceptions and experience with technology. Universities and faculty, while promoting an ICT, may unintentionally reproduce inequity when not attentive to the ways in which students, as socially situated actors, acquire or fail to acquire the practice of effectively adopting technological innovations.

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Methodology	This study was an instrumental case study of the phenomenon of ICT adoption, in this instance tablet technology for academic purposes, at a public university where over 30% of students in the study self-identified as the first generation university attending student within their household. This study utilized mixed methods to identify students' perceptions regarding this ICT, using a two-phase survey (phase 1 n=652; phase 2 n=440), and then explored students' experiences and associated meanings regarding this technology through the use of photo diary interviews (n=11) and focus groups (n=6,6,2). The survey items were based upon constructs found in the Unified Theory of Acceptance and Use of Technology. These constructs include determinants and moderators for behavioral intention and use behavior for user adoption of a specific ICT.
Contribution	This study contributed to research as follows: 1) ICT adoption from students' perspectives; 2) evidence for segments within populations based upon perceptions and meanings associated with ICT adoption; 3) evidence for how *situatedness* affects adoption; 4) a practice-oriented approach that distinguishes adoption of a specific technology relative to efficacious practice of selecting and using ICT; and 5) how promoting adoption of a specific technology, given effects of *situatedness* and variations in segments, may help or hinder the adoption of the critical practice of effectively selecting and using technology thereby affecting students' participation in modern society. This study points to ways to better understand and support segments of students based upon variations in ICT perceptions and practices, differences in ICT assemblages, and dissimilar *situatedness*. This study advocates for a critical techno-pedagogy whereby students cultivate the practice of critically choosing and effectively using ICT thereby improving their agency within a digital society.
Findings	The findings from this study included 1) variations among students in perceptions, meanings, and practices associated with the adoption of a specific technology; 2) segments of students, based upon sociodemographic variables, for whom there were similar perceptions, meanings, and practices; 3) *situatedness* affecting students' adoption of a given technology based upon students' available ICT assemblage, instructional context, settings of student work, and social and cultural contexts; and, finally, 4) technology adoption as a practice, shared from teacher to students and promulgated within an educational institution, may compel some students to adopt a given technology rather than promote the critical practice of effective selection and use of ICT.
Recommendations for Practitioners	Universities and faculty should ascertain and accommodate segments of students who have variations in perceptions and practices associated with ICT adoption as well as differences in *situatedness* relative to students' available ICT assemblage, instructional contexts, and social contexts. Universities should insist on student participation in the design and implementation for prospective ICT adoptions and ensure student voice from a diverse set of students. Universities should accommodate variations among student segments by tuning ICT designs, implementations, and supports for each segment. The methods described in this study facilitate timely discovery of student perceptions and practices as well as situatedness of students relative to an ICT adoption. Institutions and teachers should model ICT adoption practices that foster mature student-centered ICT adoption in ways that cultivate the competent practice of effectively selecting and using ICT.

Recommendation for Researchers	Research on ICT adoption should consider 1) the voice of adopters, 2) segments among adopters differentiated by perceptions, practices, or sociodemographic variables, and 3) in what ways *situatedness* affects ICT adoption. Researchers should evaluate effectiveness of accommodations to ICT adoption initiatives where design, implementation and supports better facilitate each of the defined student segments.
Impact on Society	A critical techno-pedagogy understands that students' technological practices, as learned perspectives and embodied practices, affect students' participation as co-agents within socio-technical systems of education, employment and life in current and as-yet-imagined futures. A critical techno-pedagogy is mindful of the hegemonic influence of technology firms upon education; is attentive to the non-technological dimensions shaping socio-technical systems; and is aware that technological practices embody and engender values, thereby reproducing inequity or inclusion. Institutions intent to adopt this or that technology must not forget the future-ready imperative of cultivating students' critical techno agency, namely, setting students on the journey of effectively selecting and using ICT in ways that realize students' participation in an information economy and networked society.
Future Research	Future research should explore the interplay of student learning experiences and outcomes relative to pedagogical practices as well as available ICT assemblage including devices, connectivity, and applications. Research should also explore how the interplay of agents and social practices within education effect the development of the practice of effectively selecting and using ICT.

Keywords	student, technology, equity, situatedness, segment, cluster, practice, learning, pedagogy, adoption

INTRODUCTION

The modern technological society is similar to previous sociotechnical systems in its inherent social dynamics (Horst & Miller, 2013; Pfaffenberger, 1992; Selwyn, 2011). The level of access to and use of social, cultural, and economic capital still lead to socioeconomic differences and manner of participation in society (Pfaffenberger, 1992; Van Dijk, 2005). However, the modern sociotechnical system is distinguished by the intrinsic value of information within economic exchange and the power of networks within social systems – an information economy and networked society (Berger, 1986; Castells, 2000; Warschauer, 2004). Hence, access to and use of information and communication technology[1] can affect the nature of inclusion within socioeconomic systems (Selwyn, 2015; Van Dijk, 2005; Warschauer, 2004). Further, given the speed of technological innovation, those positioned in social networks favoring adoption of technological innovations enjoy privileged, early access to subsequent innovative technologies (Rogers, 2003; Warschauer, 2004). In fact, evidence for a stratified model suggests failure to adopt early might result in failure to adopt at all (Norris, 2001). Hence, the critical technique that promotes social power is no longer acceptance and use of any given technology, but rather the practice of effectively selecting and using technologies in ways that realize a person's participation in society (Rogers, 2003; Warschauer, 2004).

This paper explores an attempt to promote technology adoption in an institution of higher education. It constitutes a case study of the ways in which socially situated actors acquire – or fail to acquire – this practice, including experience and knowledge necessary to effectively adopt technological innovations. Technology, even as tool or artifact, cannot be understood apart from practice. Fur-

[1] This paper intentionally uses the term Information and Communication Technology ('ICT') while occasionally using 'technology' where it improves readability and, in such cases, 'technology' refers to 'ICT'.

ther, technology acceptance and use, as practice, is not mere action but rather the embodiment of agency, socially-constructed and situated in the context of a sociotechnical system (Horst & Miller, 2013; Rogers, 2003). As context, socio-technical systems can contribute to the reproduction, amplification, or disruption of existing social structures. Hence, technology acceptance and use, as practice, emerges out of the tension between structures and agency, reproduction, and participation. Higher education, as a sociotechnical system, at its best serves to disrupt existing structures and cultivate the agency of students but may unwittingly help reproduce existing structures or inadequate practices; thereby preserving inequitable distributions of capital in all its forms.

The context for this case study is students' adoption of tablet technology for academic use. However, the focus of this study is students' practice of selecting and using technological practices; and how this practice is affected by and within the sociotechnical of an institution of higher education as it promotes technology adoption. This case study demonstrates methods to explicate variations in perceptions and meanings associated with the adoption of a technology; facilitate the segmentation of the population based upon these variations; constitute agents' practice, within a respective segment, based upon their behaviors and beliefs; and compare these agents' adoption of a specific technological practice relative to their adoption of the critical practice of effectively selecting and using technologies. This research asks 1) what are variations in students' perceptions and meanings associated with the adoption of a technology; 2) can segments in populations be discerned based upon clusters of students given sociodemographic moderators and responses to determinants for behavioral intentional and use behavior; 3) in what ways students' *situatedness* affects these perceptions and meanings; and 4) in what ways the promulgated technology practices may diminish or further inequity. This study contributes to research as follows: 1) evidence for, and methods to extract, segments within populations based upon perceptions and meanings associated with the adoption of a technology practice, 2) evidence for, and methods to ascertain, *situatedness* that affects segments adoption of a technology practice, 3) a practice-oriented approach that distinguishes adoption of a specific technology relative to efficacious practice of selecting and using technology, and 4) how promoting adoption of a specific technology, given effects of *situatedness* and variations in segments upon adoption, may help or hinder the adoption of the critical practice of effectively selecting and using technology, thereby affecting students' participation in modern society.

Below, we explore technological adoption among different segments of students and then draw relationships between these practices engendered within educational systems and social reproduction. While the university technology adoption initiative made some positive moves toward pedagogical transformation and educational equity, it also missed opportunities to address the ways in which adoption practices can reinforce the social reproduction of inequality. We conclude by arguing that a critical techno-pedagogy, recognizing the *situatedness* of technological practice while promoting students' critical agency vis-a-vis technology, can facilitate interactions between students and educational systems in ways that increase equity. This critical techno-pedagogy is informed by structure, agency, adoption practices, as well as the *situatedness* of agents' interactions with people and technology. These critical perspectives guide the exploration into students' interactions with technology and engagement with adoption practices.

PERSPECTIVES SHAPING A CRITICAL TECHNO-PEDAGOGY

Foundational theorists in the social sciences, from Marx (1859/1970) and Mills (1959), to Bourdieu (1972/1977, 1998) have sought to understand the reproduction of inequality in society. Their approaches range from the Marxist focus on structural features of human systems of production to the micropolitics of everyday interaction explored by Bourdieu. Scholars of education have noted that schools themselves often play crucial roles in the reproduction of class inequalities, with major statements by Willis (1977), Foley (1990), Giroux (2003) and the more recent contribution of Armstrong and Hamilton (2013) on how colleges reproduce unequal status among students. Taken to-

gether, the literature on social reproduction points to both overt and subtle ways that institutions and individuals reinforce inequalities.

Yet, within the literature, there are also clear attempts to make analytic room for human agency. Attempting to portray the relationship between agency and social reproduction in a non-deterministic way, Bourdieu introduced the concepts of field and practice linked together by the mediating concept of habitus, "that system of dispositions which acts as a mediation between structures and practice…" (Bourdieu, 1972/1977, p. 487; see also Bourdieu 1977, 1980/1990, 1986; Bourdieu & Wacquant, 1992; Reay, David, & Ball 2005). Bourdieu further offered an understanding of social, cultural, and economic capital to operationalize the way habitus connects structure and practice. The individual habitus generates different kinds of capital, which individuals leverage – usually unselfconsciously – as they pursue their goals (Bourdieu 1986). Bourdieu's approach has been particularly influential in the sociology of education, owing in part to his own work on education and social reproduction. Subsequently, Giroux (2003) recognized schooling as a "site of contestation, resistance and possibility" where effective pedagogical practice was crucial to students' capacity to participate in relevant cultural spheres (p. 6). Most recently, some scholars have stressed the need for an asset-oriented approach that credits students from traditionally marginalized backgrounds with forms of capital that have value in spite of their devaluation in schools and universities (Auerbach 2006; Clegg, 2011; Gofen, 2009; Yosso, 2006). Through this line of work, we can detect an ecology of concepts that enables us to credit social structures with significant reproductive power while also remaining attuned to the agentive work of students (see especially Reay et al., 2005).

Theories of social practices seek to liberate agency from the binary constraints of structural or individualist models (Postill, 2010; Reckwitz, 2002) with practices theorized as "embodied, materially mediated arrays of human activity centrally organized around shared practical understanding" (Schatzki, 2001a, p. 11). A practice is a set of activities organized by understanding, rules, and teleoaffective structure (Schatzki, 2001b) or as routinized behavior with interconnected elements including bodily and mental activities, material and its use, contextual understanding, know-how and motivational knowledge (Reckwitz, 2002). A practice's performance and its associated meaning may vary across practitioners, suggesting similar actions may embody different meanings from one practitioner to another (Cox, 2012). The social becomes the nexus of activity where interaction between actors occurs, and, here, practices emerge through and results from these interactions (Shove & Pantzar, 2005). Actors' practice-activities, depending upon context, may vary in their dependence upon other actors' practice-activities. The diffusion of practices occur through practitioners performing the practice thereby communicating the practice-related beliefs, emotions, and purposes (Ropke, 2009). Here the interplay of social and individual occurs through social contexts (technological, institutional, infrastructural), constituted by practices, and providing a context for the performance of practices (Ropke, 2009). A practice emerges or changes through a reconfiguration of its interconnected elements or through interactions with other actors or within other contexts. In the educational context, teachers' practices shape students' *horizon of intelligibility* determining the efficacy and durability of students' adopted practices (Schatzki, 2001b). Theories of social practice contribute to the goals of this study by offering insight into how social reproduction occurs within educational contexts through the interplay of actors' activities; how materially mediated activities can only be understood within embodied practice; and how embodied practices, with their composite elements, become the hermeneutic locus to better understand adoption of technological practices. Technological practices, socially situated within arranged things and organized activities, become intelligible through individual actions (Schatzki, 2001a). Herein, embodied practice exists in creative tension with the structure/agency dynamic as this study explores technology adoption, adoption practice, and equity.

A nuanced view of the relationship between structure and agency, mediated through embodied practice, is particularly critical to understanding technology adoption. Adoption is the selection, acceptance, and use of technological practices by people and diffusion is the communication and spread of these practices within social systems (Rogers, 2003). Adoption and diffusion are processes

where practices are shared within social contexts and, hence, where reproduction occurs. However, the popularization of diffusion (e.g., Moore, 1991) led to a common sense view where the innovative protagonist discovers and spreads the news about a technology leading the population to adopt it. This common sense view arises from an oversimplification of the adoption process (Rogers, 2003) or a failure to recognize social determinants in the shaping of technology (Howcroft, Mitev, & Wilson, 2004; MacKenzie & Wajcman, 1999). This understanding fails to consider social structures and adoption contexts, resulting in a technological or adoption bias (Feenberg, 2010; Rogers, 2003; Van Dijk, 2006). In fact, the normal curve represents adoption over time by an entire population, and only occurs in retrospect where the entire population adopts the technology (Rogers, 2003). Yet, segments of the population display differences in their levels of adoption both over time and in their ultimate level of adoption (Fresno State, n.d.; Rogers, 2003). Often, a stratified model of adoption exists where 1) a portion of the population does not or cannot adopt the technology, or 2) technology shifts such that those more advantaged segments of the population begin adopting the next technology while the remainder are still working to adopt the previous (Norris, 2001; Van Dijk, 2005; Warschauer, 2004).

In other words, technology adoption is socially situated (MacKenzie & Wajcman, 1999; Rogers, 2003). Some aspects of *situatedness* point to the importance of macro-social context, such as structures of inequality by race, ethnicity, class, and gender. However, *situatedness* also refers to the meso and micro levels of human interaction. Technology is a social fact for which meaning is negotiated within specific contexts (Selwyn, 2011; Verbeek, 2011). Technological practices are situated within the interactions and interrelations of persons, technology, and work (Dourish, 2004), grounded within the complex social framework of daily activity (Suchman, Blomberg, Orr, & Trigg, 1999), and expressed through materially mediated activities (Schatzki, 2001a). Hence, student adoption of technological practice is situated within the social structure of U.S. society, as well as their social networks, chosen academic disciplines, learning spaces on campus, lived spaces beyond campus, and their existing assemblage of available technologies (Delcore & Neufeld, 2017; Fresno State, n.d.; Tomlinson & Javius, 2012). These aspects of students' *situatedness* will be explored further below.

Attention to structures of inequality has already yielded important results that help us better understand variable ways students adopt and use technology in the educational field, and the ramifications for their lives beyond school. For example, we have evidence that students' socioeconomic conditions, race/ethnicity, and gender affect their time to adopt, resultant levels of adoption, and their subsequent ability to participate in society (Dupagne & Salwen, 2005; Goode, 2010; Lopez, Gonzalez-Barrera, & Patten, 2013; Sun & Metros, 2011). Acquiring effective adoption and use practices is especially important for students from lower socioeconomic conditions given the social structures affecting adoption and the impact of adoption practices on societal inclusion (Goode, 2010; Warschauer, Knobel & Stone, 2004). Students' digital identity and technological practices are formed from students' experiences in home and school environments based upon instruction associated with technology and students' interactions with technology. Students' resultant digital identity and acquired technological practices determine students' ability to navigate technological ecosystems including those related to students' work and learning. Students' digital identity and technological practices are determined by social structures and also determine students' degree of achievement within educational endeavors and work opportunities. Other practitioners' performance of practices, through the interplay of actor-activities, either enrich or diminish the practice-related understanding, know-how, and intentions of students' embodied practices.

This study built on the existing literature with a heightened attention to *situatedness* at multiple levels (macro, meso, micro), and by carefully attending to student agency. Much has been made of the agency of educational leaders, faculty, or corporations related to the adoption and diffusion of technological practices (Fresno State, n.d.; Giroux, 2003; Selwyn, 2015). Little research has focused on student's lived-experience during the adoption of technology for academic use, especially being mindful of structure and *situatedness*. This focus on students' interactions with technology within

social-technical systems is especially pertinent given technological forces acting upon educational systems (Giroux, 2003; Selwyn, 2011, 2015) and technological innovations arising within socio-political systems (Feenberg, 2002; MacKenzie & Wajcman, 1999). A focus on student-agency becomes especially critical as students graduate into work, learning, and life in a world infused with technology, accelerating change, and global interconnectedness.

These perspectives become the foundations for a *critical techno-pedagogy*: structure and agency, education and equity, adoption and reproduction, *situatedness* and technological practices, embodied practice and materially mediated activity, and students' agency in a world infused with technology. Certainly, an exploration of student engagement with adoption practices must occur within a framework sensitive to structure, agency, and *situatedness*. Rogers (2003), theorizing on adoption and diffusion, urged ethnographic explorations of prospective adopters' engagement with the process of adoption so as to respect adopters' agency, adopters' context or *situatedness*, and as an antidote to pro-technology bias. This study explored students' interaction with technology and engagement with the adoption of technology while remaining sensitive to structure, *situatedness*, agency, practice and equity.

CONTEXT AND METHODS

This study was an instrumental case study of the phenomenon of adoption, in this instance, adoption of tablet technology for academic purposes within an educational setting (Delcore & Neufeld, 2017; Neufeld, 2015). This study focused on the moment of institutional and consumer adoption of this technology, which is the ecological context emphasized by Venkatesh, Thong, and Xu (2012). This study occurred at a 4 year public university with more than 1,200 faculty and 20,000 students. These students represent a diverse population with large percentages of first generation, Hispanic and Asian American students. Over 30% of students in the study self-identified as the first generation university attending student within their household, an indicator highly correlated to lower socioeconomic conditions (Engle & Tinto, 2008). The university launched a program, 'DISCOVERe', in 2014 with the intent of developing ways to teach that "engage and challenge students to improve their success is the classroom" and as an "aggressive initiative to break down the digital divide" with a focus on "tablets [as] a teaching and learning tool" (Fresno State, n.d.). The program began with a cohort of 40 faculty members committed to and compensated for the redesign of one fall 2014 course that leveraged the use of tablet technology. There were about 1,000 students who enrolled in course sections identified for tablet use with the university subsidizing student purchases of tablets based upon SES level (socioeconomic status). The university also upgraded wireless networking and classroom presentation technology in classrooms designated for use by the program (Fresno State, n.d.).

Student adoption is exhibited as use behavior and can be predicted by behavioral intention to use a technology (Venkatesh, Morris, Davis, & Davis, 2003). The determinants for behavioral intention serve as indicators of a population's disposition towards acceptance and use. These determinants may also be used to segment populations based upon distinctive clusters of determinant values (Neufeld, 2015). The Unified Theory of Acceptance and Use of Technology or UTAUT (Venkatesh et al., 2003; Venkatesh et al., 2012) offers a predictive model with determinants for behavioral intention to adopt and use technology and, using demographic attributes, reveals differences among segments of the population. The determinants for behavioral intention and use behavior within this study (Neufeld, 2015) included performance expectation, effort expectancy, social influence, facilitating conditions, hedonic motivation, and price value (Venkatesh et al., 2003; Venkatesh et al., 2012). The moderators of these determinants, used to determine differences among segments within the population, included race/ethnicity, socioeconomic conditions, gender, access, and experience (Neufeld, 2015). See Figure 1 for pertinent moderators and determinants of behavioral intention and use behavior.

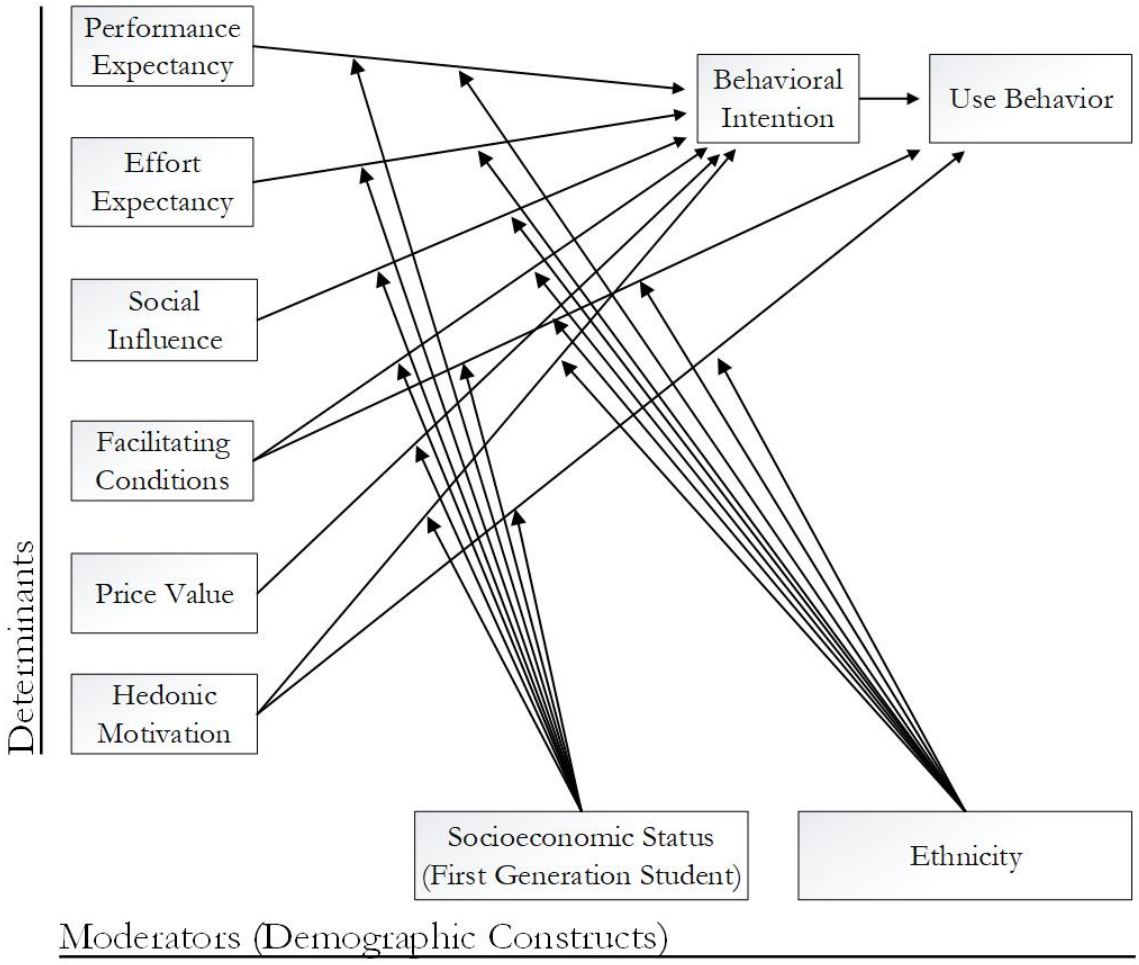


Figure 1. Determinants of behavioral intention and use behavior.

The determinants for behavioral intention include performance expectancy, effort expectancy, social influence, facilitating conditions, hedonic motivation and price value. The determinants of use behavior include facilitating conditions, hedonic motivation and behavioral intention. The strength of each determinant is moderated by socioeconomic conditions (First Generation Student) and race/ethnicity (White or Hispanic).

There are several methods to explore behavioral intention and use behavior including server-based activity logs or client-side logs to track usage. Yet only phenomenological methods, such as photo diary interviews and focus groups, facilitate understanding of students' beliefs embodied within their everyday practice in the use of tablet technology for academic purposes. Further, photo diaries provide an effective means of gathering participant practice and reflection in situ without researchers being physically present with participants (Gabridge, Gaskell, & Stout, 2008). The photo diary served as an observational log with pictures and observations that later serve as artifacts and the basis for interviews (see Figure 2 for examples of photo diary journal entries). Often, agents' practice is misinterpreted (Suchman et al., 1999) without careful coupling of inductive inquiry to deductive analysis so researchers better understand individuals' practice. Here agents' selection and annotation of their practice within photo diaries, coupled with subsequent interviews, grounded the record with their know-how and beliefs about their embodied practices. The study made extensive use of triangulation to confirm understanding and increase credence including the use of multiple methods, mul-

tiple spatial or temporal domains within a practice, and collaboration by the research team especially during interpretive interactions with data.

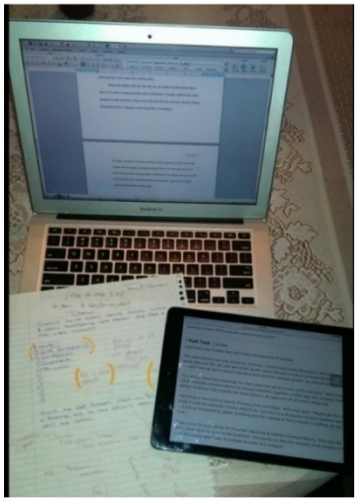
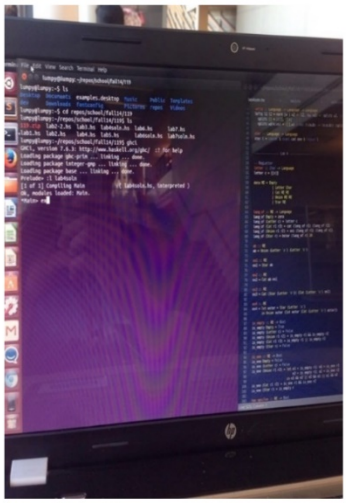
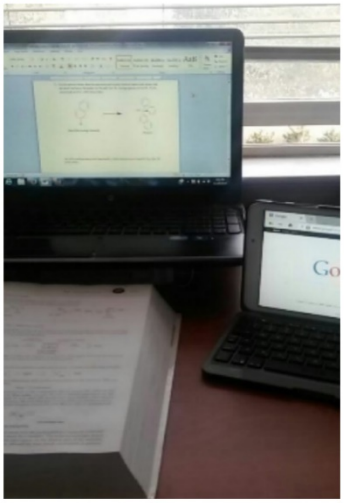
Javier	Braden	Brooke
		
"use a whiteboard app on iPad to help answer problems while doing homework on MyMathLab on MacBook"	"due to demand of complex software … I bring my laptop to school most days … I tend to leave my tablet at home"	"I can look up chemical structures on tablet while doing homework on laptop"

Figure 2: Photo Diary Entries with photos and corresponding annotations

This current study (Neufeld, 2015) intentionally used multiple methods to better understand the phenomenon of acceptance and use (Rogers, 2003; Venkatesh, Brown, & Bala, 2013). The surveys, using inferential statistics, provided distinctions between segments of the population in their perceptions of determinants for behavioral intention and use behavior. The photo diary and focus groups colored in these distinctions among student segments with students' expressed meaning.

The sample for the survey was selected using criterion-based, cluster sampling (Pedhazur & Schmelkin, 2013) where the criterion included classes where students would be considering adoption of tablet technology and the cluster was determined by class enrollment. These courses included undergraduate courses on subjects such as history, English literature, business administration, political science, psychology, linguistics, mechanical engineering, and computer science. Participants for the photo diary and focus groups were selected as a purposeful, stratified, criterion-based sample. Participants in phase 1 of the survey were asked whether they might participate in either the photo diary and/or the focus groups. The population of those who responded positively were then stratified by socioeconomic status and race/ethnicity with care to balance participation across ethnicity (Hispanic, White) and SES (first generation student or not). Participants were then contacted about the study, provided informed consent and asked to participate, and then selected participants were scheduled and equipped to participate in the study. All participants received an informed consent and agreed to it within the survey and verbally prior to beginning the photo diary and focus groups.

The survey used items derived from UTAUT constructs (see Appendix A for Survey Items) and used the designation of "first generation student" as the proxy to classify students from lower socioeconomic backgrounds (Engle & Tinto, 2008; Neufeld, 2015). The pilot of the survey was administered to 30 students with feedback used to make adjustments to the survey items and survey administration process. The survey was administered to students in two phases (phase 1 n=652; phase 2 n=440; see Table 1 for respondents' demographics). The survey was administered during class sessions and used Qualtrics to deliver a responsively-designed survey where students could use whatever student-brought mobile device was available to students. The use of a mobile web survey has been

shown to not effect survey validity and reliability (Peytchev & Hill, 2010). The survey items were designed to use vocabulary understandable by the majority of respondents with a Flesch-Kincadi Grade Level of 8. The survey was consistently introduced to participants in the respective classes by a researcher (see Appendix B for Survey Verbal Introduction). Following data collection, the reliability of the survey instrument was calculated using Cronbach's alpha to measure the internal consistency of items related to each construct. The performance expectancy construct consisted of 3 items (α = .83), effort expectancy consisted of 4 items (α = .71), social influence consisted of 4 items (α = .83), facilitating conditions consisted of 4 items (α = .83), behavioral intention consisted of 2 items (α = .77), and use behavior consisted of 3items (α = .72). Each of these constructs had a Cronbach's alpha greater than .7 meeting internal consistency reliability expectations and all but two of the items had a principal component loading of .70 or higher.

Table 1. Respondents' Self-Report of First Generation Student and Race/Ethnicity

	Phase 1		Phase 2		Total
Demographic	*N*	%	*N*	%	*N*
First Generation Student					
No	459	70	317	72	776
Yes	193	30	123	28	316
Total	652		440		1092
Race/ethnicity					
American Indian	7	1.3	5	1.4	12
Asian	96	17.2	66	17.8	162
Black or African American	16	2.9	15	4.1	31
Hispanic. Latino or Spanish Origin	221	39.7	131	35.4	352
Native Hawaiian or Pacific Islander	11	2.0	7	1.9	18
White	187	33.6	133	35.9	320
Other	19	3.4	13	3.5	32
Total	557		370		927

Students within the photo diary group (n=11) took annotated photos whenever they perceived value in tablet use for academic purposes, support in their use of tablets, or observations about their ICT assemblage (see Table 2 for photo diary participants' demographics; Appendix C for Photo Diary Prompt, and Appendix D for Photo Diary Interview Questions). The photo diary participants used the mobile dscout app to upload and annotate photos while the researchers used the dscout web app to curate data.

Table 2. Socioeconomic Conditions and Ethnicity for Photo Diary Participants

Pseudonym	**First Generation Student**	**Ethnicity**
Angela	No	Hispanic
Antonio	No	Hispanic
Brooke	No	Hispanic & White
Braden	No	White
Chandler	No	White
Carlos	No	Hispanic & White
Evelyn	No	Hispanic & White
Jeanette	No	Hispanic
Javier	Yes	Hispanic
Jorge	Yes	Hispanic
Lily	No	White

The two student focus groups included 12 students (n=6, 6) while a third focus group included two teacher assistants (n=2) responsible for four class sections with course sections of 50, 50, 25 and 20 students (see Table 3 for photo diary participants' demographics; Appendix E for Focus Group Interview Moderator Script). There were three photo diary participants who also participated in a focus group; they were Alyssa, Braden, and Evelyn.

Table 3. Socioeconomic Conditions and Ethnicity for Focus Group Participants

Group	Pseudonym	First Generation Student	Ethnicity
Focus Group 1			
	Braden	No	White
	Diego	Yes	Hispanic
	Edna	Yes	Hispanic
	Hannah	Yes	White
	Imani	No	Hispanic & White
	Juanita	Yes	Hispanic
Focus Group 2			
	Angela	No	Hispanic
	Carmelo	No	Hispanic
	Evelyn	No	Hispanic & White
	Justina	No	Hispanic
	Shauna	No	White
	Trevor	No	White

Analysis of the quantitative data began with cleaning the data, eliminating invalid cases, and creating dummy dichotomous variables to decompose categorical variables into variables that fit regression analysis. Correlation analysis was used to explore the relationships between determinants and moderators (race/ethnicity, socioeconomic status, gender). Regression analysis was then used to determine the effects of the moderator categories on the determinants including the direction and significance of these relationships. Finally, analysis of variance was used to determine if categories within the moderator variables had a significant effect on the determinants. For the qualitative data, the researchers individually reviewed the participant demographics, focus group transcripts and photo diary streams including photos, annotations, and interviews. This data was uploaded into Dedoose, an online service that facilities qualitative data, coding and analysis. The research team developed codes, based upon acceptance and use theory, and performed cross-excerpt coding to test for inter-rater reliability and clarify code definitions and their application (see Appendix F Closed Codes). The research team worked in pairs to code remaining excerpts and then met as a team to review coding and triangulate interpretation amongst the researchers. The two lead researchers then reviewed the participants and their respective coded streams to better understand the themes emerging from participants' practice. The resultant themes were then tested against each of the participants and their coded streams to determine the valence of the themes for each participant. This resulted in the thematic findings presented below.

FINDINGS

The findings from this study reflect variations in determinants for adoption between segments of student populations; the *situatedness* of technology adoption and use; and the pitfalls inherent in an institutional, pedagogical adoption of technology. These findings, supported by the foundational perspectives noted above, undergird the need for a critical techno-pedagogy.

Variations in Determinants for Adoption; Identification of Segments within Population

Survey responses improved understanding of students' perspectives regarding adoption of tablet technology for academic use; and determined, based upon these perspectives, unique segments within the population. Regression analysis examined relationships between determinants (predictors) and behavioral and use behavior while ANOVA was used to determine if categories within the moderator had a significant effect on the determinants. The multiple regression model showed the six determinants explained 38% of variance in behavioral intention, $R2 = .38$, $F(6,978) = 101.45$, $p < 001$. A significant portion of variance within determinants was attributed to the demographic constructs of race/ethnicity and first generation college student. Hispanic students showed a co-linear effect for performance expectancy, effort expectancy, hedonic motivation, and price value while first generation college students showed higher than their peers on performance expectancy and use behavior.

These findings demonstrate variations in students' perceptions associated with the adoption of a technology, using determinants from UTAUT, and confirm the existence of segments within populations given the clustering of student responses based upon sociodemographic moderators. This suggests students' adoption of technology may be more a function of sociodemographic factors and perceptual responses then a function of adoption over time (e.g., leaders, laggards). These results then influenced the inquiry of the ethnographic methods to focus upon performance expectancy (to what degree and how will this technology help me do my work) and facilitating conditions (to what degree and how will I find support as I learn to use this technology) while continuing to remain open to other themes that might emerge.

Situatedness of Technology

A fully situated account of technology adoption; with attention to both structure, agency, and embodied practice; requires attention to multiple levels of *situatedness*. The contextual features we found most relevant to the adoption and use decisions of the population in this study include the student's ICT assemblage, teaching and learning trends in public higher education, the settings of student work, and the social and cultural context of U.S. society (e.g., stratification by class and ethnicity). All of these contextual features impact students' decisions to adopt and use tablet technology for schoolwork. ICT adoption decisions are only comprehensible by exploring the context, including the nature of work, where and with whom it is pursued, the assemblage of ICT tools available, and the physical/mental aspects of embodied practice.

Device assemblage: No act of ICT adoption occurs without reference to student's ICT assemblage

Students found value in the use of tablets for information search, retrieval (downloading), storage, reading, annotation (e.g., of PowerPoint lecture slides in class), document composition and collaboration. However, some functions of tablets that students adopted for school work were sensible only in relationship to the rest of their ICT assemblage (namely, their assemblage of devices, connectivity, apps, and web services). We saw a pattern where students adopted tablets not because they were necessarily functionally better than other devices, but because, within their device assemblage, tablets played a mobile device role. For example, Javier reported relying on a laptop for word processing, but he used cloud storage to make partially-completed assignments available for work on his tablet while on campus. Hence, his adoption of tablet use for productive work was driven by its portability, not its inherent functionality as a word processing device; his use only made sense given the dominant role of the laptop as his primary word processor. Hence, each device has its role to play in the total ICT assemblage available to each student.

Students from different SES backgrounds also had differential access to ICT. In short, lower SES students had poorer device assemblages, which led to higher expectations for tablets to help them

with schoolwork to augment their device assemblage. Higher SES students' device assemblage was more current, performant, and often included mobile devices, tablets and laptops. Given their more robust assemblages, some higher SES students found costly the program's requirement to purchase a tablet, without a subsidy, when they might already have purchased a laptop for college. For example, Imani, a focus group participant, said:

> I was honestly mad. Because I purchased a brand new Macbook right before [freshman orientation event], and I was like, I just bought a brand new Macbook, why do I have to buy a tablet? Isn't it the same thing, it's an electronic device, I can bring it to my course. And they're like, no it's required, so that didn't really make me happy, because I just spent a lot of money on this.

Imani's experience illustrates the importance of the assemblage as a context for understanding the adoption experience.

Students' perceptions and meanings associated with the adoption of a particular technology are shaped in the context of their available ICT assemblage and the activities they seek to perform within their practices as a student. This data illustrates how students' socioeconomic context, including their available ICT assemblage, affect their technology mediated activities like studying. And what may appear as non-rational choices relative to schoolwork practice, namely, higher performance expectancy towards and use of tablet technology for productive work by lower SES students, imply practices are materially mediated by individuals' ICT assemblage more than just a specific technology.

Public higher education: The drive for collaboration

The program's major goals included pedagogical transformation. Instructors who join the initiative are encouraged to completely transform their course in a student-centered, collaborative direction to enhance student engagement. Hence, students reported that instructors in some classes were encouraging use of tablets in class, and beyond, for collaboration. For example, Evelyn highlighted the use of shared Evernote notebooks in her English class as a way for her and her classmates to share notes and drafts as part of an instructor-driven collaborative reading and writing assignment. Hence, faculty, acting on the pedagogical transformation mandate, gave the tablet a collaborative function that hinged on the contemporary public education context and its emphasis on collaborating for learning within social relationships of instructors and peers. Importantly, collaboration was not an anticipated use of the tablet for any participants; no students cited collaborative work as an expected function of tablets prior to adoption. Rather, the tablet's collaborative function emerged from the social/educational context and then became a key point of meaningful, positive use as students encountered faculty-driven collaborative assignments and classroom styles. Several students explicitly cited the collaboration occurring in these classes, with tablets, as helpful to their learning. Antonio said, "I liked it better than a normal history class….It seems a little bit more fun. It seems like I'm more engaged... We're all just getting along [and] it's becoming a class." Here, faculty design of collaborative learning experiences shaped student technology use and the technology's perceived usefulness; and students reinvented their academic use of technology towards collaborative learning.

However, the beneficial collaborative function of tablets existed in tension with other functional limitations of tablets. The photo diaries often showed a laptop next to a tablet with students, when interviewed, indicating the laptop was necessary for "serious" work. Higher SES students most often had a laptop next to the tablet or planned to purchase a laptop later in the semester. Braden, a Computer Science major, found the tablet insufficient for programming assignments noting "a laptop is the only option for completing necessary schoolwork" and as a result left his tablet at home most days. Hence, promoting tablets for "collaboration" might result in student adoption of a technology that supports collaboration while providing limited functionality students find critical within their academic context.

This finding shows how students' *situatedness* within instructional activities affects students' perceptions and meanings associated with a given technology, particularly relative to the design of instruc-

tion and its actuation including students' interaction with teachers and students. Further, students' *situatedness,* within the context of a higher education institution's propagation of a pedagogical strategy, affects the value of a student's available ICT assemblage. This adoption, with its focus on a singular device rather than a response to students' assemblage of technologies, may have ineffectively addressed students' technology needs in ways that impact their learning and, through learned practice, shared the less-than-effective practice of selecting technology that doesn't best fit task and context.

The settings of student work

The photo diaries included a rich sample of students' actual work spaces, postures, and ergonomic arrangements. We found students sitting on bed and floors, reclining, balancing devices on their laps and knees and otherwise breaking away from desk, table, and chair. While these work practices may not be new, per se, they highlight the utility of tablets to the work styles of students. For example, Braden spoke glowingly about his tablet's ability to remember where he left off in a course-related video he started watching at home, so when he arrived on campus he could easily pick it back up. When we reminded him that he had a laptop media player that could do the same thing, he revealed that he had been lying in bed when he started watching the video. Tablets had an ergonomic advantage to Braden given his work posture (lying down) while accomplishing this specific task.

The note-taking and annotation function of tablets was pervasive. Many students found value in being able to follow an instructor's lecture with the PowerPoint slides, previously downloaded, available for annotation. However, they also noted that the small size of desk surfaces in many classrooms facilitated the adoption of tablets for note-taking and annotation: they found that desks were simply too small to easily use a laptop. (On the other hand, the educational context of STEM disciplines inhibited student satisfaction with adoption of tablets for note-taking: engineering students told us they were not able to effectively use tablets to take notes in some classes because of the complex notations in their fields.) The photo diaries are replete with these kinds of preferences for tablets, which conform to a variety of work spaces, including beds, as well as knees while sitting on the couch studying, and the small desk surfaces of classrooms. Taken together, these examples highlight the *situatedness* of adoption decisions within physical and social settings. The where, when, and how of student work matters to ICT adoption and to the adoption of specific technological practices.

Class stratification: Tablet adoption along the choice continuum

The preceding findings highlight the importance of micro and meso levels of analysis in understanding adoption choices: the device assemblage, the institutional context, and where and how students work all affect the types of technology practices students adopt. However, these levels of analysis are encompassed by the macro frame of reference: the unequal structure of U.S. society. Class stratification represents a crucial way in which ICT adoption by American college students is situated. Indeed, in light of the survey, focus group, and photo diary data, we can see that adoption decisions and subsequent use experiences are sensitive to the location of students in the class structure of the United States. However, in analyzing adoption decisions and use experiences, we resist the tendency to see the technology practices of students in simple asset-deficit terms. Instead, we are sensitive to the habitus (Bourdieu, 1972/1977) of students from different SES and ethnic backgrounds. It is more useful to see their choices in terms of constraints and opportunities, as well as predispositions (habitus) that encompass social and cultural capital acquired as a result of experiences within the class system (Clegg, 2011; Trueba, 2002; Yosso, 2006).

For example, the survey findings reveal that adoption varied by SES and ethnicity. Hispanic students reported higher performance expectancy, price value, behavioral intention to use, and hedonic motivation than whites. Lower SES students reported higher performance expectancy, behavioral intention to use, and use behavior than higher SES students. These variations suggest that lower SES and Hispanic students may be more enthusiastic adopters of tablet technology than their white and high-

er SES peers. Data from the ECAR survey of undergraduate student technology use supports this finding: "First-generation college students, those who received free or reduced-cost lunch in high school, and/or those attending a community college gave higher importance ratings to their mobile devices for academic and administrative functions than other types of students" (Dahlstrom, Brooks, Grajek, & Reeves, 2015, p. 20).

The photo diary data, in which students chronicled their ICT-related school use, revealed that students of higher socioeconomic status had more resources than their lower SES peers to invest in new technology. Hence, higher SES students had greater freedom in choosing and acquiring the devices they felt best fit their needs. Their photo diaries revealed that their device assemblages tended to be populated by newer, more robust equipment, compared to their lower SES peers. As a result, they enjoyed the opportunities to match device to task. For example, teaching assistants in one focus group recalled that the higher SES students pulled out laptops later in the semester when these students found tablets wanting in functionality – while lower SES students continued to use their tablet. We return to the class differences in device assemblages and their effect on adoption below.

Students' tablet-acquisition choices were also different. Two higher SES participants actually acquired hybrid devices on their own and reported that these devices fulfilled nearly all of their computing needs, pushing out usage of tablet and laptops ("hybrid" devices emerged concurrent with this study as a design combining the mobility of a tablet with the "production" functionality of a laptop). Also, the teaching assistants who participated in Focus Group 3 reported that the higher SES students in their classes tended to switch out their tablets for laptops – sometimes newly acquired – as the semester went on and they discovered that some work was better performed on a laptop. The lower SES students tended to stick with their tablets, the focus group and photo diary data suggest this is because their laptops were very old, had degraded batteries, were unavailable because they were being shared with siblings, or because they could not afford to purchase another device.

Lower SES students had fewer resources for acquiring robust devices for their assemblage. They tended to own older devices, particularly laptops and desktops, which were nearing the end of their usable life. However, they also exhibited a resourcefulness in their device usage. Several participants were sharing devices with siblings, for example, and passing old devices back to younger siblings as they were able to acquire new ones. They were also attuned to the opportunity presented by the program to adopt the use of a new device, or to upgrade from an older one. Jorge, for example, recounted his history of resourcefulness. His parents were immigrants from Mexico who did manual work for a living and had relatively little experience with ICT. He told us he had to "force" them to buy him a computer he could use during high school. Jorge, who shared an older laptop with his younger brother, became a tablet user for the first time when he enrolled in a required English course that happened to be in the program. Jorge proceeded to expand his tablet-related technology practices well beyond his DISCOVERe English course; for example, he used his tablet to aid in following PowerPoint lectures in a challenging science course. Javier, also a son of Mexican immigrants, was already an iPad user when he enrolled in a DISCOVERe class. However, when Javier saw that the program-provided iPad would come with a data plan, he took the newer device and passed his other iPad back to his younger sister. Hence, the lower SES students saw and took opportunities to improve the device assemblage available to them and to their families.

Compared to lower SES students, higher SES students exhibited less dependence on technology support offered on campus, and some explicitly criticized the services as inadequate. The lower SES students also tended to have positive attitudes toward tech support on campus, including the new DISCOVERe Hub, which was established explicitly to support student tablet users. They regularly reported using campus tech support resources, and intend to use them in the future. Their resourcefulness when it came to seeking support may reflect the relative lack of ICT knowledge and expertise in their immediate social networks. Higher SES students consistently noted that they could call on immediate family (parents, siblings) and friends for help with technology-related challenges. Lower SES students were far less likely to find such support. From them, we heard the consistent refrain,

"my parents are not tech savvy." However, the lower SES students were not simply suffering from a deficit of cultural capital. For example, compared to white students, Hispanic students, who were over-represented in the lower SES group, seemed to draw on a wider network of family members for tech support, including generation mates (both siblings and cousins) and relatives in their parents' generation.

However, in spite of their resourcefulness in accessing tablets through the program, and in leveraging institutional and social resources for support, lower SES students still faced significant disadvantages compared to their higher SES peers. For example, students in the study were nearly unanimous in maintaining the continued centrality of laptops to accomplishing schoolwork. Higher SES students had, in their device assemblages, more recent, lightweight laptops and several had acquired hybrids, while lower SES students appeared to struggle to maintain access to newer, robust laptops.

When it comes to adoption of ICT, individual choices are constrained by class inequality. However, students from lower SES backgrounds may have a habitus marked by cultural capital, like greater resilience and resourcefulness, that makes them more attuned to opportunities for acquiring new devices, tools, skills and support. Hispanic students, in particular, may have social capital in the form of extensive kin networks from which to draw support for their ICT adoption efforts. In the end, however, they may still experience disadvantages in accessing the right ICT resources for their work, as evidenced by the tendency of higher SES students to move toward hybrids and laptops over time in at least some DISCOVERe courses.

This theme of class stratification reveals the ways institutional adoption of technology practices may diminish equity. It also distinguishes the constituent elements of a practice for adoption of a specific technology relative to the practice to effectively select and use technology; and how promoting a specific technology may hinder segments of the population. This study contributes to ICT adoption research by characterizing students' choices, relative to adoption, in terms of constraints, opportunities and predispositions that shape practice.

Discussion for *Situatedness* of Technology

Statistical analysis of the survey responses and the themes emerging from analysis of the photo diary and focus group interviews revealed ways students' *situatedness* affected their perceptions and meanings associated with adoption of technology. *Situatedness* was a surprise in the research in its utility and veracity as well as its reach and depth. *Situatedness* affects perception and meaning relative to a student's available ICT assemblage, an institutions pedagogical shift towards more use of collaboration, the settings of student work, and class stratification. And *situatedness* heavily informs technology adoption at the micro, meso and macro levels. This paper especially contributes to adoption research by noting that no act of ICT adoption occurs without reference to an actor's ICT assemblage. Relative to educational technology, learning practices, as materially mediated by the available ICT assemblage, both afford and constrain learning activities; while teaching practices, when specifying technology choices, may inhibit learning opportunities for students without a more current and robust ICT assemblage. Mobile technology changes learning practices affording students new ways of interacting within time, space and the material ordered within their space. Finally, class stratification reveals students' adoption choices in terms of constraints, opportunities and predispositions shaped by socioeconomic and ethnic factors. These contributions further the body of research and suggest new trajectories for exploration asking how students' *situatedness*, at all levels and from multiple perspectives, might shape improved learning practices for every student through technologically-mediated activities. Such research trajectories might include the interactions of students and their ICT assemblage within physical space; similarly such interactions within virtual spaces; or the design of pedagogical practices relative to these interactions. Another research program could be designing sociotechnical systems or ecosystems whereby the design, implementation and supports for technology improve adoption for all students. All of these contextual features impact students' decisions to adopt and use tablet technology for schoolwork. ICT adoption decisions are only comprehensible by

exploring the context, including the nature of work, where and with whom it is pursued, the assemblage of ICT tools available, and the physical/mental aspects of embodied practice.

Pitfalls Illustrated by Javier: Why We Need a Critical Techno-Pedagogy

Initial reading and analysis of the artifacts and interview transcriptions led to a hypothesis that a higher socioeconomic condition leads to greater efficacy and expertise. However, subsequent readings and analysis revealed that quality access and meaningful experience improves efficacy and expertise. Quality access to ICT may be affected by socioeconomic condition; higher SES photo diary and focus group participants cited numerous examples of previous meaningful use of ICT based on home, family and school experiences. However, meaningful experience can affect competence and confidence regardless of one's socioeconomic condition.

For example, Javier, a lower SES student from a Mexican immigrant family, reported that he first used computers in pre-school and received a boost in his technological competence when, in 5th grade, he helped a school computer tech set up a computer lab. Javier had his first academically meaningful experiences with a tablet later in high school, when he learned that its mobility meant he could use it to share his college entrance essays with teachers and advisors. As a DISCOVERe student, Javier developed an extensive range of academic uses for his tablet, continuing a meaningful use experience with ICT that stretches back to his early years. The data was inconclusive on whether socioeconomic status or race/ethnicity sufficiently account for previous meaningful experience; although it's clearer that meaningful use experience tends to create increased ICT efficacy and expertise.

Efficacy increased across the first and second phase of the survey for Hispanic and lower SES students, providing statistical support for the qualitative findings that student tablet adoption for schoolwork goes hand in hand with increased technical competence and confidence. These students were also more sanguine about the tech support available on campus and were resourceful about using it, along with wide social networks, to support adoption. In other words, Hispanic and lower SES students in the study are using the opportunities presented by the current institutional context to become more effective adopters and users of tablet technology.

However, tablet promotion at a public university also risks impairing students' abilities to effectively evaluate new technology and how it fits both their own assemblage and their tasks. This pitfall potentially affects all students. Above, we touched on the mismatch between tablet technology and certain STEM fields, where, in spite of the tablet's benefits for collaboration, laptops remain central to common tasks. Also, while higher SES students retain the flexibility to match devices from tablets from their relatively robust assemblages to the tasks at hand, they, too, might be forced to acquire less-than-optimal devices. For example, one higher SES student, Hannah, delayed purchase of a laptop due to the requirement to purchase a tablet for her DISCOVERe course.

But the risks of an uncritical techno-pedagogy are most pronounced for lower SES students. Due to their more highly constrained consumer choices, lower SES students taking adoption cues from the university could be encouraged down a path that both enables an uncritical approach to adoption and creates a path dependence toward suboptimal devices. Javier's inventory of devices at home revealed that, aside from the smartphones owned by his mother, sister and himself (his father used a flip-phone), the family had two iPads, a MacBook and an older Compaq laptop. The Compaq and one of the iPads were pass-backs from Javier to his sister, a high school student, when he got newer devices. Javier said his parents did not use a computer often, but when they needed to, they used his sister's Compaq. However, the Compaq was heavy, overheated easily, and had a short battery life. Javier's sister reported that she preferred to use her iPad because it was lightweight, mobile, and could, in her opinion, do anything the Compaq can do. She liked that she could use the iPad to take notes in class and then "wind down" at the end of the day by using it to listen to music or watch a movie. Still, to write papers, she preferred a laptop or the desktops at school because she did not like

typing on her tablet. Javier said that he has been trying to help her get better at typing on her iPad, and he thought she should get rid of the Compaq laptop because it was heavy, overheated, and had poor battery life compared to the iPad.

Javier's technology adoption choices have had some benefits for his family's tech assemblage. In particular, Javier's enrollment in a DISCOVERe course enabled him to leverage institutional resources and make his sister an iPad owner. Her use, in turn, is situated as a result of her social relationship to her brother in a family with relatively few resources to support her work with a new device. However, from a different angle, Javier and his family are perhaps at risk as a result of his adoption and use of a tablet for school work, and even his participation in DISCOVERe. Javier and his sister agree: the iPad is very useful for school. His sister even says she prefers it to her Compaq, but the reason seems to be closely tied to the disadvantages of that five year old device. They both recognize that they still need a laptop for productive work. The risk for Javier's sister is that, as the junior sibling, she becomes caught in a disadvantaged position vis-a-vis the scarcest ICT device in her household: the laptop. Yet laptops are still the dominant productivity device for college students. She seems to already be learning, perhaps incorrectly, to prefer a tablet over a laptop, when arguably what she really needs to be more effective in school is a new laptop.

Goode (2010) reviews the strong evidence that K-12 schools reproduce digital inequalities by providing lower income students less access to computing devices and lower quality computer-related curricula. Hence, students who most rely on schools for technology access, due to lower access at home, also encounter relatively poor computing resources at those schools, and the school becomes complicit in social reproduction. Javier's story points to this kind of risk: that tablet adoption may be abetting, or at least not addressing, social reproduction of inequality. White, generally higher SES participants in the study seemed to consider what devices best fit their learning context and existing device assemblage, and made consumer choices accordingly. As reported in Focus Group 3, higher SES students tended to move toward laptops as the semester went on. Within the photo diary group, we had two participants who opted to purchase hybrids, which they preferred over their tablets and felt were able to satisfy nearly all of their school work needs. While Javier's entrance into DISCOVERe - and his longer trajectory of tablet adoption for school work - reflected self-efficacy and resourcefulness, he (and his sister) were nevertheless dependent on institutional resources and hence constrained to acquire tablets rather than more powerful and versatile computing devices.

SUMMARY AND DISCUSSION

The findings, in response to the research questions, included 1) variations among students in perceptions, meanings, and practices associated with the adoption of a specific technology; 2) segments of students, based upon sociodemographic variables, for whom there were similar perceptions, meanings and practices; 3) *situatedness* affecting students' adoption of a given technology based upon students' available ICT assemblage, instructional context, settings of student work, and social and cultural contexts; and, finally, 4) technology adoption as a practice, shared from teacher to students and promulgated within an educational institution, may compel some students to adopt a given technology rather than promote the critical practice of effective selection and use of ICT. These findings signal new possibilities for policy and practice.

The existing research is challenged and extended by the finding that variations exist among students relative to the adoption of a particular ICT and that these variations may be correlated with sociodemographic variables thereby constituting segments of the population. This finding affirms the existence of determinants for adoption and that these determinants may be assessed through quantitative analysis of perceptual measures. This study's model, given determinants for the adoption of a specific technology, yielded $R^2 = .38$, $F(6,978) = 101.45$, $p < 001$. Technology acceptance and use studies generally examined a population's perceptions associated with the adoption of a particular ICT within a given context as though that population was homogenous (Venkatesh, Thong & Xu, 2016). Such studies explore determinants for adoption as indicators of a population's rate of adop-

tion-over-time with successful adoptions resulting in a normal curve of 'early' and 'late' adopters (Moore, 1991; Rogers, 2003). However, the findings here show that populations are not homogenous relative to the adoption of a given technology, which conforms to cluster analysis or segment identification, methodologies developed for market research (McCarty & Hastak, 2014; Sarstedt & Mooi, 2014). The finding of sociodemographic patterns in variation within the population validates the use of this study's model, using determinants and moderators relative to the adoption of a specific technology, to determine segments within the population. Given technology's manifold design realizations and ecological affordances, the perceptions of a given segment may be used to improve the design, rollout, and supports for a given technology resulting in accelerated adoption and deeper integration (Neufeld, 2015).

Technology acceptance and use studies, even those with models yielding R^2 from .40 to .70 (Venkatesh et al., 2003), concede the question "what other factors determine adoption"? Alternative models of adoption diminish the focus on adopters' rates of adoption by elevating the effects of sociopolitical contexts (Fichman, 1992; Greenhalgh, Robert, Macfarlane, Bate, & Kyriakidou, 2004), the types of target technologies (Fichman, 1992), the ecological context (Adner, 2012), or the meaning emerging from interactions with the technology, a meaning inseparable from its context or the social world (Dourish, 2004). This study suggests that the *situatedness* of agent and technology is an important factor determining adoption at the micro, meso, and macro levels. The findings related to *situatedness* at the micro level extend the work of Suchman et al. (1999) and Dourish (2004); and, at the macro level, extend Bourdieu's concepts of structure/agency and acknowledge ecosystems power to shape agency (Adner, 2012). This elusive yet ever present factor could only be uncovered through methods like focus group and photo diary interviews.

The first case of *situatedness* was a student's available ICT assemblage. The ecological setting for this case study, the point of adoption of tablet technology for academic purposes, occurred at the intersection of institutional and consumer contexts. Education technology adoption research often focuses on the adoption of this or that technology. Adoption research allowed technological innovations to be considered a *package* with components (Rogers, 2003). The findings here, however, go beyond *package* to propose that adoption of a specific technology is affected by the adopters' ICT assemblage – the set of available ICTs. Recent digital divide research unbundles ICT into components affecting access – this study confirms the notion of the set of ICTs theorizing that individual choices are predicated on individuals' available ICT assemblage including devices, access, and applications. From a social practices perspective, a student's ICT assemblage constitutes the bounded set that materially mediates practice and hence this ICT assemblage limits or extends students' adoption practices.

The second case of *situatedness* was the public higher education context, namely, the drive for collaboration to improve student engagement and deeper learning. Here, industry, institutions, and faculties shift in pedagogical practice affects students' learning practice and hence the nature of students' interactions with technology. This finding confirms the research of Suchman et al. (1999) and Dourish (2004) that meaning emerges from interrelations with others, technology, and the tasks at hand. It also extends social practices theory into the education technology domain, where technology mediates teachers' practices and the interrelation of these practices with students' learning practices. However, following Bourdieu and Giroux, power rests with institutions and faculty rather than students, affecting the interplay of practices in ways that may reduce students' agency.

The third case of *situatedness* was the settings of student work. Modern ICT and students both exhibit greater mobility and hence new ways of learning. This finding moves beyond the social shaping of technology to suggest practices are materially mediated within the interplay of space and ICT. This interplay of technology and space redefines space-as-facilitating-technology (e.g., power charging stations, wifi-enabled hot spots) or space-as-inhibiting-technology (e.g., desks too small for laptops). The interplay of technology and space gives rise to manifold realizations prescribing how and where students work with technology for learning.

The fourth case of *situatedness*, at the macro level, is the class stratification within the social and cultural context of U.S. society. Students' social *situatedness* may limit access to ICT and more importantly the effective adoption of ICT. This social *situatedness* creates privileges for students from higher socioeconomic conditions like the ability to effectively enrich their own ICT assemblage. This study considered socioeconomic conditions as incumbent upon yet exogenous to agents while giving credence to asset-based considerations affecting agent decisions. This perspective allowed the researchers to view choice, as a reflection of student agency, along a continuum where students with higher socioeconomic conditions chose better devices and where students with lower socioeconomic conditions chose, given their cultural values, to enrich their family's ICT assemblage.

The researchers in this study intentionally brought theoretical perspectives to inform methods and analysis, while remaining open to the hermeneutic unfolding of the phenomenon of ICT adoption. There is a long tradition of adoption studies using perceptual determinants of acceptance and use behavior (Dwivedi, Rana, Chen, & Williams, 2011). Venkatesh et al. (2013) and Rogers (2003), in their more recent research, advocated the use of mixed methods to better understand the phenomena of adoption. Quantitative analysis alone, while important, could not have uncovered the findings revealed through focus groups and photo diary interviews. This study confirms the value of ethnomethodology in ICT adoption studies and extends such ethnomethodological research (Delcore, Teniente-Matson, & Mullooly, 2014; Gabridge et al., 2008).

Educational technology adoption studies usually consider the perspective of institutional systems, leadership, or faculty – few consider adoption from the student perspective (Broos, 2005; Dahlstrom et al., 2015). However, research from participative or user-centered design suggests effective design of ICT requires understanding of personas representing segments of a population (Holmlid, 2009; Miaskiewicz & Kozar, 2011). This is especially critical given students' ICT adoption choices occur within complex, consumer ecosystems and within power structures balanced towards faculty and the institution.

The theoretical perspectives and findings culminate in a story about Javier, intimations of the pitfalls associated with the institutional promotion of a specific technology. This study revealed that, for a given social practice, similar physical activities can be associated with different mental activities, especially for different segments of a population. The same social practice, ICT adoption for learning, yielded mental and physical activities that varied between segments of students. Students from lower socioeconomic conditions chose to improve their family's ICT assemblage and/or live within the sociotechnical system's directives for the adoption of a given technology. Students, regardless of their socioeconomic conditions, developed new practices as they interacted with teachers' practice of ICT adoption for teaching and the institution's practice of ICT adoption. The effectiveness of students' practice of ICT adoption for learning was greatly dependent upon the institution and teachers adoption practices thereby determining whether students gained the critical practice of effectively selecting and using technology.

This study contributed to research as follows: 1) evidence for, and methods to, extract segments within populations based upon perceptions and meanings associated with the adoption of a technology practice, 2) evidence for, and methods to ascertain, *situatedness* that affects segments' adoption of a technology practice, 3) a practice-oriented approach that distinguishes adoption of a specific technology relative to efficacious practice of selecting and using ICT, and 4) how promoting adoption of a specific technology, given effects of *situatedness* and variations in segments, may help or hinder the adoption of the critical practice of effectively selecting and using technology thereby affecting students' participation in modern society. The methods and findings evoke manifold opportunities for future research including replications of this study in other educational contexts, the extension of adoption models to include ICT assemblage and *situatedness*, and studies honoring students-as-adopters in ICT adoption studies. Future studies might explore what happens when ICT design incorporates or accommodates preferences of segments of students, what happens to student practices

when teachers demonstrate effective selection and use of ICT, and what happens when students experience authentic choice in selection and use of ICT.

This study suggests refinements to educational technology policies and ICT adoption practices. Policy should acknowledge and accommodate segments or clusters of students who have variations in perceptions of ICT, differences in ICT assemblages, and dissimilar *situatedness*. Policy should encourage ICT adoption, at a programmatic-level, that realizes effective targeted interventions to reduce inequity in ICT adoption. Practice should accommodate variations among segments by tuning ICT designs, implementations, and supports for each segment. Policy can reward effective ICT adoption practices, and effective adoption practice can result in deeper integration and shorter time to adoption. Policy may require student participation in the design, implementation, and support for prospective ICT adoptions and that such student voice be informed by a diverse set of students. Policy may also dictate the supports for and level of ICT adoption and integration in faculties' instructional practice or students' learning practice required before a program receives full funding. Policy must reconstitute the digital divide as both a function of students' available ICT assemblage as well as students' competency with the practice of ICT adoption. Institutions and teachers may model ICT adoption practices that are pro-technology and pro-adoption or they may foster mature student-centered ICT adoption in ways that cultivate the competent practice of effectively selecting and using ICT.

CONCLUSION

Practice is what one does when one does what one does instinctively and intentionally – a complicated expressive gesture that cannot be broken down into discrete symbols or a choreographic snapshot. Humans, always able to improve the skillfulness of their practices, must now learn the technological practices of effectively selecting and using technology and co-shaping their futures in relation to technology. Skillful practice must be attuned to *situatedness* and context. Successful practices produce capital in all its forms.

Institutions of higher education, in their ICT adoption practice, may now discover variations among student populations for the adoption of an ICT using a mixed methods approach that provides sufficient veracity and utility to accommodate each student segment through design, implementation, and supports that equitably improves ICT adoption by each student segment. Institutions and faculty can then constitute students' adoption of ICT for learning practice based upon each segment of students' beliefs and behaviors to ensure equitable adoption of effective ICT for learning practice. Institutions and faculty, through the development of ICT adoption practices, will learn to shape efficacious ICT adoption practice among students – carefully growing among students the critical know-how and beliefs so every student can effectively adopt ICT in ways that further their own and common goals. Such intentional practice ensures every student becomes competent to critically and effectively choose how they adopt ICT.

A critical techno-pedagogy understands that students' technological practices, as learned perspectives and embodied practices, affect students' participation as co-agents within socio-technical systems of education, employment, and life in current and as-yet-imagined futures. A critical techno-pedagogy is mindful of the hegemonic influence of technology firms upon education; is attentive to the non-technological dimensions shaping socio-technical systems; and is aware that technological practices embody and engender values, thereby reproducing inequity or inclusion (Feenberg, 2002; Selwyn, 2011; Verbeek, 2011; Warschauer, 2004). Institutions intent to adopt this or that technology must not forget the future-ready imperative of cultivating students' critical techno agency, namely, setting students on the journey of effectively selecting and using technologies in ways that realize their participation in an information economy and networked society.

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APPENDIX A: SURVEY

Student Acceptance and Use of Tablet Computers

Q1.1 Welcome to the Student Acceptance and Use of Tablet Computers Survey. This survey explores student's perspectives on the acceptance and use of tablet computers. We're asking you to share your perspective. This survey should take less than 10 minutes.

We define a "tablet" as a personal electronic device with a touch screen. It may but does not need to have a detachable keyboard. It is not a laptop with a keyboard that cannot be detached. It is not a mobile device that is mostly used as a phone.

We define "class work" as school related work done during a class and "homework" as school related work done outside of the class. We define "school work" as school related work done inside and/or outside of the class.

The information gathered from this study will remain anonymous except as required by law. Your decision to participate or not will not affect your relationship with your professor or with the university in any way. The Committee for the Protection of Human Subjects has reviewed and approved the present research. Questions regarding the rights of research subjects may be directed to the Chair of the Committee for the Protection of Human Subjects.

I am at least 18 years of age and agree to participate in this study

Yes (1)

No (2)

Q2.1 Are you enrolled in at least one course where your teacher expects use of a tablet for class work or homework (not a computer or a laptop)?

Yes (1)

No (2)

Q2.2 [This question only appears in the second phase of the survey and only if the respondent answers Yes to Q2.1]? Please rank in order the reasons why you took a tablet course in which you are enrolled?

Degree requirements

Course fit schedule

Specific faculty teaching course

Friend's recommendation

Course used tablet technology

Do not know.

Q3.1 I think using a tablet would help me do work in class more quickly.

Strongly Disagree (1)

Disagree (2)

Agree (3)

Strongly Agree (4)

Don't know (5)

Q3.2 I think using a tablet would allow me to be more efficient with homework (to work faster or get more homework done).

Strongly Disagree (1); Disagree (2); Agree (3); Strongly Agree (4); Don't know (5)

Q3.3 I think using a tablet would be helpful during class.

Strongly Disagree (1); Disagree (2); Agree (3); Strongly Agree (4); Don't know (5)

Q3.4 I think using a tablet would help me be more organized.

Strongly Disagree (1); Disagree (2); Agree (3); Strongly Agree (4); Don't know (5)

Q3.5 If I had unlimited access to a tablet, I would use it for non-school activities whenever I could.

Strongly Disagree (1); Disagree (2); Agree (3); Strongly Agree (4); Don't know (5)

Q3.6 I think learning to use a tablet would be easy for me.

Strongly Disagree (1); Disagree (2); Agree (3); Strongly Agree (4); Don't know (5)

Q3.7 I think it would be easy for me to develop the skills needed to use a tablet.

Strongly Disagree (1); Disagree (2); Agree (3); Strongly Agree (4); Don't know (5)

Q3.8 I think homework would be easier to do if I used a tablet.

Strongly Disagree (1); Disagree (2); Agree (3); Strongly Agree (4); Don't know (5)

Q3.9 I think checking on class assignments would be easier to do if I used a tablet.

Strongly Disagree (1); Disagree (2); Agree (3); Strongly Agree (4); Don't know (5)

Q3.10 I think it would take me more time to do my homework if I used a tablet.

Strongly Disagree (1); Disagree (2); Agree (3); Strongly Agree (4); Don't know (5)

Q3.11 I think my family believes I should use a tablet to do my school work.

Strongly Disagree (1); Disagree (2); Agree (3); Strongly Agree (4); Don't know (5)

Q3.12 I think my friends believe I should use a tablet to do my school work.

Strongly Disagree (1); Disagree (2); Agree (3); Strongly Agree (4); Don't know (5)

Q3.13 I think my teachers at this university believe I should use a tablet to do my school work.

Strongly Disagree (1); Disagree (2); Agree (3); Strongly Agree (4); Don't know (5)

Q3.14 I think my classmates believe I should use a tablet to do my school work.

Strongly Disagree (1); Disagree (2); Agree (3); Strongly Agree (4); Don't know (5)

Q3.15 If I needed help using a tablet, I would know how to get help.

Strongly Disagree (1); Disagree (2); Agree (3); Strongly Agree (4); Don't know (5)

Q3.16 I think I could figure out what I would need to know to use a tablet.

Strongly Disagree (1); Disagree (2); Agree (3); Strongly Agree (4); Don't know (5)

Q3.17 If I needed help using a tablet, I think I would know how to get help from the University Help Desk.

Strongly Disagree (1); Disagree (2); Agree (3); Strongly Agree (4); Don't know (5)

Q3.18 If I needed assistance using a tablet, I think I would be able to get help from friends or family.

Strongly Disagree (1); Disagree (2); Agree (3); Strongly Agree (4); Don't know (5)

Q3.19 If I had unlimited access to a tablet, I would use a tablet for classwork during class time in …

None of my courses (1)

Some of my courses (25)

Most of my courses (3)

All of my courses (4)

Don't know (5)

Q3.20 If I had unlimited access to a tablet, I would use a tablet to do homework for …

None of my courses (16)

Some of my courses (2)

Most of my courses (3)

All of my courses (4)

Don't know (5)

Q3.21 If I had unlimited access to a tablet, I would use a tablet for non-school work

None of the time (40)

Some of the time (41)

Most of the time (42)

All of the time (43)

Don't know (5)

Q3.22 Before I came to the university, I regularly used a computer or a tablet to do classwork in high school or at my previous college.

Strongly Disagree (1); Disagree (2); Agree (3); Strongly Agree (4); Don't know (5)

Q3.23 Before I came to the university, every student had easy access to a computer or a tablet at the high school or previous college I attended.

Strongly Disagree (1); Disagree (2); Agree (3); Strongly Agree (4); Don't know (5)

Q3.24 If you encountered a challenge using a tablet, what is the level of help you would need to overcome the challenge?

I could figure it out on my own. (1)

I would need online help or training. (2)

I would need someone available to help me by phone. (6)

I would need someone available to help me face-to-face. (3)

Don't know. (5)

Q3.25 I think using a tablet would make homework more enjoyable.

Strongly Disagree (1); Disagree (2); Agree (3); Strongly Agree (4); Don't know (5)

Q3.26 I think using a tablet for homework might distract me from doing the actual work.

Strongly Disagree (1); Disagree (2); Agree (3); Strongly Agree (4); Don't know (5)

Q3.27 I think spending money on a tablet to help me do school work would be worth it.

Strongly Disagree (1); Disagree (2); Agree (3); Strongly Agree (4); Don't know (5)

Q3.28 I currently use a tablet for homework.

None of the time (1)

Some of the time (2)

Most of the time (3)

All of the time (4)

Don't know (5)

Q3.29 I currently use a tablet during class time.

None of the time (1)

Some of the time (2)

Most of the time (6)

All of the time (3)

Don't know (5)

Q3.30 I currently use a tablet for non-school work.

None of the time (1)

Some of the time (2)

Most of the time (3)

All of the time (4)

Don't know (5)

Q3.31 I have regular access to a tablet.

Yes (1)

No (2)

Q4.1 What is your ethnic background? Select all that apply.

American Indian and Alaskan Native (1)

Asian (Please specify; e.g., Chinese, Hmong...) (2) _____

Black or African American (3)

Hispanic, Latino or Spanish origin (4)

Native Hawaiian and Other Pacific Islander (5)

White (6)

Other (Please specify) (7) _____

Prefer not to answer (8)

Q4.2 Are you the first person in your family to attend college?

Yes (1)

No (2)

Don't know (3)

Q4.3 In high school did you "receive free or reduced lunch"?

Yes (1)

No (2)

Don't Know (3)

Q4.4 What is your gender?

Female (1)

Male (2)

Other (5)

Prefer not to answer (6)

Q5.1 There is a drawing for $25 and $10 Bulldog Bucks gift certificates. If you want to be in the drawing you will need to provide your contact information. The drawing will be within 7 days after this survey. Contact information will be deleted after the drawing. Do you want to be entered in the drawing?

Yes (1)

No (2)

Q5.2 Just like the survey you took, additional input on student perspectives will be collected through the use of photo diaries and focus group interviews. We invite you to participate in one or more of these opportunities to provide feedback. The information will be used to improve technology services on campus. [A photo diary includes taking photos using your smartphone based upon a prompt related to tablet technology. A focus group is a group of students coming together and discussing some questions related to tablet technology.] Please indicate below where you would be willing to participate.

Photo Diary (1)

Focus Group Interview (2)

Both Photo Diary and Focus Group Interview (3)

Neither (4)

Q5.3 This study also explores academic indicators and their relation to how students adopt and use new technologies. The consent below permits the research team to review your academic records for research purposes only, and the results of that review will remain confidential. Please indicate your consent to participate in this important study by selecting YES and entering your Student ID in the contact information below.

Yes (1)

No (2)

Q6.1 You chose to participate in the drawing or additional research, so please enter your contact information below.

Student ID (8)

First Name (9)

Last Name (5)

Email Address (2)

Phone Number (4)

Thank you for your participation!

APPENDIX B: SURVEY VERBAL INTRODUCTION

Phase I

"Hello. I'm [insert name]. I'm part of a research team exploring the acceptance and use of tablet technology by students. This information will be used to improve technology services on campus and inform research regarding student adoption of educational technology.

Today, we're asking you to participate in a survey that explores student's perspectives on the acceptance and use of tablet computers. This survey is phase one of a two-phase survey - which means the survey is given now and again in November. This survey should take less than 10 minutes. The survey should work on any mobile device including a computer, laptop, tablet or smartphone.

Your participation in this survey is voluntary. However, your perspective is very important so we appreciate your time. Please click through the link provided to you and begin the survey."

Phase II

"Hello. I'm [insert name]. I'm part of a research team exploring the acceptance and use of tablet technology by students. This information will be used to improve technology services on campus and inform research regarding student adoption of educational technology.

Today, we're asking you to participate in a survey that explores student's perspectives on the acceptance and use of tablet computers. This survey is phase two of a two-phase survey. This survey should take less than 10 minutes. The survey should work on any mobile device including a computer, laptop, tablet or smartphone.

We also want to let you know that there are opportunities to participate in additional research opportunities. One opportunity is what is called a photo diary -where you take photos using your smartphone and then jot a note down with each photo. We provide a prompt and, after seven days, we may interview you about your photo diary. The other opportunity is a focus group. Both opportunities include a small thank you gift for your participation.

Your participation in this survey is voluntary. However, your perspective is very important so we appreciate your time. Please click through the link provided to you and begin the survey."

APPENDIX C: PHOTO DIARY PROMPT

Materials needed: Smartphone

If you have not done so already, please visit your smartphone's app store and download the free app called, dscout. Dscout enables you to submit "snippets" (dscout lingo for pictures and comments) to the researchers. The research team will access your snippets online using a password-protected dscout website. Your pictures and comments will remain anonymous. The web server on which they reside will be protected from public view. Only the research team will see your snippets. If you have any problems making dscout work, a research assistant is available to help you.

In the next two weeks, you will be looking for opportunities to take pictures based upon the prompts. Each time you take a picture, use the dscout comment box to briefly describe the context of the picture and why you took it. If you don't encounter some of these situations, it's ok. Do what you can and we will talk about the results when we meet.

First, tell us a little about the people and technology around you.

If you live in the household in which you grew up, or visit that household during the photo diary period, please:

Make a photo inventory of all computing devices in the household.

Ask at least one person in the household, whose technology skills and knowledge you respect, which device he or she think would be the most important for school and why (take the individual's photo if he or she are willing and if they are not willing then a photo of the device).

If you do not live in the household in which you grew up, or do not visit that household during the photo diary period, please do an inventory with the people with whom you currently live. If you live alone, please do this with a group of peers.

Next….

During the next ten days, please take a picture of your tablet and the surrounding workspace every time you use your tablet for school work, both in and out of class (make sure to capture those times when you had challenges making your tablet work for you).

Specifically, take a picture of your workspace when you are using your tablet for school work or for your inventory of devices at home. Give your snippet a title. Then briefly, identify where were you and what were you doing when you took the picture. If you were having trouble with your tablet, tell us about that.

APPENDIX D: PHOTO DIARY INTERVIEW QUESTIONS

The Pictures

At each picture, restate the participant's comments on the snippet and ask them to elaborate.

For example, the research might say "In this snippet, you took a picture of a blank screen on your tablet and said, 'I don't know why it's doing this.'"

To what item on the prompt was this snippet directed? (Possible answers include, "You found you have the appropriate knowledge to use your tablet effectively.")

Where were you when this happened?

What were you trying to accomplish at this point?

How did you handle the problem?

What would have made you more effective in this situation?

We appreciate your participation and have a $25 Starbucks gift card available to each participant. Thank you.

APPENDIX E: FOCUS GROUP INTERVIEW MODERATOR SCRIPT

Welcome and Introductions

Thank you for agreeing to participate in this focus group interview. We appreciate your willingness to participate. I, [name], am the moderator for this focus group interview. My colleague, [name], will be recording our conversation and taking notes.

Purpose

This study is exploring student's acceptance and use of tablet technology for academic purposes. We want to hear your perspective so please be open with us as you share your thoughts.

Ground Rules

We want you to do the talking. We want everyone to participate. So I may call on you if I haven't heard from you in a while.

There are not right or wrong answers. Everyone's perspective is valuable. So speak up whether you agree or not.

What is said here stays here. We want you all to feel comfortable sharing your perspectives.

We will be tape recording our conversation. We want to capture everything that is said. We won't identify any one by name in our reports.

Guided Interactions

We first want to explore [performance expectancy] where you see tablet technology as useful, better than the alternatives, or particularly valuable.

Would a tablet enable you to do your homework faster? If so, how?

When would you find a tablet especially useful, helpful or valuable? [After exploring each episode then ask, with appropriate time for processing] Why was the tablet especially useful in such a situation?

Next, we want to explore [facilitating conditions] where you have had a particular challenge with tablet technology and what you did to get this resolved.

If you encounter a challenge using a tablet, what is the level of help you would need to overcome the challenge? For example, you might believe any of the following: I could figure it out on my own; I would need online help or training; I would need someone available to help me by phone; I would need someone available to help me face-to-face.

When would you find the tablet especially challenging and what did you do to resolve this challenge?

Finally, we want to explore [social influence related to performance expectancy] what your family and friends believe is more valuable: a smart phone, tablet computer, or laptop computer.

Which device; a smart phone, tablet computer, or laptop computer; would your family and friend believe is the more valuable device? Why would they think this device is more valuable?

Are there times when the second or third most valuable device is more helpful, useful or valuable?

Closure and Dismissal

Is there anything else you would like to say about what makes a tablet computer valuable or useful?

We appreciate your participation and have a $10 Starbucks gift card available for each participant. Thank you for participating in this group study.

APPENDIX F: CLOSED CODES

Function of Information and Communication Technology (ICT)

Note: Can code for more than one in this group, however, VALPRO and VALCON must be mutually exclusive. VALPRO and VALCON are both present, decide which is dominant and code for that.

Value Generation-Production (VALPRO): Student is using ICT to produce text, audio, video, or some other output. Includes both paper and pen products and digital products. Examples include doing problem sets, writing a paper, composing a presentation, editing video. When coding snippets, apply this code when production is the dominant activity.

Value Generation-Consumption (VALCON): Student is using ICT but not producing output. Includes reading, studying for an exam. When coding snippets, apply this code when consumption is the dominant activity.

Access (ACCX): Student is using ICT to access information. Examples: using a search engine or database. When coding snippets, apply this code whenever present, even if not the dominant activity.

Control (CONX): Student is limiting or enabling others' access to some resource, either digital or physical. (We are unlikely to see this.)

Entertainment (ENTX): Student is using ICT in a way that they identify as primarily about enjoyment, relaxation, etc. When coding snippets, apply this code whenever present, even if not the dominant activity.

Collaboration (COLX): Student is using ICT in a way that brings them into contact and engagement with others. Can be about school (e.g. using Google Drive to give a classmate feedback on a shared assignment) or non-schoolwork (e.g. online multi-player game). When coding snippets, apply this code whenever present, even if not the dominant activity.

Type of Work

Schoolwork (SCHX): The work is in response to school requirements or assignments. When coding snippets, apply this code when schoolwork is the dominant activity.

Non-Schoolwork (NONX): The work is NOT in response to school requirements or assignments. Could include entertainment, hobby-related activities, etc. When coding snippets, apply this code when non-schoolwork is the dominant activity.

Location

In-class (INCX): Student is in a classroom while class is in session.

Residence (RESX): Student is at home (defined as where they are sleeping).

Public-off-campus (OFFX): Student is in a public space off-campus.

Public-on-campus (ONX): Student is in a public space on-campus.

Constructs

Performance Expectancy (PERX): The situation registers performance expectancy, defined as "the degree to which an individual believes that using the system will help him or her to attain gains in job performance" (by being more effective or efficient). Includes cases when the tablet actually helped or hindered job performance. Beware of simple declaratives about function; it is PERX when it is said or seen to actually increase/decrease or improve/impede performance.

Effort Expectancy (EFFX): This is about ease of use. The situation registers effort expectancy, defined as "the expected degree of ease associated with user's use of technology." Includes cases when the tablet, including its OS and apps, actually was or was not easy to use. Beware simple statements of function; it is EFFX when it is said or seen to be easy/difficult to use.

Social Influence (SOCX): The situation registers social influence, defined as "the degree to which an individual perceives that important others believe he or she should use the new system." Also includes any mention of social influences on choice to use or not use (e.g. a prof encourages a student to download and use a new app on a tablet for the course - without supporting or personally facilitating that action).

Facilitating Conditions (FACX): The situation registers facilitating conditions, defined as "the expected degree to which an individual believes that organizational and technical infrastructure exists to support use of the system. This is the user's perception that resources and support will be available to help the user perform the desired activity." Includes any mention of steps taken to resolve challenges to use, or any support offered by a representative of the university to facilitate use (e.g. a prof talks a class through the download and use of a new app for use on the tablet in the course).

Devices

Note: Include both devices pictured and devices mentioned, even if they are not in the picture. When coding snippets, assign one code to each device present.

Cell Phone (CLPH): Personal communications device that is intended for cellular communications and Internet browsing functionality is at best limited.

Smartphone (SMPH): Personal communications device that supports Internet browsing and the use of device specific applications or 'apps'. Phablets are phones with large screens and this will be coded as Smartphone.

Tablet (TBLT): Portable personal computer with a touch screen as its primary input device (EDUCAUSE, 2014). It normally does not have the compute capacity of a laptop. It may have a detachable keyboard. Slates are tablets where the keyboard is optional and this will be coded as Tablet.

Laptop (LPTP): Portable personal computer with a keyboard as its primary input device. It may have a detachable keyboard.

Hybrid (HYBD): Portable personal computer with a detachable keyboard and a touch screen. The user may choose to use the computer as a tablet (detach keyboard, use touch screen) or a laptop depending upon the circumstance. Laplet or 2-in-1 is also used as a term for a laptop/tablet with a detachable keyboard and more processing power. However, the term Hybrid will be used here.

Challenges

Note: Apply these for challenges related to tablets only.

Knowledge (KNGE): The student was challenged due to a lack of knowledge expressed as "I did not know how to..." or evidenced by "I then was able to … when I learned how." When coding snippets, apply this code whenever present, even if not the dominant challenge.

Connectivity (COTY): The student was having difficulty connecting to the Internet, wired or wireless connection. The student may be experiencing this due to a problem with wireless or broadband access. When coding snippets, apply this code whenever the student cannot connect to the Internet, even if not the dominant challenge.

Equipment (EQNT): The student has a device failure due to a hardware problem or the because the base operating system is not working. This may be evidenced by "device won't turn on", "screen goes black (or white)", "screen is broken" etc. When coding snippets, apply this code whenever present, even if not the dominant challenge.

Applications (APNS): The student is having difficulty with an app or application. This can be the result of a bug in the application (e.g., the app just disappears or quits), an authentic issue (e.g., can't log on), a functional issue (e.g., it won't save my ePortfolio to Blackboard), or a compatibility issue (e.g., Notability version x does not work with iPad version y). When coding snippets, apply this code whenever present, even if not the dominant challenge.

Performance (PECE): The student is having difficulty because their device, application or Internet connection is performing poorly. This may also be caused by Internet access beyond their device being negatively impacted or the enterprise/cloud service supporting the app or application performing poorly. Nonetheless, the student is experiencing poor performance. This may be evidenced by comments like "the application crawls" or "this web page is really slow but I can watch a YouTube video without a problem." When coding snippets, apply this code whenever present, even if not the dominant challenge.

Convenience (CONVX): Registers the person's experience of the physicality of the device and/or the relation of the device to the physical environment. Includes traditional understandings of "convenience," such as not wanting to carry three devices (laptop, phone, tablet), or feeling the portability of a tablet confers an advantage over laptops. Also includes ergonomic experiences such as the tablet fitting well on a small desk or on your thigh, or preferring a laptop's larger keyboard and screen to type text. Device relation to the physical environment includes, for example, lack of outlets for charging, room lighting, etc.

BIOGRAPHIES

Dr. Philip Neufeld is the Executive Director, Technology Services, at Fresno Unified School District, a diverse urban district with 72,000 students. Previously Philip served as Senior Director, Technology Services, at California State University, Fresno, a Hispanic-serving institution with 21,000 students. Philip currently teaches Education and Technology in the Educational Leadership Doctoral Program at Fresno State. He has over 30 years of leadership experience, mostly I.T. related, in industries including healthcare; agriculture; water management; as well as software and data services. He has an MBA in I.T. and an Ed. D. in educational leadership from California State University, Fresno, and a B.A. in History from the University of Winnipeg. Philip serves to shape educational ecosystems to empower effective and equitable 21st century learning experiences better preparing students for learning, work, and life.

Dr. Henry D. Delcore is a Professor of Anthropology at California State University, Fresno. His research explores the nature of student work and its relationship to technology, physical infrastructure and the built environment. He is also involved in design and user experience research both on and off campus, using anthropological methods to generate ideas for designing better products and services. Dr. Delcore has a M.A. and Ph.D. in Anthropology from the University of Wisconsin-Madison and a B.S. in Foreign Service, Asian Studies from Georgetown University.