A Closer Look at a Tablet PC Program: The Faculty Perspective

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Abstract **- The uses of technology and software in the classroom continue to evolve as educators strive to prepare the next generation for their own career choices. One such technology, the Tablet PC, promises increased interaction and organization, seemingly potential benefits to any college student. As with any tool, the value of the Tablet PC should be measured and evaluated to recognize its benefits and disadvantages and to improve its use as an educational tool. In 2004, a Tablet PC program was implemented at the engineering school of a public institution. Each faculty member and student was given a Tablet PC in the first year. Since 2005, incoming freshman students were required to purchase their own Tablet PC and the faculty continued with the Tablet PC's provided by the school. In this study, questionnaire responses from the instructors are evaluated, with preliminary results on the educational and ergonomic impacts of the Tablet PC program. Understanding the implementation process and impact in one program may help other colleges improve their own programs or processes.**

Index Terms – Tablet PC, College, Instructor, Education, Ergonomics.

INTRODUCTION

Many institutions all over the US are incorporating mandatory computer programs for their students, and the majority of these programs involve mobile computers, either Laptop PC or Tablet PC. Computer requirements appear to be driven by the perceptions of them as tools for learning and highly relevant to students' future careers [1]. As with any learning tool, it is important to evaluate the tool's impact on students; this depends, in part on the extent to which instructors effectively use the tool.

Programs tend to vary by institution, with respect to scale, extent of planning and involvement of faculty, and selection of participating faculty and students [2]. A review of the literature reveals that Tablet PC programs are generally viewed favorably by instructors when they have been given the option to participate in the program. Weitz et al (2006) assessed faculty perspectives on their use of Tablet PCs for university-level teaching and learning, during a one semester pilot effort [3]. Faculty from this institution were already experienced Notebook PC users; in spite of this, only one-third volunteered for the Tablet PC pilot project. End-of-semester survey responses from the 64 participants revealed fairly low use of Tablet PC-specific functionality, with few exceptions, though satisfaction with using those features in-class or out-of-class was generally positive amongst those who used them. Smaller scale programs seem to yield similarly overall positive perceptions of Tablet PCs by faculty who volunteer or are chosen to use them through a competitive section process [4,5,6].

Given the paucity of published information about university faculty experiences with Tablet PC programs, a study was conducted in order to gather data on this topic; information about the students' experiences was gathered at the same time. This paper only presents results from the faculty portion of the study.

Study participants were members of the engineering faculty at the University of Louisville (U of L), where a Tablet PC program was implemented in 2004. Each faculty member and student was given a Tablet PC in the first year of the program. Since 2005, incoming freshman students have been required to purchase their own Tablet PC and the faculty continue to use Tablet PCs provided by the college.

The research team was interested to learn: what the instructors brought with them to the Tablet PC program (in terms of prior computer experience), how they used instructional technology once in the program, their perceptions of the training provided through the program, what effects they felt the program had on students, and what their experience was with the Tablet PC from an ergonomics perspective (including their patterns of use and musculoskeletal discomfort attributed to PC use).

METHODS AND MATERIALS

Questionnaire

The questionnaire used in this study was based on previous questionnaires studying computer users, including

high school students and teachers, college students and professional workers [7,8,9,10]. The Institutional Review Board approved the protocol for the study.

Participants answered questions specific to their primary computer: a Desktop PC (DPC), Laptop/Notebook PC (LPC), or Tablet PC (TPC), as well as questions that were not specific to one type of form factor user or another. The results presented in this paper focus on the impacts of the TPC program on faculty and students' performance in the class.

Subjects

A listing of faculty and lecturers was obtained from U of L's Speed School of Engineering (SSE). Each member was invited to participate via email. The email briefly explained the study, and that participation was voluntary. An informed consent paragraph was at the beginning of each on-line questionnaire. Compensation for participating in the study was given in the form of a t-shirt. The response rate was calculated by comparing the number of instructors in the college to the number of questionnaire respondents.

Main elements of questionnaire

Evaluation of the instructor's ability and willingness to incorporate the technology in the classroom consisted of four main elements: Prior PC experience, PC/technology use, Attitudes & Perceptions, and Training (Figure 1). Each area is explained below:

- **PC experience**: instructors' perceptions of their computer skills and their comfort with using technology (PC Comfort and Skills).
- **PC/Instructional technology use:** computer form factors used by instructors; types of software used; patterns of PC use (where and when).
- **Attitudes & Perceptions:** instructors' attitudes towards instructional technology (including PC); views on obstacles to using instructional technology; perceptions of pressure to use Tablet PC; perception of effects on student performance; musculoskeletal discomfort associated computer use.
- **Training:** about training that was offered and training needs.

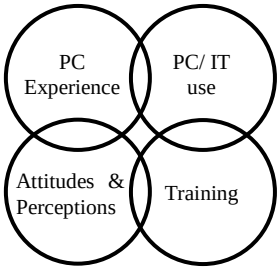

FIGURE 1: MAIN ELEMENT REVIEWED FOR THE FACULTY PERSPECTIVE

Microsoft Excel was utilized to generate descriptive statistics, and statistical analyses (ANOVA) were completed using SAS Enterprise Guide 4.1. The Friedman's test was followed by the Bonferroni (Dunn) test. Associations between variables were assessed using Spearman Correlation Coefficients.

RESULTS

The study was conducted in the 2008-2009 academic year, three years after the Tablet PC program began. Sixty-six instructors entered the study, for an initial response rate of 73%. The completion rate was 78% for those who entered the study (n=50).

Demographics

Ten women and 40 men completed the questionnaire. Ethnicity identification amongst respondents were as follows: 34 White, non-Hispanic, 8 Asian or Pacific Islander, 3 Hispanic/Latino, 2 African-American, and 1 multi-ethnic. Ages ranged from under 30 to over 60 years. There was a bimodal distribution with respect to rank, with 20 Assistant Professors and 23 Professors participating, along with 3 Associate Professors and 1 lecturer. Eight engineering departments were represented.

PC Experience

PC Comfort and Skills

Most instructors appeared to be confident in their computer skills and working with computers, at an overall level. For example, when asked whether they agreed or not to following statements: "I feel confident in my computer skills", and "I like learning and working with computers", over 70% responded in the affirmative (Figure 2).

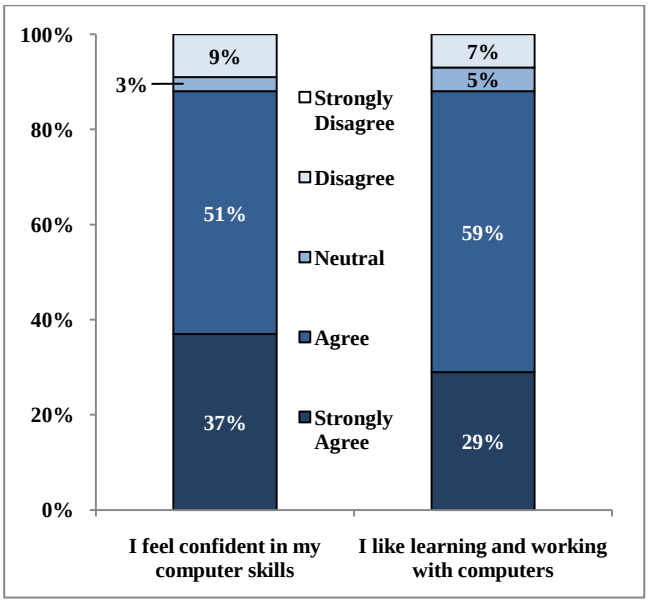

FIGURE 2: CONFIDENCE IN COMPUTER SKILLS AND COMPUTER USAGE AMONG INSTRUCTORS

Most instructors reported that they first felt comfortable using a computer (PC Comfort) before or during their own college experience (87.5%), and a smaller proportion while teaching (12.5%).

PC/Instructional technology use

Frequency of use

Most instructors reported daily use of more than one computer form factor. Table 1 shows form factor categories and combinations of use by respondents. When asked which computer was considered their main (primary) PC, or which one PC they use most often, the TPC was indicated by only 10% of the instructors (Table 2).

TABLE 1: DAILY USE OF COMPUTERS

	TPC	LPC	DPC	
Multiple PC	x	x	x	22%
	x	x		4%
	x		x	18%
		x	x	26%
One PC	x			6%
		x		10%
			x	14%

TABLE 2: MAIN COMPUTER TYPE DISTRIBUTION

% Instructors	Reported as the Main PC Type
10%	**Main PC is the TPC**
22%	Main PC is the LPC
66%	Main PC is the DPC
2%	Does not have a Main PC type

Instructors did not rate their computer skills with the TPC as high as with the LPC ($F=4.42$, $p<0.005$). As seen in Figure 3, the percentage of instructors indicating an intermediate skill level or higher for each computer configurations was Desktop PC (79%), Laptop PC (91%), and Tablet PC (79%).

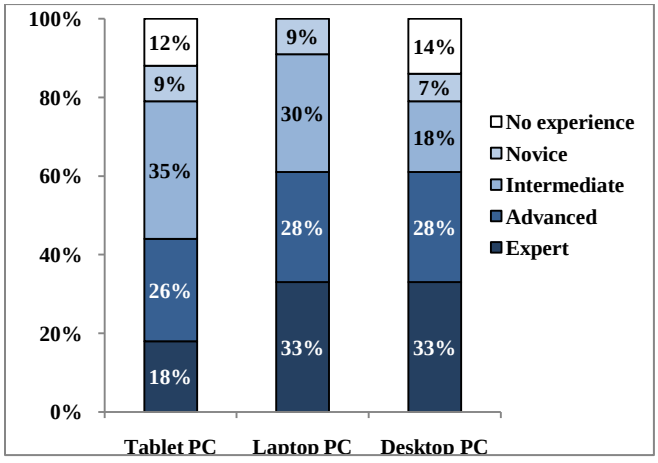

FIGURE 3: PARTICIPANTS' REPORTED SKILL LEVEL BY THEIR MAIN COMPUTER TYPE

PC software in/for class

Instructors were asked to rate their abilities with a variety of information technology (IT) elements, including software available to instructors and students. The results for software varied, mainstream programs probably in use longer by instructors (such as the MSOffice Suite) rated higher when compared to DyKnow which was adopted along with the TPC program three years ago.

The SSE campus uses the Microsoft Windows operating system and software. Instructors indicated a level of at least intermediate skill or higher in using PowerPoint (91%), Word (93%) and Excel (96%). Other traditional programs with similar historical use followed MSOffice Suite skill rankings. For example, 83% of instructors reported intermediate skill or higher with Blackboard. However, instructor's skill with more recently introduced programs, such as DyKnow Vision, was much lower, with only 19% reporting intermediate or higher skill levels (Figure 4). In addition to this, only seven instructors reported using DyKnow in class.

Comparison of Information Technology skill

To illustrate the contrast in reported skill level between the traditional programs (MSOffice Suite) versus more recently introduced programs or computer form factors, each skill was assigned a numeric value as follows: Expert=4, Advanced=3, Intermediate=2, Novice=1, No experience=0. Table 3 shows the composite score of all instructors' reported skill levels. Non respondents were excluded.

TABLE 3: COMBINED SKILL SCORES BY SOFTWARE PROGRAMS AND TASKS

	Score
SMART board	**0.22**
DyKnow Attendance	**0.29**
DyKnow Monitor	**0.32**
Journal writer	**0.46**
DyKnow Vision– for presentations	**0.55**
OneNote	**0.67**
Use voice recording feature	**0.77**
Using electronic textbooks	**1.51**
Tablet PC	**2.02**
Digital camera	**2.30**
Blackboard	**2.43**
PowerPoint	**2.49**
Desktop	**2.58**
Converting paper documents to electronic files (scanning)	**2.65**
Computer skills (such as organizing file folders and folders and finding files)	**2.81**
Laptop	**2.84**
Word	**2.88**
Excel	**2.93**
Internet	**3.02**
Email	**3.12**

4= Expert, 3=Advanced, 2=Intermediate, 1=Novice, 0 = No experience

Locations of LPC and TPC use

In a typical week, during the last year, 90% of instructors reported using an LPC or TPC at least one or more days in class. Instructors reported that their students (70%) use an LPC or TPC in class. The most common locations for instructors' computer usage were at:

- Home-at desk or table (73%)
- Home-not at a desk or table (80%)
- Classroom (73%)
- Hotel/Guest room (33%).

Preference and Pressure

Three instructors indicated that they had used the Tablet PC before and now prefer not to use it, and ten instructors indicated that they felt pressure to use the Tablet PC.

Attitudes & Perceptions

The perceptions of benefits and concerns were both reported regarding Information Technology and the Tablet PC program (IT/TPC). Nearly all instructors (88%) indicated that they "like learning and working with computers", but 12% disagreed or indicated a neutral response. In general, instructors reported that computers helped their students do or perform certain tasks or activities better. Instructors recognized the TPC as an organizational tool for students' notes, as 55% agreed that the TPC helped students take notes in class.

50% of the TPC and LPC users rated the TPC "Very Useful" as a tool, the highest possible rating. When asked how the TPC affected the student's academic performance, 67% of instructors responded "not applicable", and the remaining 33% responded in the neutral or negative to the question. When asked how they perceived the TPC impact their student's evaluation of the instructor's performance, the responses were similar, with 67% of instructors indicating "not applicable" and the remaining 33% responding in the neutral or negative. It is unclear if the "not applicable" response indicates that the instructors do not feel the TPC impacts these elements, but there is a concern with the remaining instructors responding in the neutral or negative to these questions.

More than half of instructors (61%) indicated experiencing at least one obstacle to the incorporation of IT/TPC. Three of the five top obstacles were associated with not having enough time. Specifically, the instructors felt that they did not have enough time to incorporate the IT/TPC into their already established curriculum, did not have enough time to learn to use the IT/TPC with confidence, and that IT/TPC use was too time consuming.

Ergonomics

Regarding the TPC program's ergonomic impact, instructors reported using a computer between 2-6 hours per day during the week. Many of the instructors reported assuming awkward postures (77%) while using a computer. Some instructors (40.5%) reported pain in at least one body area "quite often" or "almost always" and that the pain was associated with their computer use. The instructors suggested improvements in the physical components in the classroom that would improve usability for both students and instructors.

Training

Overall, 50% of the faculty wanted more training, and most recommended improvements in training, such as offering self-guided short online tutorials or subject area focused training. The faculty also indicated an ergonomic element was not part of the TPC program for themselves or for their students. Instructors indicated that previous training sessions were offered to be frequent enough (50%), while 25% disagreed. Sixty-nine percent found training that was offered to be at or during a convenient day or time, as seen in Figure 4.

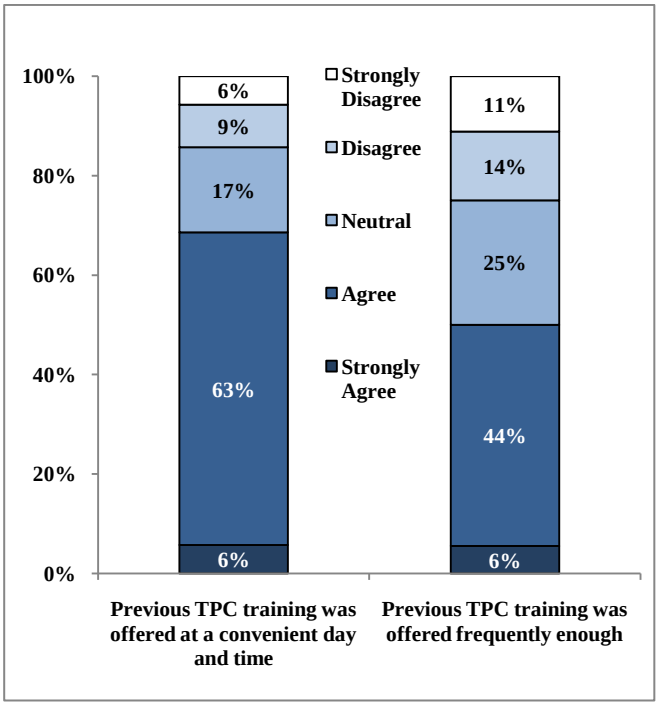

FIGURE 4: PARTICIPANTS' REPORTED ON PREVIOUS TRAINING EXPERIENCES

PC experience and PC*/technology use: correlations among perceptions*

PC experience included self-reported ratings and the comfort level of the instructor with the computer. Statistically significant associations, moderate to weak in strength, are included in Tables 4 & 5 below. Use of the TPC was more strongly associated with self-reported skill level rather than with the instructors comfort using a computer.

TABLE 4: ASSOCIATION BETWEEN SELF-REPORTED SKILL LEVEL WITH A TPC AND TPC USE

	n	Spearman ρ	p value
Daily use of TPC	43	0.477	0.0012
Using the TPC in class	43	0.660	<.0001
Use of TPC within the last year	43	0.381	0.0117

PC Comfort describes the point in their lifetime that the instructors' reported a level of comfort using any PC. In Table 5, the associations were positive, but weak when comparing PC Comfort with the daily use of TPC, and the number of obstacles attributed to the TPC program.

TABLE 5: ASSOCIATION BETWEEN PC SELF-REPORTED LEVEL OF COMFORT IN RELATION TO TPC USE AND PERCEPTIONS

	n	Spearman ρ	p value
Daily use of TPC	40	0.297	0.0624
Count of obstacles indicated	39	0.335	0.0365

Training and PC*/technology use: Associations amongst perceptions*

Training was reported in two ways: with respect to previous training experiences and whether or not more training was needed. The training outcomes were not found to be significantly related to PC/technology use or attitudes and perceptions of the TPC.

CONCLUSIONS AND DISCUSSIONS

As previously discussed simply providing the "technology alone would [not] provide the primary motivation for its use" [11]. The program described by Weitz et al 2006 had a different approach than SSE's, offering the Tablet PC as part of a faculty Laptop PC renewal program; the researchers found mostly successful integration from the instructors who voluntarily opted for introducing the Tablet PC into the classroom.

In the current study, a review of the instructors' self-reported TPC skills, PC usage comfort and other technologies may be affecting the instructors' perception of the TPC program overall. The main obstacle appears to be the lack of time, and can be improved in a variety of ways. For example, improvement of their PC skills could reduce the time to complete tasks. Finding a root cause to the lack or limited PC skills reported by some instructors may lay in the amount of TPC usage in and out of the classroom, i.e. using the TPC more would increase their familiarity with the TPC. It is also troubling to have any instructor indicate that they prefer not to use the TPC or to report being pressured to use the TPC while it is being mandated by the university.

Also, the lack of time may have affected attendance in training sessions; therefore SSE should adopt alternative training methods, as suggested by the instructors. One such example is online short video clips, which may be more likely fit within instructors' time schedules.

Overall, the instructor's current integration of technology was found to be low in the classroom. The mandatory implementation of a TPC program still remains challenging for some instructors, and can be improved. For institutions considering the implementation of any computer requirement, potentially offering the PC one year prior to the student's mandatory ownership may help. Furthermore, a preliminary evaluation of the instructors' computer knowledge and focus groups will identify initial needs prior to adding the TPC to help them prepare for implementation of a TPC program. An important element of any TPC program should be to minimize the instructors' workload as ultimate goal is to successfully relay course content.

As long as the mandatory TPC program will remain a part of the SSE, an improvement step to consider would be to address instructors request for more training. The training should be flexible, taking into account the concerns about the 'lack of time'. Also, any additional training should incorporate ergonomic awareness elements, as the need is evident for both instructors, and, based on other studies, for students, as well [1].

In conclusion, the TPC program at SSE is moving forward. The instructors comfort with the TPC and usage of the TPC are at least loosely related to their experience. Although a link between training and these elements was not established, a loose connection is logical. If the proper training level were to be implemented, the TPC would possibly be used more often in the classroom. More usage (or practice) with the TPC is likely to improve an instructor's efficiency, mitigating the obstacle of lack of time.

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