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Perceived Need for Course Topics and Student Engagement in Computer Education

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ABSTRACT

Student perceptions about course content, and student engagement, achievement, prior knowledge, and department of enrollment were investigated through an ex-post-facto research study at the school of education in a large university in Turkey. The following questions were explored: (1) What are the topics in computer literacy students are most and least interested in, (2) is this perception related to the department of enrollment, and (3) how do prior knowledge and department of enrollment affect engagement and achievement? ANOVA and MANOVA were used to analyze data from 212 freshmen taking the Computer-I course. It was found that students from different departments differ significantly on achievement and engagement. Moreover, achievement can be predicted from prior knowledge but prior knowledge cannot be predicted from engagement. Parallel to the literature, students who have little or no prior knowledge are less successful. Overall, students are not as much engaged in schoolwork as one would expect.

Key Words: Engagement, Achievement, Topic, Teaching, Media, Pedagogy, Learning, Strategy.

Bilgisayar Eğitiminde Ders İçeriğine Olan Algısal İhtiyaç ve Öğrencinin Derse Katılımı

ÖZET

Türkiye'deki bir üniversitede eğitim fakültesindeki öğrencilerin ders içerikleri hakkındaki algıları ile derse katılımı, başarısı, hazırbulunuşluğu ve bölümleri, ex-post-facto araştırma metodu yardımıyla araştırılmıştır. Şu sorulara cevap aranmıştır: (1) Bilgisayar okuryazarlığında öğrencilerin en çok ve en az ilgisini çeken konular nelerdir, (2) öğrencinin bölümü bu kararı etkilemekte midir ve (3) hazırbulunuşluk ve öğrencinin bölümü, öğrencinin başarısı ve derse katılımını nasıl etkiler? Birinci sınıfta okuyan ve Bilgisayar-I dersini alan 212 öğrenciden toplanan veri ANOVA ve MANOVA yardımıyla analiz edilmiştir. Farklı bölümlerde okuyan öğrencilerin başarı ve derse katılım düzeylerinin anlamlı bir şekilde farklı olduğu bulunmuştur. Başarı hazırbulunuşluğa bağlı olarak değişmektedir fakat hazırbulunuşluk öğrencinin derse katılımını etkilememektedir. Literatürde bulunduğu gibi, başlangıçta az veya hiç bilgisi olmayan öğrenciler ders sonunda daha az başarılı olmuşlardır. Genel itibariyle, öğrenciler derse kendilerinin beklenenden daha az vermektedirler.

Anahtar Sözcükler: Derse katılım, Başarı, Konu, Öğretim, Medya, Pedagoji, Öğrenme, Strateji.

INTRODUCTION

Authors of this paper work at different universities in Turkey. Many of their colleagues complain about freshmen's limited interest in computer literacy. Students either do not participate or enthusiastically seek information. Such a propensity could be understood by investigating what students already know and perceived necessity of different course topics/subjects. The hypothesis is that students who are knowledgeable might not find the course valuable, so knowledgeable students could easily get bored. An analogy might help understand this: suppose that you ask someone who is fluent in reading/writing to attend a first grade reading-writing course. How engaged would you expect that person to be with the class? Most instructors try improving student success by different activities such as lectures and discussions, but factors other than instruction also influence engagement and achievement.

This study investigates how freshman's pre-knowledge/skills in information technologies affect interest and involvement in computer literacy. Here, computer literacy is considered as information taught in Computer-I and Computer-II in schools of education at Turkish universities.

This study specifically concentrated on Computer-I. From this point on, the term “computer literacy” stands for Computer-I.

Prior Knowledge

Prior knowledge has been investigated especially for social sciences in higher education. Prior knowledge can contribute to subsequent learning (Spires, Donley, and Penrose, 1990). Liu, Andre, and Greenbowe (2008) conducted a study on college students taking an introductory chemistry course involving computer simulations. They found that groups with students who had low prior knowledge seemed to interact less with peers in comparison to groups with students who had high prior knowledge. Moreover, students with low prior knowledge relied on computer simulations to answer questions; students with high prior knowledge engaged with simulations differently. The latter were inclined to solve problems on their own and then confirm their answers through simulations.

Thompson and Zamboanga (2003) reported that prior knowledge significantly predicted achievement. Recent studies in college psychology also show that students with a better prior knowledge reveal better comprehension and recall more (Thompson and Zamboanga, 2004).

Literature generally discusses the potential influences of prior knowledge on various college-level courses (e.g., Dochy, Segers, and Buehl, 1999; Glasson, 1989; Johnson and Lawson, 1998; Lawson, 1983; Luu, and Freeman, 2011; Schutz, Drogosz, White, and Distefano 1998), but widespread use and interest in information technologies highlight courses specifically like computer literacy. Since computers are inevitable in daily life, students are likely to enroll in such courses with substantial prior knowledge. One source of such knowledge could be classes they take in high school. Others include information from media and daily technological applications. Prior knowledge perhaps positively affects subsequent learning.

A fact is that the amount of time students are engaged with instructionally meaningful activities positively correlates with success in academics (Carini, Kuh and Klein, 2006). Still a critical research remains not-fully-answered; that is to determine how prior knowledge impacts engagement and, in turn, achievement in higher education. The purpose of this study is to investigate the relationship between prior knowledge, engagement and achievement in computer literacy along with other relevant factors.

Student Engagement

For long, educators have been interested in studying achievement and engagement in terms of attitudes and perceptions (National Center for School Engagement, 2006). Research connecting achievement and engagement has roots on empirical research. Chickering and Gamson (1987) summarize such research in a framework with seven good practices for higher education, which suggest that a successful faculty "encourages contact between students and faculty, develops reciprocity and cooperation among students, uses active learning techniques, gives prompt feedback, emphasizes time on task, communicates high expectations, and respects diverse talents and ways of learning" (p.3).

Engagement is about participating in schoolwork – attending classes and completing assignments (Chapman, 2003a). According to Natriello (1984), engagement is "participating in the activities offered as part of the school program" (p.14). Or, unengagement may mean cheating on exams, causing damage in school properties and not attending classes regularly (Chapman, 2003b). Engagement is also about the participation's quality (Skinner and Belmont, 1993).

This study focuses on behavioral engagement, which prescribes that engaged students obey rules, respect norms, and participate in school-related activities (Fredricks, Blumenfeld, and Paris, 2004). Respectively, behaviors such as asking questions in class, participating in discussions, and so forth were inquired.

Student Achievement

As educators, should we care about engagement? Most relevant findings are encouraging. Research on engagement supports linkages with achievement and retention. Research also suggests that engagement might allow pedagogical alteration (Fredricks, Blumenfeld, and Paris, 2004; National Research Council and Institute of Medicine, 2004; Pascarella and Terenzini, 2005). Therefore, it can be assumed that if instructors engage students through various instructional strategies, students can attend classes more regularly and be more successful.

Carini, Kuh and Klein (2006) studied the relationship between engagement and learning in college. Their findings associated engagement with higher grades and critical thinking. Linkage between engagement and achievement was not as strong as one would expect. Nevertheless, freshmen and seniors differed in the type of activities they engage. Students with lower abilities gained more from being engaged.

All these studies suggest promoting engagement for better success. However, engagement levels in schools are relatively low (Marks, 2000; NSSE, 2006; [citation-removed-for-review]). This means engagement can potentially be improved to impact learning.

School of education students have been required to take computer literacy that teaches them basic computer knowledge. Today's technology-oriented environment already teaches students considerable technological knowledge. Requiring students to learn such topics causes some negative consequences, one of which is lack of student engagement. This observation is the motivation of this study.

Purpose of the Study

When students register for university, they also expose what they enjoy to learn. The most visible way to see such inclination is the department they enroll in. In very simple terms, a department is the collection of some interrelated topics of courses. Computer literacy, on the other hand, is interdisciplinary – not all students would necessarily enjoy taking it. This hypothesis might be true for computer literacy in general, but might also be true for certain subjects of that course. This possibility is usually disregarded by the higher education system.

Prior knowledge and department of enrollment together are thought to be two possible factors that affect engagement with academic activities in computer literacy. The aim of this study is to test this connection. So, the research questions are: 1-What are the topics in computer literacy courses that students perceive most and least necessary? 2-Is there a difference in student perceptions on most and least necessary topics in computer literacy courses based on students' department of enrollment? 3-What is the effect of students' prior knowledge and department of enrollment on student engagement and achievement? And 4-Does the interaction between prior knowledge and engagement significantly affect student achievement?

METHODS

Design

An ex-post-facto research design was used (Cohen, Manion, and Morrison, 2000; Fraenkel and Wallen, 2003; Lord, 1973). Computer literacy courses primarily teach common information technologies, including introductory information about hardware and software structures, operating systems (OS), and Microsoft Office. Only Word was taught as part of Microsoft Office.

Participants

From 12 different sections, 381 freshmen taking the "Computer-I" at a Turkish university were invited to participate. Students were from four different departments of the School of Education: (i) Religious Culture and Moral Education (RCME), (ii) Language Education (LE), (iii) Counseling and Educational Psychology (CEP), and (iv) Elementary Education (EE). Three surveys - entry, mid, and exit - were conducted. 212 students participated to all three surveys (Table 1), corresponding to a return rate of 55.6%.

Table 1: Participation by departments and surveys

Department	Entry	Mid	Exit	All
RCME	28	43	51	24
LE	158	133	183	114
CEP	31	37	43	27
EE	79	82	70	47
Total	296	295	347	212

Data Collection

Data collection took one semester with the timeframe provided in Figure 1. Entry Survey investigated the perceived computer knowledge level. This study incorporated one item from that survey, which grouped students according to their level of computer knowledge based on a four-point Likert scale (1="not knowledgeable" to 4="very knowledgeable"). Later, these were collapsed into two groups called low (little or no perceived prior knowledge) and high (medium or higher perceived prior knowledge) to form the independent variable prior computer knowledge.

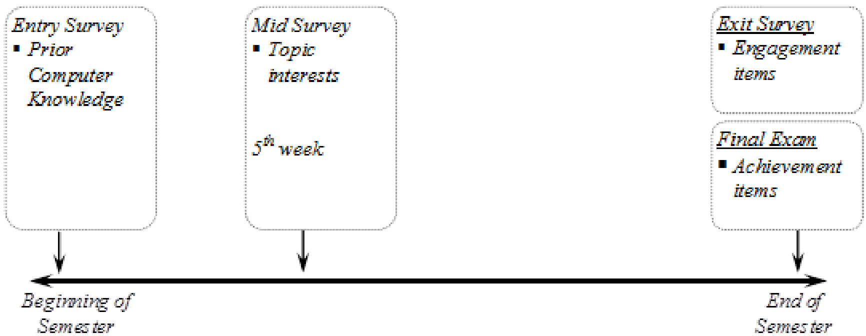

Figure 1: Survey administration timeframe.

Mid Survey consisted of two open-ended questions asking student interests in computer-related topics and was administered at the fifth week of classes. The questions were: What are the three topics that you found the most necessary (or beneficial) and why? What is the topic that was the least necessary (or least beneficial) and why?

Topics students had learned by the sixth week were mostly theoretical part of computer literacy and basic information about the Windows OS. The list of topics given in the syllabus of the course was used to code responses. Two variables were created for each subject – one to code "necessary" (meaning that student thought the subject to be the most necessary) and one to code "unnecessary" choice. Each time a student referred to a subject, the corresponding variable (either necessary or unnecessary) was marked "1". Otherwise the variable was left blank.

Exit Survey aimed to measure student engagement. Exit Survey items were adapted from the National Survey of Student Engagement (NSSE) 2006 and evaluated behavioral engagement. Exit Survey consisted of 13 questions, containing items similar to "asked questions in class or contributed to class discussions." A four-point Likert scale was utilized (1="never" to 4="very often"). Except one item, all survey questions were grouped to form an engagement scale. The scale's coefficient alpha reliability (Cronbach, 1951) was 0,801.

Student achievement was measured through a final exam, administered at the end of semester. It had 25 multiple-choice questions and tested knowledge about the course topics.

Data Analysis

A MANOVA analysis was utilized to investigate student engagement (a mean score of Exit Survey items) and achievement (a mean score of final exam items) together as research outcomes. The independent variables were prior knowledge and departments. Individual ANOVAs were run to investigate other research questions along with frequency distributions.

RESULTS

Results are provided below in the order of the research questions. In interpreting the results for the first and second research questions, which are related with student opinions on the most and least necessary computer literacy topics, two details need clarification. First, because each student could perceive a topic as either the most necessary or the least necessary, it is possible to look at the topics through those two perspectives. Second, since the students were allowed to write multiple topics, student percentages and frequency count of the referred topics do not match one-on-one.

Course Topics Students Found Most Necessary

"Computers' negative effects and prevention from them" (CNEPT) was perceived to be the most favorite topic. Among the 295 respondents, 174 referred to this topic as necessary. Table 2 presents the frequency distribution of student opinions on the percieved most necessary topics. Because many topics existed, the first ten were listed in the table for comprehension convenience. It is important to note that even though students rated only three topics as "necessary", sometimes they used general terms, which meant more than one topic to be coded during the analysis. Therefore, if needed, more than one topic was coded as "1".

Table 2: Topics students found most necessary

Students Referring to the Subject		
Subject	N	%
CNEPT	174	58,98%
Microprocessors	80	27,12%
Using Windows efficiently	78	26,44%
History of information technologies (HIT)	76	25,76%
Fundamentals of computers	76	25,76%
Creating shortcuts	74	25,08%
Working with Windows	72	24,41%
Structure of computers	71	24,07%
Organizing files and folders	71	24,07%
Capacity and size of computers	70	23,73%

Course Topics Students Found Least Necessary

Regarding the perceived least necessary subjects, HIT had the highest frequency. 115 students out of 295 referred to this topic as the least necessary, (Table 3). In this category the students were allowed to rate only one topic, so the numbers need to be interpretted differently than the numbers in Table 2. The first ten were listed in the table for convenience.

Table 3: Topics students found least necessary

Students Referring to the Subject		
Subject	N	%
HIT	115	38,98%
Microprocessors	64	21,69%
Structure of computers	35	11,86%
Capacity and size of computers	23	7,80%
Memory units	18	6,10%
Hardware structure of computers	17	5,76%
Central processing unit	17	5,76%
Input – output units	15	5,08%
Ports	15	5,08%
Uses of computers (application areas)	14	4,75%

Because the most frequently referred "necessary" and "unnecessary" items had to be counted separately, it was possible to see the topics like "processing structure of computers" and "HIT" both in the necessary and in the unnecessary categories (Table 2 and 3). The focus of this research question is on the topics that appeared at the top of these two tables.

Based on these findings, CNEPT and HIT appear on two opposite ends of the student interests. Therefore, these two were selected for further analysis. The researchers were interested in identifying whether possesing these opinions differed based on department. Starting with this analysis, Table 4 describes the statistical analyses conducted througout this paper. Table 4 explains what kind of treatment existed in each analysis. Table 4 should be evaluated in connection with Table 5 especially to understand the thresholds.

Table 4: Description of analyses conducted throughout the paper

Analysis	Groups	Treatment
Analysis 1	By department	Being part of a different department
Analysis 2	By department	Being part of a different department
Analysis 3	Knowledge groups are assigned by means of a cutoff point on prior knowledge scores	Being part of a knowledgeable group + Being part of a different department
Analysis 4	Knowledge and engagement groups are assigned by means of a cutoff point on prior knowledge and engagement scores	Being part of a knowledgeable group + Being part of a engaged group

Table 5 lists descriptions and properties of variables. Analyses column – in connection with Table 4 – points out how each variable was used, and whether the variable was an independent (IV) or a dependent variable (DV). The numbers are used throughout the paper as reference; for example "1" indicates Analysis 1 and "3" indicates Analysis 3.

Analysis 1

Analysis 1 was conducted to test the 2nd research question. Each topic was examined from two perspectives – by whom it was referred to as necessary and unnecessary. So, four separate ANOVAs were run to identify any possible difference. Table 6 shows the numbers of students referring to the topics by departments.

Findings indicate that except for CNEPT being most frequently referred unnecessary topic, all other student opinions were significantly different from department to department based on ANOVAs. Specifically how departments differed was identified by Tukey post-hoc tests. The results mean that students from different departments found different topics to be necessary and unnecessary (Table 7).

Table 5: Description of variables used in analyses

		Type and Values		Analyses	
Variable	Description	S= N=	Scale Nominal	DV	IV
History Necessary	Students who thought HIT was necessary	N	0 = not referred to 1 = referred to	1	
History Unnecessary	Students who thought HIT was unnecessary	N	0 = not referred to 1 = referred to	1	
Health Necessary	Students who thought CNEPT was necessary	N	0 = not referred to 1 = referred to	1	
Health Unnecessary	Students who thought CNEPT was unnecessary	N	0 = not referred to 1 = referred to	1	
Achievement	Achievement defined by final exam score	S	0 = unsuccessful 100 = fully successful	3; 4	
Engagement	Active participation in schoolwork	S	1 = never participated 4 = very often participated	3	
Engagement Quartile	Grouping on frequency quartiles of engagement scores	N	1 = Engagement < 1.500 2 = Engagement < 1.750 3 = Engagement < 2.083 4 = Engagement >= 2.083		4
Prior knowledge	Perceived computer knowledge at the beginning of the course	N	0 = low (little or no perceived prior knowledge) 1 = high (medium or higher perceived prior knowledge)	2	3; 4
Department	Enrolled department	N	1 = RCME 2 = LE 3 = CEP 4 = EE		1; 2; 3

By looking at Table 7, it is possible to note drastic differences in several instances. For example, very few students (a mean score of 0,07) from RCME thought HIT to be unnecessary whereas almost half of the students in LE considered the same topic unnecessary. Similarly, almost all of the students in CEP thought that CNEPT topic was necessary whereas nearly half of the students from LE considered the same topic necessary.

Table 6: Topic choices by departments

	Least necessary						Most necessary					
	Health			History			Health			History		
Department	0	1	Total	0	1	Total	0	1	Total	0	1	Total
RCME	42	0	42	39	3	42	3	40	43	17	26	43
LE	127	4	131	66	65	131	71	59	130	100	29	129
CEP	37	0	37	21	16	37	2	35	37	22	15	37
EE	77	2	79	48	31	79	42	40	82	76	6	82

Numbers indicate the number of times students referred to an item.
1=Referred to the topic; 0=Did not refer to the topic.

Table 7: ANOVA[a] and Tukey post-hoc tests for the necessity of the topics – subset mean scoresb

	Least necessary		Most necessary				
	History		Health		History		
	F(3, 285)=8,667		F(3, 288)=21,613		F(3, 287)=18,047		
Department	1	2	1	2	1	2	3
RCME	0,07			0,93			0,60
LE		0,50	0,45		0,22	0,22	
CEP		0,43		0,95		0,41	
EE		0,39	0,49		0,07		

[a] For all ANOVA statistics p<0,001.
[b] Values show mean scores ranging from 1=Referred to the topic to 0=Did not refer to the topic.

Analysis 2

Whether the departments had students with varying degrees of prior knowledge was tested with ANOVA only to reveal that departments had balanced distribution, F(3,292)=0,886 p=0,449. Therefore this was a confirmation of the ideal condition for a comparative study: initially departments had students with similar prior knowledge.

Analysis 3

The descriptive results of the engagement and achievement scores were reviewed in Table 9. RCME with the lowest engagement scores had the average score of 1,72 where 1=not engaged, 4=highly engaged. The department with the highest average student engagement score had a score of 1,83. The overall average indicates that the engagement level (1,80) is extremely low. Percentage-wise, the overall engagement score would translate into a score of about 26,67% where 100% represents a fully-engaged student.

Table 9: Mean engagement and achievement scores by departments

	N L/(T)	Engagement M/(SD)			Achievement M/(SD)		
Department		L	H	T	L	H	T
RCME	10	1,62	1,77	1,72	60,40	62,67	61,86
	(28)	0,38	0,37	0,37	6,38	10,36	9,07
LE	94	1,81	1,79	1,80	57,94	64,84	60,73
	(158)	0,40	0,50	0,45	10,51	12,36	11,76
CEP	17	1,75	1,81	1,78	58,82	62,57	60,52
	(31)	0,32	0,35	0,33	11,98	11,80	11,85
EE	39	1,73	1,94	1,83	57,24	58,90	58,10
	(79)	0,30	0,57	0,46	12,05	9,15	10,60
Total	160	1,78	1,82	1,80	58,03	62,57	60,13
	(296)	0,38	0,48	0,43	10,78	11,35	11,26

L = Low – little or no perceived prior computer knowledge.
H = High – medium level or higher perceived prior computer knowledge.
T = Total
N = Number of participants
M = Mean
SD = Standard Deviation

The department with the lowest average achievement score was EE. Interestingly, as mentioned above, EE had the highest average engagement level, but the lowest achievement score. The highest average achievement score belonged to RCME. Similarly, RCME had the lowest engagement scores among the other departments. The overall average achievement was 60,13, which is not drastically high, but is typical of this sort of computer classes.

The second to the last row in Table 9 shows the total engagement and achievement scores arranged by prior knowledge. According to this row, students who had little or no prior knowledge were overall less engaged (1,78) than the other students (1,82). The former also scored less on the achievement test (58,03) compared to the students with medium or high prior knowledge (62,57).

The results so far were given just to present the big picture with simple descriptive statistics. A MANOVA was run to investigate the possible effects of prior computer knowledge and department of enrollment on engagement and achievement. The results showed that prior computer knowledge affected student achievement and/or engagement; but department did not affect any of the dependent variables, nor were there any interaction effect between the independent variables (Table 10).

Tests of between-subjects effects showed that the difference actually exists only on students' achievement results (Table 11). This means that regardless of the possessed prior knowledge or department, students had similar engagement scores. However, students with different prior knowledge scored significantly differently on achievement.

Table 10: MANOVA results for achievement and engagement

	Wilks' Lambda	F	df [a]	Sig.
Prior Computer Knowledge	0,98	3,01	2; 257	0,05
Department	0,97	1,55	6; 514	0,16
Prior Computer Knowledge by Department	0,98	1,10	6; 514	0,36

[a] df = (df for hypothesis; df for error)

Table 11: Tests of between-subjects effects for achievement and engagement

	Achievement			Engagement		
	df	F	Sig.	df	F	Sig.
Prior Computer Knowledge	1	4,32	0,04	1	2,11	0,15
Department	3	2,32	0,08	3	0,68	0,56
Prior Computer Knowledge by Department	3	1,03	0,38	3	1,03	0,38

[a] df for error = 258 for all statistics

Based on Table 11, when the students' mean achievement scores were investigated, it was found that students with little or no prior knowledge were performing worse on the achievement test than their counterparts. The formers' average exam scores (58,03) were significantly lower than the scores of the students with higher perceived prior knowledge. Overall these results also show that department of enrollment did not have any effect on student engagement or achievement.

Analysis 4

The next research question was to identify whether the interaction between prior knowledge and engagement had any effect on achievement. An ANOVA was run where achievement was the dependent, and prior knowledge and engagement were the independent variables. For this purpose, Engagement Quartiles were formed where students were divided into frequency quartiles according to their engagement scores. Prior knowledge was already identified as affecting student achievement. Results of Analysis 4 showed that neither the student engagement nor the interaction of engagement and prior knowledge had any effect on student achievement.

DISCUSSION

So far the topics were separately examined in terms of perceived necessity in Table 2 and 3. It would be helpful to see them altogether to get the big picture. So, they were composed again in Table 13 ranging from the most to the least necessary. This table is a reflection of student opinions about the course topics ordered percentage-wise. To allow a magnitude-wise comparison, Table 13 was specifically arranged to show both the percentage of students choosing each topic and the percentage of codes that were chosen for each topic. Because students were asked to state three favorite topics and only one least favorite topic, comparing directly student percentages would be misleading. Therefore, the percentages were also given relative to the total number of codes presenting the necessary (N= 2,611) and unnecessary (N= 466) topics.

Table 13: Topics ranked percentage-wise, according to perceived necessity

Necessity		Topic	(% students)		(% codes)		
Rank			Most	Least	Most	Least	Differ.
Most	1	CNEPT	58,98%	2,03%	6,66%	1,29%	5,38%
⇧	2	Creating shortcuts	25,08%	0,68%	2,83%	0,43%	2,40%
▫	3	Using Windows efficiently	26,44%	1,02%	2,99%	0,64%	2,34%
▫	4	Organizing files and folders	24,07%	0,68%	2,72%	0,43%	2,29%
▫	5	Working with Windows	24,41%	1,02%	2,76%	0,64%	2,11%
▫	6	Fundamentals of computers	25,76%	2,71%	2,91%	1,72%	1,19%
▫	7	Uses of computers (application areas)	18,64%	4,75%	2,11%	3,00%	-0,90%
▫	8	Input-output units	16,27%	5,08%	1,84%	3,22%	-1,38%
▫	9	Ports	15,93%	5,08%	1,80%	3,22%	-1,42%
▫	10	Hardware structure of computers	18,98%	5,76%	2,14%	3,65%	-1,50%
▫	11	Memory units	19,66%	6,10%	2,22%	3,86%	-1,64%
▫	12	Central processing unit	16,95%	5,76%	1,91%	3,65%	-1,73%
▫	13	Capacity and size of computers	23,73%	7,80%	2,68%	4,94%	-2,25%
▫	14	Structure of computers	24,07%	11,86%	2,72%	7,51%	-4,79%
⇩	15	Microprocessors	27,12%	21,69%	3,06%	13,73%	-10,67%
Least	16	HIT	25,76%	38,98%	2,91%	24,68%	-21,77%

At the beginning of this paper ten topics were identified for each of the categories that were just mentioned. Because four topics were listed in both the most and the least necessary categories, the total number in Table 13 drops to 16 instead of 20. CNEPT appears to be the most favorite topic. In the opposite direction, the topics of HIT and “microprocessors” are the least favorite topics with even higher magnitudes compared to CNEPT. This outcome can easily be interpreted as that students show more distress about some of the topics than they show interest. This fact might inform decision makers to give the higher priority to eliminating the topics that were identified unhelpful rather than to promote the perceived most necessary topics.

Differentiating what attracts students to some topics but the others is difficult. At first glance, the topics that were listed towards “the least” appear to be knowledge geared towards the details of computers – highly theoretical in nature. HIT is not even dealing with computers, but instead the historical aspects of technology. A few examples of student quotes may help understand the student mindset. “Listening to where the computers came from once, perhaps like a story, may be fine, but the history with all the mentioned terms is very unnecessary to me.” Another student expresses his feelings by indicating that “I find history of information technologies to be depicted with so much detail unnecessary. I think that rather than their history, what they are today, what their novelties are and what our needs are should be taught."

Generalization about "the most" is harder. "Fundamentals of computers" are indented to cover basics of computers. "Using Windows efficiently" is a hands-on topic that must be appealing to students in terms of going beyond what they already know about Windows. For CNEPT to be at the top of the list, students use statements like the following. "Learning the healthy sitting positions was the most important thing for me, because when I sit in front of the computer for a long time, there was distress at my neck. From now on I will be careful." "I learned that many diseases may occur because of wrong seating while using computers. I had thought they were related only to eyes, but I learned that they could extend even to the joints. Therefore, I will be a little more careful when using the computer."

The results also indicated that students referred to the necessity of topics significantly differently depending on the department they are enrolled in (Table 6). This is true except for the CNEPT, which was rarely referred to as the least necessary by students regardless of department. It would be suitable to imply that teaching this course to different departments would be better with instructional techniques and contents customized to the needs of the departments to attract students.

It was expected that the students with little or no prior knowledge would have high engagement with computer literacy in contrast to students with medium or higher level of prior knowledge. Then, the latter would be more successful whereas the former could vary in success. These expectations were depicted in Figure 2 along with what was actually found in this study.

	Expected		*Found*	
	Engagement	*Achievement*	*Engagement*	*Achievement*
Little or no Prior Knowledge	⇧	~	~	⇧
Medium or higher Prior Knowledge	⇧	⇧	~	⇧

⇧ = higher score
⇩ = lower score
~ = randomly varying score

Figure 2: Relationship of prior knowledge with engagement and achievement

Findings, however, were not supporting the expectations. Although the levels of achievement can be predicted from prior knowledge, engagement cannot be predicted. Department does not have any effect on those two outcomes, either. Furthermore, no significant impact of the interaction between prior knowledge and engagement were found on achievement. Thus, drawing a relationship along the path of prior knowledge, engagement, and achievement fails.

Student engagement was chronologically pictured in-between prior knowledge and achievement as a mediating factor (Carini, Kuh and Klein, 2006). If engagement is taken off of the equation, a positive linkage already exists between prior knowledge and achievement, meaning that greater the prior knowledge, greater the success (Thompson and Zamboanga, 2003; Thompson and Zamboanga, 2004). There is nothing unexpected for prior knowledge and achievement if followed from the literature, but no connection appears between engagement and prior knowledge.

As stated in relevant studies (Marks, 2000; NSSE, 2006; [citation-removed-for-review]), engagement rates are low. An intervention is necessary to engage students. One strategy could be to grant exemption. This right could be subject to a pre-exam administered before the semester. Not that the study can tell whether the lower ability students would be more engaged, but this way, higher-ability students who are not necessarily expected to be engaged would be eliminated from the environment. Yet, the lower-ability students could get to flourish in a more homogenously-fashioned environment.

The study was conducted on the first five weeks of the classes. The reason for this survey to last short is simple. It is the instructors' observation that students initially attend the class expecting that they would spend most of their time in front of computers. But the course starts with lessons that are basically geared towards teaching theoretical information about computers – with no laboratory experience. Also, many are already knowledgeable about Windows to the extent that they are able to manage by trial-and-error. They search for advanced information. Failing to see advanced information appears to cause frustration on students. Therefore having identified the topics that interest the students most and the least should help future classes to be geared more towards the needs and interests of the students.

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