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I am submitting herewith a thesis written by Almut Haboeck entitled “The tech-savvy generation? Students’ experience with computer technology at the University of Tennessee.” I have examined the final electronic copy of this thesis for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Master of Science, with a major in Instructional Technology.

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**THE TECH-SAVVY GENERATION? STUDENTS'
EXPERIENCE WITH COMPUTER TECHNOLOGY
AT THE UNIVERSITY OF TENNESSEE**

A Thesis Presented for the
Master of Science
Degree
The University of Tennessee, Knoxville

Almut Haboeck
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ABSTRACT

This study analyzes the technology experience and knowledge of students of the generation of digital natives at the University of Tennessee. In an online survey students were asked about their experience and knowledge of certain software applications, their daily computer habits and their ability and skills to troubleshoot a malfunctioning computer.

In general, the results show that students' computer experience and knowledge are limited to a specific set of software applications that is widened according to required needs. Students are knowledgeable in web browsing, using word processors, course management software and email. If academic courses require them, students learn how to use other software applications, such as Microsoft Excel and PowerPoint. At the same time a majority of students show a limited set of troubleshooting skills. A high percentage would still be able to resolve virus or spyware issues, but if it came to troubleshooting other problems, such as a malfunctioning network connection or a computer that doesn't boot, they would consult an expert right away without attempting to resolve the issue themselves.

Though the majority of students did not wish for more computer integration in their courses, they wished that their education of computer skills in high school had prepared them better for college. At the same time students show a lack of interest in computer workshops, which could improve these skills. They are rather interested in learning computer skills for their personal use, such as Adobe Photoshop or web design.

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CHAPTER I

INTRODUCTION

Today's schools and universities, as well as the workplace, require computer literacy such as the knowledge of certain software applications and how to use the Internet. Some researchers and educators have assumed that the generation of students born after 1980 is computer literate, that the computer and other technologies, such as cell phones and iPods, are part of their daily life. It is thought of as the generation that can be described as the "digital natives," the generation of computer literate people, whose brain structure has started to change due to the daily use of the computer. (Prensky, 2001)

But are students really so savvy in their use of technology as such a definition seems to assume? Is Prensky's claim that teachers and professors should use more computer technology in the classroom valid? This is a necessary question to ask and to answer, a claim that needs to be proven, as it influences the technology of instruction (i.e., the establishment of an efficient learning environment for students). Further, it is important for universities and colleges to know about the level of technology knowledge that may be expected from students entering post-secondary education. Such knowledge will allow the institutions to refine course offerings in regard to computer technology as well as to refine the integration of computer technology in the classroom according to the needs of their students. At the same time, such study is useful for middle and high schools to be able to prepare their students for entrance into the university.

Therefore, more empirical data is needed if we really want to improve instruction using computer technology and other emerging technologies (cell phones, for example) as a learning tool. This means we need to assess students' knowledge, experience and preferences of the use of computers in the classroom in cooperation with instructors' experiences of efficient learning systems (Kennedy, Krause, Judd, Churchward and Gray, 2008). And if students would like to

rely on technology, it is also important to ask about their skills in computer maintenance and troubleshooting, as a functioning computer is the basic tool of computer technology.

Within this context, the aim of this study was to gain basic information about students' computer habits in high school as compared to college. It is an attempt to learn about students' access to technology, how students use the computer as a learning tool, how knowledgeable they are with various software applications and search engines and, further, how satisfied they are with the current integration of technology in high school and in college. In addition, the study focused on students' abilities to troubleshoot and maintain their computer. This kind of empirical knowledge gained through the study can hopefully contribute to the grounds upon which to base the integration of computer technology into the classroom.

In summary, this study is designed to research the computer literacy of the “digital natives.” The basis of measurement is a specially designed questionnaire that poses targeted questions concerning computer knowledge and habits of the participants of the study. The participants are mainly undergraduate students who qualify as digital natives at the University of Tennessee.

CHAPTER II

LITERATURE REVIEW

Prensky's claims (2001 and 2007) about the new generation's experience with computer technology have been questioned in several recent articles and studies, as Bennett, Manton and Kervin show (2008). The authors argue against Prensky's claim of a generation immersed in technology that, in turn, requires a very different kind of education due to changing brain structures. They further contend that the debate surrounding the digital natives is not empirically or theoretically informed, but takes the form of a "moral panic." In their argument about and judgment of the "digital natives debate" they refer to the latest empirical studies, which have been conducted in regard to technology use and experience of the digital natives (Bennett, Manton and Kervin, 2008). These studies include studies about technology experience, habits and knowledge of young people (Kvavik, Caruso, Morgan, 2004, Kennedy, Krause, Judd, Churchward and Gray, 2006, and Oliver & Goerke, 2007) and further studies of teenagers' and children's use of the web (Lenhart, Madden & Hiltin, 2005, and Livingston & Bober, 2004).

None of these studies can confirm Prensky's claims, but rather show that the generation's use and knowledge of and about technology is more diverse and complex. Two of these empirical studies are especially of relevance for my own study here, i.e the studies done by Caruso and Kvavik in the United States (2005) and the study conducted by Australian researchers at the University of Melbourne (2006).

In their most recent and largest study about technology experience of the net generation, Caruso and Kvavik (2005) gained data from 18,039 students of 63 higher education institutions throughout the country. In addition, their findings were supported by the analysis of 82 interviews of undergraduate students and instructional support staff from 7 institutions as well as comments in long answer questions by 8,000 participants. The main results of their study showed

that students seem to be tech savvy, but they just ask for a moderate use of technology in the classroom. At the same time though, the majority (64.1%) of students surveyed reported that technology in the classroom improved their learning. Further, this study showed that the so-called generation of digital natives is not such a homogeneous group of tech-savvy people as Prensky suggests. The study revealed that the majority of students are experienced with so-called “core technologies,” surfing the net, emailing and word processing. Few use computers for more specialized applications, such as video editing or creation of websites. Similarly, the Australian researchers Kennedy, Krause, Judd, Churchward and Gray (2006) could not confirm the existence of a homogenous group of tech-savvy digital natives. Like Bennett et al., they state, that “little empirical evidence has been provided to support claims made about the Net Generation and their implication for higher education” (Kennedy, Krause, Judd, Churchward and Gray, 2006, p. 4).

They surveyed 1973 first year students at the University of Melbourne during orientation in 2006. Participants were born after 1980 and came from different disciplines and departments. They were asked questions about their access to and use of technology, ranging from questions about whether they use cell phones to access the computer, use the computer for writing, playing music, playing videos, or if they have created a website, use it for social networking, for blogging, etc.

The findings suggested that many students were tech-savvy, but not all. In fact, the results of the study show that the “digital divide” exists within the group of incoming first year students. Much like the American study, the Australian study showed that students are knowledgeable and engaged in basic tasks such as web browsing, emailing and word processors, but that the range of knowledge and engagement with more computer or cell phone technology

varies greatly—such as building or maintaining a website or engagement in social networking sites (Kennedy, Krause, Judd, Churchward and Gray, 2008).

Both studies suggest that Prensky's notion of a uniform generation of digital natives is flawed and that, instead, the net generation's engagement in technology is far more complex and diverse than Prensky assumed (see also Bennet, Manton and Kervin, 2008). One common characteristic about the new generation of college students is that they want to be able to rely on technology for their academic work (Caruso and Kvavik, 2005).

CHAPTER III METHOD

The data were collected from undergraduate students of the University of Tennessee in 2010. An online questionnaire was sent to students who were taking basic English courses which are a general education requirement. The survey was also sent out in an email to undergraduate art students. The participants of the study constitute a self-selected sample and not a random sample.

Participants

A total of 109 students completed the questionnaire. 92 were “digital natives,” (born after 1980) and qualified for participation in the study. The age range of the students who participated in the study is 18 to 28.

Thirty-three of the students were freshmen, 32% sophomores, 20% juniors, 10% seniors and 4% were graduate students or post-graduates (see Figure 1) More females than males answered the questionnaire, (28% male and 72% female) (see Figure 2). The majority of students were Americans (99%), and 1% international students (see Figure 3).

Materials

The survey I designed for this study, was based on the “Experience with technology” survey (Kennedy, Krause, Judd, Churchward and Gray, 2006) and insights that I have gained in my work as a computer consultant for students at the University of Tennessee where I frequently help students with computer issues like virus detection and removal, software installation, and troubleshooting malfunctioning computers. My survey used the same three sections as Kennedy, Krause, Judd, Churchward and Gray’s (2006) survey that mine was based on. The first block asked students’ about their access to technology; the second block presented questions about

computer use. The third section asked students' experience with computer technology in high school (rather than in the university as did Kennedy, Krause, Judd, Churchward and Gray) and how well they felt they had been prepared for college. In addition, my survey included another block of questions focused on issues of computer maintenance, and how satisfied students have been with their computer use in college.

I was interested in less detail than were Kennedy, Krause, Judd, Churchward and Gray, so, for example, I asked only "How much time do you spend listening to music" rather than including separate questions about whether music was streamed or stored locally.

In addition, my survey concentrated exclusively on computer technology in the university setting; Kennedy and al. included many technologies, for example cell phones and mp3 players.

In addition to the sections about computer use, my survey included information about students' demographics. It verified that the participants belong to the generation of the digital natives. I also asked for their gender in order to find out if computer knowledge and habits are gender specific. Further, I collected data concerning their majors to be able to investigate trends in behavior and knowledge in regard to students' interests. (For example, do students have more experience with PowerPoint and Excel if they were business majors, or do English majors write more blogs than engineering majors?)

The questions concerning computer knowledge and habits can be categorized in four different blocks. The first block was dedicated to collecting data concerning student's access to technology in college in high school. I wanted to know how technologically equipped students were as access to such devices is a prerequisite for being "emerged in technology." Students were asked what kind of techno devices they owned, such as computers, laptops, smart phone and mp3 player

The second block of questions was aimed at questions of students' experience with and knowledge about computer technology in college. This section was designed to collect data that could provide information about the role of computer technology in their daily life and students' experience with a variety of software. It focused on questions about ownership of different devices such as laptops, cell phones, Ipods, as well as students' use and experience of computer technology. For example, questions asked how many hours students spend using computers for different tasks, like surfing the web, doing homework, emailing, chatting, and how experienced they are with various kind of software.

The third section was designed to collect data about students' access to technology and computer education in high school. This part of the survey probed students' prior computer education and how computer use influenced their use of and knowledge about computer technology in college. Questions in this section of the questionnaire included questions such as "How frequently did you use a computer during your time in high school," "what kind of computer classes did you have in high school," and "please list the kind of computer technology your teacher used in the classroom." In addition, I included open-ended questions in which students were asked if they thought their knowledge about computer technology has improved and if there were computer skills they had wished to have learned in high school before entering college.

The last section concentrated on acquiring data concerning students' overall and extended interest in and knowledge about computer technology including questions about computer maintenance. The goal was to find out in what kind of aspects of computer technology and software applications students were interested in. Further, I wanted to find out how proficient students were in maintaining their computer. This section contained questions to this research area.

Students were asked if they maintained their own website or blog. Further, it included open-ended questions, such as if they were interested in computer workshops or what they would do when their computer became unusable or was infected with viruses or spyware.

Procedure

Data collection took place in March of 2010. To gain a sample from many different majors, participants were recruited from the Art and English departments. After agreement with the department head of the English department one of the instructors whom I had contacted about my study sent a request to participate to all instructors of rhetoric and composition (about 60 people). Some instructors forwarded the request for participation to their students; some also mentioned the survey in class.

Art department students were recruited by the professor in charge of the undergraduate curriculum who invited students to by forwarding the request for participation to all undergraduate students in the art department.

Instructors in both departments were encouraged to send the request for participation out both before and after spring break. A copy of the complete survey including the confidentiality agreement is attached in Appendix B.

Design/Coding

The results were tested for female and male differentiations, but t-Tests showed that gender differences were insignificant, so gender differences were not considered in this study. Similarly, t-tests of differentiations among students with different majors were also insignificant, partly due to the small sample size and large number of majors.

The responses to the question about which kind of computer workshops students were interested in were divided into the specific workshop topics/software programs and tallied. For

example, if students stated to be interested in a workshop for Dreamweaver and Photoshop, the numeral value in each category was increased by one and in the end a percentage of the total value calculated.

For the question of what students had wished they had known before entering college, I listed the specific skill and added another numerical value of 1 with every student who mentioned that specific skill.

For the question of how students thought their computer knowledge had improved since high school, I first divided students into two categories—those who thought their knowledge has not improved and those who thought their knowledge had improved. As with the other questions, I established a numerical value for the stated specific kind of knowledge (e.g., their skill in conducting efficient web searches), which I then tallied.

The question of what students would do if they experienced a malfunctioning computer I analyzed similarly. I set up two categories—one for students who tried to troubleshoot the computer on their own, and those who did not think of solving the problem on their own. Each answer meant a numerical increase of one in one of the categories. Again, I transferred the numerical value into a percentage for the end result.

Reliability

Though the participants were not randomly selected from the population of the university, reliability is evident in that the answered questions are internally consistent. For example, students who reported using spreadsheets infrequently also reported low expertise in spreadsheets.

Validity

The questionnaire was based closely on a survey developed by Kennedy, Krause, Judd, Churchward and Gray (2008) and was reviewed by experts in survey design. Also university students similar to those targeted in the study completed early versions of the survey and were given opportunities to ask questions about items that were unclear.

CHAPTER IV RESULTS

Main findings

Access to computer technology

All students reported having access to computer technology in high school and all owned a computer when they started college.

Use and experience of computer technology

The majority of students reported to spend 1 to 6 hours per day using a computer. The time is equally distributed on academic or job related work and fun activities. They said to spend their time with academic work, emailing, searching the web, chatting and phoning, watching videos and listening to music. Surprisingly, the majority of students reported spending little time playing video games.

The majority of students report being “very experienced” or “experienced” with software such as web browsers, word processors and Blackboard, and at least familiar with Excel and PowerPoint. Most students have experience with installing software and are able to deal with issues of virus/spyware infections without the help of others, but just a few could deal with a computer or a problem with an Internet connection. 67% would consult an expert right away.

Use and experience of computer technology in high school

In high school the majority of students were exposed to multimedia software (82%) and the web (76%). Further, computer classes offered to a majority of students in high school include typing (74%) as well as how to use various software applications such as Word (48%).

Students' satisfaction with use of computer technology

Almost 80% of the students reported being satisfied with the use of computer technology in the classroom. Most students (71 %) stated that they thought their computer knowledge had improved since high school, especially their general knowledge about computers and knowledge about software applications and how to do efficient Internet research. More than 60% of students stated that they wished they had better knowledge about academic searches and the use of Excel before they had entered college.

In regard to workshops, they showed less interest, not even half of the students (47%) would be interested in a one to three-hour long workshop to improve their computer skills.

Detailed Findings

Students' access to technology: high school compared to college

First, I wanted to find out how well students are equipped with technology, such as computer, phones and mp3 players, as access to technology is essential for learning with and about these tools. Therefore, I asked students about their access and ownership of technical devices in college and high school.

In general, all of the students had access to a computer in high school and in college. Almost half of the students had their own computer in high school and more than 80% had access to a computer at home (see Figure 4).

Students who owned a computer in high school spent significantly more time using computers than those who did not. ($p < .05$), (see Figure 5)

The percentage of computer ownership rose to 100% when students entered college. In addition, more than 80% of students own an MP3-player, and about 40% have a smart phone (see Figure 6).

Computer use

I was also interested in students' how much students use technology and especially how much they use computers. Therefore, the survey asked students about the amount of time they spent using the computer and how the time was split up between academic work and leisure activities. A third question asked more specifically what they used the computer for, such as searching the web, emailing, watching movies, listening to music, reading news, social networking, chatting, or playing video games.

The amount of time that students spend using the computer rose considerably when they entered college. In high school about 35% of students spent one or more hours per day using a computer; in college, approximately 40% spend 4 to 6 hours per day, and 37% spend 1 to 3 hours per day on the computer (see Figure 7).

Further, 52% replied that half of the time spent on the computer is dedicated to academic or job-related work; 24% spend a quarter of their time on the computer on professional tasks, and 21% more than three quarters (see Figure 8).

The majority of students spend 1 to 10 hours per week on academic work, browsing the web and social networking. 48% spend 1 to 5 hours, and 26% of student participants spend 6 to 10 hours on the computer for academic work, and 15% spend even 11 to 15 hours. Regarding Internet use, 7% stated being on the web for 1 to 5 hours per week, 24% spend 6 to 10 hours and 13% spend 11 to 15 hours online. Almost half of the participants (49%) spend 1 to 5 hours per week on social networking sites; 17% spend even 6 to 10 hours and 14% 11 to 15 hours.

75% of students spend up to 5 hours on emailing. A majority of 62% spend up to 5 hours on reading news, and a majority of 42% is listening to music for up to 5 hours per week, and half of the students are watching videos up to 5 hours per week. The majority of participants (69%)

do not play video games or only spend up to 5 hours/week playing (23%). Also, students' responses show that they do not use the computer often for text or audio chat. 41% never use text or audio chat, and 36% use the computer for these tasks up to hours per week (see Figure 9).

Software experience and skill levels

To clarify how computer literate the so-called “digital natives” really are, I included two questions about software expertise. I asked the participants to rate how experienced they were with office applications (e.g., Microsoft Word, Excel and PowerPoint), web browsers, web development tools (e.g., Dreamweaver) and video and audio editing software. For each type of software the survey asked whether it was used for work or leisure. Also there were questions about typing skills and if and where they had learned to touch type.

The findings for students' use and experience levels for different kinds of software showed that web browsers and word processor are most widely used among students. While most of the students use web browsers equally for work and play, word processors are more frequently used for work purposes. Students rarely or never use multimedia software such as web authoring, image editing, sound editing and video editing software. If students use multimedia tools, they use them for play rather than for work (see Figure 10).

The frequent use of web browsers and word processors is equally reflected in the skill level of students. 97% of the participants claimed to be very experienced with browser software, and the other 3% claimed to be experienced. Similarly, 51% claimed to be very experienced, and 48% to be experienced with word processors. In addition, students show high experience levels with the learning management system Blackboard. 62% claimed to be very experienced and 25% to be experienced in the use of Blackboard or any similar learning management system. The level of experience starts dropping with PowerPoint and further with Excel. Only 8% claimed to

be very experienced with PowerPoint and 7% with Excel. 41% of students still showed a level of experience with PowerPoint, but just 17% professed experience with Excel. 47% reported being only familiar with the presentation software and 56% reported some familiarity with Excel. However, the number of students who barely know Excel rose to 20% in comparison to 2% of students who barely know PowerPoint.

The rare use of multimedia software results likewise in low experience levels and skills handling such software (see Figure 11).

Further, most students claim to have good typing skills (30 or 50 wpm) which they were either taught in high school or acquired themselves. (see Figure 12)

Students' experience with computer technology in high school

As I was interested in getting data regarding students' satisfaction with computer use in college and how well they were prepared for college in regard to computer technology, the survey included questions about students' experience with computers in high school. These questions asked about the variety of software, which was use in the classroom or if they were taught how to use specific software such as PowerPoint of Word, if the school offered a course management system, if they had been taught how to conduct effective web searches, or if they had been taught skills such as installing an operating system.

The majority of students were educated with the use of computer technology in the classroom. One of the most frequent types of tools used in the high school classroom were multimedia software and the web. Rarely, a school offered a course management system or special software programs (see figure 13).

More than 70% of students learned how to touch type in school, and almost 50% of the students were offered classes on how to use specific software applications. Classes about

programming or installing an operating system were rarely offered in high school (see Figure 14).

Further, about half of the students participating in the study were taught how to conduct an academic web search in high school; about 20% received instructions in college, and almost 20% never received any guidelines (see Figure 15).

Satisfaction with computer use in college and computer education in high school

Prensky (2007) suggests that these digital natives want their instructors to use more technology in the classroom; this part of the questionnaire asked students if their classes used technology as much as they would like and how well they were prepared to use computers in college. Additionally, students were asked if they were interested in instruction to acquire more computer skills.

In general, almost 80% of the students reported being satisfied with the use of computer technology in the university classroom (see Figure 16).

Concerning learning about and satisfaction with their own knowledge of and about computer technology in college, the majority of students (71%) reported that they learned much more in college than they did in high school. Just 17% of students felt their computer knowledge did not or barely improved since high school (see Figure 17).

Students answered most frequently that their general knowledge about computers and software has improved. More frequently, students also mentioned improvement of knowledge regarding efficient web searches and handling of library databases as well as learning how to handle a course management system and Excel software (see Figure 18).

In addition, 62% of the students replied that they wished they had had more knowledge about computer technology and how to use certain software applications before entering college. (see Figure 19).

The most frequently stated skills and knowledge students would have wished they had acquired before entering college was knowledge of Excel as well as better knowledge of efficient web searches for academic research. They further specifically wished they had had better typing skills and knowledge of Photoshop and PowerPoint (see Figure 20).

The majority of students (66%) do not maintain a website or a blog.

Almost half of the participants (47%) stated that they would be interested in any kind of one-to-three-hour-long computer workshop, and 37% have no interest at all. (see Figure 21). The most frequently named skills students wished to learn in such a workshop were Photoshop, web design and video editing (see Figure 22). Students with no interest in any workshop frequently stated time issues as the reason for their disinterest and, also, that they did not think that such a short workshop would really teach them any skills. These students rather believed in a “learning-by-doing” approach.

Computer Maintenance: Troubleshooting experience and skills

Caruso and Kvavik (2005) found that students want technology that is reliable; I investigated whether students are prepared to maintain their own computer, install software, and manage virus and spyware infections. I wanted to know whether students were able to troubleshoot their own computer when it turned out not to be reliable.

A high percentage of students seem to be able to handle virus and spyware infections themselves. While 22% of the participants reported to never experiencing such an infection, almost 40% were able to repair infections themselves, and another 32% at least attempted to fix

it on their own. Female students reported a significantly lower infection rate than male students ($p < .05$) (see Figure 23). Further, a majority of students seem to be able to install software. 71% reported to have installed software themselves.

But just a minority of students would be able to deal with more severe computer problems by themselves —such as when the computer does not boot or the Internet connection does not work. The great majority (68%) would consult a computer expert right away without attempting to figure out the problem themselves (see Figure 24).

CHAPTER V

DISCUSSION AND CONCLUSION

Discussion

The results of the study about the technology experience of students belonging to the generation of digital natives at the University of Tennessee are consistent with the studies done by Caruso and Kvavik (2005) and also partially confirm Kennedy, Krause, Judd, Churchward and Gray's (2008) study. Though this study used a small non-random sample, its findings are nonetheless useful. Since students knew that the survey was about technology, it follows that those who completed the survey may be those who are more interested in and better at using computers than are their peers. Therefore, it is somewhat surprising that this group is not as computer savvy as Prensky (2007) would have us think. Further, the students came from various disciplines, which makes it more likely that the results can be representative of a larger student population.

Students' use of computer technology is adapted to their immediate needs.

The results show that students have almost unlimited access to computer technology and know how to use the kind of computer technology which is best adapted to their daily needs (i.e., software tools like word processors and internet browsers as well as the appropriate learning management system). Depending on their academic needs, they show familiarity and expertise with other software programs such as PowerPoint and Excel. Students use the computer equally for work and play at an average of 1-6 hours daily. Their use of computer technology concentrates mainly on the use of the Internet as research tool for academic and leisure purposes, such as social networking and emailing.

In summary, we can assume that the majority of students who grew up with computer technology are indeed tech-savvy in regard to a rather narrow framework of computer experience and knowledge, which is mostly adapted to their immediate needs. It includes the ability of Internet browsing, emailing and the ability to handle basic software applications, such as Word, PowerPoint and Blackboard. But, as also Kvavik and Caruso (2005) as well as the Australian researchers (Kennedy, Krause, Judd, Churchward and Gray, 2008) have found, further levels of expertise and range of knowledge with a larger variety of software applications among the student population varies.

Students' evaluation of technology experience in college and high school

As in Caruso and Kvavik's study (2005), the majority of students in this study are satisfied with the implementation of computer technology in the academic curriculum and do not wish for more use of the computer in the classroom.

Students' lack of interest in one-to-three-hour-long computer workshops—workshops that could improve computer skills for their academic work—suggests that they are mostly satisfied with their computer knowledge. It further suggests that they have the necessary computer skills for their academic work. If students show interest in any workshop it is clearly aimed at improving skills for their personal use unrelated to academic work. The most frequently mentioned skills were Photoshop and web design as well as video editing.

Though it seems that these skills are not of immediate need for the academic curriculum, colleges and high schools might consider offering such workshops. Such workshops might foster students' interest in computer technology and advance other computer skills as well as learning skills appropriate for other subjects. Further, the availability of course which students genuinely enjoy might contribute to greater motivation and satisfaction with their academic life.

At the same time, the majority students report that their computer skills have improved considerably since entering college, especially in regard to academic searches and general computer knowledge. This might explain the fact that students are less interested in workshops as they managed to attain the required computer skills during their first year at the university. In this context, it is also no surprise that the majority would have liked to be better prepared for the computer use at the university. Such preparation would have eased academic challenges, especially in the freshman year. Students especially mentioned the use of specific software applications—Excel, Photoshop and PowerPoint—and the ability to conduct efficient research on the web.

Students lack skills in computer maintenance.

When it comes to issues such as troubleshooting a malfunctioning computer or network connection, the majority of students seem to lack the skills, knowledge, or interest to do so. The majority of students in this study would not even attempt to or have any idea how to troubleshoot, but would hand over their computer to an expert (e.g., to a computer store or the computer help desk at the university). Besides the lack of knowledge in this realm, the majority of students do not express any interest in gaining such knowledge. It seems that most students have and always had any necessary support at hand so that they are not confronted with the need to learn how to troubleshoot a computer or barely experience such a major problem. The results also demonstrate that students' knowledge and understanding of computer technology is quite limited to the aforementioned framework of knowing how to use some software applications. If any issue or problem outside this framework occurs, the results of this study suggest that they are not knowledgeable or maybe computer-savvy enough to deal with it. Rather, they see such

knowledge as something that is unique to a computer expert and beyond what they might be able to understand as laymen.

On the other hand, a large percentage (40%) of students are equipped to deal with virus and spyware infections themselves. This would confirm the assumption that students' attitude to learning new computer skills is rather pragmatic. If computer issues are immediate and frequent as well as obvious, they seem more inclined and able to learn the necessary skills to deal with these issues, no matter if it is a software application or any other computer skill.

This implies that students would learn how to troubleshoot diverse computer problems if they thought it was an important skill to have.

More computer education in high school could prepare students better for their needs in college

These perspectives suggest that computer classes in high school could be improved to prepare students better for their needs in college. This would entail more instruction and practice on efficient web searches and more training in certain software applications and lessons in computer maintenance. At the same time, universities might consider offering such computer classes, especially to freshmen. For example, a class on how to conduct efficient academic searches could be integrated into the curriculum of undergraduate studies. Such a class could be co-taught in combination with, for example, a general education class or an English public writing class.

Limitations of the study

Some findings also show how difficult it is to translate computer habits into "facts" of what students really can do and how knowledgeable they are. Though almost all students are savvy in their use of web browsers and they use the Internet frequently for work and fun, we

cannot necessarily draw the conclusion that students know how to do an efficient Internet search or know which websites are valid to be used as source of reliable information.

Likewise, though students do use certain software applications frequently, as for example word processors, we do not necessarily know how detailed students' knowledge really is. Further, though student reported that multimedia software was used in the high school classroom frequently, we cannot draw the conclusion that they know how to use this software. The majority of participants reported that they rarely use multimedia software and even students' skill levels of PowerPoint varied greatly. Another example of the restrictions of this quantitative study is the fact that male students reported a significantly higher infection rate with virus, mal-or spyware infections than their female counterparts. The numbers can tell us, that there is a difference between male and female students' infection rate, but we can only make assumptions about the reasons for this discrepancy. Is it the sites they are searching, are females less inclined to notice infections, are male students less hesitant to click unknown links?

These issues are in accordance with the Australian researchers who stated "that core technology based skills do not necessarily translate into sophisticated skills with other technologies or general information literacy" (Kennedy, Krause, Judd, Churchward and Gray, 2008).

It seems that the expertise and experience with computer technology, the required familiarity with and range of software applications in college, can almost exceed the "digital native" students' knowledge and abilities, or at least it seems to provide a learning experience and challenge for a large percentage of students. Therefore, it seems necessary that instructors and administrators remain in close communication with students about their needs and the ability of faculty to provide an efficient learning environment that integrates computer technology.

Universities and educators might be able to assume core knowledge of computer literacy, but how this core knowledge really translates into practice has to be tested and refined continuously.

Conclusion

The results of this study only can give a limited view on students' experience with and knowledge about computer technology. The results reveal certain habits, interests, preferences and computer knowledge of students who have grown up with computer technology. But the data are not sufficient to draw a conclusive picture of how an effective integration of computer technology and/or further emerging technology would look like. In order to reach this goal, more research would be necessary. For example, the age range of students, which in this study was mainly 18-22 years, should be widened. Maybe, instead of looking for the differences between "digital native" and "digital immigrants," it is time now to ask, how far the technology experience of digital immigrants who "invented" Google, blogs, etc, differs from the generation who grew up with such technology as a finished product. Has there been a shift in technology experience and knowledge from students who were born in the 90s and later versus students who marked the beginning of the so-called "net generation"? We might also ask, who are the experts students consult when they have computer problems.

Further, to really assess students' preferences and experience of computer technology, qualitative studies would be of great value. As was shown in this study, using a software application frequently does not necessarily entail that one knows specific details, but still can mean that the knowledge of how to use the application is quite limited. A phenomenological study, for example, could be of great value to gain data of how students exactly use the Internet or what their experience with a software application looks like. Such studies could give a more

complete picture of the subject in question. But how to integrate this knowledge into practice will be another question.

LIST OF REFERENCES

Bennett, S., Martion K., and Kervin, L. (2008). The “digital natives” debate: A critical review of evidence. *British Journal of Educational Technology*, 39(5), 775-786.

Caruso, J. B. & Kvavik, R. (2005). ECAR study of students and information technology 2005: Convenience, connection, control, and learning. EDUCAUSE.
<http://net.educause.edu/ir/library/pdf/ers0506/rs/ERS0506w.pdf> (Retrieved 02/1/2011)

Kennedy, G., Krause, K., Gray, K., Judd, T., Churchward, A. (2006). First year students’ experience with technology: Are they really digital natives? Preliminary findings.
http://www.bmu.unimelb.edu.au/research/munatives/natives_report2006.pdf (Retrieved 4/18/2011)

Kennedy, G., Krause, K., Gray, K., Judd, T., Churchward, A. (2008). First year students’ experience with technology: Are they really digital natives? In *Australasian Journal of Educational Technology*, 24 (1), 108-122
<http://www.ascilite.org.au/ajet/ajet24/kennedy.html> (Retrieved 02/12/2011)

Kvavik, R.B., Caruso, J.B. & Morgan, G. (2004). ECAR study of students and information technology 2004: convenience, connection, and control. Boulder, CO: EDUCAUSE Center for Applied Research.
<http://www.educause.edu/ir/library/pdf/ers0405/rs/ers0405w.pdf> (Retrieved 02/12/2011)

Kvavik, R.B. (2005). Convenience, communications, and control: How students use technology.
In D. Oblinger & J. Oblinger (Eds.), *Educating the Net Generation*, 7.1-7.20.

EDUCAUSE. <http://net.educause.edu/ir/library/pdf/pub7101.pdf> (Retrieved 02/12/2011)

Livingston, S. & Bober, M. (2004). Taking up online opportunities? Children's use of the
Internet for education, communication and participation. *E-Learning* 1, 3 395-419.

Oliver, B. & Goerke, V. (2007). Australian undergraduates' use and ownership of emerging
technologies: Implications and opportunities for creating engaging learning experiences
for the Net Generation. *Australasian Journal of Educational Technology*, 23(2), 171-186.
<http://www.ascilite.org.au/ajet/ajet23/oliver.html> (Retrieved 02/12/2011)

Prenksy, M. (2001a). Digital Natives, Digital Immigrants. *On the Horizon*, 9(5).
<http://www.marcprensky.com/writing/prensky%20-%20digital%20natives,%20digital%20immigrants%20-%20part1.pdf> (Retrieved
02/12/2011)

Prenksy, M. (2001b). Digital Natives, Digital Immigrants, Part II. Do they really think
differently? *On the Horizon*, 9(6). <http://www.marcprensky.com/writing/Prensky%20-%20Digital%20Natives,%20Digital%20Immigrants%20-%20Part2.pdf> (Retrieved
02/12/2011)

Prensky, M. (2007). How to teach with technology: Keeping both teachers and students comfortable in an era of exponential change. *Emerging Technologies for Learning*, Vol. 2 (2007).

APPENDIX

Appendix A

Figures

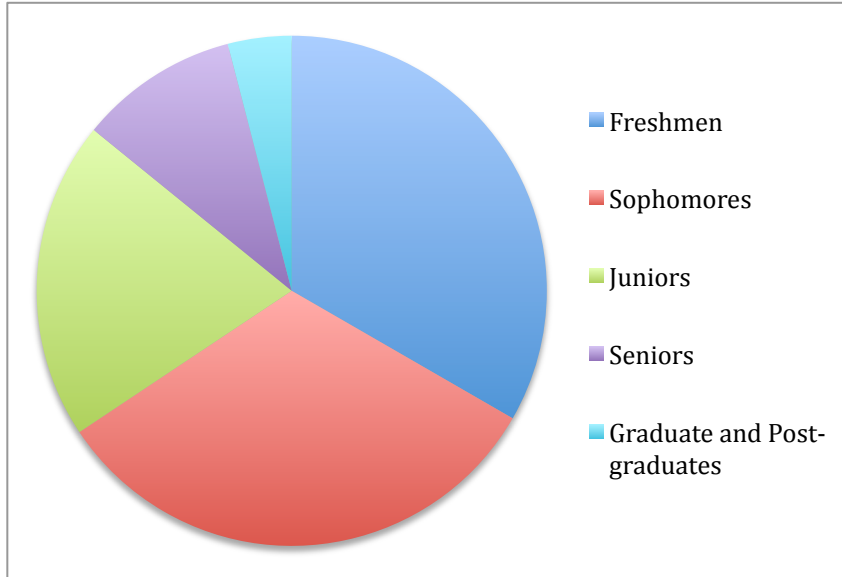


Figure 1: Distribution of participants by major

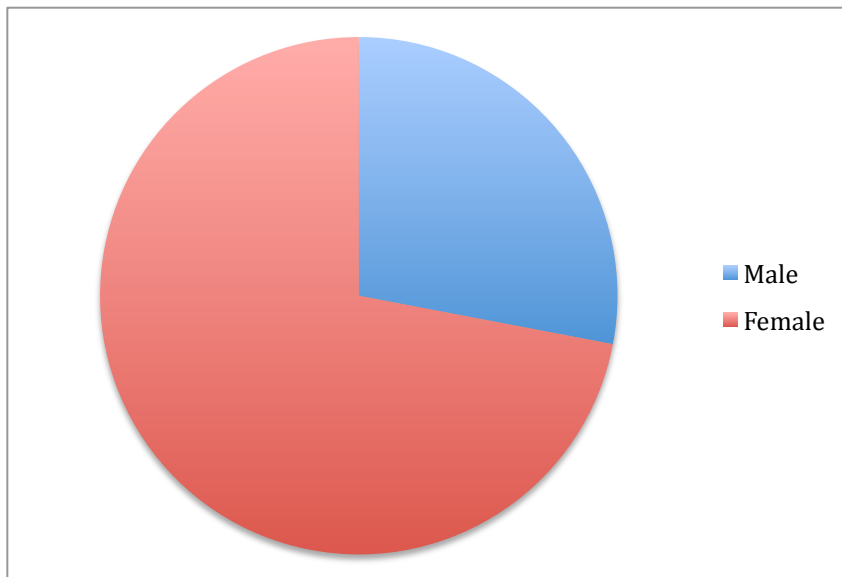


Figure 2: Distribution of male and female participants

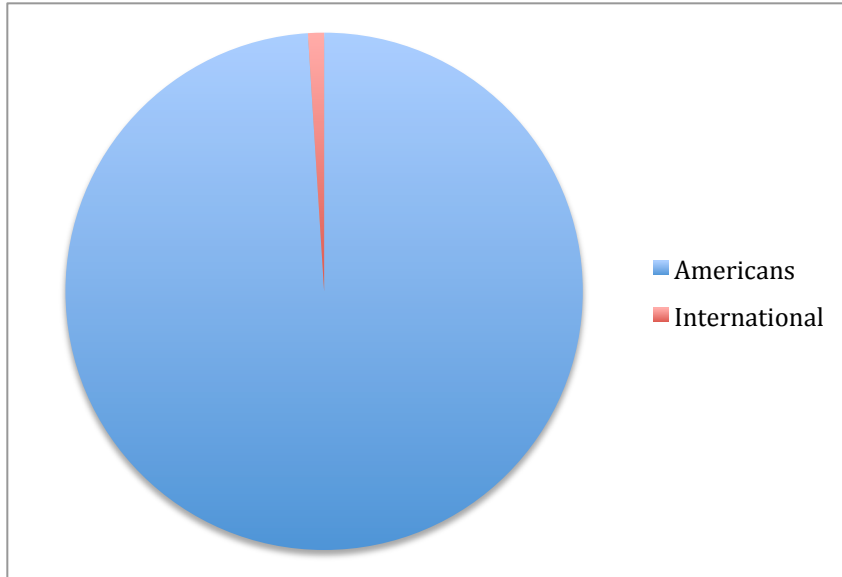


Figure 3: Distribution of participants by nationality

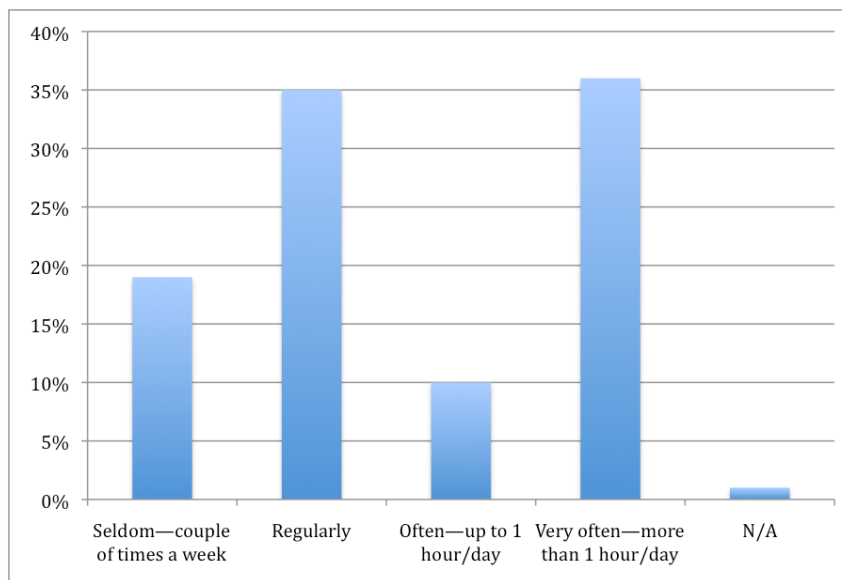


Figure 4: Use of computer in high school (frequency)

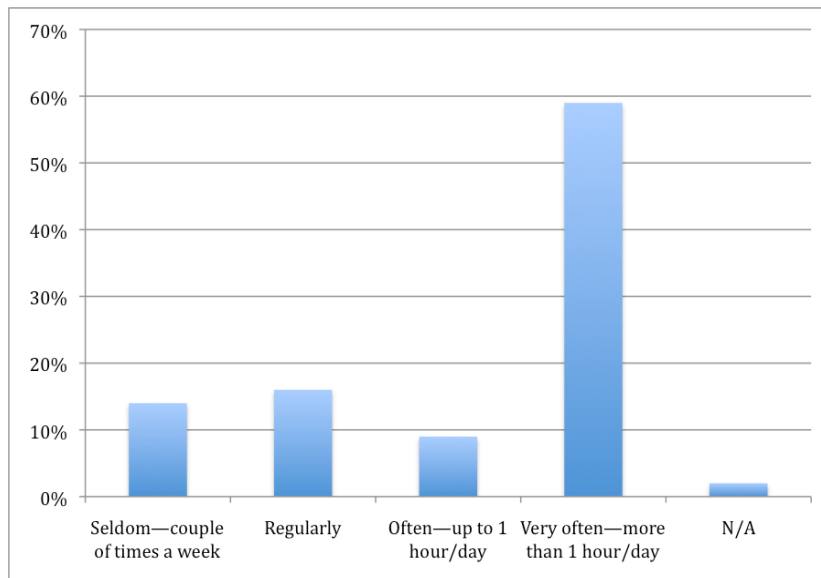


Figure 5: Use of computer in high school of students who had their own computer (frequency)

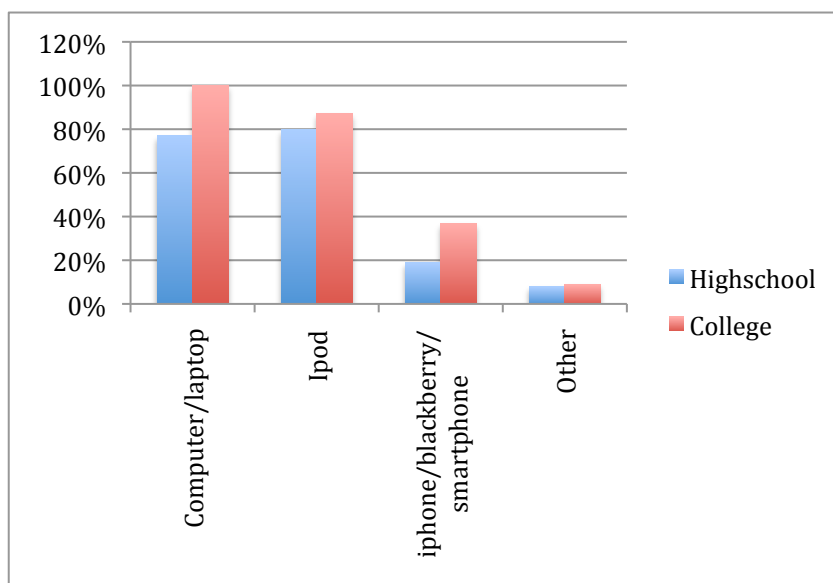


Figure 6: Ownership of tech-devices in college in comparison to high school

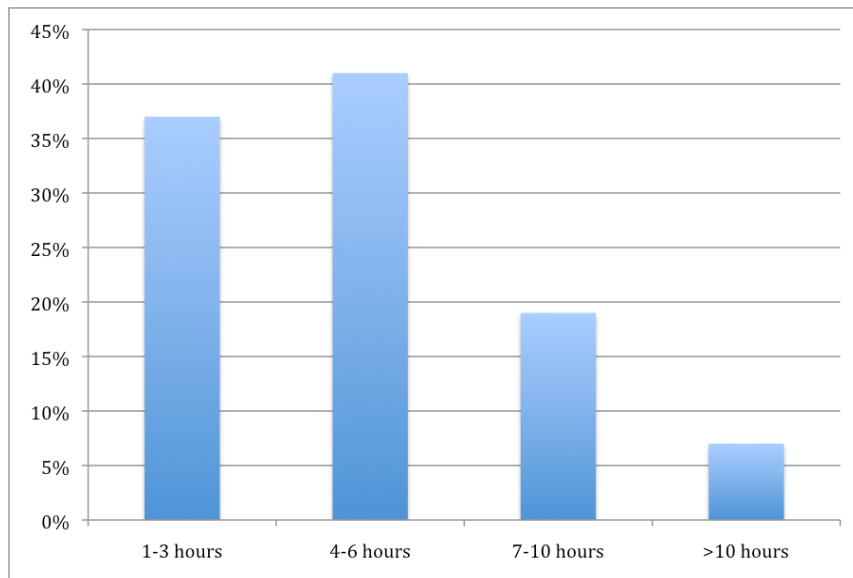


Figure 7: Average time spent using a computer in college per day

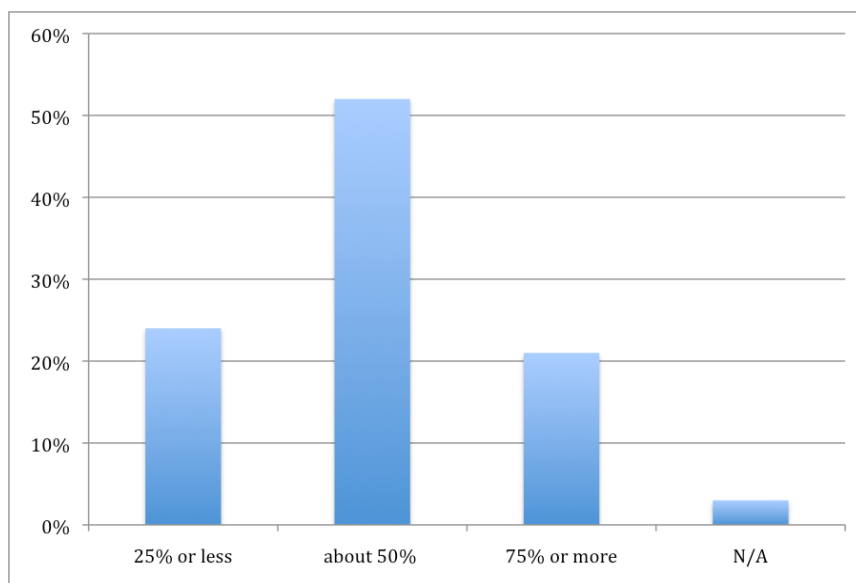


Figure 8: Percentage of hours spent for academic work and/or job

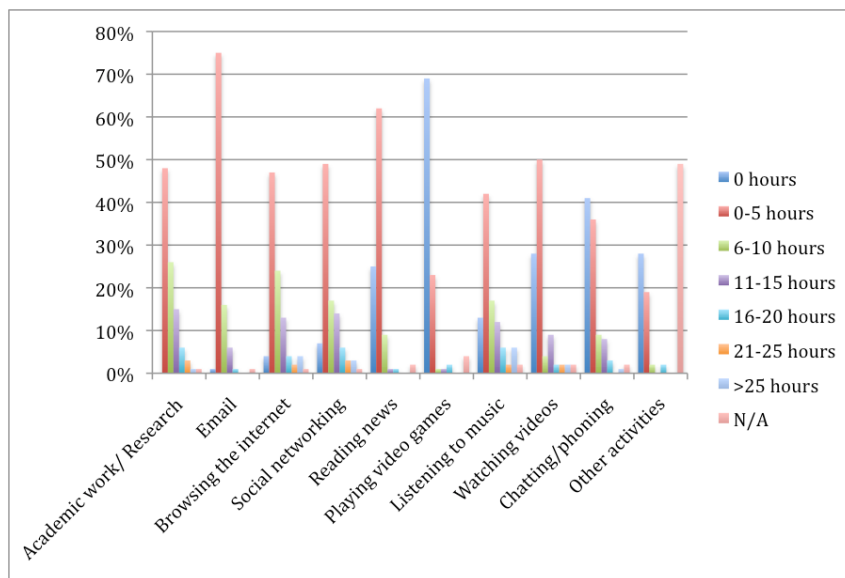


Figure 9: Students' computer activities in hours per week

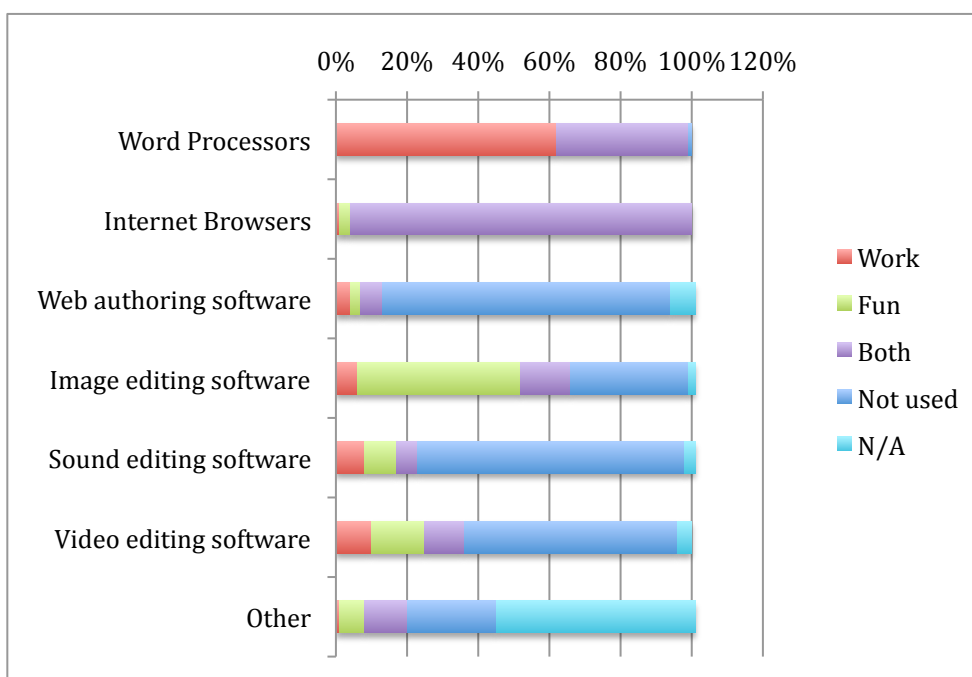


Figure 10: Students' use of software

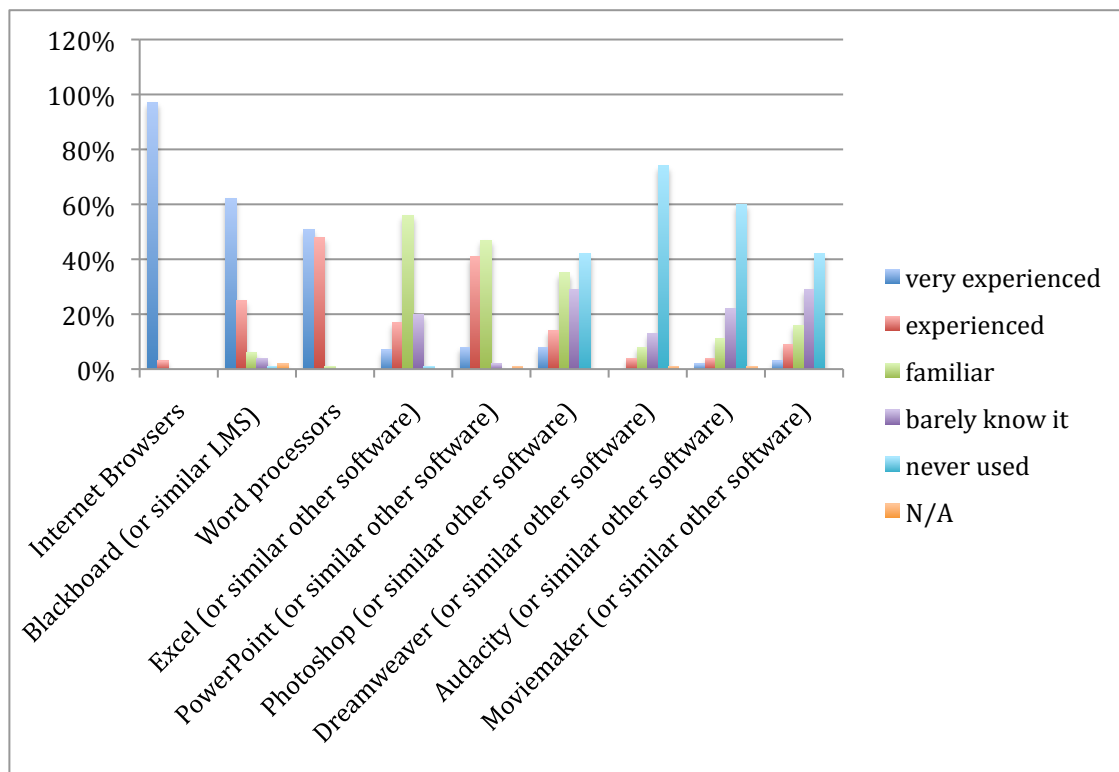


Figure 11: Students' experience levels with different kind of software

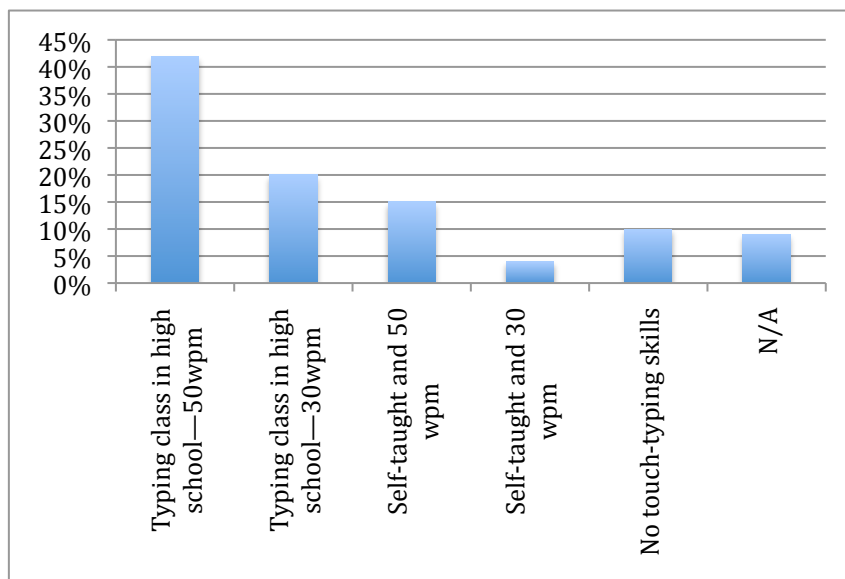


Figure 12: Students' typing skills

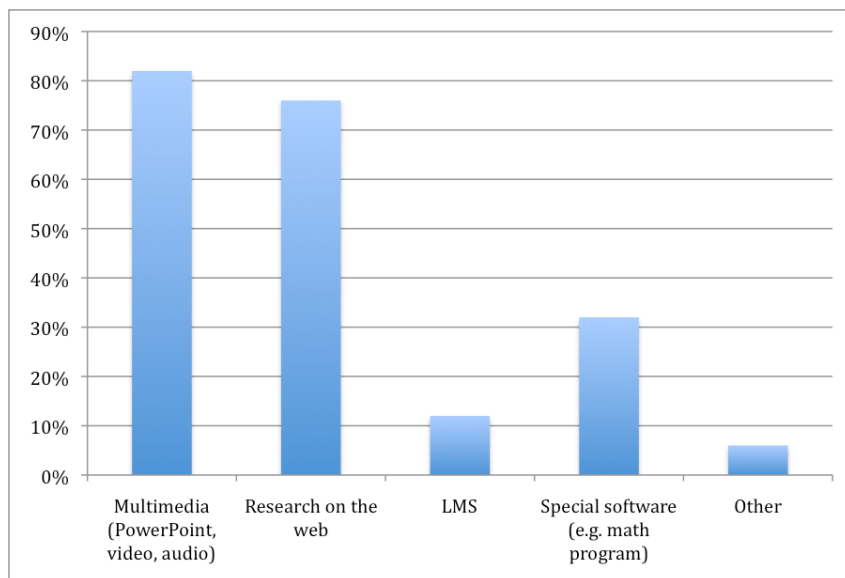


Figure 13: Computer technology used in classroom in high school

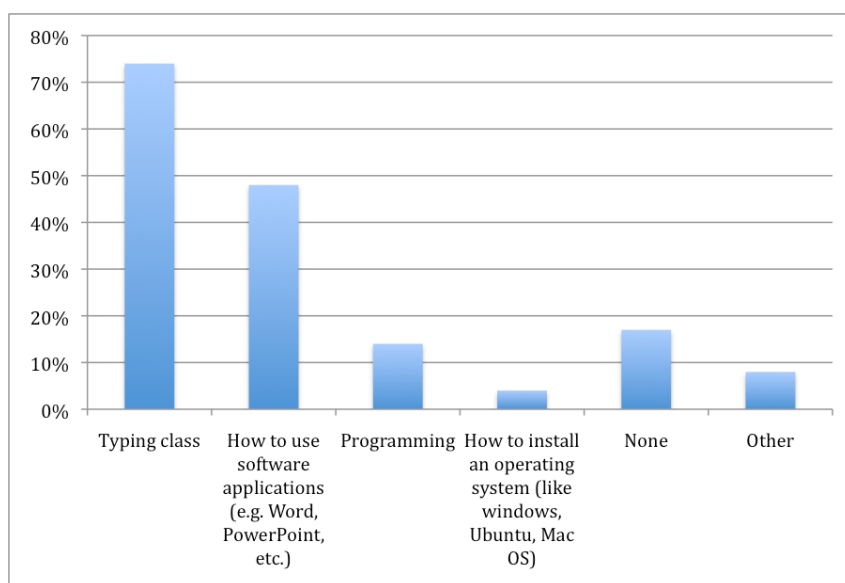


Figure 14: Computer classes offered in high school

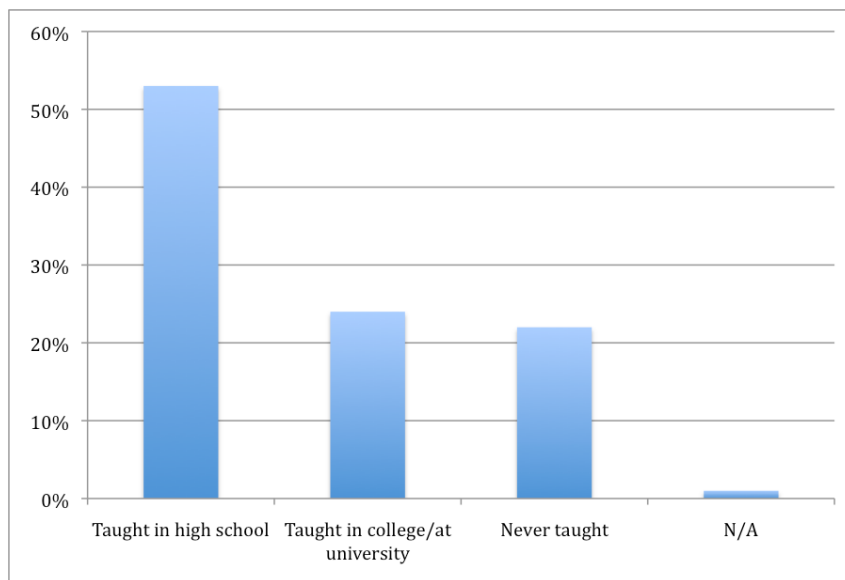


Figure 15: Instruction received concerning the issue of conducting web searches for (academic) research

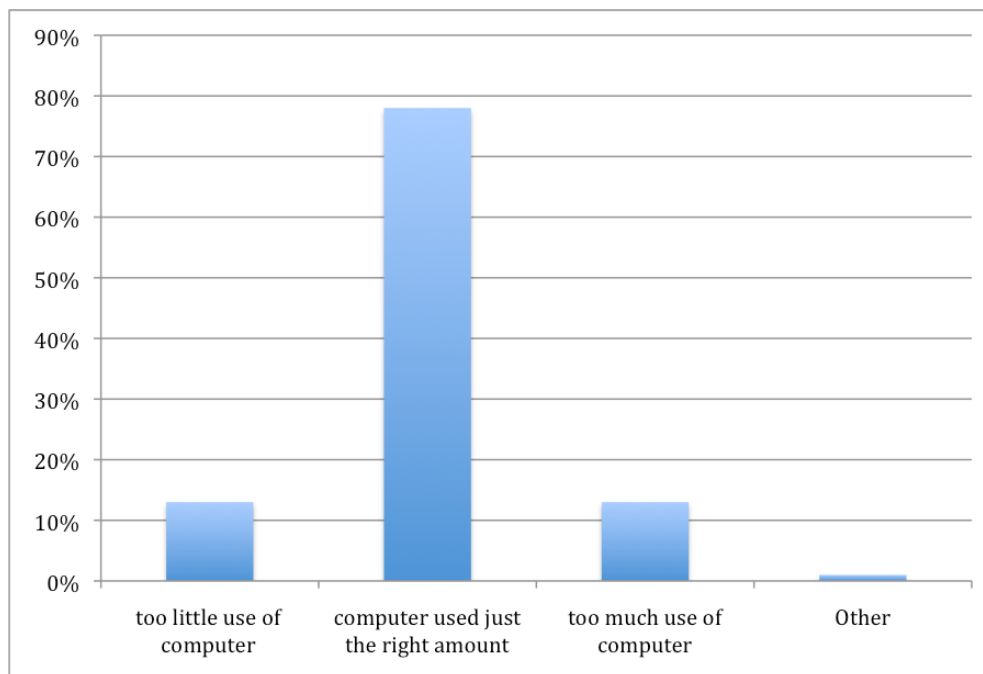


Figure 16: Students' satisfaction with the use of computer in classroom

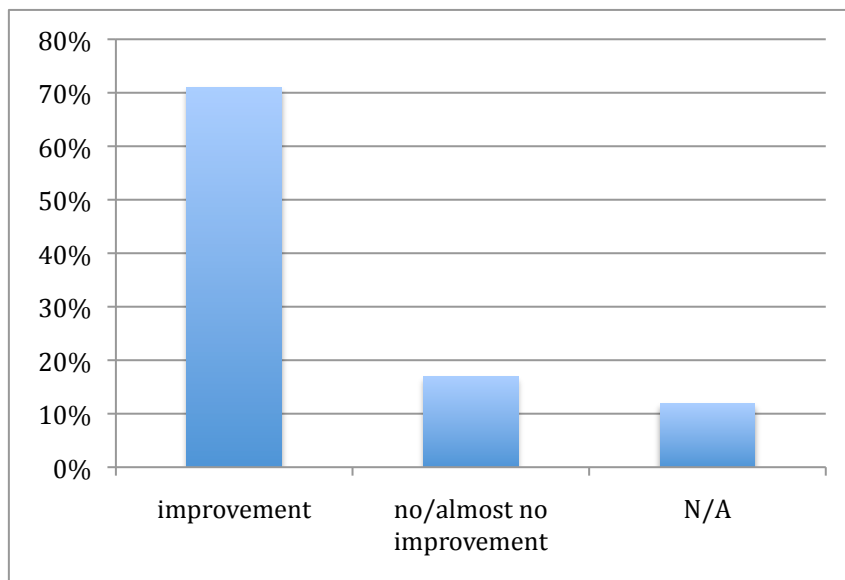


Figure 17: Students improvement of computer technology in college

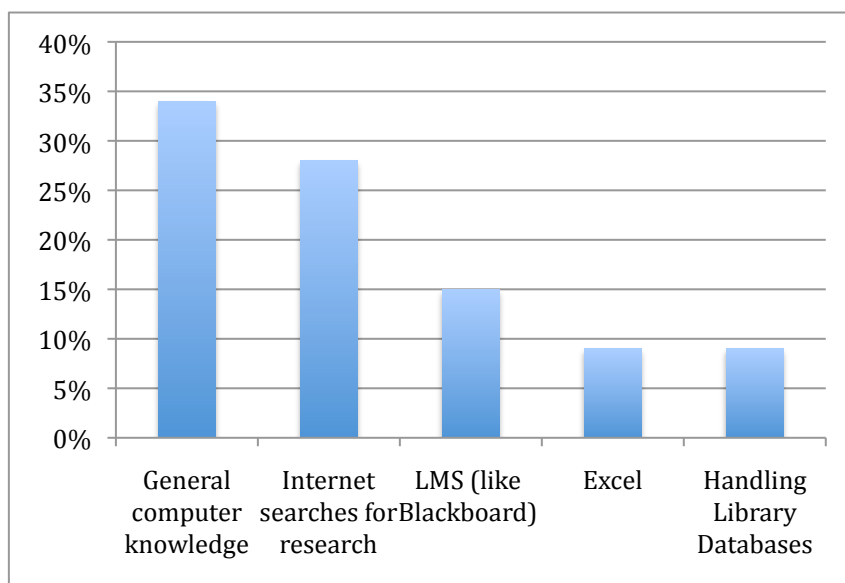


Figure 18: Improvement of computer knowledge in college (in percentage of those who reported knowledge improvement)

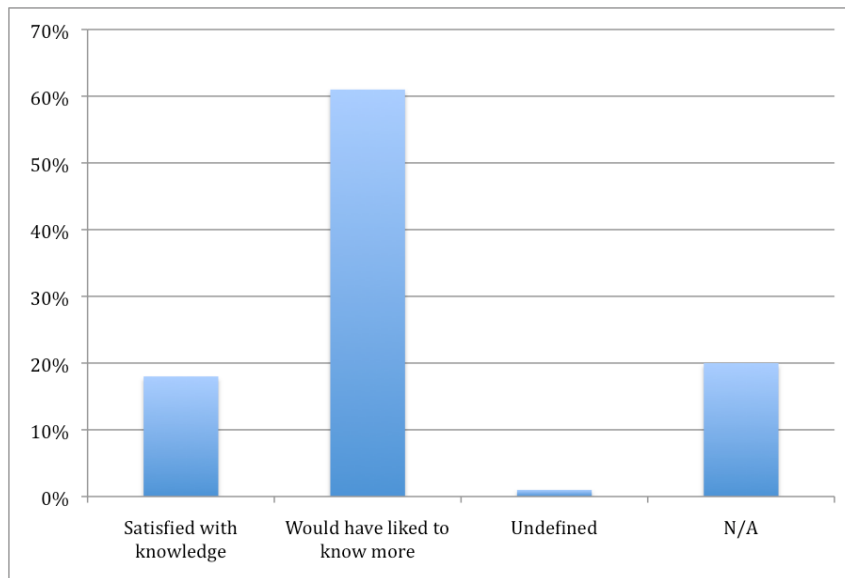


Figure 19: Computer knowledge students wished they had before entering college

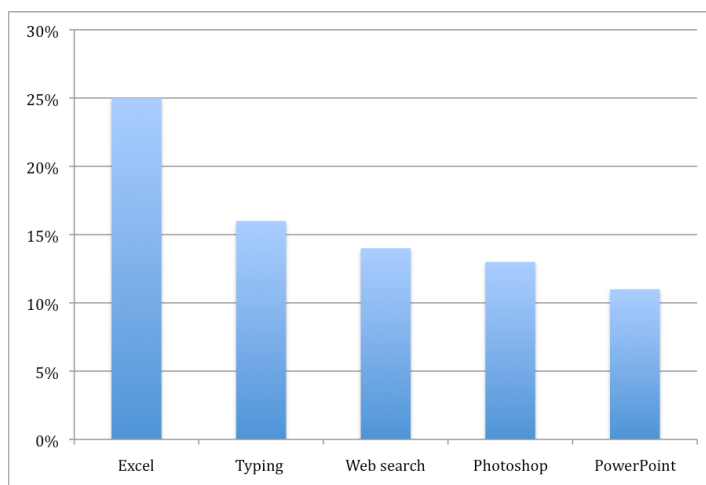


Figure 20: Knowledge students wished they had before entering college (in percentage of students who wanted to know more before entering college)

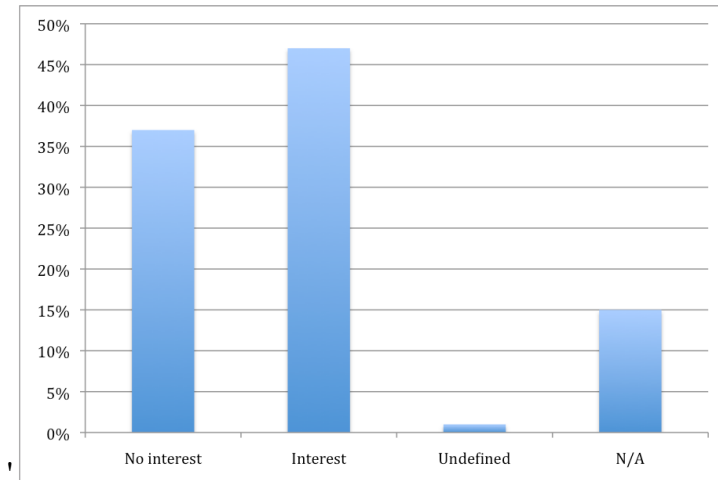


Figure 21: Students' interest in computer workshops

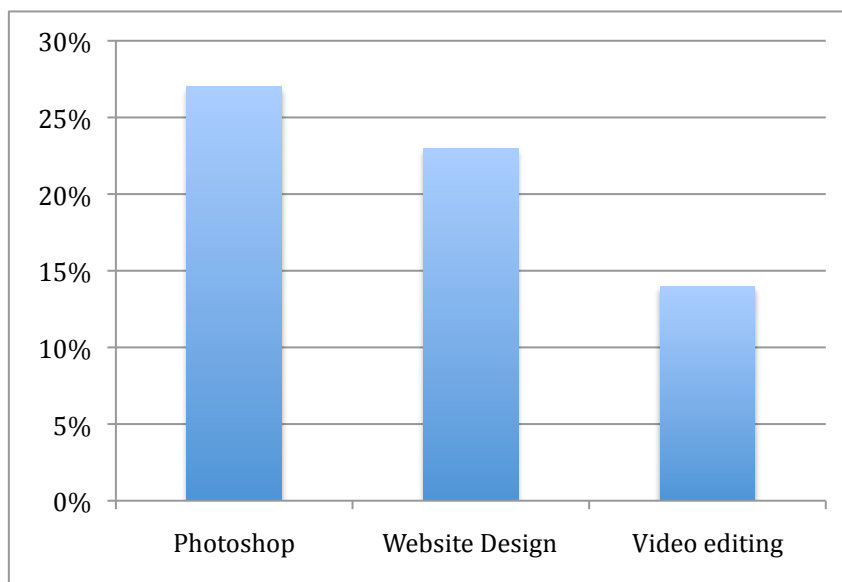


Figure 22: Kind of workshops students are interested in (in percentage of students who are interested in computer workshops)

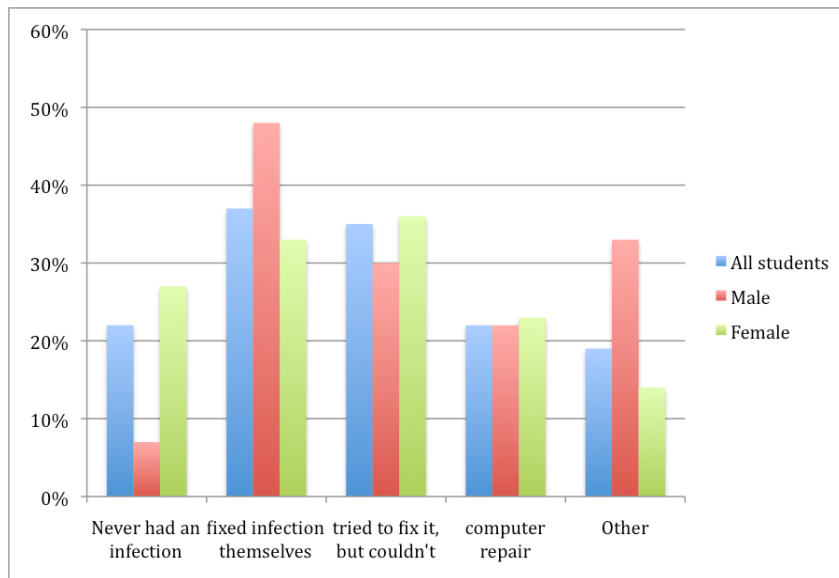


Figure 23: Students' experience of dealing with virus/spyware infections

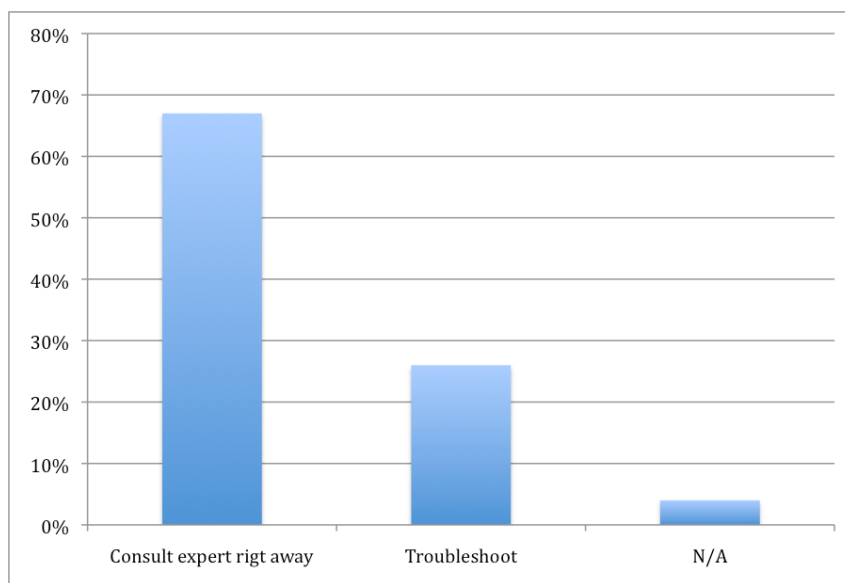


Figure 24: Students' actions if their computer became unusable

Appendix B

Survey

Technology Experience

This survey is for me to learn more about how students use and learn to use technology, especially computers. Thanks very much for your time.

Participants' Consent Form

Motivation for free Contribution

My name is Almut Haboeck. I am working on a M.S in Instructional Technology at the University of Tennessee. I am interested in computer literacy of these generations of students who grew up with computer technology. Your answers can help to revise computer lessons in high schools or initiate computer classes for freshmen at the university or revise in general the use of technology in the classroom. Most of the questions are multiple choice questions concerning availability of computer technology during high school and as a college student, knowledge concerning software applications and computer repair. This survey will take 5-10 minutes. To protect your privacy, I ask for no information, which would allow me to track you.

Thanks,
Almut Haboeck <ahaboeck@utk.edu>

Confidentiality Acknowledgment and Participation Agreement

If you have questions about the study, please contact me at ahaboeck@utk.edu, 319-321-2141 or 1857 Beech Street, Knoxville, TN 37920. If you have any questions about your rights as a participant, contact the Research Compliance Services section of the Office of Research at (865) 974-3466. Participation in this research is voluntary.

Permissions

Data will be stored securely and will be made available only to persons conducting the study. Data may be shared with graduate students or colleagues who assist in analyzing the data. All persons working on this project or who will have access to this data will be required to sign a Surveys will be stored electronically on computers. These computers will include my laptop computer, which I keep with me or in my home, and a server at home that is used to backup my files. There is no direct benefit to you as a participant. Refusal to participate will involve no penalty or loss of benefits. If you elect not to participate in this study, just close the website now. The remainder of this survey will immediately be discontinued. If you agree to participate in this study, you have the right to withdraw from the research project at any time without penalty or loss of benefits. Selection of NEXT below, serves as an acknowledgment that you have read the above information and that you agree to participate in this study. Thank you in advance for your willingness and time to participate in this study.

Almut Haboeck

Personal Data

1 Gender

Please choose **only one** of the following:

- Female
- Male

2 Age

Please write your answer here:

3 Year of study

Please choose **only one** of the following:

- Freshman
- Sophomore
- Junior
- Senior
- Other
-

4 Year of High school graduation

Please write your answer here:

5 Your major

Please write your answer here:

6 Are you an American or International student?

Please choose **only one** of the following:

- American
- International

Experience with technology

7 Which of the following devices do you own now?

Please choose **all** that apply:

- computer/laptop
- ipod
- iphone/blackberry/smartphone
- Other:
-

8 Do you have access to internet at home?

Please choose **only one** of the following:

- Yes
- No

9 About how many hours each day do you spend using a computer (on average)?

Please choose **only one** of the following:

- 0
- 1-3
- 4-6
- 7-10
- >10
-

10 About what percent of the time you use computers is related to class work or your job?

Please write your answer(s) here:

- 25% or less
- about 50%
- 75% or more

11 How many hours each week do you spend using your computer for following activities/tasks (on average)?

Please choose the appropriate response for each item:

0 1-5 6-10 11-15 16-20 21-25 >25

Academic work/research

Social networking

Reading news

Playing video games

Emails

Chatting/phoning

Listening to music

Browsing the internet

Watching videos

Other

12 Which kind of software do you use on a regular basis? Do you use it for fun, work or both?

Please choose the appropriate response for each item:

	Don't use this software	Work	Fun	Both
Word Processors (Word, OpenOffice, TextEdit, etc.)				
Internet Browsers (Internet Explorer, Firefox, Safari, etc.)				
Web authoring software (Dreamweaver, FrontPage, etc.)				
Image editing software (PhotoShop, Gimp,				

iPhoto, etc.)				
Sound editing software (Audacity, etc.)				
Video editing software (Moviemaker, iMovie, Final Cut. etc.)				
Other Software				

13 How experienced are you with following software applications?

Please choose the appropriate response for each item:

	Very experienced (I work with this software everyday)	Experienced (I work with this software every week)	Familiar (I have used it a couple of times)	Barely know it (Have used it once or twice)	Never used
Word, (or similar other software)					
Excel (or similar other software)					
Powerpoint (or similar other software)					
Photoshop (or similar other software)					
MovieMaker (or similar other software)					
Audacity (or similar other sound-editing software)					
Internet Browsers (Internet Explorer, Firefox, Safari, etc.)					
Dreamweaver (or similar other web-authoring software)					
Blackboard (or similar other LMSs, like Moodle)					

History of Computer Use

14 Before you started college, which of the following devices did you own?

Please choose **all** that apply:

- computer/laptop
- ipod
- iphone/blackberry/smartphone
- Other:

15 Did you have access to a computer in high school?

Please choose **all** that apply:

- Yes, in computer lab
- Yes, in classroom
- Yes, we had a computer at home for everyone to use.
- Yes, I had my own computer.
- No, I didn't have access to any computer.

16 How frequently did you use a computer during your time in high-school?

Please choose **only one** of the following:

- Never
- Seldom—a couple of times a week
- Regularly—everyday
- Often— up to 1 hour /day
- Very often—more than 1 hour/day

17 What kind of computer classes did you have in high-school?

Please choose **all** that apply:

- None
- Typing class
- Programming
- How to use software applications (e.g. Word, Photoshop, PowerPoint, etc.)
- How to install an operating system (like Windows Mac OS X, Ubuntu)
- Other:

18 Please list the kind of computer technology your teacher used in the classroom.

Please choose **all** that apply:

- Multimedia (like PowerPoint presentation, video, audio)
- Doing research on the web
- Course Management System (like Moodle, Blackboard)
- Special software (e.g., a math program)
- Other:

19 Did your school offer a Learning Management System (e.g. Moodle, Blackboard, etc.) ?

Please choose **only one** of the following:

- Yes
- No

20 Did you learn how to touch type in school?

Please choose **only one** of the following:

- Yes, I can type approximately 50 wpm
- Yes, I can type approximately 30 wpm
- I learned it myself and can type approximately 50 wpm
- I learned it myself and can type approximately 30 wpm
- No, I can't touch type.

21 Did you ever take a course or were taught how to conduct a web search for (academic) research? Such information might have included reliability of websites, efficient searches, etc.

Please choose **only one** of the following:

- Yes, in high school
- Yes, in college/at university
- No, never

22 How has your knowledge about computer technology improved since you started university? (Do you know more software programs, have more knowledge of how to use certain software, are better at Internet searches, etc. and how did you gain this knowledge, i.e. classes, self-taught, etc.)

Please write your answer here:

23 Please describe any computer skills that you wish you had learned before you entered college.

Please write your answer here:

24 Please describe any 1-3 hour computer skills workshops you might be interested in attending. If you are not interested in any workshops, why not?

Please write your answer here:

Knowledge about computers beyond use of software applications, etc.

25 Have you ever installed software? If yes, which?

Please choose **only one** of the following:

- Yes
- No

Make a comment on your choice here:

26 What would you do (or have you done) if your computer became unusable (e.g., would not boot, could not connect to the internet)?

Please write your answer here:

27 What would you do (or have done) to solve problems caused by viruses, malware or spyware on your computer?

Please choose **all** that apply:

- I never had a virus, malware or spyware.
- I fixed it myself.
- Brought computer to computer repair or computer store to get it fixed
- Tried to fix it myself, but couldn't.
- Other:

28 Do you have your own blog or web site?

Please choose **only one** of the following:

- Yes
- No

29 Do you think that the classes that you take at UT use computers too little, about the right amount, or too much? Please describe how you wish your instructors integrated computers differently.

Please choose all that apply and provide a comment:

	Comment:
too little (I wish professors encouraged or integrated computer use more)	
about the right amount	
too much (computer use gets in the way of my learning)	
Other:	

Submit your survey. Thank you for completing this survey.

VITA

Almut Haboeck was born and raised in Germany. She attended primary school in Roettenbach, Germany and graduated from the Gymnasium Hoechstadt and der Aisch, Germany. In 1998, she graduated from the University of Vienna, Vienna, Austria, with a Master degree (Mag. Phil). in Art History with a concentration in 20th century art. Her master thesis “Paul Kirnig, 1879-1955” was published in 2009 by Peter Lang Verlag. For 10 years, she worked in the art world, including work in academia, museums and galleries in Vienna, Iowa City and New York.

In 2008, Almut Haboeck started the M.S. program in Instructional Technology at the University of Tennessee and graduated in 2011. During this time she has worked at the office of Information Technology at the University of Tennessee assisting students, staff and faculty with computer problems.