

## Appalachian State University

### Freshman Computing Skills & Experiences

#### Executive Summary

Appalachian's 1999 Freshman Class participated in a series of assessment tests to benchmark their entry-level computing skills and experiences. All students completed a survey of prior experiences and a random sample also participated in a hands-on test of computing skills. These assessment data begin a longitudinal evaluation of learning outcomes connected to Appalachian's core curriculum computing goals.

#### Key benchmarks include:

- Nearly all students agreed that computer ownership "provides an academic advantage."
- Students came from homes with wide access to computing, entertainment, and communication technologies. Over half had a personal e-mail account in the previous year.
- Most new freshmen own computers (90% brought a computer to campus – 90% were IBM format. Ten percent more plan to obtain a computer soon.).
- Nine of ten students primarily used an IBM-format computer in the prior year.
- Students own new computers (2 of 4 new within 3 months, 3 of 4 new within 12 months).
- Over half of computer owners were new "sole owners" of a computer, a change from sharing a computer with other family members in the prior year.
- Comparative ratings suggested a tentative confidence. While students rated their own skills as high or "expert," self ratings were lower than those given to friends, high school teachers, and fathers.
- A large gap in computing skills and knowledge was connected to prior year experience. Computer owners, in the prior year, scored consistently higher than students who shared a computer. On average, those without a computer at home were the lowest scoring. A clear division existed between the "haves" and "have nots."
- Students were capable of basic e-mail and word processing, however, they were not prepared for academic computing demands (sending attachments, managing files, formatting papers, etc.).
- A large gap existed between the ability to access and the ability to evaluate internet information.
- Only a few students had even elementary spreadsheet skills.
- Many students lacked basic skills in saving electronic files and folders.
- Students sought out-of-class instruction in e-mail and web searching, while faculty taught electronic library searching and e-mail.
- Most students received some instruction in computing tasks during the first three weeks of the first semester in college.

## **Appalachian State University Freshman Computing Skills & Experiences**

Computing skill development is an integral part of many undergraduate classes and a core curriculum goal at Appalachian State University. Yet, in spite of its curricular importance, data were not available to quantify freshman skill levels and past computing experiences. The first step toward measuring learning outcomes and evaluating institutional effectiveness in meeting general education goals called for benchmarking freshmen computing skills. From these benchmarks, change in computing skills will be evaluated in the sophomore and senior years.

“Fall Focus Day,” a reserved day for assessment testing, provides an opportunity to collect benchmarking data. Focus Day assessment at Appalachian is cohort based, so that at least one element of the core curriculum becomes the focus of a longitudinal assessment plan for each entering class of new freshmen. The focus of assessment for the 1999 Cohort is computing skill. Data collected are expected to inform current instructional activities, guide computing policies, and evaluate institutional effectiveness in meeting curricular objectives.

The 1999 Cohort participated in assessment activities during the third week of their first term on campus. All students were assigned to complete a survey of computing experiences, derived in part from the TLT Flashlight Current Student Inventory<sup>1</sup>, and 108 students were randomly assigned to also complete a locally produced, hands-on test of computing skills. Two thousand fifteen first semester freshmen, 90% of the entering class, participated in the survey and 94 (87%) of the randomly selected students completed the hands-on computing test. Details about the instruments, sampling methods, and testing conditions can be found at Appalachian’s assessment web site<sup>2</sup>.

### **Access to Technology in the Prior Year**

A series of prompts focused on student access to a variety of technologies in the year before entering college. Freshmen reported the type of access they had to selected technologies (sole ownership, ownership shared with family, etc.), and whether the technologies were “easily available,” “limited,” or “not available.”

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<sup>1</sup> <http://www.tltgroup.org/programs/flashcsi.html>

These items documented the access students had to computers and internet connections, and provided reference points for comparison with other technologies such as televisions and cellular phones.

The vast majority of Appalachian students came from homes with access to a range of computing, entertainment, and communication technologies. Freshmen reported individual or family ownership of a telephone line (99%), a VCR (98%), a personal computer (89%), a cable/satellite television connection (89%), and internet access (76%). Less than 1% reported no access to a personal computer.

Over half of the students (52%) owned individual e-mail accounts during the year before they entered Appalachian and over a third were sole owners of VCR's (44%), telephone lines (38%), cellular phones (39%), and cable or satellite television connections (36%). Following in rank were sole ownership of personal computers (29%), internet accounts (24%), and pagers/beepers (23%). These data showed easy access to computing technologies in the year before college, however, fewer than a third of students were sole owner of personal computers. The percent of students reporting sole or shared ownership is displayed for ten technologies in Figure One.

#### Prior Year Computing Experiences

Ninety-four percent of students reported convenient prior year access to computers, but they also reported relatively low expectations for academic use of computers. Sixty-two percent had not taken a computing course the year before entering college and over half (55%) did not enroll in even one course where computing skills accounted for a majority of the final grades. A third of the cohort reported that none of their previous year classes included computing as even 10% of the final grade. Although half (55%) of the students reported frequently using a word processor during the year before entering college, less than a third (32%) reported frequently formatting academic papers. A majority did not send e-mail to a teacher (87%), produce a web page (91%) for academic credit, or use a spreadsheet (56%) during the year before entering college. Nearly half of all students did not use database (47%) or desktop publishing software (46%) in the year before entering college.

Students reported using other technologies more frequently. A majority of students used a graphing calculator (89%), searched the web for information (89%), sent e-mail to friends/relatives at least once a week

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<sup>2</sup> [http://www.appstate.edu/www\\_docs/depart/irp/assessment/compoverview999.html](http://www.appstate.edu/www_docs/depart/irp/assessment/compoverview999.html)

(78%), created at least one multimedia presentation (57%), and participated weekly in a chat room (57%) during the year before they entered college.

These data pictured entering freshmen as capable of using computers for basic tasks and casual communications but not prepared for greater demands of collegiate academic computing. Particularly significant was the finding that, prior to entering college, very few students used e-mail as a means of communication with teachers.

#### Prior Year Computing Environment

Most students (85%) primarily used IBM-format computers during the year before entering college. Only 6% were frequent MAC users, and 9% reported using “other” types or were not sure about the type of computer used.

Most students had ready access to computing equipment at home, and most rated their parents as competent sources for assistance with computing tasks. Almost half (46%) considered their father/male guardians to have high or expert computing skills and a similar proportion (40%) gave the same rating to their mother/female guardians. Over half (57%) rated their high school teachers’ skills as high or expert and even a larger proportion (63%) rated the skills of their close friends as expert or high. Ready access to computing equipment, parents skilled in computing use, and skilled high school teachers suggested that students spent the prior year in environments highly capable of supporting and encouraging skill development.

Glowing marks for computing skills given to others contrasted, however, with self-evaluations. Only 43% of students rated their own skills as equal to those of parents, teachers, or peers. This tentative confidence may help explain why 17% of students stated that they would rather take courses which did not require computing skills.

#### **Computers for the Freshman Year**

A majority of students agreed that computer ownership “provides an academic advantage.” More students who owned computers (68%) strongly agreed with that statement than students without computers (58%), however, the combined positive responses (“strongly agree” and “agree”) showed that over 95% of both groups considered computer ownership to be an academic advantage. The belief in the importance of computer ownership was widely shared across the freshman class.

Students took action to back up their beliefs about the importance of computer ownership. Seventy-one percent (71%) of new freshmen brought to campus a computer capable of word processing and e-mail. A majority of computer owners brought IBM-format computers (90%) which were purchased new within the last 12 months (75%), with over half purchased within the past 3 months (57%). Nearly all (90%) computer owners reported owning word-processing, spreadsheet, presentation, and web browsing software. Although most computer owners (51%) did not expect to frequently use the University computing labs, nearly a fourth planned to use the labs and another fourth were unsure.

Twenty-nine percent of new freshmen came to campus without computers. Over half of these students (53%) reported plans to use a roommate's computer and they expected to frequently use University computer labs (61%). One third of students without computers expected to obtain a computer during the academic year (10% of the total freshman class). Combined, students who owned a computer and planned to buy a computer brought total computer ownership to 80% of the freshman class. (See Figure Two.)

Over half of the freshman class were new to the role of "sole owner" of a computer. If the students who reported plans to buy a computer during the academic year did so, then 6 out of 10 Appalachian students would be new sole owners of computers. In the prior year, most of these students had shared a computer with other family members, many with parents the students rated as "expert" computer users. Their new role as sole owner of computers may bring new challenges in maintaining, up-grading, loading software, and solving hardware problems. These issues could affect computing support services students will seek from the campus.

Portions of the survey assessed knowledge of computing hardware and ability to make computer purchase decisions. Early in the survey, students reported their own abilities to compare two computer configurations to determine which would be the best buy. Later in the survey, students demonstrated their knowledge by answering questions about two lists of hardware configurations presented in a manner similar to that which a consumer would encounter in sales flyers and advertisements. For example, students had to identify which configuration contained the hard disk with the largest memory capacity.

Most students (56%) reported "no ability" or "low ability" to compare hardware configurations, while 28% considered their ability "above average" or "expert." Questions which tested knowledge of hardware configurations produced similar results in that 36% of students missed over half of the items, and 22% made perfect or near perfect scores. Prior year experience and current ownership of a computer explained the

difference. Students with prior year sole ownership both reported greater abilities and scored higher on the test of understanding computer hardware. These results showed that a large gap existed in the freshman class. Many students had a high level of computer hardware understanding, but a third to a half of students showed little ability to make an informed purchase of a new computer. The correlation between the test and self-report showed students were well aware of their limited knowledge of computer hardware.

Table 1: Ownership, self reported, and tested skills

Computer Ownership		Mean self reported ability to understand computer hardware and percent of maximum score (ANOVA result)	Mean score on test of computer hardware understanding and percent of maximum score (ANOVA result)
Previous year (n)			
Sole owner	(n = 465)	3.08 (62%)	5.45 (69%)
Shared with family	(n = 960)	2.31 (46%)	4.91 (61%)
Limited access	(n = 153)	2.01 (40%)	4.18 (52%)
No access	(n = 16)	1.44 (29%)	3.31 (41%)
		( $F_{3, 1589} = 47.3, p=.000$ )	( $F_{3, 1589} = 25.8, p=.000$ )
Current owner (n)			
Yes	(n = 1382)	2.70 (54%)	5.25 (66%)
No	(n = 577)	2.04 (41%)	4.39 (55%)
		( $F_{1, 1957} = 94.7, p=.000$ )	( $F_{1, 1962} = 93.8, p=.000$ )

### Self-Reported Computer Skills

Students gave high ratings to their own skills for a variety of computing tasks. Forty-three percent (43%) considered their “overall computer skills” at the point they entered college to be “above average” or “expert.” A gap in perceived skill was apparent in that 16% describe themselves as having low computing skills. Figure Three shows student self-reported skills in computing and selected other technologies.

Over two-thirds of Appalachian students considered themselves to be expert or above average in word processing, searching the web, and using e-mail. The inconsistencies in student computing skills is apparent, in that over a third of students also reported low skills in connecting a printer, downloading graphics, or using spreadsheet and database programs.

### Tested Computing Skills

A random sample of students participated in a locally developed, hands-on assessment of five computing applications. The timed test required students to perform tasks using word processing, web browsing, e-mail, file management, and spreadsheet programs.

### Word Processing:

Most students (80 to 90%) demonstrated skills in formatting a paper by changing font size and style, centering text, and creating a bulleted list. A similar proportion of students correctly performed functions not displayed on the standard toolbar (setting line spacing and inserting page numbers). The proportion of students capable of more advanced word processing declined rapidly beyond basic tasks. Fifty-four percent created and formatted a header, and 45% pasted and centered a graphic image. Only 39% set right and left margins. Eighteen percent created and formatted a basic 2 X 4 table. The task of creating a table showed that students could access functions on the standard tool bar but lacked the skills to fully complete tasks requiring multiple selections. Seventy-six percent of students managed to form a table of some configuration of rows and columns, 42% created the requested 2 x 4 table and placed some text in at least one cell, but only 18% managed to create the table and position text in each cell. These results indicated student capabilities for adequately producing a basic document, but not for following a specific style guide, or producing a research paper using tables, headers, and prescribed margins.

### Web Search Skills:

Students displayed proficiency in elementary web searches. Ninety percent could find specified information on a past United States President and nearly 75% could cite the URL of their source. Evaluating web information was the focus of a separate assessment activity (results pending), however, one indicator from the hands-on test showed misunderstandings about web-based materials. Sixty percent of students incorrectly reported that the Federal government required web sites to identify the authors, dates created, and host institutions. This finding suggested that students believed web information was “controlled” by Federal law and highlights the gap between abilities to access information and abilities to critically evaluate web information. Faculty can not assume that freshmen understand the variance in quality across web sources.

### E-mail:

The narrow range of student skills was evident in the ability to produce e-mail. While 70% successfully sent an e-mail message using their own mail accounts, only half recognized “@appstate.edu” as an e-mail domain and only 40% were able to attach a file to an e-mail message. These results indicated that most Appalachian students quickly learned to compose and address e-mail as would be required for casual use, however, few

understood how to use e-mail to accomplish academic and work tasks. Faculty asking students to submit work electronically for grading or exchanging among peers cannot assume that freshmen are ready for such tasks.

#### Spreadsheets:

Only the most basic spreadsheet skills were available to new freshmen. Over 90% of students could edit an existing spreadsheet and a similar proportion could correctly identify the type of data displayed in a pie chart. Fewer than 3 out of 10 students, however, could use a spreadsheet to sum three numbers, average a group of numbers, or create a simple bar chart. Except for basic data entry, students lacked even rudimentary skills for using spreadsheets as mathematical or analytical tools. The 1999 freshman class did not arrive at Appalachian prepared for assignments utilizing spreadsheet programs.

#### File Management:

Inconsistencies in computing skills were evident in abilities to manage electronic files and folders. Fewer than half of students could download an image from the web to a floppy disk and only 38% could create a folder on a floppy disk. These findings showed that a majority of students lacked the skills necessary to organize and save electronic files with confidence. The absence of file management skills could reduce students' abilities to use computers for academic tasks and create obstacles when learning new computing applications. Faculty can not assume that students understand how to save their work to a floppy disk – an essential skill for classes taught in a University computing lab.

### **Computing During the First Three Weeks of College**

The first weeks of college presented a variety of challenges to students' computing skills. From sending e-mail to professors to using spreadsheets, students faced challenges beyond those encountered during the prior year. Figure Four shows that within three weeks many students were successfully meeting new challenges, a few tried without success, and a number expected to face new challenges soon. Students quickly learned to use their Appalachian e-mail to continue communicating with friends and family. The percent of students using e-mail to communicate with instructors rose from the 17% reported during the year before college to 54% in the first weeks of the freshman year. Nearly half (47%) of all students managed to connect their own computers to the University network, although an additional 11% had tried and failed to complete that task. Thirty-seven percent had already conducted at least one electronic search of the library using computers in the library and 18% had performed a library search from their own computer. Over 18% of students had already

completed an academic assignment requiring a spreadsheet application and an additional 21% anticipated such an assignment soon.

Particularly noteworthy in these data is the small percent of students reporting unsuccessful attempts at computing tasks. Less than 2% had tried and failed to complete a search of the library or send e-mail to their professor. One exception existed. Eleven percent of students reported trying, without success, to connect their computer to Appalachian's network. It is not clear from these data what connection problems these 227 students were experiencing or why 357 additional students were still only planning to make the connection soon.

#### Instruction during the first weeks

Two measures of the importance of computing skills were included in the hands-on assessment test. Students were asked to indicate the computing skills they had been taught during the first weeks of the term and to indicate if the instruction was primarily in class or on their own out of class. Their responses showed which computing skills were being taught in the first weeks of the freshman year and the division between classroom based and out of class instruction.

About a third of freshmen received instruction in electronic library search procedures (33%) or basic e-mail (31%) as part of classroom instructional time during the first three weeks. The placement of these lessons early in the term may measure the importance faculty place on these skills. Conducting library searches and producing e-mail appeared to be important skills in a number of freshman classes as shown in Figure Five.

Students indicated that they valued basic e-mail and web search skills enough to seek instruction out of class. Thirty-one percent of students received instruction in basic e-mail and 25% received instruction in searching the web from sources outside of the classroom setting. On both word processing and web searching, students were more likely to receive their primary help outside of classroom time. The importance of peer and non-faculty helpers was highlighted by these findings.

Only a small number of students reported receiving any instruction to help them understand hardware configurations. That finding might explain the large number of students who had not successfully connected personal computers to the University network by the third week of classes.

A difference between faculty and student investment in information search strategies was recorded. Faculty focused on teaching students to use electronic library resources while students sought help for conducting

searches on the web. These data may indicate different levels of trust of web materials and comfort differences in using the two kinds of resources. Clearly faculty and students approach information searches differently.

In total, 60% of this sample reported receiving instruction in at least one computing skill from classroom-based instruction during the first three weeks of the semester. Only 20% of students reported they had not received any instruction in or out of class in computing skills. These combined findings confirmed that computing was an important part of the first weeks of the collegiate experience. These data also raise a question about duplication of instruction. It is not clear from this survey whether students are encountering the same instruction, for example how to send e-mail, in several classes. Efficiency might be increased if instructors could be assured that all freshmen had received instruction in e-mail, connecting to the campus network, etc. before the first day of classes.

### **Summary and Conclusions**

Freshmen in the 1999 entering class came to Appalachian well equipped with new computers and software appropriate for a range of academic tasks. Within three weeks, most had successfully connected to the University network and learned to use the basic functions of the local e-mail program.

Many freshmen were new to the role of “sole owner” of a computer, a change from their prior year experiences sharing a computer with other family members. They were also inexperienced in using e-mail to communicate with instructors or exchange attached files. Few could demonstrate even rudimentary skill in spreadsheet use and most showed low skills in understanding computer hardware configurations.

Inconsistencies were apparent across student computing skills. For example, most students could insert a graphic image in a word document yet most were unable to set the margins on that same document. Students reported only a low level of use of computing skills in academic tasks during the prior year. A small proportion of students took computing courses in the prior year and few had enrolled in courses in which computer skills accounted for more than ten percent of the final grade.

During the first three weeks at Appalachian, most new freshmen received some instruction in computing and many reported requirements to use spreadsheets, e-mail, word processing, and search engines. Clearly student skills were being challenged to use new and more sophisticated computing skills within the first days of their Appalachian experience.

The next phase of assessment will occur in January, 2001, when this student cohort will participate in a second round of assessment tests to measure computing skills as they near completion of the core curriculum and move into upper-division colleges and departments.

Randy Swing, Acting Director of Assessment  
Appalachian State University  
October 13, 1999

Postscript: Special thanks are extended to over 120 students, staff members, and professors who volunteered to lead and proctor the fall assessment tests. Their dedication to Appalachian students is unsurpassed. The assessment office also gratefully acknowledges the entering class of 1999. That over 90% participated in assessment testing shows the commitment of students to maintaining and improving Appalachian as a premier learning community.

Figure One:

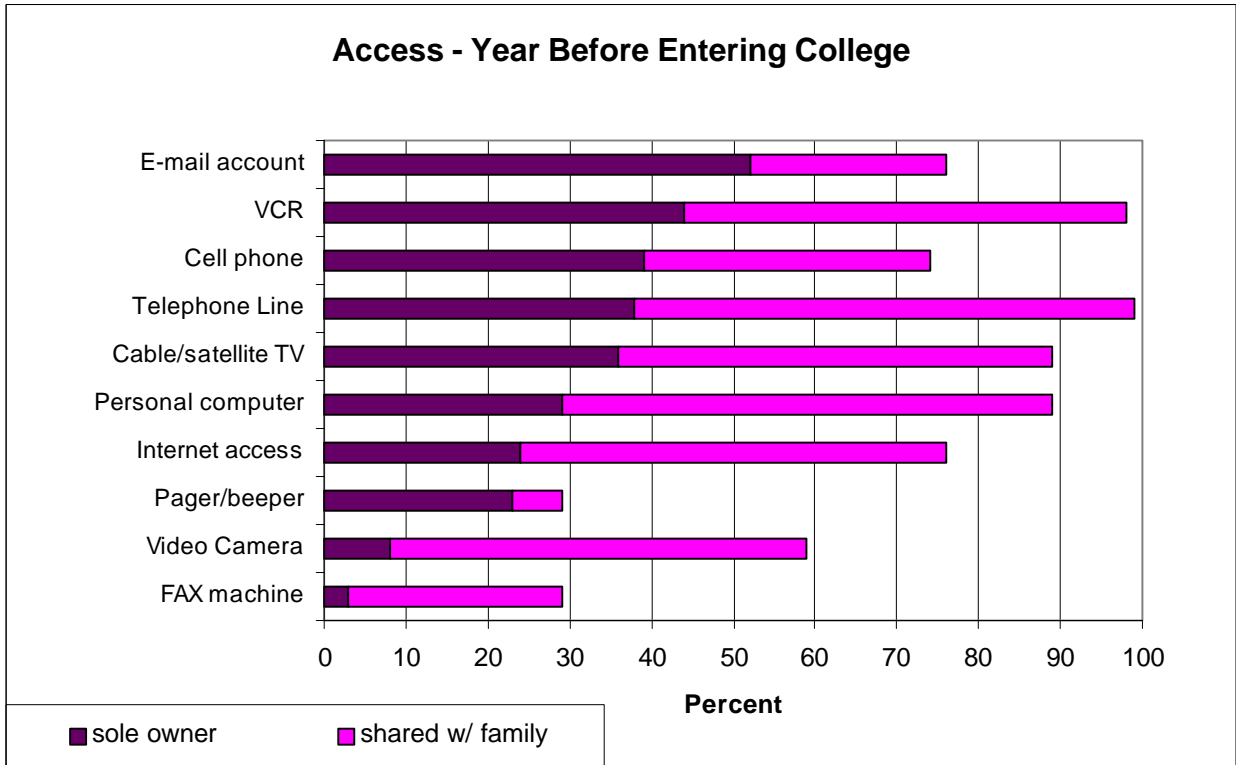


Figure Two:

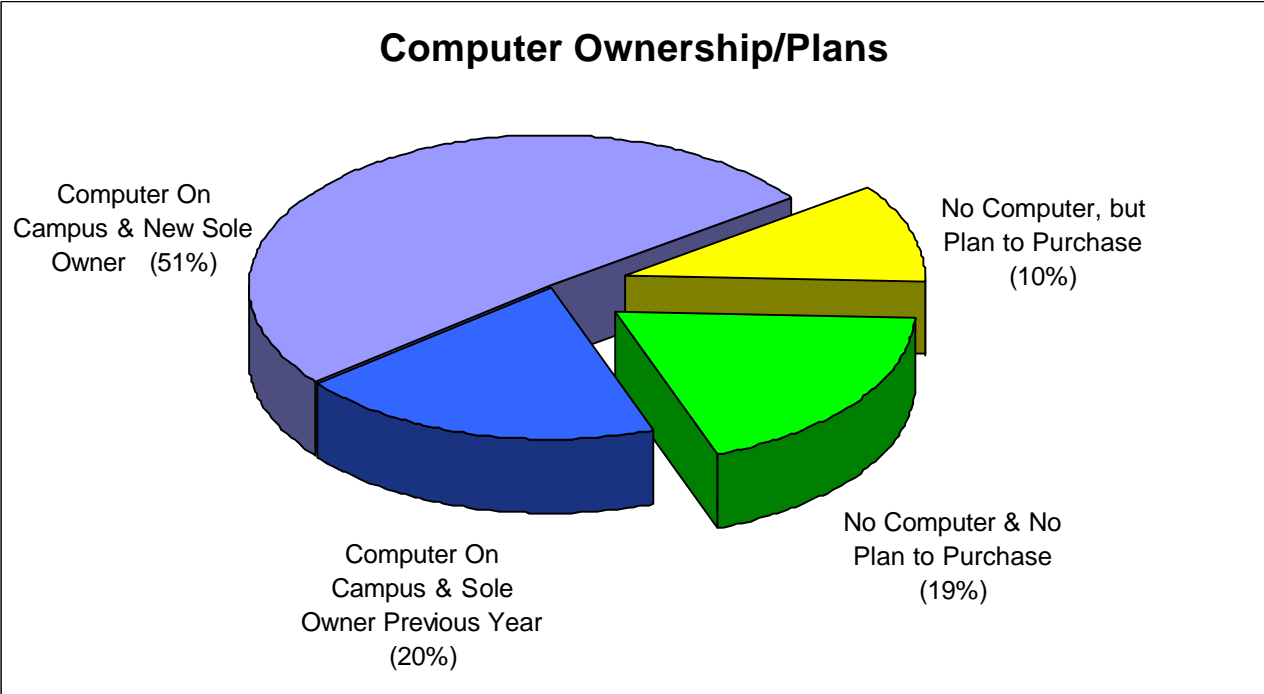


Figure Three:

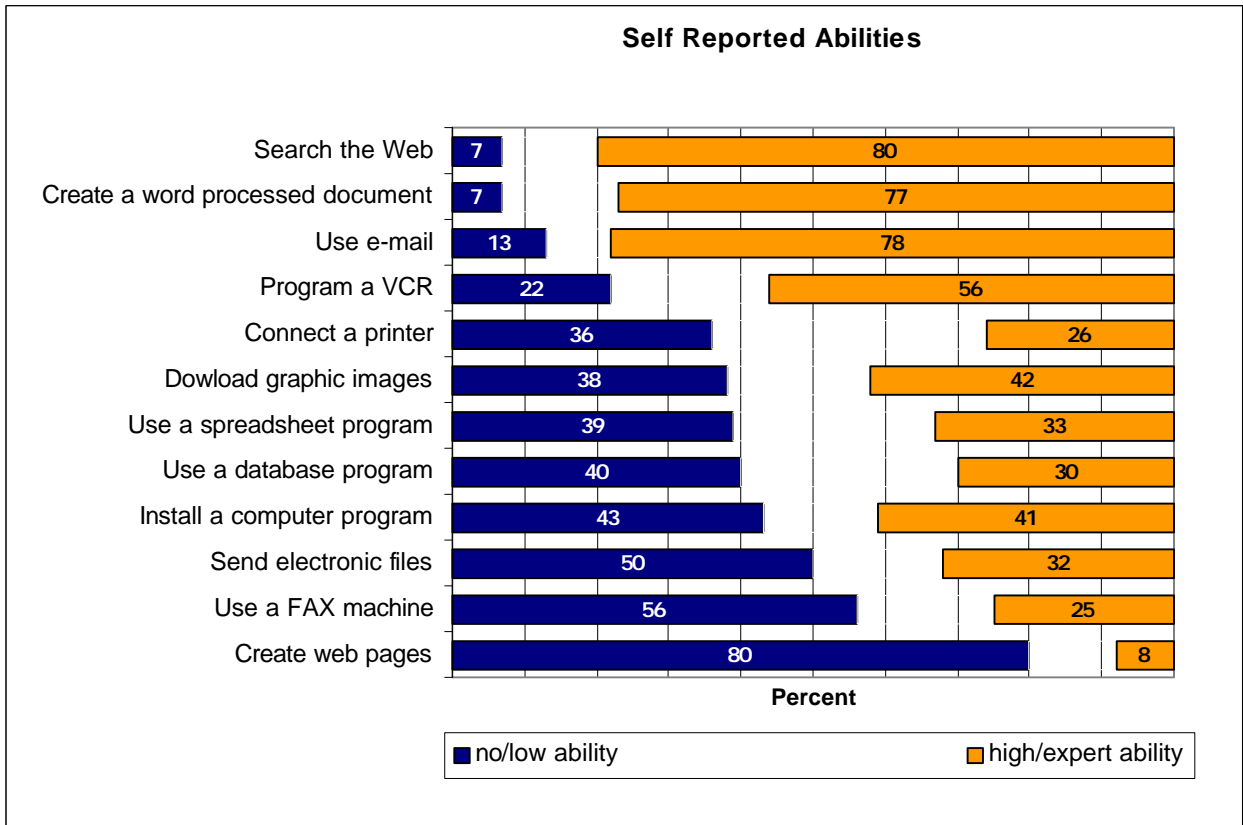


Figure Four:

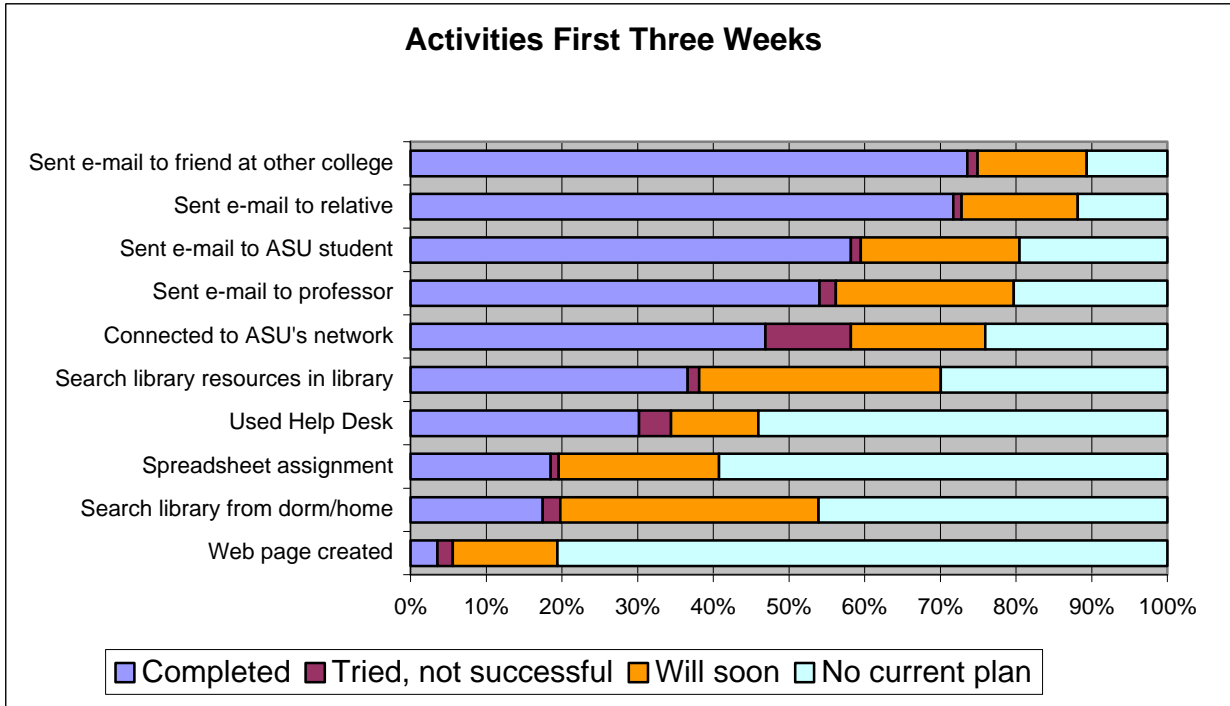


Figure Five:

