Technology Competency Assessment Proposal

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Institution: University of Virginia—School of Engineering and Applied Science

Standards/Definition of Technology Competency

The University of Virginia's School of Engineering and Applied Science (SEAS) expects its students to master the essential computer skills and fundamental problem solving techniques common to engineering. More specifically, at a minimum, the SEAS expects its graduates to know and to be able to demonstrate the following seventeen essential technology competencies:[1]

1. ***Setting up a personal computer***

A person who uses computers should be able to connect the parts of a personal computer and its major peripherals (e.g., a printer). This entails knowing about the physical appearance of cables and ports, as well as having some understanding of how to configure the computer (e.g., knowing that most computers provide a way to set the system clock, choose a screen saver, or change the screen resolution).

2. ***Using basic operating system features***

Students should be able to install new software, delete unwanted software, and invoke applications. Other skills included in this category are the ability to discover file sizes and determine the amount of free disk space.

3. ***Using a word processor to create a text document***

Minimal skills in this area include the ability to select fonts, paginate, organize, and edit documents. Integration of image and other data also is essential. Students would demonstrate these skills in either a word processing application or in a web page creation tool.

4. ***Using a graphics and/or artwork package to create illustrations, slides, or other image-based expressions of ideas***

This skill involves the ability to use the current generation of presentation software and graphics packages.

[1] The first ten items in this list of essential technology competencies have been adapted from recommendations of a research report of The National Research Council, Being Fluent in Information Technology, Washington, D.C., National Academy Press, 1999. The report is available at: http://books.nap.edu/catalog/6482.html.

5. ***Connecting a computer to a network***

Students should be able to demonstrate they know basic skills for connecting a computer to a telephone jack and configuring a system for dial-up access to an Internet service provider.

6. ***Using the Internet to find information and resources***

This skill includes locating information on the Internet and using browsers and search engines. The use of search engines and browsers requires an understanding of one's needs and how they relate to what is available and what can be found readily, as well as the ability to specify queries and evaluate the results.

7. ***Using a computer to communicate with others***

This skill includes being able to use electronic mail as a primary mode of computer-based communication.

8. ***Using a spreadsheet to model simple processes or financial tables***

This skill includes the ability to use standard spreadsheet systems to carry out basic mathematical calculations.

9. ***Using a database system to set up and access useful information***

This skill includes the ability to use a database system for basic operations or to use personal information mangers.

10. ***Using instructional materials to learn how to use new applications or features***

This skill involves using online help files and reading and understanding printed manuals. One aspect of this process is obtaining details or features of systems one already comprehends; a second aspect is using the tutorial to grasp the essential models and ideas underlying a new system.

11. ***Putting data in a table and plotting and performing basic statistics on the data***

This skill includes the ability to use a standard spreadsheet or equation-solving package to set up a two-dimensional table, plot the data on at least two different types of axes, create a histogram, use intrinsic functions, create a user-defined function and find the sum, mean, median, mode and standard deviation of the data in the table.

12. ***Creating matrices, performing matrix algebra, and solving simultaneous systems of equations***

This skill includes the ability to use a standard spreadsheet or equation-solving package to create matrices, find the sum, difference and product of matrices, transpose a matrix, find the determinant and inverse of a square matrix and use matrices to solve systems of simultaneous equations.

13. ***Performing curve fitting on a data set***

This skill includes the ability to use a standard spreadsheet or equation-solving package to determine the equation of a curve that represents the aggregate of the data.

14. ***Using an Interactive Development Environment (IDE) to compile and build an existing program***

Students should be able to open an IDE, open an existing program file, name the parts of the program and compile and build the program.

15. ***Performing simple debugging of a program***

Given a simple program with expected inputs and outputs, a student should be able to correct logic or programming errors to remove the fault in the program.

16. ***Hand-checking a computer function***

Students should be able to read a function and a set of input (actual) parameters, and determine the result of executing the function.

17. ***Writing a computer program that interacts with a user and performs basic statistical calculations on a data set***

Students should be able to write a simple, interactive program. This program should input a data set, fill an array, and calculate basic statistical information about the data set and output these results.

Description of Measure to be used

A panel of independent evaluators will assess the technology skills and competencies of not fewer than 5% of fourth-year SEAS undergraduates chosen at random (about 25 students in all). Students will carry out activities in each of the seventeen areas, and for each activity an evaluator will give each student a score based on a 4-point scale described below. A score of 4, 3, 2, or 1 will be assigned for each of the seventeen skills and competencies for each student. A final composite score of 4, 3, 2, or 1 will be determined for each student by averaging the seventeen individual scores. The following is an explanation of the 4, 3, 2, 1 scale to be used.

A SCORE OF 4 (strong competence): A score of 4 will indicate that the student is able to complete the activity successfully without any assistance.

A SCORE OF 3 (**reasonable competence):** A score of 3 will indicate that the student is able to complete the activity with minor assistance, or almost complete it correctly without assistance.

A SCORE OF 2 (some competence): A score of 2 will indicate that the student understands or has some understanding of the concept behind the activity, but is unable to carry out the specific steps on the computer to accomplish the activity's goal without the need for major assistance.

A SCORE OF 1 (little competence): A score of 1 indicates that the student does not have a basic understanding of the concept behind the activity and thus could not accomplish the activity.

Description of the Administration Process

Assessment of technology competency of fourth-year undergraduate SEAS students will take place at various times throughout spring term, 2002 and every three years thereafter. The Office of Institutional Assessment and Studies will choose a random sample of not less than 5% of the SEAS fourth-year class. Students will be asked to go to one of the University's computer labs at designated times to participate in the assessment exercise. Students will be able to choose a convenient time and either a PC or Macintosh based computer lab. At the assessment site, students will receive instructions for performing a set of activities that together cover all of the seventeen assessment skill exercises. Evaluators will monitor each student during the process and assign a grade of 4, 3, 2, or 1 to the completed skill exercise for each student using a detailed assessment guide. Students will not be informed of the grade assigned. We estimate that each assessment will require about one hour and fifteen minutes of each student's time.

Faculty members of the Department of Computer Science in the School of Engineering and Applied Science will develop the assessment guide and choose and train the assessment evaluators. The evaluators themselves will be graduate students in the Department of Computer Science or a closely related field.

When students arrive in the computer lab for the evaluation, they will work individually on a computer, following instructions for a set of activities. The instructions will be printed or available on the web. There will be a number of evaluators assigned to each lab, probably one for each set of ten students being evaluated. Each activity will direct the student to carry out some task related to one of the skill areas described above. When possible, we will have a mechanism where we can record automatically if a student can complete an activity without assistance. In most instances, each student will show one of the evaluators that he or she has completed each activity. The evaluator then will record a score from 4 to 1 for the activity for that student. Evaluators will be allowed to give minor assistance (which will lead to a score of 3) to the students. If students cannot complete an activity without major assistance, they will be asked to continue to the next activity. The evaluators will talk to the student briefly before awarding them a score of 1 or 2 for that activity.

Preliminary proposal about how results of the competency assessments will be described in a way that will be meaningful to the various publics with a stake in the quality of Virginia higher education

The University will describe the technology assessment results as follows:

1. A description of the University's expectations for minimum technology competence of graduates of the School of Engineering and Applied Science.

2. A description of the technology assessment process including the characteristics of performances that are scored 4, 3, 2, or 1.

3. The percentage of students that were determined by the evaluators to fall within each of the categories of the 4-point scale.

Submitted by: _____
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