COMPUTER LITERACY AND INCOMING BUSINESS STUDENTS: ASSESSMENT, DESIGN AND DEFINITION OF A SKILL SET

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ABSTRACT

We often hear that we are living in the information age and that computer technology and information literacy are significant parts of our business life and culture. A dialogue amongst researchers and educators has been ongoing for years about how to prepare people for the information age via computer literacy.[4] Today, researchers aren't alone when talking about information literacy. The sources of this discussion are widespread. Business leaders, politicians, educators, and the mainstream press all point to the fact that in order for people to live productive lives today and in the future, we all are going to need be comfortable with and knowledgeable about technology.[2,8 & 9] So, it seems that there should be a concerted effort at every level of our educational system to ensure that students are taught basic computer literacy. And for those students going on to college to major in business, basic computer literacy seems to be an absolute necessity.

Keywords: Literacy, Assessment, Design, Business, Students, High School

INTRODUCTION

We conducted research in 1995 that assessed the computer literacy of our business students.[1] We found that the students were lacking in some areas but were making progress in others. And, we predicted that over the next five years that we as a college could transform ourselves from teaching computer literacy to requiring it as a skill set for our incoming freshmen. Sure, we thought that we would still have to offer a computer literacy deficiency class to catch the small percentage of students who managed to come to college lacking such skills. We made changes to the course and prepared for the day when most of our students would simply take exams to demonstrate their skill set matched our requirements. Yet, six years later we find ourselves offering many sections of the class each semester. Only a small percentage of our incoming freshmen actually test out of the class. And, we are wondering why. This problem has prompted many questions for us: (1) Is the design of our program working? (2) Are our expectations unreasonable? (3) What is the basis for a computer literacy skill set for business majors? (4) What do our professors expect? (5) What do employers expect? (6) Do we communicate our expectations to the schools that provide us students? (7) How well are secondary schools preparing students? (8) How do they decide which skills to teach? (9) Are secondary schools

requiring computer literacy from their college bound students? In this paper, we will attempt to answer some of these questions.

DEFINING COMPUTER AND INFORMATION LITERACY

"The need for computer literacy has become widely accepted as a kind of value-neutral, technological necessity of modern life."[3] The vast majority of us have accepted the "vocational argument that computers will dominate the workplace of the future, and that students must therefore have some knowledge of how computers function, in order to be comfortable and competent in such a workplace."[3] Given that acceptance, what is meant by computer literacy?

A generally accepted definition of computer literacy is difficult to pin down but some authors have tried to do so. Hess[5] developed a time line of computer literacy and found that prior to 1980 it was commonly described as a "course of study", what was to be known as computer science. But, in the last twenty years, the definition has been muddied. Prior to 1980, if you were computer literate you had proficiencies in both programming and using technology. Since then, the definition has also included individuals who were proficient at using computer applications without the underlying technical knowledge of what makes the computer work. In effect, being computer literate includes "knowledge about, and awareness of, computers and their uses."

Another aspect of computer literacy is sometimes referred to as information literacy. Today, it may be assumed that information skills automatically include technology skills. Technology has become essential to the current information infrastructure of society. We use computers as tools to generate data and turn it into information. Also, technology is used to gather information that others have created. Computers allow us to communicate with one another, sharing ideas within organizations and around the world. Lin[7] includes information literacy in his definition of computer literacy that he refers to as "fluency with information technology." The author argues that computer literacy should go beyond the ability to competently use computer applications. Fluency with information technology includes both "the understanding of the foundational concepts of information technology and the ability to use problem-solving intellectual capabilities in an information technology context."

Kay[6] points out that advances in computer technology are the reason that computer literacy has been defined in a number of ways. The author concludes that in this most recent stage, computer literacy definitions have developed in an environment in which "no one individual could possibly acquire all the skills necessary to run a computer in every conceivable way. In fact, the abundance of hardware and software choice precipitated a personal-needs perspective on defining computer literacy." In other words, computer literacy can have different meanings to different people and all still be computer literacy. So, in effect computer literacy is determined by individual (organizational) needs. You can now understand given this approach, it is difficult to design a curriculum that addresses computer literacy because computer literacy is defined differently by different organizations. And, all of these definitions are essentially correct.

For the purposes of this research, computer literacy can be broadly defined as the ability to use technology in order to solve problems, make decisions, and to gather and disseminate

information. It is in this context that we plan to explore the computer literacy needs of different organizations and individuals.

CHANGES IN THE APPROACH TO COMPUTER LITERACY AT ONE UNIVERSITY

In the mid 90's we decided that incoming students should begin entering the university with sufficient computer literacy. The evidence suggested that the technological skills of our newest students were improving. We assessed at that time that it was only a matter of a couple of years before we wouldn't have to teach numerous sections of our computer literacy course. Therefore, we started to change our program from teaching computer literacy to expecting and testing for computer literacy. At that time 100% of our incoming students were required to take the class. We envisioned a system where an increasing percentage of our new students would be able to simply demonstrate a level of proficiency that we were teaching in the class. We expected within five years that 90% of our students would simply test out of the computer literacy class.

To prepare for the exams, we put together a website that students could use to learn about the content of the exams.. We attempted to assess the literacy of our incoming students during orientation and then we advised them as to whether they should take the exams or take the class. And early in the process, we had students sign up for and take the exams the first two days before classes started. This didn't work out so well. We found that a large percentage of the students we had advised into taking the exams, failed the exams. This was not a good first experience for these students. We had expected them to use the web resources and prepare for the exams but in many cases this did not happen. Also, some of the unique features of our computing environment caused problems for the new students. So, our solution to this problem was to present the details of the literacy requirement to the students upon entering the university and to allow them to evaluate for themselves if they should take the exams or take the class. All we require is that they complete the class or the exams before the end of their freshmen year.

Given the change, in our process, we expected an increasing number of students to choose the exam route over taking the class. There were a few reasons for this. First, the exams are cost free while one hour of tuition is assessed to the class. Secondly, for the class you are required to complete homework each week. We felt students would prefer spending three hours taking exams versus 13 hours in class and another 13 hours doing homework. Third, the class was made pass/fail so that there was no grade point advantage to taking the course. Lastly, the one-hour class no longer counts toward total hours required for graduation. These changes were made to encourage students to take the exams and to bypass the class. The idea being that only those students who really needed the class would choose to take the class. That was three years ago and since then we have not seen any appreciable difference in the number of students opting to take the exams. A large proportion of students still take the class. And, as we state in the introduction, we are wondering why.

Several possible causes came to the forefront. The first of which was that our design was flawed. And, there is merit is this conclusion. We allow students to choose between the class and the exams. Even though we have designed the system to encourage the exam route, there are some weaknesses to the system. The students may be computer literate (which we needed to find out) but how confident were the students in their skills. Also, taking a class fits better into a students' comfort zone. Taking the exams requires that the students prepare on their own,

schedule when to take the exams and follow through. The exam option is more akin to an independent study experience. Whereas, if students take the class, they are led through the process. There is a given meeting time and place, a definitive schedule and due dates. And since there is more immediate interaction with the faculty, the students perceive they will have more help if they take the class.

Another aspect of the design is the literacy skill set that we have defined. We have to the best of our knowledge picked those skills that we think students will need during their college careers. The assumption has also been made that this skill set sufficiently meets the expectations of employers. But, we need to verify that the skill set we have designed meets both the needs of the professors and employers. This aspect of the research has yet to be done but it will be critical to our assessment and redesign of the requirement. This knowledge will have a significant impact on how we continue to run the course.

If we assume that the students are coming to college with the proper skills then our design concerns are paramount. But, what if the students are not coming with the skills that we require. Using the skill set as it is currently defined, we needed to find out if our incoming freshmen were coming to college with those skills. So, we have collected information from all of our incoming freshmen that plan to be business majors. In the next section we will discuss the survey and the results thereof.

Additionally, we also wanted to begin to explore how our feeder institutions were preparing students for computer literacy. We were wondering what kind of on going dialogue existed between our school and the high schools that provide us with students. We knew for sure that there was no direct communication between the faculty that designed the literacy requirements and the high school administration. So, how were high schools preparing their college bound students? To find out we interviewed two high school curriculum directors. We have gained some insights from this experience that we want to share in this paper.

ASSESSING THE COMPUTER LITERACY OF OUR INCOMING FRESHMEN

To begin this discussion, it is useful for us to define the current skill set for our literacy requirement. We break this up into three exams. The first exam covers file manipulation (for example using windows explorer), compressing files, e-mail and attachments, FTP, word processing and presentation software. The second exam covers research via the web, using the electronic resources of the library, proper citation of books and articles, plus designing, creating and launching a web page. The third exam tests the students' knowledge of spreadsheets. Coverage includes the basics, some intermediate concepts and skills and using spreadsheet graphics. Of course, some skills cross over between exams such as the use of FTP and e-mail. The exams are held in a computer lab and are project based. The students have to use all of the software to complete the test.

For one of our surveys we also include some skills not currently covered by our literacy requirement such as photo editing software, database software and the use of on-line chat. This assessment was approached using two different surveys. Both were given to the same group of students (the incoming freshmen class of business majors). The first survey asks the students to define their confidence in using certain types of software. (see

http://cartman.bradley.edu/~prs/surveys/) The instrument is fairly broad asking, for example, how confident they are using spreadsheet software. The students filled out this survey first. The second survey (also found at the website) asks students if they can perform certain basic skills within different types of software. So, an example for spreadsheet software asks if they can copy and paste from one cell to another. Or, another example asks if they know the difference between relative and absolute references.

Table 1 – Students Reported Confidence with Using Various Software

Skill	Scale					Scale					-	+
	0	1	2	3	4	0	1	2	3	4	0/1/2	3/4
Word Processing Software	0	0	2	27	81	0.0%	0.0%	1.8%	24.5%	73.6%	**1.8%**	**98.2%**
Spread Sheet Software	2	4	20	53	31	1.8%	3.6%	18.2%	48.2%	28.2%	**23.6%**	**76.4%**
Presentation Software	2	11	22	39	36	1.8%	10.0%	20.0%	35.5%	32.7%	**31.8%**	**68.2%**
Internet Browser	2	7	10	28	63	1.8%	6.4%	9.1%	25.5%	57.3%	**17.3%**	**82.7%**
E-Mail	1	1	4	12	92	0.9%	0.9%	3.6%	10.9%	83.6%	**5.5%**	**94.5%**
Groupware	52	11	26	18	3	47.3%	10.0%	23.6%	16.4%	2.7%	80.9%	19.1%
Attaching Files in E-Mail	2	13	17	37	41	1.8%	11.8%	15.5%	33.6%	37.3%	**29.1%**	**70.9%**
PDF Maker	36	18	23	25	8	32.7%	16.4%	20.9%	22.7%	7.3%	70.0%	30.0%
FTP	48	20	20	15	7	43.6%	18.2%	18.2%	13.6%	6.4%	**80.0%**	**20.0%**
Database Software	10	19	23	40	18	9.1%	17.3%	20.9%	36.4%	16.4%	47.3%	52.7%
Statistical Analysis Software	16	20	30	31	13	14.5%	18.2%	27.3%	28.2%	11.8%	60.0%	40.0%
File Compression Software	18	31	32	16	13	16.4%	28.2%	29.1%	14.5%	11.8%	**73.6%**	**26.4%**
Scanning Pictures	4	14	24	26	42	3.6%	12.7%	21.8%	23.6%	38.2%	38.2%	61.8%
OCR	14	28	33	20	15	12.7%	25.5%	30.0%	18.2%	13.6%	68.2%	31.8%
Photo Editing Software	9	23	28	26	24	8.2%	20.9%	25.5%	23.6%	21.8%	54.5%	45.5%
Conducting On-Line Research	0	1	5	20	83	0.0%	0.9%	4.6%	18.3%	76.1%	**5.5%**	**94.5%**
Obtaining Full Text Journal Articles	4	5	21	29	51	3.6%	4.5%	19.1%	26.4%	46.4%	**27.3%**	**72.7%**
Internet News Groups	14	19	27	25	25	12.7%	17.3%	24.5%	22.7%	22.7%	54.5%	45.5%
Internet Bulletin Boards	11	14	31	23	31	10.0%	12.7%	28.2%	20.9%	28.2%	50.9%	49.1%
Using On-Line Chat	0	6	11	28	65	0.0%	5.5%	10.0%	25.5%	59.1%	15.5%	84.5%

We will be tracking the students throughout the year to find out which students take the exams, which ones take the class and how well they do. We will compare this to their self-reported confidence level and skill set.

Examining the data on a student-by-student basis reveals that perhaps 25% of the incoming freshmen should be taking the class while the rest should take the proficiency exams. Of the 75% that should be taking the exams about 50% of those have a weakness in one or two skills. But, with the study aids available, the students should be able to easily pick up those skills on their own. Table 1 reveals the students' level of confidence with various software skills. The percentages shown as bold are from those skills currently included in our literacy requirement. In eight out of the ten cases at least two-thirds of the students report some/strong confidence with

the skill. The remaining two skills, FTP and file compression show weakness in these areas. But, overall, these results indicate that a much higher percentage of students should be taking the literacy exams and foregoing the class.

INTERVIEWS WITH HIGH SCHOOL CURRICULUM DESIGNERS

A section of our student survey asks the students to tell us how many computer usage courses they took in middle school and high school. We found a large range in the number of classes taken, from zero classes (12% of the students) to those having 5 or more classes (14%). But, we also found little correlation between the number of courses reported and the reported confidence levels in using the various packages. The correlation matrix shows neither a large positive or negative relationship. In all cases the relationship was positive but weak..(the strongest is .33) This seems to indicate that many of the students are picking up skills on their own or as part of classes that are not mainly for the purpose of teaching computer literacy.

Our interviews with high school curriculum designers reveal that they are doing a pretty good job at anticipating the skills that students need. But, two areas of concern became apparent. First, literacy skills are not a requirement for college bound students. If a student chooses to avoid technology they can. Second, literacy skills are not being uniformly reinforced in other classes. Many teachers are not incorporating technology into their curriculum. This stems mainly from a lack of knowledge from the teachers themselves. What we were told was that training is available but teachers are slow to get training and then even slower to incorporate lessons into the classroom. There is some resistance from teachers but mainly it is a lack of time that is hampering the process. Additionally, there is a lack of technological resources throughout the schools. Many schools have isolated pockets of technology available for use but it is difficult to incorporate them into every day use in the classroom or even for routine assignments.

The interviews we have conducted up to this point could be considered "good case" scenarios. The school districts are fairly well funded and the communities fairly affluent. One would expect to find some drastic differences from district to district with poorer communities showing a complete lack of literacy training and rich communities showing an abundance of resources.

CONCLUSIONS AND EXTENSIONS OF THE RESEARCH

Given the outcome of our assessment of incoming freshmen, we will propose changes to our program. First, we will use the survey as an assessment tool in order to place students in either the class or the exams. The students will not choose. We will provide more structure to the exam path so that students know how to make use of resources. And, we will redesign the testing phase so that students are expected to meet specific due dates. This year we will monitor the students to find out what choice they make and if our efforts during orientation have had an effect on these choices.

Our initial goal with this research has been to describe our situation and address some of the questions raised. We now have a better understanding of the computer literacy of our incoming freshmen. Yet we still have much work to do. We still have to determine the expectations of professors and employers. This will aid us in redesigning the content of our literacy requirement. And once we have that, we can effectively communicate to secondary educators what our expectations are.

But, these questions prompt us to think about these issues on a national scale. Understanding the expectations of universities and businesses and designing a computer literacy system may be a need throughout the country from which our current problem is merely a reflection. To extend this research, we propose that a nationwide study be conducted to determine: (1) A computer literacy skill set for college bound students, (2) the expectations of college professors and employers, and (3) the state of preparation of students at the high school level. From this we would hope to make recommendations for designing a program that offers students mandatory computer literacy skills enhancement throughout their educational careers.

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