

A Worldwide Descriptive Analysis of Educational Technology Use

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Abstract— The use of technology in the education vertical has been with us for as long as educational curricula have. The technology has changed, but the application of the tools to teaching and learning has been constant. From blackboards, to overhead projectors to now, information and communication technologies have permeated the classroom to various extents. Although there are many measures and studies of the use and effectiveness of educational technology in our educational systems, most of these have been limited geographically, politically and economically. These limitations have hindered a broad reaching viewpoint of the use of the technologies and have stopped comparisons and contrasts between different theatres of our world. This study attempted to measure the use of educational technology worldwide within a specific worldwide program. The gathered data allows comparisons and contrasts between use worldwide and within the various technological sectors present in today's marketplace. The study was conducted in Fall of 2010 with users of the Cisco Networking Academy Program. These users all follow the same curricula, roughly; so, the variability of programs is held relatively constant. Preliminary findings were that use of technology with each theatre of the world was relatively constant with some indications that lower GDP countries had more extensive use of "social networking" software tools and more consideration of flexibility and agility in the classroom.

Keywords – Educational Technology; Technology Use; Global assessment.

I. INTRODUCTION

The field of education has been with mankind since our first discovery of fire. Passing down the information to later generations was as crucial then as it is now to perpetuate the species, expand the political/cultural environment and maintain the government and language of the then existing region or country. Starting with story telling, cave pictures, and show and tell, the educational systems has always done

it best to improve the methods of transfer of information from those who know to those who want and need to know.

In more recent terms, the application of tools to the teaching/learning process has absorbed the name educational technology. Currently, meaning some digitally based electronic tool, educational technology does incorporate everything from the blackboard to the movie, to the overhead. Depending on the decade we live in defines the technology that is currently in vogue with the educational technology space. The 1960s had the overhead projector, the 1970's the movie projector, and the 1980's the start of the personal computer revolution, and so on.

Attention has also always been paid to measuring the use and effectiveness of these tools. How much is enough? How effective is it in transferring information to students? How does it adapt to current pedagogical styles of teachers? The questions are numerous and therefore the attention researchers pay this is high (especially in the doctoral program research produced worldwide). Unfortunately, due to economic, time and logistic reasons most of these studies have been limited. The limitations are mostly geographic (studying a state, or possibly country), but also include curricular and other limitations.

Using the Cisco Networking Academy Program (CNAP) as a base, this study surveyed the global population (broken-down by theatres) to assess the use of current educational technology. The Cisco Networking Academy Program (CNAP) is a program first promulgated by Cisco Systems Inc, in the late 1990's to enhance the awareness of, and training in the Internetworking field. Internetworking being the core of the current Internet with all its comingled and associated parts and pieces. Starting with two beta sites in the United States it has grown to over 10,000 academies in over 160 countries of the world. Available in many languages, the CNAP program is brought forward in an on-line fashion with a heavy emphasis on hands-on learning, formative assessment and instructor involvement. The program is also heavily supported by more traditional book publications, Interactive course guides and various other tools and techniques (Cisco.netacad.net).

The results of this survey, in its descriptive form, hold implications for education in general, but more specifically within the educational technology space. Implications can also be found for vendors and other service providers who support the initiatives of the educational movement. The results of this study also hold merit for further study of equity in access for educational programs worldwide.

The organization of this paper follows with the main body description of the review of related literature. Following describes our methodology, sample population and results. A conclusion, nomenclature and references conclude the paper.

II. MAIN BODY

A. Review of Literature and Background

Classroom access to Technology

Studies conducted to look at classroom technology have focused on two areas: technology access and technology implementation. From these studies, cultural and environmental factors determined the viability of classroom technology integration [2]. Other studies concluded that attitudes and limited skills of legislators, administrators, teachers, and students, detracted from classroom technology integration [4].

The integration of technology in the classroom is not limited to just legislatures, teachers, and students but external factors such as family environment. It is also not limited nationally as a United States problem, but a worldwide problem. In a study titled *Factors Influencing Technology in Teaching: A Taiwanese Perspective*, concerns about students' school activities came from families. One teacher in the study reported that concerns from families arose from not having an Internet connection in the home or a computer. Therefore, time for accessing computers was limited to school time. The teacher concluded that since time for accessing computers at school was scarce, most students needed to have a computer at home to work on assignments [5].

Another report completed suggested that, "Technology use in classrooms is often employed for all the wrong reasons—such as convenience, pressure from school administrators, the belief that students need to be entertained, and so on" [3]. The authors believe that the technology must be facilitated in a way that students are using the technology and not the instructors [3]. When technology is used as a creative tool rather than for the distribution of content and information, it allows students to participate more willingly with tasks and to create their own work, rather than regurgitating the information back to the teacher [6, 10].

It is not the Technology it is the People

In a recent study conducted by the Harvard Graduate School of Education they examined the ratio of one computer to one student. According to the study "...the

presence of 1:1 laptops did not automatically add value and their high financial costs underscore the need to provide teachers with high-quality professional development to ensure effective teaching" [1].

In a study conducted by Jing Lei, looking at the quality of technology versus the quantity of technology used, Lei came to the conclusion that it is not the quantity of the technology used, but the quality of using the technology effectively [4]. The study also examined different types of technologies had different outcomes. In their analysis general technology use was confidently related with student technology aptitude, while subject specific technology use was adversely related with student technology aptitude [4].

The main component in this review of literature is the 2008 analysis and review titled *A Framework for Addressing Challenges to Classroom Technology Use*. In this article, six factors were recognized that influenced technology application and the instructor's ability to positively incorporate it into the classroom. The six factors are, "(a) legislative factors, (b) district/school-level factors, (c) factors associated with the teacher, (d) factors associated with the technology-enhanced project, (e) factors associated with the students, and (f) factors inherent to technology itself" [2]. The frequent changes in policy and lack of research by legislatures often lead to poorly designed policies that discourage technology use in the classroom [2]. Some of these same issues with legislature are true for the district level factors. Teachers do not receive enough support resources to favor and use technology-based learning in the classroom [2]. Students present their own challenges to technology-based learning, such as lack of skills, limited prior experience and attitudes towards technology [2, 12].

B. Methodology

1. Participants

The context of this research is the Cisco Networking Academies (CNA; see [13]) public/private partnership between Cisco and over 10,000 educational institutions in over 160 countries. Cisco, previously called Cisco Systems, is the world's largest maker of computer and data networking hardware and related equipment. Cisco provides partnering schools with free on-line curriculum and on-line assessments to support local school instructors in teaching ICT skills in areas related to PC repair and maintenance as well as computer and data network design, configuration, and maintenance in alignment with entry-level industry certifications. The value of the program from the perspective of corporate social responsibility was discussed by [7], while the logical origins of the e-learning approach have been described by [8]. Behrens, Collison, and DeMark [9, 11] provide a conceptual framework for the many and varied aspects of the assessment ecosystem in the program. This research focuses on four courses in a sequence that prepares students with the skills required for

the Cisco Certified Network Associate (CCNA) certification.

More specifically the survey was made available to all English speaking programs in the full geographic scope of the CNAP program. Participation was limited to those going through the CCNA Curricula (Both Discovery and Exploration) and not to the various other curricula offered. Participation in the survey was voluntary and therefore not random. The Course Management Systems of the program was used for notification and dissemination of the survey tool This allowed easy access to the survey for all participants and demographic data was collected via the log on account information from the users.

The sample size and demographics show in the following table.

TABLE 1 SAMPLE DEMOGRAPHICS

Theatre	Sample Size	Pop %
Africa	8.1	5
Asia Pac	13.1	17
Greater China	2.8	7
CEE	11.5	7
European Markets	11.1	19
Japan	0	1
IA and C	23.1	17
ME	11.0	7
Russia and CIS	4.7	2
US/Can	14.5	17

Education Level	Sample Size	Pop %
Sec/High School	14	15
Com/Tech College	21	35
College/University	62	44
Other	3	5

3. Results

A survey was administered to students and instructors (who self selected) querying them about their use and presence of educational technology. The survey was offered world-wide to all participants and was submitted back by 1,064 instructors and 1,136 students. Below is the breakdown of some of the key findings.

When comparing the use of technology by theatres several interesting facts came to light. The United States is not the only dominate user of technology. The survey first examined how regions perceived their Internet access speed. Close to 80 percent believed their Internet speed was moderate to fast or better. Europe, Asia, Australia, and the Americas all reported above or close to this number. The only regions that perceived their Internet speed to be less than adequate was the Middle East and Africa. In the table below, the percentages for each region are listed.

TABLE 2: PERCEPTION OF INTERNET SPEED (MODERATE TO FAST OR BETTER SPEED)

Region	Percentage
United States	87%

Asia Pacific / Australia	72%
America's minus US	73%
Africa	57%
Europe	86%
Middle East	51%

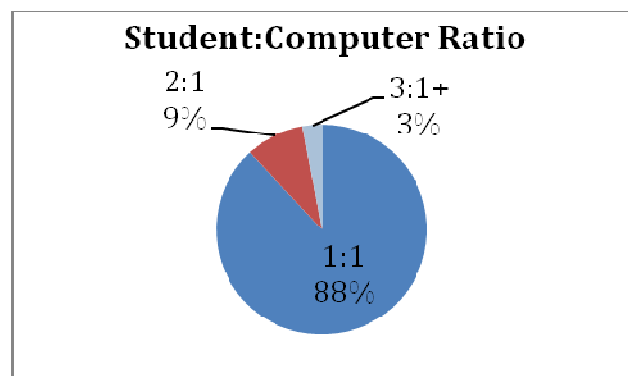
Even though the majority of the theatres report to have moderately fast and higher Internet speed, most report using Windows XP as the operating system of choice for classroom computers. Table 3 shows worldwide data regarding OS used.

TABLE 3: OPERATING SYSETMS USE IN THE WORLD

Operating Systems	Percentage
Windows XP	68%
Windows 7	19%
Linux	4%
Windows Vista	5%
Other	2%
Windows prior to XP	1%
Mac	<1%

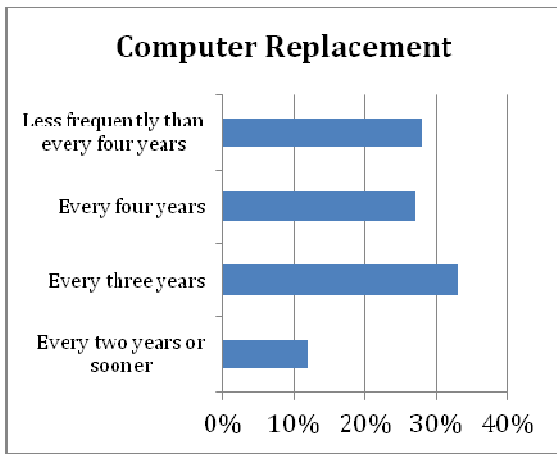
The results also produced interesting observations in computer to student ratios. Figure 1 shows that 88 percent of the world has a 1:1 computer to student ratio.

FIGURE 1: COMPUTER STUDENT RATIO



Further analysis showed the refresh ratio for computer technology globally compared. Based on the results listed below in Figure 2, very few schools have the ability to replace computers sooner than three years.

FIGURE 2: FREQUENCY OF COMPUTER REPLACEMENT



Based on the survey results, it appears that Internet speed internationally is not an issue. However, the issue seems to lie with acquiring newer computers and software for students to use.

The survey asked participants about how often and which web 2.0 technologies they used in the classroom. The instructor survey results are in Table 4. The student survey results are located in Table 5.

Based on the results, students and instructors both share many similarities when it comes to use of web 2.0 technologies. The students and instructors both tend to use social networking the most on a daily basis. Based on the responses received, reading blogs, visiting social networking sites, watching videos and listening to music ranked high on student and instructor web 2.0 uses.

TABLE 4: INSTRUCTOR WEB 2.0 USE

Web 2.0 Technologies	Daily	Weekly	Monthly
read online forums	27	62	85
visits social networking sites	23	49	62
read blogs	18	42	62
watch videos (YouTube)	12	50	73
listen to or download music	11	34	54
comment on social network	9	31	48
listen to podcasts	7	26	51
publish or update own website	7	25	44
update status social network	7	23	43
update blog	5	19	32
upload photos	3	12	30
upload video	3	9	20

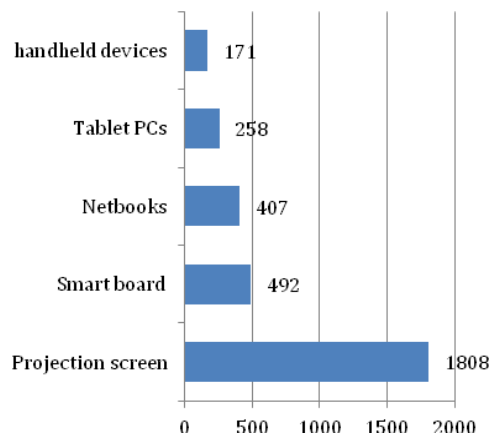
TABLE 5: STUDENT WEB 2.0 USE

Web 2.0 Technologies	Daily	Weekly	Monthly
visits social networking sites	46	69	80
read online forums	31	65	84
watch videos (YouTube)	28	64	83
comment on social network	24	53	70
listen to or download music	24	52	73
read blogs	21	49	69
update status social network	18	47	67
update blog	11	29	45
listen to podcasts	10	31	54
publish or update own website	7	22	41
upload photos	7	26	49
upload video	5	18	36

Instructors and students were asked what technology devices were implemented in the classroom. With an overwhelming response projection screens are predominately used to teach students during the learning process. It was quite a surprise how little the other technology devices were applied.

FIGURE 3: DEVICES USED IN THE CLASSROOM

Devices Used in the Classroom



III. CONCLUSION

A. Discussion

The purpose of this study was to assess the use of educational technology worldwide within the purview of the Cisco Network Academy Program. In addition, it provided the opportunity to compare and contrast use and type of

educational technology within various theatres of the world. As the results are examined, it is important to keep in mind that survey participants were members of the CNAP program, a specific curriculum within the broader educational realm.

It is interesting to note, that Laptop PC and Cell phone rated the most frequently obtained technology for students worldwide. Desktop was slightly less held with notebooks and tablets being much lower on the scale. Worldwide comparison shows little difference. Difference between student and instructor technology use showed little difference.

The survey also queried participants on the access to and type of LMS/CMS used in their educational environment (Learning/Course Management System). Results show that 50% of users do not have access to an L/CMS. The remainder use mostly open source tools.

The survey was quite comprehensive and the limited real estate of the article prohibits more extensive discussion of the descriptive results or the analytical results. Further analysis will be forthcoming.

B. Limitations

It should be noted that participants who filled out the survey were self-selected. Therefore, because of the lack of randomness, a truly valid nature of the results cannot be established. In addition, the instructor and students who filled out the survey were only English speaking, so only native speakers were excluded. Results therefore cannot absolutely be attributed to the data obtained. Finally, we rely on instructors and students to accurately report their environment, their perceptions and their actions. It is unknown the extent to which instructors and students may mislabel their classes. Additionally, this study only held participants within the CNAP program. This may hold a biases view as this is a technology rich environment.

C. Conclusions

Our reporting enclosed is a first blush at a descriptive analysis of the use of educational technology worldwide. There are continued questions about the comparisons of theatre use and impact of educational technology. Further study and more use of inferential statistics will allow a closer look at the data and may provide further information on theatre performance. This study examined this question with a global sample of instructors and students. There was some suggestion that use of educational technology is affected by world theatre, and further study will attempt to group countries by GDP to see if that has a major effect on use of effectiveness of Educational technology.

IV. NOMENCLATURE

The context of this research is the Cisco Networking Academies (CNA; see [13]), a public/private partnership between Cisco and over 10,000 educational institutions in over 160 countries. Cisco, previously called Cisco Systems,

is the world's largest maker of computer and data networking hardware and related equipment. Cisco provides partnering schools with free on-line curriculum and on-line assessments to support local school instructors in teaching ICT skills in areas related to PC repair and maintenance, as well as computer and data network design, configuration, and maintenance in alignment with entry-level industry certifications. This research focuses on four courses in a sequence that prepares students with the skills required for the Cisco Certified Network Associate (CCNA) certification.

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