COLLABORATION BETWEEN UNIVERSITIES AND SCHOOLS TO ENHANCE COMPUTER LITERACY IN MIDDLE SCHOOL

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Introduction

Thomas Friedman in *The World is Flat* wrote, “The NSB (National Science Board) report found that the number of American eighteen- to twenty-four-year-olds who receive science degrees has fallen to seventeenth in the world, whereas we ranked third three decades ago[1].” This view is also supported by a report submitted by the Association for Computing Machinery and the Computer Science Teachers Association. According to this report, the number of secondary schools that offer introductory computer science courses dropped 17% from 2005 to 2009, and the number that offer Advanced Placement computer science courses dropped 35% in that time period[2].

This problem is mainly due to declining interest in Engineering and Technology among the middle and high school students. Engineering and Technology are intertwined with society as they are with themselves. In this digital age, computers are used in almost every walk of life. If daily activities are governed by digital media, it is very important to impart computer education to students starting from the elementary school level. Moreover, computer education provides better jobs and higher education prospects, even in the face of a falling economy and rising competition [2].

Many studies have been done in this area, and they define the relationship between STEM subjects (Science, Technology, Engineering and Mathematics) specifically at the K-12 levels [3]. Several interesting experiments have been performed to assess the influence of the internet on literacy instruction in their classroom, especially with respect to reading and writing. The study explores the convergence of technology with classroom curriculum with the increase in number of internet connections [4]. Many articles have been published about the effect of technology occupations being a male-dominated area. They analyse the attitude of the two genders on using and adapting to technology. Results show that male gender as being more aware towards using technology. One study reports the results of surveys taken which intend to provide an empirical base of the anecdotal evidence that technology is a male domain. One survey provides developmental data to substantiate the hypotheses that males and females view computers and video games as male activities. The other survey examines the differences between the attitudes of males and females toward computing among a highly select achievement-oriented group of college freshmen [5].
The Association for Computing Machinery and the Computer Science Teachers Association conducted an extensive study on two main factors:

1. To what degree have the ACM/CSTA Model Curriculum for K–12 Computer Science standards been adopted by the different states in the USA?
2. As national organizations such as Achieve.org and the National Council of Teachers of Mathematics have pushed states to adopt requirements that students take a four-course sequence in mathematics and a four-course sequence in science in secondary education, to what extent do states support computer science to count as a graduation credit in a required or “core” subject?

The survey shows that despite a national push for preparing students to succeed in the 21st Century, on average only 55% of the ACM/CSTA model computer science education standards appear in the state standards for grades 9-12 across the Nation. The study also concludes that computer science education in K–12 is vital. However, some amount of specific intervention at all levels of government may be required to keep Computer education from fading away from American schools. This will affect not only the field of computing but also all the fields that depend on innovations that originate in computing. To remain competitive in the global, high-tech marketplace of the 21st Century, it is important to revitalize computer science education in K–12 and make it part of the core curriculum for all students [2].

In a step towards achieving goal this, our study involves a collaborative program between a University and a school to impart computer education to K-12 students. Many aspects of computer literacy have been explored in this study. We try to comprehend the influence of various factors such as age, gender, race etc., on student’s performance in computer education courses. We evaluate the performance of students individually and as teams at different levels of progression and also in different computer applications such as MS-Word, MS-Excel and MS-PowerPoint. This program has been of great use to elementary and high school students and has received a positive feedback from school administrators. It is also a motivating experience for those aspiring to be engineers and computer scientists. As voluntary Instructors, the graduate students are also able to develop teaching skills and establish their own curriculum. Moreover, small class strength allows better student-teacher interaction and provides additional attention towards each member. Though the program monitors the performance of students regularly, inclusion of the program as a part of the curriculum will enhance the seriousness among participants. This is because, on being an extra-curricular subject, only those students with real interest concentrate during the sessions while others fail to learn much.

Methodology

The training program was carried out among the Columbus School students, Bridgeport, CT, USA. The instructors were graduate students from the Department of Electrical Engineering who were in their first or second year of graduate degree program. All of these volunteer students were foreign students and proficient in Microsoft tools such as Excel, Word and
PowerPoint. The average class strength was 8 students/class and the grades 4-8 were taught under this program. Students were of different ages, genders and ethnic background. The students primarily belonged to minority groups (mostly Hispanics and African Americans). They came from different countries such as Mexico, Puerto Rico, and Dominican Republic. The program consisted of an instruction period of 1-2 hours per week for each grade. There was a well defined lesson plan with a uniform distribution of time among the three computer applications taught. There was flexibility in the materials taught based on the grade. The program lasted about 3 months and was evaluated based on the students’ performance at three levels of progress - initial, intermediate and final.

The teaching methodology was subjective to the instructor. However, the evaluation was based on oral interviews, dialogue sessions during class, responsiveness of student towards materials taught, individual demonstration by candidates, group discussions, quizzes and exams. These common methodologies were used with slight variations. The program involved two main surveys - one at the beginning and the other at the end of the program to estimate the benefits of the program. Regular classroom session involved instruction by the tutor which may have been verbal, as a PowerPoint demonstration or using the black board or smart touch screen boards. Materials collected from academic websites were used to impart instruction. Several exercises based on Word, PowerPoint and Excel were illustrated and also assigned to students to evaluate performance. The effectiveness of the course in enabling the students toward comprehending various concepts such as formatting, page setup, indentation, text orientation and style in Word, creation of a PowerPoint presentation with necessary animation, multimedia, formatting and style in PowerPoint, data entry and analysis, plotting charts and graphs, sorting data in Excel were all covered in the exercises using interesting and illustrative examples.

The study also analyses the comfort levels of the students at using computers before and after the course. The study also involved collection of feedback from the students which mostly contained positive comments.

Results

Only a selected set of students from the entire lot was used for formulating the results. This is because of various factors like: irregular attendance of students, student joined the class towards the end of the course or quit the class in between, gave insufficient data in the surveys etc. These factors forced us to exclude some students from the analysis. We evaluate the performance based on 2 surveys: one taken at the beginning of the course and the other at the end of the course. The students were evaluated in their skills in different concepts on a 10-point scale. The following concepts were considered:

- Comfort in using a computer
- MS-Word
- MS-PowerPoint
- MS-Excel
- Usage of fonts, font sizes, Bold, Italics and Underline
The average points on each question before and after the survey are computed and plotted. The light gray bars represent the evaluation before the course and the dark gray bars represent the evaluation after the course. Fig.1 shows the evaluation of the students’ performance before and after the course for all grades (specifically 7th and 8th). Fig.2 shows the evaluation of the students’ performance before and after the course for 7th grade only and Fig.3 shows the evaluation of the students’ performance before and after the course for 8th grade alone. Fig.4 is a pie chart showing the number of students most comfortable in Word, PowerPoint and Excel after the course. For plotting the first graph, we have used data from 12 students. Fig.2 uses 5 students, Fig.3 uses 7 students and Pie chart is plotted for 13 students.

![Graph](image)

**Fig.1:** Comparison for 12 students for 11 questions before and after the course (7th and 8th grade students included)
Fig. 2 Comparison for 5 students for 11 questions before and after the course (only 7th grade students included)

Fig. 3 Comparison for 7 students for 11 questions before and after the course (only 8th grade students included)
The positive feedback received from several students evaluates the program to be a success. A student in the 8th grade wrote “I learned how to use Excel, how to plot data in Excel. I learned how to use MS word even better than I knew before. I also learned how to use Powerpoint”. Another student supported this review as “I learned how to do my margins and how to make boxes in MS word and in Powerpoint. I learned how to do animation, the different type of slides and on the Excel-I learned how to use it. My favourite part is when I got to split the boxes”.

The feedback from Columbus school administrators has been overwhelmingly positive. They want us to continue this program in the next semester, and want us to hold advanced classes where the students learn how to use the skills acquired in building a virtual bridge.

**Conclusion**

Our study analyses the progress and outcomes of a collaborative training program between a school and a University. The program involves imparting computer education to middle level school students and the improvement is observed at three stages - initial, intermediate and final. We observe a good improvement in the knowledge of basic computer tools, Microsoft Office tools viz., Word, PowerPoint and Excel. The improvement shown by students of 7th grade based on the survey taken by students is 44%. The improvement shown by students of 8th grade is 57%. The overall improvement shown by students of 7th and 8th grade based on the survey is 57%. Feedback from students and administrators indicate that this program has been a success and there’s a desire to continue if further in the school.

**References**

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