A Study of Student Attitude towards Media Based Instruction in Introductory Engineering Courses

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Abstract - In this paper, Media Based Instruction technique is used to enhance student understanding of engineering fundamentals. It also seeks to examine the effects of technology based instruction in order to complement conventional instruction. This progress as well as lessons learned in the first two semesters of Media Based Instruction in introductory engineering courses namely Circuits, Electronics, and C++ for digital computation is evaluated and some statistics are offered. Pilot study: A concluding section assesses the advantages of complementing conventional instruction with Media Based Instruction.

Index Terms – Engineering Education, Media Based Instruction, Pedagogy

INTRODUCTION

This paper seeks to present the results of a study and feedback of a survey completed by students that was based on their outlook toward a media based tool that was used in the instruction of C++ for Digital Computation. The outcome of this paper complements similar studies on media based instruction. Cohen et al [1] who found that students learned more from such instruction methods compared to traditional methods of instruction. Similarly, Powell et al [2] investigated further and found that such instructional methods were instrumental in raising the GPAs of the students. For the convince of readers, the authors wish to point out the fact that Dr. Thomassian used to be an assistant professor of electrical engineering at Georgia Southern University when this study was conducted.

DIGITAL COMPUTATION: A BRIEF COURSE OVERVIEW

The aforementioned course deals with foundations of computing with an introduction to design, analysis of algorithms and an introduction to design and construction of programs for engineering problem-solving. C++ is the principal computing language under consideration in addition to introductory segments of EXCEL MACROS. All students enrolling for this course are required to take a course in basic calculus as a pre-requisite. Students predominantly from the aerospace, civil, chemical, computer, electrical and mechanical engineering programs enroll in this course. This course is a required course for the aforementioned majors. The course structure is as follows: It is a three credit hour course (two 50 minutes lectures combined with a two hour laboratory meeting each week).

1. Have a working knowledge and general understanding of the C++ and MACROS environment [3].
2. Know the basic types of arrays such as numeric, cell and structure arrays that are implemented in the above environment.
3. Gain experience with advanced plotting and model building techniques.
4. Solve elementary linear algebra problems in the C++ environment [4].
5. Implement rational and logical operators, conditional statements, loops and switch statements.
6. Gain exposure to basic programming and plotting techniques in Microsoft Excel [3,4].
7. Implement functions (mathematical, user-defined, and advanced) in C++ and gain experience with data file management.
8. Understand program design, development process and basic programming skills including debugging in C++ [3,4].

The above objectives are in agreement with ABET criteria for accreditation of Engineering programs [5].

TECHNIQUE FOR OUTCOME ASSESSMENT AND ASSORTMENT OF INFORMATION

This paper reports the outcomes and feedback of a study that the students completed. These studies were based on their outlook on the media based tutorial that was used in the instruction so as to facilitate the instruction of C++ and Excel MACROS in the Digital Computation course.

STUDENT POPULATION

Forty Five (45) participant students at Georgia Southern University (GSU) were enrolled in the Digital Computation course and participated in the study. Out of this population, 78% were freshman and 22% were sophomore. Students varied in age from 17 to 21 years. 67% were 18 years old, 22% were 19 years old, 7% were 17 years old and one student was 21 years old. The average student age was 18 years old. Students ranked themselves regarding computer skills based on a 1 to 10 scale. Of the 45 respondents, 78% believed their level of computer skills to be 7 or higher and
22% below 7. Based on gender, there were 76% male and 24% female respondents.

**Technology Based Tutorial for Instructing the Essence of the C++ Code**

A new media based tutorial was created for teaching C++ and Excel Macros for Digital Computation. This media based tutorial was available to students enrolled in the course through WebCT. In order to gain access to this tool, access to the internet and password access was important. The tool imparts step-by-step simulation to teach some of the basic maneuvers of using C++ program structure through a simple example – hello world program. The tutorial starts under the assumption that Visual Studio is installed on the students’ machines.

The tutorial depictions and walks the students through all the required setups, file saving, running the program, and viewing the results through text editor and screen captures. Every main point is emphasized in sufficient detail. Students can go through the tutorial at their own pace and in their own time. Students are not time constrained in any manner while accessing the tutorial.

**Experimental Procedure and Design of the Experiment**

Students were instructed to log into their WebCT account and download the tutorial. It was recommended that students spend an average of one hour per day using MBI on WebCT. None of the students had been exposed to C++ programming at the time of the implementation of this tool. They were able to follow and comprehend the tutorial with relative ease and in a short amount of time. In the following laboratory session they accessed the Visual Studio in order to run and simulate the given laboratory that was due for that day.

The main assessment objective was to evaluate students’ outlook to media based tutorials. To accomplish this goal, a questionnaire consisting of 12 questions was given to students enrolled in Digital Computation at the end of the laboratory session. The full questionnaire used in this study is shown in Table 1.

The questionnaire was given to the students by asking them to give their level of agreement on each statement using a five point Likert scale with higher values indicating greater levels of agreement with the statements. The scale is designated as follows:

- 5 for strongly agree,
- 4 for moderately agree,
- 3 for no opinion,
- 2 for moderately disagree, and
- 1 for strongly disagree.

### Table 1: Questionnaire

<table>
<thead>
<tr>
<th>Media Based Instruction Technique</th>
<th>Rank</th>
<th>Fr</th>
<th>Sr</th>
<th>Md</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>I am highly competent with using a web array of computing applications such as MS Office.</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>I feel technology driven instruction techniques facilitate ease of learning programming languages such as C++.</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>I would prefer not to use media based instruction techniques while learning to use C++ when I practice by myself.</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Technology driven instruction plays a prominent role in making learning enjoyable.</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>I think learning programming languages will be beneficial to my program.</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>I feel technology driven instructional materials are difficult to understand.</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Media based instruction techniques are more helpful than textbooks in the learning process.</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Media based instructional techniques are stimulating and help me concentrate on the subject matter better than other techniques.</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Traditional methods do a mediocre job when dealing with learning programming languages.</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>I can learn in an unstructured manner and pace myself using media based instruction techniques.</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Media based instructional techniques get me more involved in the subject matter.</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>I was encouraged to experiment and learn more due to media based instruction.</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
</tbody>
</table>

Notes: The following abbreviations are used for each major.

- AeroE: Aerospace Engineering
- CEE: Civil Engineering
- ChemE: Chemical Engineering
- CompE: Computer Engineering
- EE: Electrical Engineering
- ME: Mechanical Engineering

### Statistical Results and Analysis

Statistical results from the 45 correspondents are reported in Table 2. The group average scores for all questions are significantly above 3.0. This indicates that collectively, students either strongly agree or moderately agree to all statements which indicate that they have favorable attitudes toward media-based instruction. Comparing average scores across individuals, a significant majority have favorable responses.
Students were advised to write some comments regarding technology based instruction at the back of the questionnaire. The following is a summary of some of the student comments:

- I look forward to using MBI in the future.
- I enjoy using Media Based Instruction.
- I prefer MBI over using traditional methods.
- It is more active than a lecture. It is fun and exciting!
- I feel that it helps me out a lot more when I get the hands on training. It is a very good process.
- Media based instruction should be used with traditional instruction styles
- Need more explanation on how to operate the program

CONCLUSION

This paper presented the results of a survey taken in order to gage the effectiveness of technology based instruction techniques in an introductory Computing class at Georgia Southern University. It examined the usefulness of media based instruction in an introductory computing course for engineering majors at Georgia Southern University. From the survey results and student responses in this pilot study, it is concluded that media based instruction in combination with traditional teaching methods is vastly preferred by students over other methods of instruction. This specific instructional technique provides a highly positive reinforcement to the students' learning environment and seems to be preferred method. The authors intend to repeat this experiment over another five to seven years. Experimental results will be shared with the academic community in the future through appropriate publications.
REFERENCES


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