Computer Science and Information Systems

Rekenaarwetenskap en Inligtingstelsels
CALL FOR CONTRIBUTIONS

South African Computer Journal (SACJ): Special Issue

Information Technology and Development

South Africa, as a developing country, needs to find ways to harness its enormous potential in a rapid and sustainable way. It is argued by some that the developments in information technology are increasingly creating opportunities for socio-economic development to be enabled by the diffusion of IT. If this is true, then these opportunities should surely be explored. Consequently, the editorial board of SACJ has decided to devote a special issue to this theme.

Some of the questions that the special issue might address are:
- To what degree can information technology enable (or accelerate) socio-economic development?
- How can the diffusion of information technology be achieved in order to maximize its contribution towards socio-economic development?
- What are the conditions required for such technology enabled development?
- Are there high leverage areas where quick returns can be achieved?
- Should the state play an active role and in what way?
- What are the experiences of other developing countries in information technology enabled socio-economic development?
- What are the moral and ethical issues involved in information technology enabled socio-economics development?

We invite all researchers in the field of information technology and other disciplines to contribute to this special issue. All contributions will be reviewed by three independent reviewers. Contributions should be sent in four copies to:

Prof Lucas D. Introna
South African Computer Journal (SACJ)
Special Issue: IT and Development
Dept. of Informatics
University of Pretoria
Pretoria, 0002
SOUTH AFRICA

Contributions should be received by June 5, 1995. Contributions sent by facsimile or e-mail will not be accepted. For any information regarding the special issue contact Prof Lucas Introna at +2712 4203376 (office), +2712 434501 (fax) or Internet: lintrona@econ.up.ac.za.

Important Dates

Contribution deadline: June 5, 1995
Notification to author(s): September 1, 1995
Final versions due: November 1, 1995
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Communications and Viewpoints

Teaching Pascal Using Multimedia

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Abstract

Research has shown that traditional teaching methods such as lecturing are not always as effective as the teacher or lecturer might like them to be. Frederick [3, p45] stated: "Nearly all learning theorists, faculty development consultants, and reports on higher education recommend the importance of interactive, participatory student involvement for learning that affects cognitive and affective growth." In this project we take a look at multimedia as an alternative or supplementary way to teach students.

Keywords: Multimedia, Teaching methods, Video

1 Introduction

The process of learning should not only be a passage of knowledge from lecturer to student. The student must be motivated to take responsibility for his or her own learning. "Learning improves when teachers engage students in problem-solving activities and shift from a primary emphasis on paper-and-pencil calculations to the full use of electronic calculators and computers." [2, p6]. People will adopt multimedia because the visual, motion and audio cues make communication better and easier. "I have given traditional presentations with overheads and 35mm slides and full multimedia presentations. My experience is that audiences respond more, and more positively, to multimedia presentations." [1, p107]

There is a critical need to develop meaningful programs and teaching materials that will excite learners. "We have to be far more activity oriented and far less textbook oriented." [2, p7]

2 Integrating Multimedia into A Standard Education Curriculum

"Technology can be defined as a synthesis of knowledge, tools and skills used to solve problems." [4, p11]

Our approach is that technology applications should relate to the overall instructional goals, that technology alone is not the answer, and that technology can help equalise opportunity for all students. "Furthermore it is imperative that students become educated about the technology society." [4, p11]

"Despite the very attractive capabilities of multimedia technology, authoring systems to implement these capabilities, and the widespread availability of generic course-ware, integration of multimedia instruction into so-called standard education curricula, in both industrial training and academic education, has been slower than expected. This situation remains true even though a growing number of studies show multimedia instruction to be superior to traditional instruction. In addition, students invariably give high approval ratings to multimedia courses." [5, p287]

Startup and development costs are generally considered to be higher for multimedia instruction than for traditional instruction. Reisman and Carr argue that the degree of integration of multimedia instruction into a standard education curriculum may depend primarily on the attitudes of the groups providing and receiving the education.

In most colleges and universities the lecture method is the customary and preferred instructional mode. There are a number of reasons why this mode is retained. Instructors are not sure how to integrate new technologies into tried-and-true methods. Budgetary considerations often preclude expenditures on instructional technology, even when it has proven to be effective. In addition, implementation of technology-dependant individualised environments usually requires substantial allocation of space. Courseware for existing curricula is not readily available. New instructional material is difficult to design and implement, and demand a large investment of time. Any one of these issues can become a significant stumbling block to initiating a successful multimedia project.

3 Objectives

The purpose of the present project was to examine how teaching based on a multimedia authoring system compares with teaching by means of lessons on video or traditional teaching by a lecturer in a classroom. The teaching material
was Turbo Pascal for first year students.

The main objectives of this study are:

- to create an environment in which a student is encouraged to autonomously investigate, think and learn,
- to provide the student with basic instruction and motivate him to gain more knowledge and experience on his own, and
- to improve informal communication.

4 The Experiment

The Turbo Pascal course was previously taught in a traditional lecture mode. Students were required to attend a practical session in a computer laboratory during which theoretical material was applied on a computer and where small programs were written. An experiment was designed along the following lines.

- Learning centre. Ten multimedia workstations were installed in a separate room which students and personnel could enter throughout the day. No limitations were placed on the time and the duration for using the computers.
- Learning environments. A multimedia instructional course in Turbo Pascal was designed and implemented to be used by one third of the first year students. One third received a video programme on Turbo Pascal and one third attended lectures.
- Group selection. The students were grouped according to their final marks at the end of the first semester in the following manner. All students with a final mark of eighty and above, were randomly divided into three groups. Similarly, students with final marks between seventy and eighty; between sixty and seventy; between fifty and sixty; and between forty and fifty were divided into three groups, respectively. After the three groups thus obtained were randomly selected as a class group, a video group and a multimedia group.
- Student attendance. The video and multimedia groups did not attend lectures and worked through the instructional material at their own pace. The third group attended traditional lectures twice a week for 90 minutes.
- Minimising courseware costs. The multimedia programme as well as the video programme was developed at minimum costs. Although not as professional as we would have liked it to be, it was judged preferable to keep initial costs down and to later improve on the quality of the products if the experiment turned out to be successful. "Fear of an amateurish result causes many organisations to shy away from producing their own multimedia, computer-controlled video discs." [5, p291]
- Semester constraints. Students could proceed at their own pace through the course. However, because the university environment requires that all students complete a course by the end of a semester, students had to complete the course within a prescribed time frame to enable them to write the semester examinations.
- Student testing. During the first four weeks of the semester the students did not write any tests. During the fifth and sixth week they had to write a semester test, based on a prescribed part of the courseware. A one week holiday followed the semester test. Since the results of the semester test were not satisfactory, we decided to test the students more regularly. This seemed to have the desired effect since the scores on average during these later tests were considerably higher than those of the semester test.
- Daily operating schedule. The multimedia working centre was open daily Monday through Friday from 8:00 a.m. to 23:00 p.m. The lecturer as well as an assistant were available to provide guidance and information from 8:00 a.m. to 16:30 p.m. If necessary an appointment could be made for assistance after the normal hours.

5 Results

Table 1 shows the results of the experiment. The first column, N, represents the number of students in each group. The second column, S, is the average first semester mark used in the group selection process. T1 through T6 represent the scores of the tests taken during the experiment. The numbers represent the average scores of the different groups.

6 Conclusion

On the basis of student performance and student opinion alone, this study was an outstanding success. As Table 1 indicates, we cannot say that the students in the video and multimedia groups outperformed the class group. We can deduce, however, that the video and multimedia groups performed at least as well as the class group. The fact that this was the first time that the students were allowed to work in an entirely individualised environment and that this was the first time that they worked with multimedia, might explain the bad performance of the video and multimedia groups in T1.
Table 1. Average Scores

<table>
<thead>
<tr>
<th>Group</th>
<th>N</th>
<th>S</th>
<th>T1</th>
<th>T2</th>
<th>T3</th>
<th>T4</th>
<th>T5</th>
<th>T6</th>
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<td>All</td>
<td>90</td>
<td>58</td>
<td>52</td>
<td>69</td>
<td>59</td>
<td>53</td>
<td>72</td>
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<td>64</td>
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<td>59</td>
<td>46</td>
<td>79</td>
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<tr>
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<td>58</td>
<td>47</td>
<td>70</td>
<td>58</td>
<td>55</td>
<td>68</td>
<td>62</td>
<td>60</td>
</tr>
<tr>
<td>Full-time</td>
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<td>57</td>
<td>53</td>
<td>70</td>
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<td>53</td>
<td>61</td>
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</tr>
<tr>
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<td>64</td>
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<td>57</td>
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<td>59</td>
<td>71</td>
<td>53</td>
<td>58</td>
</tr>
</tbody>
</table>

Student opinion surveys were taken twice during the project, once at the semester test and once almost at the end of the study. Both surveys indicated that students' opinions regarding the course material, the learning centre, the nature of their individualised learning experience and the project in general, were overwhelmingly positive.

References


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Notes for Contributors

The prime purpose of the journal is to publish original research papers in the fields of Computer Science and Information Systems, as well as shorter technical research papers. However, non-refereed review and exploratory articles of interest to the journal’s readers will be considered for publication under sections marked as Communications or Viewpoints. While English is the preferred language of the journal, papers in Afrikaans will also be accepted. Typed manuscripts for review should be submitted in triplicate to the editor.

Form of Manuscript
Manuscripts for review should be prepared according to the following guidelines.

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  - author’s initials and surname;
  - author’s affiliation and address;
  - an abstract of less than 200 words;
  - an appropriate keyword list;
  - a list of relevant Computing Review Categories.
- Tables and figures should be numbered and titled. Figures should be submitted as original line drawings/printouts, and not photocopies.
- References should be listed at the end of the text in alphabetic order of the (first) author’s surname, and should be cited in the text in square brackets [1-3]. References should take the form shown at the end of these notes.

Manuscripts accepted for publication should comply with the above guidelines (except for the spacing requirements), and may be provided in one of the following formats (listed in order of preference):

1. As (a) \LaTeX \textsuperscript{X} file(s), either on a diskette, or via e-mail/ftp – a \LaTeX \textsuperscript{X} style file is available from the production editor;
2. As an ASCII file accompanied by a hard-copy showing formatting intentions:
   - Tables and figures should be on separate sheets of paper, clearly numbered on the back and ready for cutting and pasting. Figure titles should appear in the text where the figures are to be placed.
   - Mathematical and other symbols may be either handwritten or typed. Greek letters and unusual symbols should be identified in the margin, if they are not clear in the text.

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These charges may be waived upon request of the author and at the discretion of the editor.

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Announcements and communications of interest to the readership will be considered for publication in a separate section of the journal. Communications may also reflect minor research contributions. However, such communications will not be refereed and will not be deemed as fully-fledged publications for state subsidy purposes.

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Contributions in this regard will be welcomed. Views and opinions expressed in such reviews should, however, be regarded as those of the reviewer alone.

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References
## Contents

### GUEST CONTRIBUTION

Organizational Computing Technologies for Supporting Organizational Activities  
FH Lochovsky .......................................................... 1

Editor's Notes ........................................................... 11

### RESEARCH ARTICLES

Specialization by Exclusion  
H Theron and I Cloete .................................................. 12

A Linear Time Algorithm for the Longest (s-t)-path Problem Restricted to Partial $k$-trees  
M Mata-Montero and JA Ellis ........................................ 21

F Sutherland ............................................................ 32

### TECHNICAL REPORT

On Using The Situation Calculus Dynamically Rather Than Temporally  
WA Labuschagne and MG Miller .................................... 43

### COMMUNICATIONS AND VIEWPOINTS

Teaching Pascal Using Multimedia  
DB Jordaan and S Gilliland ........................................... 50

The Innovative Management of Information in The Mid-1990s  
D Remenyi .............................................................. 53