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STUDYING ABOUT THE USE OF COMPUTERS IN MATHEMATICS EDUCATION

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ABSTRACT

Mental computation and mathematical reasoning are two intertwined top-level mental activities. In deciding which strategy to use when doing mental computing, mathematical reasoning is essential. From this reciprocal influence, the current study aims at examining the relationship between mental computation and mathematical reasoning. The study was carried out with 118 fifth-grade students (11–12-year-olds). As data collection tool, "mathematical reasoning test" and "mental computation test" were developed and used. In analyzing the data, Pearson's correlation coefficient (r) between participants' scores of each test was computed. Some sample student responses to some questions in both tests were also presented directly. Evidence was found that there is a significant positive correlation between mental computation and mathematical reasoning.

Keywords: - Computer, Education, CAI, Maths, Student.

I. INTRODUCTION

COMPUTERS IN MATHEMATICS EDUCATION

Mathematics instruction is among the most explored research area in education. There have been considerably varied computer applications in instruction (Hatfield, 1984). The teachers of mathematics are confused with the extensive amount of suggestions on how to teach mathematics with a computer. Teachers' attitudes towards computers vary mostly as a function of teachers' age or years in service. Complete 'ignorance' attitude towards computers still continues, although its magnitude is weaker compared to past years This attitude is mostly shared by teachers who had had their training before the start of the computer age who have the most negative attitudes towards its pedagogical use and who insist on using the traditional modes of teaching. Second major attitude is not being able to abandon their traditional habits completely foreseeing its potential for the future of education.

II. THE TYPES OF CAI PROGRAMS

CAI means, in broader terms, the use of a computer to provide the course content in the form of drill, practice, tutorial, and simulations. Demonstration, testing, information, and communication are the main facilities provided by CAI. Hatfield (1985) counts eight basic types of CAI. The first type of CAI includes “drill and practice” programs. Here, the students rehearses different elements of teaching and develop related skills. They are presented to students in the educational software’s produced for school and home computers. That type of program relies heavily on positive reinforcement. That means, a reward follows a correct response, negative reinforcement is also used but not frequently. A good example for drill and practice programs are the ones designed to help children learn multiplication tables. The drills might be presented to students with a car race game for instance. The rule is simple: the refueling of the car depends on the correct answer the student gives to a multiplication question.

Besides drill and practice facilities the use of “computers as tutors” are as widespread as the former. The tutorial programs are the one designed to teach basic concepts or methods as well as certain subject in mathematics for instance. Those type of programs try to behave like a good stimulating teacher. It involves explanations, questions, as well as feedback and correctives. For example, when the user asks for help in a certain step he/she may need help for handling the problem.

III. EFFECTS OF CAI ON MATHEMATICS TEACHING AND LEARNING

The stimuli response bonds are established by providing positive reinforcements such as knowledge of results. Then, it was the teacher (or the organiser of the instruction) who was responsible for the selection and arrangement of content to help the desirable responses to be elicited. Then, this process leads to the discovery of feedback, the message which follows the response made by the learner. This, in fact acts as a positive reinforcement for the learner. It is also the information which shows the error and informs the student to correct this error. This is called feedback-corrective cycle. Learning takes place by rewarding the correct associations by questions and answers which is known as the reinforcement learning.CAI also brings the possibility that student interaction with the computers may result in less interaction with the teacher and the classmates. This, in fact is very harmful for the process of socialization provided by the school environment. Most of the applications of CAI have been based on the individualized learning, one student working with one computer. The model proposed by was a group based model. They found that the co-operative CAI was far more effective compared to the individualistic CAI approach in mathematics and concluded that the assumption being “all CAI should be individualistically oriented" is not a valid argument.

IV. STUDENT PROGRAMMING AND ITS EFFECTS ON MATHEMATICS CURRICULUM

Its origins and philosophy

Student programming movement started from the realization that there are strong connections between thinking processes of learners during writing their own computer programs and many aspects of mathematical thought (Hatfield, 1985). Its main assumption is that, computers can help students in learning certain mathematical topics by programming the computer which can be considered as an anti thesis to CAI. Most CAI programs were criticized because they were mainly drill and practice based which could unlikely 'relational understanding' (Skemp, 19??) of the content presented.

Seymour Papert, an influential figure in this movement, proposes that, the use of computers as teaching machines gives nothing to students (Papert, 1980). "Programming the computer, not being programmed by it" was his motto. He also argued that the students can develop their thinking skills through writing their own programs rather than using programs that were developed for them previously. Underwood and Underwood (1990) note that the open ended programs like LOGO for instance are like pencils and bicycles, in the sense that they are tools to make students reach the ultimate goal: to develop thinking. CAI programs are criticized in the sense that they have known and well defined goals which inhibits discovery.

Students sometimes give right answers for wrong reasons or wrong answers may be the result of rational thinking (Dubinsky and Tall 1993). This statement is a brief summary of the new paradigm of learning. Learning can occur by giving the student the opportunity to construct their own knowledge. This could be provided by a rich computer environment with which the students can develop new mathematical ideas and play with them. Another important feature of computer environments is their power in making abstract ideas more concrete. The computer promotes the minds of the children, causing a shift from concrete to abstract, iconic to symbolic (Kelly, 1984). Computers also assist the child to develop abstract modes of learning to direct them to higher levels of conceptual understanding. Through design, coding and revision, and debugging of a new computer program students can have an opportunity to develop higher mental skills such as deductive reasoning and problem solving. Therefore, it becomes more crucial now to incorporate computer programming into existing mathematics curricula.

Children should be actively engaged into the activities which they are exposed to (Kelly, 1984). In that way the learner can use a computer in the positive sense. As opposed to passive learning which is enhanced by the readymade packages, the student can have better learning experiences. Kelly labels CAI programs as "second-hand programs which have been prepared for them by others."

The effects of student programming on mathematics teaching and learning:

There are two basic traditions in programming. They have their own philosophy and teaching styles (Cope and Walsh, 1990). The first one is the BASIC-PASCAL tradition. The other tradition, LOGO is rooted from the artificial intelligence and supported by Piaget's cognitive development theory (Papert, 1980).

BASIC

Although it is not widely used any more, BASIC had a strong impact on mathematics education in the previous years. It is indeed an easy language. Students could write their own programs to explore mathematical ideas. They could be used for the purposes of problem solving, investigation and practical work. Although its applications were very limited, it was and (may be) is being used because of its ease of use.

LOGO

Seymour Papert in 1970 wanted to design a computer language that is suitable for children, not able to use complicated programming languages such as BASIC and PASCAL. It should be easy to manipulate and have the power of a structured programming language.

LOGO, the outcome of this effort, is a general purpose programming language. The programs in LOGO can be written to perform different tasks. It can be used to write programs across many different subjects in the curriculum. mostly in mathematics. The turtle geometry, a part of LOGO helps young children program the computer. It is used to draw whatever the learner likes, such as geometrical figures.

Programming in LOGO combines with use of microworlds. Then through programming certain problem area can be explored. With LOGO children are assumed to develop useful practices as a result of programming in microworlds. Contrary to the other programming languages, LOGO is often taught in an open ended and child centred fashion. The learner himself /herself gives directions to his /her learning. Children using LOGO develop a knowledge of how programming works through testing hypothesis.

Mathematical tools in mathematics education

By tools what is meant is the computer packages by which the learner can develop his/her thinking skills. In this context the spreadsheets such as excel, computer algebra systems (CAS), the databases, communication facilities, word processing will be analysed. Those are the tools that are used in the educational computing.

V. CONCLUSION

It is further concluded that the focus of discussion in this Chapter is on computation of sustainability of the paperless online off campus admission system which is constantly executed since 2006 pan Haryana by more than 504 institutions and found sustainable. From the perspective of students and government, the system is quite cost effective, transparent, efficient and helpful in increasing of e-readiness among students and institutions, and minimizing the human interference in evaluations and admissions. For replication of the system at other locations and states it is inevitable to ensure sustainability under different conditions of technology usage, implementation and capacity building for adequate operations etc. Therefore, Structural Equation Modelling technique has been tested by formulating a data model and deriving mathematical equations. Subsequently, deriving and solving of covariance and regression matrics by using LISREL & MATLAB for computing sustainability of the system. The sustainability index varies between 3.927 and 0.705, respectively, and the standard deviation of sustainability index in the study area is 0.072198. Also for decision making, recommendations like validation of Mathematical model using separate sample of dataset, selection of robust technology, capacity building, and establishment of help-desks etc may be followed for improved sustainability.

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