

CHANGES IN CHILDREN'S CREATIVITY IN LOGO ENVIRONMENTS

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ABSTRACT

This presentation summarizes the authors' experience in studying changes in children's creativity as a result of LOGO-based learning in different educational context. Two empirical investigations (in-school and out-of-school settings) are carried out to examine the relationships between changes in children's creative thinking abilities (measured by Torrance Tests of Creative Thinking) and characteristics of children's work with computers. The results lead to the conclusion that experimentally proved creative potential of the computer-based education needs appropriate environment and instructional strategies in order to be fully materialized in the real-life educational processes.

Keywords:

Creativity, LOGO programming, LEGO-LOGO activities, real-life educational context.

Aside our proper research interest in creativity, we firmly believe that creativity is an important aspect of human learning and living. Many of society's needs change drastically and the objectives of education, the concepts of teaching, methods of instruction and criteria for evaluating instruction must also change. There was a time when we thought that a person could learn some things at school and this learning would last him/her for the rest of his/her life. Today's schools are being asked to produce men and women who can think, who can adapt to change and who can find more adequate solutions to impelling world problems. Man of the future will have to behave creatively and today's educational technologies have to help today's students to meet the challenge.

Information Technology in Education and Creativity

Creativity is very often claimed to be a positive outcome of the computer-based education. Specialists in computers uniformly agree, that such an instructional innovation is expected to enhance children's creativity, but there are only few researches in the field: Clements (1986; 1991); Blumen (1991); Sakamoto, Zhao and Sakamoto (1991). Controversial findings are reported also (Bruce, 1989; Sakamoto, Zhao and Sakamoto, 1991) and the need for further research in this field is emphasized (Bruce, 1989; Clements, 1991).

According to Bruce (1989), the analysis of the effects of the use of information technology in education on creativity "...should be done in terms of all relevant sets of variables: the kind of technology involved, the educational strategy in which it is embedded, the functions it serves in the particular educational strategy, and the aspects of creativity involved or affected" (Bruce, 1989, p.249).

Difficulties are related mainly with the fact that there is no widely accepted theory of creativity; the field of creativity research is characterized by a rather peaceful co-existence of different approaches and models. Several conceptions have been proposed, which although very similar, differ by the answers they are giving to two principal questions: 1) how the individual's creative potential is being conceptualized (and, respectively, what kind of measurement instruments have been developed?); and, 2) is the individual's creative potential susceptible to educational influences?

Our research work is based on Torrance's (1979) conception of creativity as a natural problem-solving process which is similar in all fields and is highly teachable. We use also Torrance Tests of Creative Thinking (as did Clements, 1986; 1991; and Blumen, 1991) as a creativity measure. The Verbal and Figural batteries consist of open-ended tasks which require kinds of thinking, analogous to the thinking involved in recognized creative achievements and which measure individual differences in creative thinking abilities.

This presentation summarizes the authors' experience in studying changes in children's creativity as a result of LOGO-based learning in different settings. The main results of our studies seem to be in raising questions rather than answering them. Data analyses draw attention to the characteristics of the educational context which probably affect the impact of computers in education on children's cognitive development.

Study 1

In 1990/1991 we were engaged with an empirical investigation of the development of the creative thinking abilities in the context of learning programming in a regular classroom setting. Subjects of the study were 31 sixth-graders (19 boys and 12 girls) who studied Informatics-LOGO for a second school year. The

attitudes (self-directed search for different solutions; mutually supportive activity within the group; persistence in the work; very high level of internal motivation) which had not been typical for the regular classroom setting. It seems useful that further investigations of the computer's impact on children's creativity rely heavily on behaviorally-grounded creativity indicators.

Significant sex differences were found in the both studies. In the first study 72% of the pupils who are seen as very much interested in computers and 74% of those who have variety of experience with computers are boys; 73% of the pupils who receive highest marks in Informatics are boys too. At the same time girls outscored boys on all verbal and on most of the nonverbal creativity indicators. This discrepancy makes quite logical the negative relationship between changes in creativity and the characteristics of computer use.

Girls are minority (N=3) in the LEGO-LOGO Club too. Boys are more likely than girls to perceive computers, Informatics and different type of constructor-tools as a valuable field for expressing one's potential and receiving acknowledgement. It might be that our cultural stereotypes don't consider computers to be very much a "female" business. Similar sex differences are reported by Sakamoto, Zhao and Sakamoto (1991) for a sample of over 700 Japanese 4th - 6th graders. *

Conclusions

How can we integrate the results we obtained with the accumulated data concerning the impact of computer-based education on children's creativity?

Both Clements (1986; 1991) and Blumen (1991) investigate the influence of LOGO programming on children's creativity in well controlled experimental conditions. They both report positive outcomes which confirm that LOGO environments might be a positive factor in children's creative development.

When *real-life educational context* is considered, the results are not so conclusive. Mitterer and Rose-Krasnor (1986) revealed few changes in problem solving skills which could be attributed to the LOGO instruction (cited in Bruce, 1989). Sakamoto, Zhao and Sakamoto (1991) found out that computer use experience in school (programming) enhances children's creative initiativeness and inquiry abilities, but computer use at home (games) does not always enhance initiativeness and, on the other hand, decrease children's inquiry abilities. Therefore, *the advantages of the computer-based instruction, which have been experimentally proved, are not automatically materialized in real-life educational processes* - additional efforts are needed to put them into practice.

Considering our proper results from this point of view, we direct our attention towards those factors/variables in the Bulgarian educational context which might be responsible for the ineffective computer use in- and out-of-school. One of the most important is the overall shortage of computer resources available to children at home and at school. Our results are probably predetermined by the restricted computer experience of the Bulgarian children. Both further enrichment of the educational context by the means of new information technologies and the implementation of appropriate instructional strategies are needed to provide children's creative growth.

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