The Eurasia Proceedings of
Educational & Social Sciences (EPESS)
ISSN: 2587-1730

The Eurasia Proceedings of Educational & Social Sciences (EPESS), 2014

Volume 1, Pages 376-380

ICEMST 2014: International Conference on Education in Mathematics, Science & Technology

RATES ASSOCIATED PROBLEM-SOLVING ABILITY WITH PROGRAMMING IN COMPUTER STUDENTS

Ali HABIBI
Razi University, Computer Department

Mir Mohammad Reza ALAVİ MİLANİ
Karadeniz Technical University, Computer Engineering Department

ABSTRACT: In this study, we investigated the relationship between problem-solving ability and scores of programming, in computer students. In order to prove this claim, we design a questionnaire consisting of 15 questions. The gathered answers from student were categorized as “right”, “wrong” and “no responded”. Survey of 100 students of computer in qualitative and quantitative is performed. Also we considered scores of programming course for related students as parameter in evaluation research. for enhance the accuracy of these questionnaires we were interviews with 6 students.The result of this investigation, show that there is Significant relationship between problem-solving ability and programming. Based on the results obtained from this study suggestion were presented to enhance problem-solving ability.

Key words: First-degree equation, problem-based learning, computer algebra system, problem generator, problem solver

INTRODUCTION

It is well known that many students have difficulties in programming. Programming is a very complex subject that requires effort and a special approach in the way it is solving and taught. To become a good programmer, a student must acquire a series of abilities that go well beyond knowing the syntax of some programming language and problem solving that problem solving is very significant.

Several approaches have been proposed aiming to learning programming in different ways. Although we find reports of positive results as an outcome of some tools [1], none of them has a general use. In fact, we find reports about the difficulties many students experience when programming.

Result of investigate shows that the problem solving is in the initial phase of programming[2], when students have difficult in understand problem or in problem solving concepts, like to create algorithms that solve concrete problems. Special attention is necessary in this initial stage, not only in the development of programming specific abilities, but also in the improvement and knowledge and abilities that should have been acquired in previous years. Problem solving abilities and logic reasoning is relationship with programming[3-4]. The more traditional view of programming is a mapping of this problem understanding and problem solving onto a programming mechanism [5-6]. However, adopting the “programming as problem solving” perception leads to a programming substrate of a different nature that focuses on facilitating the problem solving process. Before even thinking about what to write in a computer program, the programmer must be sure of what the problem is, precisely. What is the input? What is the output? How should they relate? All your study in computer science will involve work with algorithms and chief notations historically have been pseudo code, flowcharts, and module hierarchy charts which direct relationship with problem solving.

Problem Solving Ability

- Selection and peer-review under responsibility of the Organizing Committee of the conference

*Corresponding author: Ali HABIBI- e-mail: a.habibi.y@gmail.com

What is a problem? A problem is a state in which you are trying to reach some goal, and must find a mean for getting there. Each problem has its own solution. Solving problems is a complex cognitive skill that characterizes one of the most intelligent human activities[7]. From childhood onward, we actively solve problems presented to us by the world. We acquire information about the world, and organize this information into structure of knowledge about objects, events, people, and ourselves bodies of understanding, mental models, convictions, and beliefs that influence how we relate our experience life, in school, in our jobs, and at play. How do humans develop their abilities to solve problems in these situations? People differ, children from adults, and experts from novices, and these differences are based on cognitive processes and mental organizations that humans have in common, and that characterize their problem solving abilities. In this study, we will be evaluated capable of problem solving any students in relation to those of skill in the programming computer[8]. We believe that students have difficult in problem solving, also in computer programming are trouble. Unfortunately, Computer programming has traditionally been taught and practised as a fundamentally individual activity; however, over the last few years, computer science educators have adopted different collaborative learning practices such as programming in pairs and team projects. Through these collaborative activities, students increase their self-confidence, produce better programs and improve their performance and programming skills. But the best way to enhance the programming ability of students is improve their problem-solving ability[9].

The first thing that people are faced is problem. These are generally divide into two categories: With clear solution and no clear solution. Problems with solutions that are commonly present in the technical books and bulletins, or are the problems that people with knowledge of the issue can be solved. This type of solution is shown in Figure 1. Here's a problem to a standard or similar problem is returned. The standard solution of problem is clear and with the solution the problem will be solved.

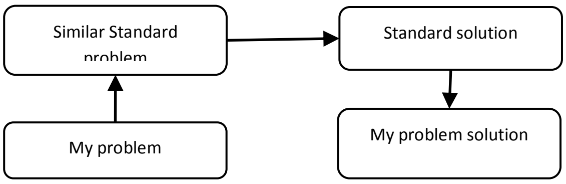

Fig. 1 Clear Solution Type of Problem Solving

Problems which require ideas and innovation are: Other types of problems, problems with uncertain solutions. These types of problems are in need of creativity and innovation. If for problem solving, personal experiences and thoughts of a person who has acquired his expertise to use environment or face defeat, to create new concepts, using alternative technologies, are called "psychological inertia ". To solve these types of problems requires expertise beyond the knowledge of the underlying, individual of creativity and innovation plays a role, too.

METHODS

Research Design

In this study, we investigated the relationship between problem-solving ability and scores of programming, in computer science students. In this research, researchers collected quantitative and qualitative data with questionnaire and interviews of students. The rationale for this approach is that the quantitative data and results provide a table of the research problem; more analysis, specifically through qualitative data collection, is needed to refine, extend, or explain. The quantitative part was conducted in questionnaire design. The treatment variable of the study was Scratch problem solving. The dependent variable of the study was programming skills. The scores of the problem solving and programming skills were gathered through Problem Solving and programming Inventory (PSAPI). In the qualitative part of the research, students were interviews in probelem solving and programming, focus group interview was conducted with students about experimental process problem solving and programming with aexpremental interviews.

Participants

100 high school students, who were attending a computer course in Iran, participated in the study. This computer course is teaching in eight hour per week.

Context and Process

According to the curriculum of the computer programming course in high schools, in many schools, programming environment is being used to teach programming to student.
In this study , we have over students who have a study done 8 hours of lessons per week of programming .
In this study, a list of questions prepared in accordance with Table 1 . As seen in Table 1 the degree of difficulty was designed with three things. Classification problems in an easy group, including basic information to solve problems that do not require special or specific innovation. These problems are expected to be resolved correctly by the majority groups. The middlegroup problems, problems they need to solve and simulate the classical method of solving problems is similar to the problems that have clear solutions discussed in the previous section of this article[10]. And Hard problems, involves problems that require individual of creativity and innovation is solving.In the design inquiries and questions are also classified into three distinct groups, from the viewpoints of two computer experts and two teachers were using computers, therefore, the questions of linguistically, levels the content it right credibility.

Table 1. List of Programming Problems

Problem
Quadric Equation solving
Factorial of *N*
Prime number of less than *N*
Sum of *N* number
Average of *N* number
Recursive function of factorial number *N*
The greatest common divisor (GCD) of two numbers
Least common multiple (LCM) of two numbers
Find an employee's net salary
Sort of *N* number
Find of Minimum and Maximum number from *N* number

Data Analysis

Gender-based research group, and the status of the problem is properly assessed, measured in accordance with Table 2 were designed based on this table were analyzed. Due to the number of students, by sex, frequency of student responses and errors were evaluated.

Table 2. Evaluation criteria in data analysis

Score	criteria
0	Empty (E)
0	Completely Wrong (CW)
1	Partially Correct (PC)
2	Completely Correct (CC)

Also, in order to assess the relationship between problem-solving ability of students with scores programming, we classify programming Course grades in accordance with Table 3.

Table 3. Benchmark score Programming Course categories

Score Range	criteria
0 - 40	Weak (W)
41 - 60	Medium (M)
61- 80	Good (G)
81 - 100	Excellent (E)

RESULTS and FINDINGS

Data analysis

The data analysis and results are presented with special reference to the research two hypotheses in the problem solving and programming study. Student-based research group, and the status of the problem is properly sessed, measured in accordance with Table 2 were designed based on this table were analyzed. Simple percentages Chi – Square. In compliance with a pre – study of the instrument was carried out and tested with Cronbach alpha coefficient and a reliability coefficient of 0.92 was obtained, which showed a strong reliability of the research instrument.

H0: problem solving will not have any significant impact on Programming.

In testing the above hypothesis, Chi-square statistics was adopted using question asked to ascertain the impact of problem solving in programming. The results are presented in the table below:

Table 4. Score of students of programming and problem solving

		Programming								
Problem Solving		Weak		Medium		Good		Excellent		
		N	%N	N	%N	N	%N	N	%N	Total
	Weak	65	.65	24	.24	8	.08	3	.03	100
	Medium	26	.26	52	.52	17	.17	5	.05	100
	Good	7	.07	20	.2	53	.53	20	.2	100
	Excellent	2	.02	4	.04	22	.22	72	.72	100

χ^2 =47.8 df=9 Sig=.003

According to table4, χ^2 =47.8, df=9 and p<.05 show that participants believe that problem solving has positive effect on programming.

CONCLUSION

In this study, the researchers explored the effect of problem solving in programming skills on high school students'. Moreover, they wondered what high school students think about programming. According to the quantitative results, programming did not cause any significant differences in the problem solving skills of the high school students. This result may show that programming in Scratch platform may not have an impact on their problem solving skills. This result can only be considered within the scope of this research. However, although this study was carried out over a short time period; there was a slight improvement in the students' self-confidence in their problem-solving ability. This slight improvement is also valuable for these conditions. In fact, this sheds light on the possibility that may problem-solving affect programming skills of the students.

Another point to be considered is that the students' self-perception about their problem-solving skills was found to be very low. Students have to be supported with different activities and applications that require high-order thinking in order to help students develop problem solving skills.

When the thoughts of the high students were considered, it can be clearly said that students liked programming and wanted to improve their programming. In the problem solving process, while half of the students had some difficulty, the others did not. Most of them tried to solve their problems in different ways. The favorite aspect of these applications were assigning a command to a character, learning how to write a program, adding a variable to a program, sharing what they did with others and creating their own world. The finally, most of the students found the problem solving of problem in programming if they have ability problem solving.

REFERENCES

A. Lawrence, A. Badre and J. Stasko, "Empirically Evaluating the Use of Animations to Teach Algorithms", in Proc. of the IEEE Symposium on Visual Languages, St. Louis, MO, October 1994, pp. 48-54.

T. Jenkins, "On the difficulty of learning to program", in Proc. of the 3rd Annu. LTSN_ICS Conf., Loughborough University, United Kingdom, August 2002, pp. 53-58.

Green, T. R. G., “Programming Languages as Information Structures,” in Psychology of Programming, J. M. Hoc, T. R. G. Green, R. Samurcay and D. J. Gilmore, Ed., Academic Press, San Diego, 1990, pp. 117-137

Castillo, E., Conejo, A. J., Pedregal, P., Garcia, R., & Alguacil, N. (2002). Building and solving mathematical programming models in engineering and science. Journal of Applied Mathematics and Stochastic Analysis, 4, 389-391.

Clancy, M. J., & Knuth, D. E. (1977). A programming and problem-solving seminar Department of Computer Science, Stanford University.

Ferreira, C. (2002). Gene expression programming in problem solving. Soft computing and industry (pp. 635-653) Springer.

Fisher, M. L. (1981). The lagrangian relaxation method for solving integer programming problems. Management Science, 27(1), 1-18.

Hoc, J. (1983). Analysis of beginners’ problem-solving strategies in programming. The Psychology of Computer use, , 143-158.

Palumbo, D. B. (1990). Programming language/problem-solving research: A review of relevant issues. Review of Educational Research, 60(1), 65-89.

Pea, R. D. (1987). Logo programming and problem solving.

Sprankle, M. (1989). Problem solving and programming concepts Prentice Hall PTR.