KNOWLEDGE TESTING IN ALGORITHMS – AN EXPERIMENTAL STUDY

Irina Zheliazkova, Magdalena Andreeva, Rumen Kolev

Abstract: With the appearance of INTERNET technologies the developers of algorithm animation systems have shifted to build on-line system with the advantages of platform-independence and open accessibility over earlier ones. As a result, there is ongoing research in the re-design and re-evaluation of AAS in order to transform them in task-oriented environments for design of algorithms in on-line mode. The experimental study reported in the present paper contributes in this research.

Keywords: algorithms, experimental study, knowledge testing.

ACM Classification Keywords: Computer and Information Science Education, Knowledge Representations of Formalisms and Methods

Introduction

Algorithms are procedural knowledge units, modeling the solution of a given class of problems. Their theory and practice constitute an essential branch of the computer science education. Additionally, an enormous number of special purpose algorithms are used in other domains, such as mathematics, informatics, economics, management, and so on. During two decades the algorithm animation systems (AAS) are the most spread teaching aids developing the learner's logical reasoning in the theory and practice of algorithms [15].

A number of empirical studies have been conducted to evaluate the effectiveness of different kinds of AAS with educational purpose but results vary [4]. Brown used BALSA-II [2] to teach an introductory programming course and an algorithms and data structure course. The system was used as a visualization program in the first course, and as a high-level algorithm animator in the second one. He reported that the use of animation scripts to supplement lectures led to "demonstrable gains in speed of comprehension" over the traditional lecture. Results of using the animator of the XTANGO [10] to teach a computer science algorithms course indicated the following. The students enjoyed the animations and the animations are able to engage students' creativity and expressiveness. Furthermore, students' understandings of the algorithms are enhanced by the animations.

The use of algorithm animation in teaching, however, does not always prove successful. Empirical studies have been conducted by educators and have produced mixed results [6]. Although the results showed that the animated group achieved higher marks than the other group, no significant benefit could be linked specifically to the animation. Similarly, Byrne et al. [3] conducted two experiments in which the results showed that the benefits of animations were not obvious. These mixed results were regarded as disappointing as most educators believe that animation does aid learning.

However, these unfavorable experiment results suggest other important factors regarding the use of algorithm animation. The results indicate that to achieve the full effectiveness of algorithm animation, it is important that the animation is used in conjunction with other factors. Lawrence et al. [7] used the XTANGO and POLKA systems to teach Kruskal's minimum spanning tree algorithm. Amongst the group of students who attended laboratory sessions, performance of students who attended an interactive laboratory session was significantly better than students who attended passive laboratory sessions. Their results have shown that it is important to let students control and interact with animation and that the animation is available to them outside the classroom setting. Better control and interaction were achieved by means of letting students to create their own data sets for the algorithm rather than observing prepared data sets.

Moreover, more recent research by Kehoe et al. [6] does make some possible claims for the use of animation as a pedagogical aid. The experiment was carried out in a different manner from other experiments. The difference in this experiment was that it simulated a homework scenario. Students were given the questions prior to the start of the session. During the test, students could have access to teaching materials and there was no limit on time spent to complete the test. Results of this experiment showed the group was interacted with animation in some aspects, but not all, performed better than the other group. The report demonstrated a more effective way of using algorithm animation in teaching to achieve higher pedagogical value. It demonstrated that algorithm animation was better used in open and interactive learning situations (such as a homework exercise). As well, algorithm animation can be more useful pedagogically when it is used in coordination with other learning materials or accompanying other instructions that explain how the animation simulates an algorithm's operations. The report also demonstrated that algorithm animation could best facilitate learning of the procedural operations of algorithms. While animation does not always facilitate learning, at least, it can make an algorithm less intimidating by making that algorithm more accessible.

In [10] Stasko et al. concluded from their experiment a number of conditions under which algorithm animation might be most beneficial. One of the conditions is to accompany algorithm animation with comprehensive motivational instructions. When the algorithm animation simulates this instruction, the animation display should be augmented by textual descriptions of the ongoing operations. Another condition is that the AAS should include rewind or replay capabilities to allow users to back up and review important operations. Some form of history showing previous state should also be provided. They also suggested that students' feedback was also valuable in improving the instructional quality of the animation.

Although results drawn from these empirical studies are not always favorable, this does not indicate that algorithm animation is ineffective in teaching. Hansen et al. [5] have developed a system called HalVis and conducted several empirical experiments using it. All experimental results shown, that hypermedia algorithm visualization is significantly more effective than traditional teaching methods.

To prove the practical usefulness of an intelligent system for teaching and learning algorithms (ISTLA) developed by Zheliazkova [11] the standard algorithm for searching the maximal element in an array of numbers has been chosen. The results of the teacher's block scheme and three simulated learners ("best", "better", "average") were compared. The block scheme built by the first learner differs from the teacher's one only topologically (not logically). So the ISTLA estimated the first learner's performance with maximal coefficient of proximity Cprox=1.00. In the block scheme of the second learner an additional unimportant condition block had been inserted within a loop and the system reduced his/her Cprox. The third learner's performance was scored even lower because missing of an important condition block within a loop. The three assessments made by the system are reasonable and had been accepted both by the teacher and learners.

With the appearance of INTERNET technologies the developers have shifted to build on-line AAS, which have the advantage of platform-independence and open accessibility over earlier systems. As a result, there is ongoing research in the re-design and re-evaluation of AAS in order to transform them in task-oriented environments for design of algorithms in on-line mode [8,9,14]. The present paper, which contributes in this research focuses on the following issues of an experimental study: goal, object and methodology of the study, experimental data, test quality evaluation, and correlation analysis. Conclusion outlines the author's team conclusions, current work, and future plans.

Goal and Object of the Study

The main goal of the study is to assess the effectiveness of the intelligent computer-based tests in the area of algorithms in comparison with the traditional ways of testing such as multiple-choice tests, and exams. Both intelligent and multiple-choice tests were generated by means of an environment developed and implemented by the authors [12]. Object of the study were students-bachelor (1^{-st} year, 2^{-nd} semester), specialties Computer Systems and Technologies (CST) and Communication Technique and Technologies (CTT) at Rousse University. In the framework of the course Programming, part 2 the students learn C++ programming algorithms. The same students during the 1^{-st} semester were taught course Programming, part 1, including the topic "Algorithms" and several topics on PASCAL programming algorithms. The learning material on algorithms was presented in 2 lectures and applied in 8 practical exercises, where the students worked on computers in teams of 2-4. During the semester the students had to perform two written tests on the learned material and one course work concerning development the block scheme of an algorithm and its implementation in PASCAL. Then an integrated mark was formed on the base of the tests and course work marks. If this mark was 5 or 6, and the student was satisfied with it he/she was relieved of the exam. Otherwise the student was examined during the session with a task similar to the course work.

Methodology of the Study

Two tests covering the topic “Algorithms” were prepared in the form of WORD-documents. The first one (T1) contains 25 multiple-choice questions and brings 25 scores respectively 1 score per the right answer (Fig.1). The second one (T2) contains 27 different types of questions with 250 total scores (Fig. 2). The questions types of are four, namely: multiple choice, unordered keywords, ordered keywords, and unordered pairs [12]. Both tests were generated in accordance with the technology of using of the authoring environment described in [1]. It can be accepted that both tests have approximately one and same length. At the same time T2 has significant higher degree of covering the taught material.

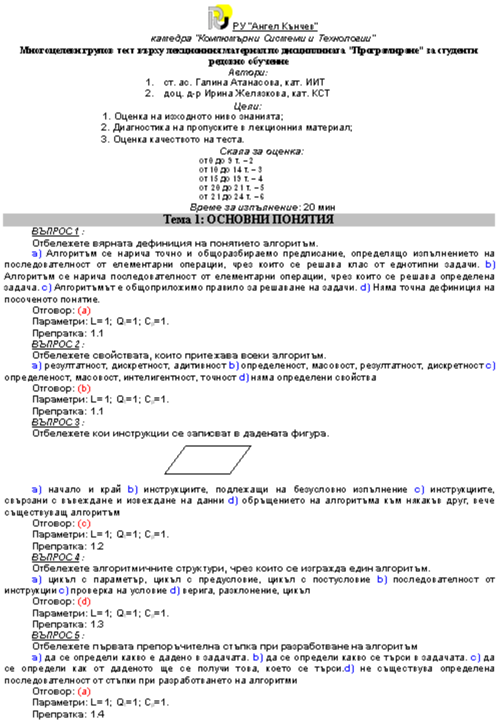

Fig.1. WORD-document of the multiple choice test

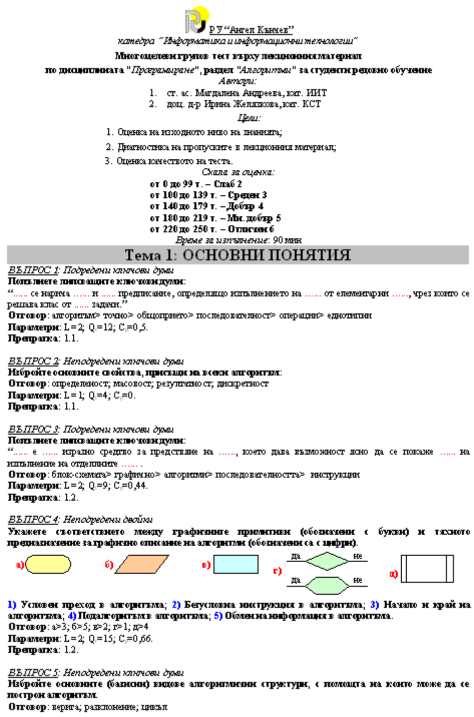

Fig.2. WORD-document of the intelligent test

The announcement about the planned experiment was made at the beginning of the second semester, to ensure students-volunteers, e.g. interested in the experiment. The generated HTML tests were uploaded on the Rousse University server in the same day of the experiment. 12 students took a part in it. At the beginning they were introduced to the study goal, the way of answering to different questions and the way of the system assessment. The students were also told that the planned time is 20 minutes for the T1, and 60 minutes for the T2. However the performance time for the tests was unlimited and was registered by the system.

The experimental data

The experimental data were brought to two tables (one for each test), containing the following information – the student’s name, the student’s ID, the number of the points for each question, the total scores, the time, the mark and the final mark on Programming, part 1 (Progr.1). The scores, time and mark are parameters automatically computed by the system. The experimental data used for the need of the test analysis are shown in table 1.

Table1. Experimental data

No	*Name*	*ID*	*Test*	*Scores*	Time	Mark	*Progr.1*
1	Nadia Genadieva Mikova	053111	T 1	21	17	5	6
			T 2	159	71	4	
2	Ivailo Angelov Nedelchev	053133	T 1	18	19	3	4
			T 2	176	81	4	

3	Vladislav Atanasov Petkov	053104	T 1	15	15	4	4
			T 2	139	46	3	
4	Nadia Yosifova Antonova	053132	T 1	18	19	4	6
			T 2	195	78	5	
5	Yanica Stoianova Stoianova	053147	T 1	17	24	4	3
			T 2	100	71	3	
6	Nedialko Dochev Nedialkov	053120	T 1	18	21	4	6
			T 2	190	62	5	
7	Ivailo Emilov Ivanov	053109	T 1	17	27	4	6
			T 2	172	77	4	
8	Neshe Nedzhi Ismail	053198	T 1	15	19	4	3
			T 2	143	60	4	
9	Nikolai Georgiev Nikolkov	053211	T 1	13	20	3	3
			T 2	84	60	2	
10	Ana Dimitrova Georgieva	053201	T 1	13	25	3	3
			T 2	81	65	2	
11	Leilia Mehmed Ahmed	053171	T 1	17	21	4	3
			T 2	125	71	3	
12	Fatme Turgai Mehmed	053181	T 1	18	24	4	5
			T 2	150	74	4	

Test quality evaluation

The student's answers in T2 are partially correct, e.g. the points received for the *i*-th question of the *j*-th student P_{ij} could be between *0* and $Pmax_i$, where $Pmax_i$ are the maximal scores for the given question. A calculated value V_{ij} was used, which represents the degree of the student's answer proximity: $V_{ij} = (Pij / P\max i).100,\%$.

According to [13] the additional processing the experimental results for T2 become universal meaning that can be used to evaluate the test quality and student's knowledge. In the first case the results are student-independent and describe the questions and test difficulty. According to the average scores of each question they were divided in five groups respectively: very difficult (VD) – from 0 to 30, difficult (D) - 30-40, moderate (AV) - 40-60, easy (E) - 60-70, very easy (VE) - over 70. For each group the average result was calculated and the corresponding graphic was drawn using EXCEL. The resulted chart together with the average approximation is shown on fig. 4. The main graphical characteristic of the question difficulty is the typical S-shape curve: 1) the width of the deviation by X-axis of a curve corresponds to the difficulty of the corresponding question, because too few correct answers are given; 2) the inclination describes the probability of guessing. The lower grade is, the more even is the curve of the distribution of answers. The average curve should be close the diagonal of the chart. It doesn't contain the whole information, that's why it's good to be combined with the number of questions in each group (fig. 4). The first graphic is not suitable for T1 because all the answers have only 2 values: true or false. So, only the second graph type could do the juxtaposition for the both tests. As it is seen from the fig.4 they have similar distribution of the question groups. T1 has no questions in the group VD and more questions in the easiest groups. T2 is more difficult and this is clear seen from fig.6, where the test results of all students are compared. It is obviously that only 3 students have close results for both tests and they are the best ones.

Shortly, the additional processing of the experimental data and their graphical interpretation confirm the expectation that both tests are valid. The main difference is that T2 is more difficult than T1. This can be explained with the availability of questions in T2 with higher level of complexity than the multiple-choice in T1.

The graphical interpretations of the dependences between the marks Progr.1 and T1 (fig.7) and Progr.1 and T2 (fig.8) are presented with dots and the linear approximation with solid line.

The smaller angle of the approximation line with respect to X-axis means lower sensitive regarding to the student's knowledge differences. From the visual comparing both figures follows the expected conclusion that the intelligent T2 is more sensitive than multiple-choice T1.

The study also allows specifying the initial time for performance of both tests defines only by the authors' experience. The actual average time for T1 and T2 was respectively 21 and 68 minutes. This means that the time for T2 could be increased to 70 minutes whereas the time for the T1 can remain 20 minutes.

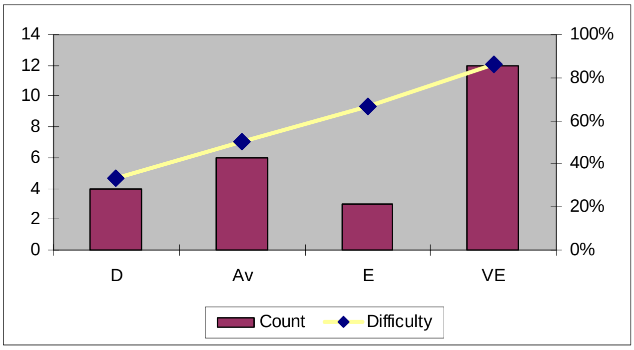

Fig.3. Task groups and their difficulty for T1.

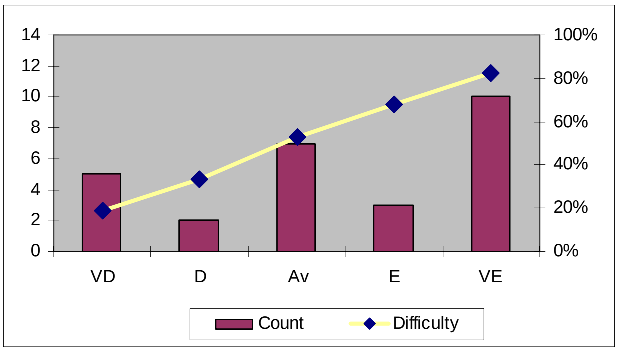

Fig.4: Task groups and their difficulty for T2.

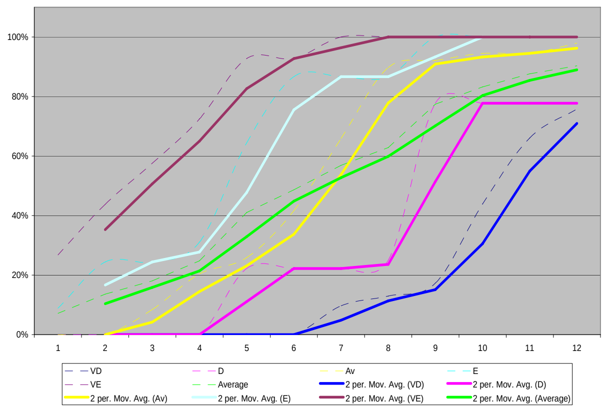

Fig.5. Tasks' difficulty for T2

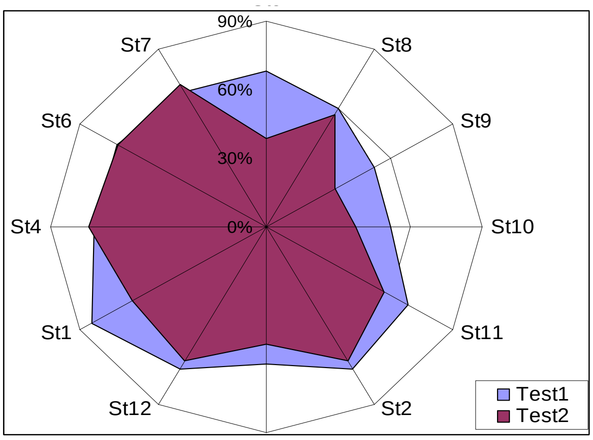

Fig.6. Student's results

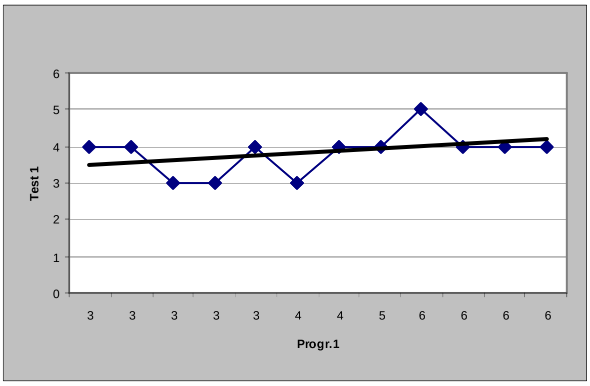

Fig.7. Dependence Prog.1 and Test1

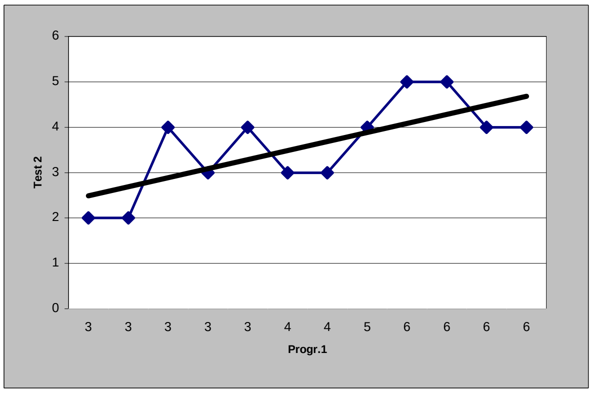

Fig.8. Dependence Prog.1/Test 2

Correlation analysis

As a quality indicator for the relationship between two test's parameters can serve the linear correlation coefficient r , a real number in the range of [-1,1]. The value of this coefficient shows how strong is the relationship between the parameters. For example, if r is in the range 0.0 ÷ 0.3 then relationship is low; 0.3 ÷ 0.5 – moderate; 0.5 ÷ 0.7 – significant; 0.7 ÷ 0.9 – high; 0.9 ÷ 1.0 – very high. If the two parameters are moving in the same way *r* = +1.0 and if in the opposite *r* = -1.0. The value 0 means that there is no relationship between parameters.

Table 2. Correlation coefficients

Relationship	*Time T1/Mark T1*	*Mark T1/Progr.1*	*Time T2/Mark T2*	*Mark T2/Progr.1*	*Mark T1/Mark T2*
Correlation coefficient	- 0.232	0.536	0.389	0.777	0.501

The relationship between the following couples of parameters are of interest for the current study: *Time T1/MarkT1, Mark T1/Progr.1, Time T2/Mark T2, Mark T2/Progr.1 and Mark T1/Mark T2*. The corresponding correlation coefficients received from the experimental data are given in table 2. It is seen that the highest correlation coefficient is for *Mark T2/Progr.1.* Its value 0.777 means that there is high relationship between these two parameters, the relationship for *Mark T1/Progr.1* and *Mark T1/Mark T2* is moderate, and the one for *Time T1/Mark T1* and *Time T2/Mark T2* is lower.

The experimental data were divided in two tables according to the mark on Programming 1. The first table contains data for the excellent students (mark 5 and 6) and the second one for the mean level student (3 and 4). That was made because the excellent students were assessed at the end of the semester (taking in mind the marks of the course works and the two tests) and were released from exam. The results from the calculation of the same correlation dependences for the two groups of students are presented in table 3.

Table 3. Correlation coefficients for the two groups

Excellent students					
Correlation dependences	*Time T1/Mark T1*	*Mark T1/Progr.1*	*Time T2/Mark T2*	*Mark T2/Progr.1*	*Mark T1/Mark T2*
Correlation coefficient	-0.647	0.250	-0.341	0.408	-0.408
Mean level students					
Correlation dependences	*Time T1/Mark T1*	*Mark T1/Progr.1*	*Time T2/Mark T2*	*Mark T2/Progr.1*	*Mark T1/Mark T2*
Correlation coefficient	-0.252	-0.091	0.294	0.418	0.382

To analyze the proximity coefficient for each student first we found the relations Scores/Max scores for each question. This coefficient for the questions in T1 is not so interested because it is 1 or 0, meaning correct or incorrect answer. Table 4 contains the calculated coefficients for T2 questions. The column "*Total*" shows the proximity of the actual student's scores to the maximal scores.

Table 4. Proximity coefficients for T2

ID	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Q16	Q17	Q18	Q19	Q20	Q21	Q22	Q23	Q24	Q25	Q26	Q27	Total
053112	1	1	0,2	0,4	1	0,5	1	0,4	1	0	1	1	1	1	1	1	0	0,7	0	0,5	0	0,4	0,3	1	0	0,9	1	0,65
053134	0	0	0,4	1	0	1	1	1	0	1	1	1	1	1	1	1	1	0,4	0	0,4	0	0,5	1	0,6	1	0,9	1	0,68
053105	0,7	1	0,8	1	1	1	0,7	0,4	0	1	1	1	1	1	0	1	1	0,7	1	0,3	0	0,6	1	1	1	0,9	0	0,74
053133	0,7	1	0,8	1	1	1	0,7	0,4	0	1	1	1	1	1	0	1	1	0,7	1	0,3	0	0,6	1	1	1	0,9	0	0,74
053148	0,5	0	0	0,6	0,3	1	0,7	1	0	0	0,4	0	1	0,4	1	1	0	0,7	1	0	0	0	0	0,6	0	0,3	0	0,39
053121	0,7	0,5	0	1	0	1	1	1	0	1	1	1	1	1	1	1	1	0,7	0	0,8	0	0,6	1	1	0	1	1	0,71
053110	0,5	0,3	0,3	0,6	0,3	0,9	1	1	0	1	1	1	1	1	1	1	1	0,9	1	0	0	0,6	1	1	1	0	1	0,72
053199	1	1	0	0,3	1	1	0,8	0,4	0	1	1	1	1	0,5	1	0,3	0	0,7	0	0,5	0	0,6	1	1	0	0,3	0	0,57
053212	0	0	0	0,4	0	1	0,8	1	0	1	1	1	0	0,3	1	0,3	0	0	0	0	0	0	0,3	1	0	0	0	0,33
053202	1	1	0	0,6	0,3	1	0,7	1	0	0	0	1	0,7	0,5	0	1	0	0	0	0	0	0	0,3	1	0	0	0	0,37
053172	0,8	1	0	1	1	1	0,8	0,4	0	1	0,4	1	0	0,5	1	0,3	0	0,4	0	0	0	0	1	1	0	0,7	1	0,53
053182	0,7	1	1	0,6	1	1	1	1	1	1	0,3	1	0,7	1	0	1	0	0,4	0	0,3	0	0,4	1	1	0	0,9	1	0,68

Approximately, the time passed from the of the written test on topic "Algorithms" (TA1) in the middle of first semester to the experiment is 5-6 months. From the cognitive psychology it is well known that each learner has knowledge forgetfulness coefficient. To evaluate it the table 5 had been composed. Its first row contains the TA1 mark for each student, the second one – T2 mark, and the last row - the proportion between these two marks.

It can be interpreted as a coefficient that shows how many percents of the knowledge the students have in the moment of T2 performance.

Table 5. Kept knowledge coefficients

ID	053111	053133	053104	053132	053147	053120	053109	053198	053211	053201	053171	053181
TA1	6	-	6	5	6	6	6	-	4	3	3.5	3
T2	4	4	3	5	3	5	4	4	2	2	3	4
T2/TA1	0.67	-	0.5	1	0.5	0.83	0.67	-	0.5	0.67	0.86	1.33

Value, greater than 1 means that the student has achieved new knowledge (ID 053181). Value, equal to 1 shows that he/she has kept learned knowledge (ID 053132). For all other students the value is less than 1, which means that the student has forgotten some learned knowledge.

Conclusions, current work and future intention

The experimental data extraction for this study is not enough representative and the intelligent authoring environment used for test generation is on the level of research prototype. Nevertheless the reported results confirms some statements of the author's team earlier studies [16,17,18] and imposes new ones valid for testing not only the algorithms but for other complex learning objects:

The difference between the expected and real results from both multiple-choice and intelligent tests is insignificant, e.g. both tests are valid. This also shows personal interest and respect of the learners to the computer-based knowledge assessment.

In comparison with the multiple-choice test the intelligent one is more effective regarding the level of the tested knowledge, degree of covering the taught material, length of the test, and sensibility of the learner' s knowledge assessment.

The relationship between the final mark given by the teacher and the intelligent test mark is very close, while the relationships between the differential marks and multi-choice test vary from moderate to low.

The research prototype of the WINDOWS-based environment for design of algorithm block schemes is in the process of implemenation. The hypothesis that will be checked by means of this environment is the evaluation of the design of block scheme by the learner is more pedagogically effective than performing an intelligent test.

Acknowledgments

The authors are thankful to all students-volunteers taken part in the experiment without which this comparative study wouldn't be carried out.

Bibliography

[1] Andreeva M. H, A Technology of Using Integrated Authoring System for Knowledge Testing, Automatics and Informatics, No1/2005, pp. 68-70 (in Bulgarian)

[2] Brown M. H., Exploring Algorithms Using Balsa II. IEEE Computer, Vol. 21, No.5, 1988, pp. 14-36.

[3] Byrne, M.D., Catrambone, R., Stasko, J. T., Do algorithm animations aid learning?, Technical Report GIT-GVU-96-18, Atlanta, GA, August 1996.

[4] Gurka J., Citrin W., Testing effectiveness of algorithm animation, Proceedings of the IEEE Symposium on Visual Languages, Boulder, CO, September 1996, pp. 182-189.

[5] Hansen S., Schrimpsher D., Narayanan H., Learning algorithms by visualization: a novel approach using animation-embedded hypermedia, *Proceedings of the International Conference of the Learning Sciences,* Atlanta, GA, December, 1998, pp. 125-130.

[6] Kohoe C., Stasko J., Taylor A., Rethinking the evaluation of algorithm animations as learning aids: an observational study, Technical Report GIT-GVU-99-10, March, 1999.

[7] Lawrence A. W., Badre A. M., Stasko J. T., Empirically evaluating the use of animations to teach algorithms, Proceedings of the IEEE Symposium on Visual Languages, St. Louis, October 1994, pp. 48-54.

[8] Marcelino, M., A. Gomes, N. Dimitrov, A. Mendes. Using a Computer-based interactive system for the development of basic algorithmic and programming skills. *International Conference on Computer Systems and Technologies (e-Learning),* Rousse, Bulgaria, 2004, 17-18 June, IV.8-1 – IV.8-6.

[9] Redondo M., C. Bravo, M. Marcelino, A. J. Mendes. Tools for Programming Learning an Approach to Provide a Social Perspective Using Collaborative Planning of Design. *IADIS International Conference e-Society 2004,* Avila, Spain, 2004, July.

[10] Stasko, J., Animating algorithms with XTANGO, SIGACT News, Vol. 23, No.2, Spring, 1992, pp.67-71.

[11] Zheliazkova I. I., An intelligent system for teaching and learning algorithms, Int. J. Computers & Education, Vol. 24, No. 2, 1995, pp. 117-125.

[12] Zheliazkova I. I., Andreeva M. H., An Intelligent Multimedia Environment for Knowledge Testing, E-learning and the Knowledge Society, Gent & Brussels, Belgium, 6-8 September 2004, pp. 3.13.1-3.13.24

[13] Zheliazkova I. I., Kolev R., Multi-parametrical Analysis of Test Results, Computer Science'2005, Halkidiki, Greece.

[14] Zheliazkova I. I., G. Atanasova. A Visual Language for Algorithm Knowledge Representation. International Conference on Computer Systems and Technologies (e-Learning), Rousse, Bulgaria, 2004, 17-18 June, IV.24-1 – IV.24-6

[15] Zheliazkova I. I., Atanasova G. Computer-aided teaching and learning algorithms (A survey), Proceedings of the International Conference "Innovation in Education for Electrical and Information Engineering", 27th-29th May, Sofia, pp. 49-58.

[16] Zeliazkova, I.I., Andreeva M., Grozdanova E., Experimental Study of the Computer-based Knowledge Testing in the Primary School, Conference of RU'2004, section "Mathematics, Informatics and Physics", pp.95-100

[17] Zeliazkova, I.I., Andreeva M., Nikolova M., Experimental Study of the Computer-based Knowledge Testing in the High School, Conference of RU'2004, section "Mathematics, Informatics and Physics", pp.89-94

[18] Zeliazkova, I.I., Andreeva M., Experimental Study of the Computer-based Knowledge Testing, 31.10-01.11.2003, Rousse, Bulgaria, Conference of RU'2002, pp.48-52

Authors' Information

Irina Zheliazkova – Associate Professor; Rousse University, str. "Studentska" 8, Russe-7017, Bulgaria; e-mail: irina@ecs.ru.acad.bg

Magdalena Andreeva – Senior Assistant; Rousse University, str. "Studentska" 8, Russe-7017, Bulgaria; e-mail: magie@ami.ru.acad.bg

Rumen Kolev – PhD Student, Rousse University, str. "Studentska" 8, Russe-7017, Bulgaria; e-mail: rkolev@ecs.ru.acad.bg

DEVELOPING COLLECTIVE TEACHING COMPUTER SOFTWARE FOR THE COURSE "DECISION THEORY"

Konstantin Berezovskiy, Olexy Voloshyn, Igor Drozdov

***Abstract**: Improvement of training students using modern information technologies, like collective developing teaching computer software, is discussed. Organizational, technical, technological advices are given. Experience of using information technologies in educational course "Decision Theory" is described..*

***Keywords:** Electronic learning, information technologies, teaching software, collective developing, Decision Theory.*

Introduction

At creation of normative documents for higher educational establishments of Ukraine in 1992-1994, after finding of independence Ukraine on initiative of one of authors, member of scientifically-methodical commission of Department of education of Ukraine on the Applied Mathematics, in the curricula of direction «Applied mathematics», «Decision Theory» course was included. Experience of the best educational establishments of the world such, as Cambridge, Oxford, Californian University (Berkeley), Massachusetts Institute of Technology etc. was taken into account. About importance of similar course testifies a fact, that for the last decade for results got