# INTERACTIVE ASSIGNMENTS IN COMPUTER SCIENCE CLASSES FOR PROMOTING COGNITION INTEREST AMONG SCHOOLCHILDREN

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## Abstract

Objectives: The paper touches upon an opportunity and efficient use of interactive computer science assignments for promoting cognitive interest among school students. Methods / Analysis: The authors dwell on the opportunity of enhancing student cognitive interest suggesting interactive assignments that are created using LearningApps in computer science classes as an example. Cognitive interest is both a means of advancing students' cognitive activity, and an efficient technique for a teacher. A teacher can make learning engaging, focus on those aspects of learning that can draw involuntary attention of students, make them mobilize cogitation, be concerned about, be anxious of, and work enthusiastically at a training exercise. The use of information and communication technologies is regarded as one of the key propriety areas for gaining in development of cognitive interest among schoolchildren. Computer science classes refer to the use and application of computer technology. However the point of cognitive interest development is also typical for this subject. Computer-based interactive assignments to be performed are supposed to involve feedback to students and a correctional capability of their own actions as long as they are completed. As an example of using interactive assignments, the authors choose the modules of the Computer Science course for 7 grade students. It suctions as the first year of learning a subject that underpin the theoretical basic knowledge. The study involved 62 students in grades seven from the gymnasium # 1 in the city of Birobidzhan, the Lyceum at Sholom-Aleichem Priamursky State University and 4 educators. Findings: The research on the developed series of interactive assignments in computer science using LearningApps proved to be efficient. In the experimental group, the number of students who are lacking in initiative and not self-supporting while completing tasks has decreased. The students lose interest when they face challenges and consequently show negative emotions such as regret, irritation, etc. Meanwhile, the share of students showing a greater degree of autonomy in accepting a task and looking for a way to accomplish it, completing it, has increased. It indicates students' interest in this activity and their wish to look for the ways to solve the task. It is also found out that the number of children who are persistent and perseverant in achieving the outcome they are pleased with, happy about and proud of progress has increased. The average rate of student cognitive interest level grew by 27% in the experimental group. It allows for the conclusion that using interactive assignments in computer science classes contribute to promoting positive changes in the level of mastering cognitive interest of students. Applications / Improvements: Further research prospects might enlarge the application field of interactive assignments in classes on other subjects and age groups of students.

**Keywords**: Computer science, cognitive interest, interactivity, interactive assignments, LearningApps.

# 1 INTRODUCTION

The researchers have investigated the issue of developing interest in learning among schoolchildren for many years. Nevertheless, it still appears to be one of the urgent and most complicated psychological and educational issues. A variety of forms and techniques is an important feature of teaching any academic subject and the foundation to develop cognitive interest. This very part makes an additional special sense at computer science lessons. After all, these are computer science lessons at which both the most innovative and available teaching aids should be applied.

One of the efficient learning aids is using tasks made up with interactive learning technologies, for instance, LearningApps resource. This resource based on Web 2.0 technology, is used to support learning and teaching through interactive modules.

The importance of developing cognitive interest among students in current educational background is obvious (Lent, Brown, Nota and Soresi, 2003). The arrangement of interactive training (Kirk, Mininger and Laird, 2016), interactive educational cooperation (Luchaninov, Bazhenov, Shtepa, Kazinets and Ledovskikh, 2016), and the use of an interactive interface (Golitsyna, Maksimov and Monankov, 2018) takes a significant part in that process. Researchers make an attempt to assess the impact of various means and methods on the efficiency of computer science teaching: peer and programming learning (Zendler and Reile, 2018), components in robotic technologies (Filippov, Ten, Shirokolobov and Fradkov, 2017), augmented reality tools and QR code integration (Bal and Bicen, 2016) and others. Furthermore, the efficient use of interactive tasks when teaching computer science based on factor analysis has been proved (Scherer and Rüdiger, 2014) and assessment in Bayesian network (Klerk, Eggen and Veldkamp, 2016).

# 2 OBJECTIVES, METHODOLOGY AND RESEARCH DESIGN

Whereas, using interactive problems as a means of developing cognitive interest in teaching computer science has been limited research in this context.

Cognitive interest as an integral feature of personality seems to be very complicated by nature. It constitutes both individual mental processes (intelligent, emotional, regulatory), as well as objective and subjective interconnection of a human with the world specified in their relationships. By way of the experience of the past, special studies and practice of current experience drawn, the authors can mention the conditions. If teachers follow them they let students' cognitive interest appear, develop and enhance.

First, this is the maximum support for the active mental activity of a learner. The main ground to develop cognitive skills and capabilities of a learner, as well as to develop true cognitive interest, are situations of solving cognitive tasks, situations of intensive exploration, guessing, thinking, reflection, situations of hard mental thinking, situations of controversial statements, oppositions of diverging opinions that a learner needs to understand on his/her own, make a decision, share a certain point of view.

Second, the development of cognitive interests and a personality in general consists of arranging education at the best level of development of a learner. The way of summarizing, looking for patterns that manage visible phenomena and processes is the way that contributes to a higher level of learning and mastering in covering a great number of scientific queries and sections. It is the condition that provides strengthening and increasing cognitive interest due to the fact that learning improves cognitive activity, methods and skills regularly and in the best way possible.

The following stages are distinguished while developing cognitive interest among learners in teaching computer science and IT:

1) Students have to work at a computer for the first time. The computer is interesting to them as something unfamiliar and that gives completely new opportunities for them. Apart from this, students feel scared. Therefore, at the first stage, it is necessary to give schoolchildren basic, entry level computer skills.

2) Students have already got elementary computer skills, so they get involved not only in performing some work, but also showing the others what they have learned. At this stage, a teacher needs to make it clear to the students that computer has got many more functions.

3) Students feel quite confident while working at the computer as they know the basics well. Therefore, it is necessary to focus on various methods of organizing training, to give students tasks of an increased level of complexity, to raise challenges to them.

4) Learning additional applications, computer functionality, and programming. Students will be able to produce complex, interesting pieces of work, be engaged in project and research assignments, show their

creativity, and put some ideas into practice due to new competences and skills acquired by students at such classes. It will also allow them to participate in various competitions, conferences, etc.

Educators do not use Web 2.0 technology enough while making efforts to teach computer science in order to increase the effectiveness of training and develop students' continuous cognitive interest. This technology implies active user activity, focused on participating in the content development of various Internet resources. An example of such a resource that puts this technology into practice is LearningApps.org. It is an entirely free service to support learning and teaching using interactive modules (LearningApps, 2019). Available modules can be included in the content of training directly, and they can also be modified or developed online. The suggested interactive modules serve as the basis for making up interactive tasks. The tasks require students' feedback as far as they complete the tasks as well as imply the ability to correct their own actions by themselves. The service is multilingual, which promotes maximum ease of use.

LearningApps contains 20 types of interactive exercises to communicate with them in a game format. First of all, the service was produced for teachers working with children. For example, assignments like Racing or Find the Pair are clearly borrowed from a child's plays.

There are two ways to work with LearningApps:

1) Apply the other authors' completed works as templates, changing the data in them. Sometimes changing the finished ones is easier than producing a new one. The difficulty may be caused by the applications not classified by type, but by topic in the gallery.

2) Do the assignment on one's own by choosing one of 20 options for game mechanics. After that, it will be proposed to get acquainted with the samples of such exercises in order to understand the logic of the assignment. Then, it is necessary to fill in the proper fields and upload images. All forms are supplied with tips.

The use of interactive tasks at computer science lesson encourages students to be active in communication with the content to be learned. The role of a teacher is changing. The teacher's activity gives way to the student activity, and his task is to direct the students' cognitive activity to study new material and master it independently during the dialogue with the information system.

## 3 DISCUSSION OF THE RESEARCH RESULTS

To verify the hypothesis on the positive impact of the system of interactive tasks introduction produced using LearningApps into education on the level of student cognitive interest; an experiment was carried out, which consisted of three main stages: ascertaining, searching and formative.

The ascertaining stage of the study was aimed at determining the initial level of cognitive interest of sixth-grade students from the Gymnasium 1 in the city of Birobidzhan and the Lyceum of Sholom-Aleichem Priamursky State University.

The students were divided into two groups. The survey was carried out in experimental and test groups. The participants of the experimental group included the students of the $6^{th}$ "B" grade from the gymnasium (19 people) and 12 students of the $6^{th}$ grade from the lyceum at the university, the control group included the students of the $6^{th}$ "A" grade (17 people) and $6^{th}$ "B" grade (14 people). Diagnostic was carried out in the second half of year (the $6^{th}$ grade). The students did not begin to study computer science at that time.

The diagnostic by N.G. Morozova 'Cognitive interest' (Morozova, 2007) was used in the survey. 4 supervising teachers of all 62 students answered the questions according to this methodology.

The level of cognitive interest in the groups of learners during the entrance diagnostic is shown in Table 1.

A low level informs that these learners are not active or independent enough while doing tasks. They can lose interest in them if they seem to be difficult and show negative emotions (upset, irritation), and do not ask clarifying questions.

The intermediate level refers to a large degree of independence in accepting the task and looking for a way to accomplish it. Having difficulty in solving the problem, students do not stop feeling emotions towards them, but ask the teacher for help, ask questions to clarify the conditions for its solution. After having received a hint, learners complete the task, which means that learners are really interested in that work and their will to look for ways to solve the problem.

**Table 1. The results of the entrance diagnostic of cognitive interest**

| Group / Level | Experimental Group | Test Group |
|---|---|---|
| Advanced | 6 | 8 |
| Intermediate | 18 | 17 |
| Low | 7 | 6 |

An advanced level determines initiative, independence, interest and a wish to solve cognitive tasks. In case of difficulty, students are not abstracted from them, being persistent and persevering in ensuring the best result that meets learners' expectations, give joy and pride in progress made.

The preconceptual study phase was aimed at investigating the content-related and operational-activity components of computer science training using interactive tasks. During the studies, the review of LearningApps resource potential, the search and development of interactive tasks in computer science, monitoring of learning and results were carried out. As an example of using interactive tasks, the topics included in the $7^{th}$ grade computer science course were chosen for the first year of studying a subject that give the basic theory and primary skills.

The formative phase was carried out during the 2018-2019 school year. During this time period, the authors continued developing an interactive task system for the computer science course and introducing them into training the experimental group on the following topics:

1) A man and information.

2) A computer: hardware and software.

3) Text information and a computer.

4) Graphic information and a computer.

5) Multimedia and computer presentations.

The introduced system of interactive tasks included those of the following types:

1) An alternative: a quiz with a single and multiple choice questions; word highlighting; word-building; a game model of TV show called *Who wants to be a millionaire?*

2) Classification: *Find a pair*, *Matching* games; Classifications; *Take a guess* Puzzle; Sorting pictures.

3) Filling in activities: a quiz with filling the answer; filling in the gaps; *Flower petal* game; the crossword game.

4) A particular order: a chronological order; arrangement in a correct order.

5) Online games: A multiplayer quiz; *Where is it placed? Measure; Racing; Challenge*.

A re-diagnostic of the cognitive interest level in the experimental and test group was carried out at the end of grade 7. The results of it are presented in Table 2.

The analysis of diagnostic point average of the cognitive interest level in each group shows that, the point average increased by 27% in the experimental group while it was only 7% in the control group.

To verify the experimental results, the authors carried out statistical processing of data by comparing two average normal/standard statistical population with unknown/ unidentified variances (dependent samples) (using Student's t-test). As a null hypothesis, the researchers suggest that the level of cognitive interest at the beginning and end of the formative experiment does not differ much. The greater change in the test item for the experimental group was proved correct for a confidence coefficient of 0.95.

Thus, the major hypothesis of the present study should be considered experimentally proved.

**Table 2. Diagnostic results of cognitive interest at the end of the formative stage**

| Group / Level | Experimental Group | | Test Group | |
|---|---|---|---|---|
| | A number of people | Change (%) | A number of people | Change (%) |
| Advanced | 14 | 133 | 10 | 25 |
| Intermediate | 13 | -28 | 16 | -6 |
| Low | 4 | -43 | 5 | -17 |

## 4 CONCLUSION

The advantages of interactive didactic materials compared to standard ones are obvious. They are availability, creativity, the ability to use different types of files (audio, video, graphic, etc.) as well as different types of assignments. All this contributes to the development of interest, cognitive activity, in addition, ICT competence of students.

The teacher's use of digital educational resources meets the education aims perfectly. Each kind and type of the resources used has its own function and necessity for learning. The interactive service such as LearningApps helps to arrange the team work of students, organize specific patterns for covering the courses, and make up their own collection of learning material. It makes it possible to diversify the educational materials applied, arrange students' learning activities according to their individual characteristics. Consequently, it results in increasing cognitive interest and making the education more effective considerably.

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