Training system for designing computer games for early career guidance of schoolchildren (Junior Skills)

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Abstract. The article deals with the development of a training system for the design of computer games based on the use of information technologies for early vocational training and vocational guidance of schoolchildren (Junior Skills). The peculiarity of vocational guidance work with schoolchildren is primarily associated with the need to overcome the contradictions between the state of the labor market, the needs of the economy and the subjective professional preferences of young people. The solution to youth career guidance issues is offered in the Junior Skills project, which includes students, employer representatives, and the expert community.

1. Introduction
The vocational guidance of schoolchildren is, in fact, not only and not so much a pedagogical problem. To solve this problem, the work of teachers alone is not enough, the problem is public. The essence of vocational guidance work with schoolchildren is associated with the need to overcome the contradictions between the state of the labor market, the needs of the economy and the subjective professional preferences of young people. The solution to youth career guidance issues is offered in the Junior Skills project, which includes students, employer representatives, and the expert community. Employers present the requirements for the competencies of demanded specialists, the expert community and teachers guide young people to acquire the necessary skills through the creation of certain projects [1-4].

2. Main headings
The specificity of the modern labor market implies the need for a large number of specialists in the field of computer technology, the training of which can be carried out starting from school age within the framework of vocational guidance programs. The importance of career guidance competitions, including the Junior Skills competition, and their impact on the effectiveness of training are of great importance.

Thus, carrying out professional training of students in order to form appropriate competencies, it is necessary to solve the following contradiction, on the one hand, tasks that develop vocational guidance training for schoolchildren should correspond to the characteristics of school age and arouse the interest of students, on the other hand, there is no methodology for teaching the design of computer games based on the use of information technology, for early vocational training and vocational guidance of schoolchildren (Junior Skills). At the same time, it is necessary to bring the content of the tasks to be solved as close as possible to actual practical results, minimizing theoretical material that is difficult for schoolchildren to perceive. The purpose of this work is to develop a training system for the design of
computer games, based on the use of information technology, for early vocational training and career guidance of schoolchildren.

The problem of the research is to determine the need to improve the system of teaching the design of computer games based on the use of information technologies, using it for early vocational training and vocational guidance of schoolchildren (Junior Skills).

Object of research: the system of career guidance in an educational organization. Subject of research: the system of teaching the design and development of computer games, as a factor in the early career guidance of schoolchildren in the Junior Skills competition.

The hypothesis of the research is that if early vocational training and vocational guidance of schoolchildren are carried out on the basis of a specially developed system of teaching the design and creation of computer games based on the use of information technologies, including the competitive component of the Junior Skill competition at the stage of control and diagnostics, then this will allow:

- Increase students’ interest in computer professions.
- Encourages the development of computer games.
- Stimulates the interest of students in the study of related computer disciplines.

Research objectives: analysis of the features of the organization of early vocational training and vocational guidance of schoolchildren.

3. Model of the training system for high school students in designing computer games based on the requirements of Junior Skills

The development of computer technology in recent years has created a need for specialists in a number of specialized professions, which can be directly related to both computer technologies and related to them. Practice shows that the specifics of work in the IT industry presupposes the need for constant retraining, since the change of technologies and platforms is ongoing and the knowledge gained 5-7 years ago may not be relevant in modern realities. Thus, the IT profession market is constantly in need of personnel. At the same time, the level of remuneration for positions in the field of information technology looks preferable to professions of a different profile. The most demanded professions in the IT field are: Web project developers; computer game developers; system programmers; system administrators; specialists in the design of local networks; information security specialists.

Designing computer games by schoolchildren can be an important career guidance factor that will determine the choice of a profession in demand in the future.

The stages of designing computer games based on the Junior Skills requirements are shown in figure 1.

![Figure 1. Stages of designing computer games based on Junior Skills requirements.](image-url)
The model of the methodological system of teaching programming based on the creation of computer games by schoolchildren is shown in figure 2.

![Figure 2. Model of a methodological system of teaching programming based on the creation of computer games by schoolchildren.](image)

**Figure 2.** Model of a methodological system of teaching programming based on the creation of computer games by schoolchildren.

### 4. Procedure for the implementation and results of a multifactor study

The name of the project is “Training in the development of computer games taking into account the requirements of Junior Skills”. The results were obtained during the master's study in the direction of training "Information and telecommunication technologies in education" [5, 6].

To diagnose the initial level of formation of IT competence in students and analyze the dynamics of its change during the experiment, as well as for further assessment, the current state of affairs, diagnostic techniques were used (table 1).

| Criteria                      | Diagnostic techniques                                      |
|-------------------------------|------------------------------------------------------------|
| Cognitive                     | SHTUR (school test of mental development).                 |
|                               | Current and final control.                                 |
|                               | Achievement test for assessing knowledge. Interview.       |
| Operational and activity      | Observation map, expert assessment, introspection, self-diagnosis. |
|                               | Solving situational tasks.                                 |
| Personal                      | Peer review methods.                                       |
|                               | R. Cattell's method of multifactorial personality research. |
|                               | Yovayshi test (career guidance).                           |
| Axiological                   | Peer review methods.                                       |
|                               | Methodology "Value guidelines" M. Rokich.                  |
|                               | Questionnaires "Choice of profession", "Questionnaire of professional inclinations" (G.V. Resapkina). |

Table 1. The system of IT competence criteria and diagnostic methods for assessing the level of its formation.
Analyzing several lessons, we can draw the following conclusions: the general picture in vocational guidance lessons contributes to an active cognitive interest in creating computer games, most of the students try to learn, learn new things, but there are also those who do not show activity either in obtaining theoretical ones, let alone, in practice.

To obtain a more complete picture of the interest, inclinations, students in IT professions during the survey, the question was asked "What is more interesting to you?" with multiple answers: web project development; development of computer games; system Programming; system administration; design of local networks; Information Security; I like everything equally; nothing interesting.

Based on the survey results, we received the following results, presented in table 2, where CM - system programming, RWP - development of Web projects, CS - information security, PLC - design of local networks, RCL - development of computer games, EG - experimental group, CG - control group.

Table 2. Results of the survey on the interest and inclination of students to IT professions.

| Group | CM | RWP | CS | PLC | RCL | all | nothing |
|-------|----|-----|----|-----|-----|-----|---------|
| EG    | 2  | 3   | 1  | 1   | 3   | 3   | 5       |
| CG    | 2  | 3   | 1  | 2   | 6   | 3   | 1       |

The next stage was testing in the direction of "IT competencies" to determine the existing level of formation of students' abilities. The purpose of the test: to identify the degree of theoretical, practical knowledge gained in the process of vocational guidance. The test results were correlated with the characteristics of the formation of IT competence according to the system of criteria, indicators and signs of its development, and the levels of training of students were identified according to the methodology adopted by us of four levels of formation of technological competence: insufficient, initial, sufficient, successful (table 3). Indicators of initial testing of the formation of IT competencies in students are presented in table 4, where EG - experimental group; CG - control group.

Table 3. Characteristics of the levels of formation of technological competence.

| Formation level | Student characteristics |
|-----------------|-------------------------|
| Successful      | Able, without the help of a teacher, to determine essential and insignificant signs, concepts and phenomena, independently establish patterns, apply them in various situations |
| Sufficient      | Able to highlight both essential and non-essential signs, knowledge and skills applies in new situations, but as a rule, after clarification with several examples |
| Elementary      | He is able to identify the essential signs of concepts, their relationships and interconnections only with the help of a teacher, applies the knowledge gained only after solving training exercises |
| Inadequate      | Difficulty demonstrating skills even with the help of a teacher. Exercise equipment required |

Table 4. Indicators of initial testing of the formation of IT competencies.

| Group | Levels | Successful | Sufficient | Initial | Insufficient |
|-------|--------|------------|------------|---------|--------------|
| EG    |        | 9          | 18         | 46      | 27           |
| CG    |        | 18         | 36.6       | 36.6    | 9            |

According to the test results, we revealed that the level of formation of IT competencies in the EG is lower than in the CG. The results obtained at the stage of the ascertaining experiment are clearly presented in the form of a diagram in figure 3.
Figure 3. Results of the level of formation of IT competencies at the stage of the ascertaining experiment.

At the end of the experiment, control testing was carried out. As a result of processing, analysis and generalization, we received the following indicators of the levels of formation of IT competence (table 5). The results of the control stage of the experiment (in %) are shown in figure 4.

Table 5. Indicators of the final testing of the formation of IT competencies.

| Group | Levels   |
|-------|----------|
|       | Successful | Sufficient | Initial | Insufficient |
| EG    | 18        | 36.5       | 45.5    | 0            |
| CG    | 18        | 45         | 28      | 9            |

Figure 4. Results of the final testing of the level of formation of IT competencies.

5. Conclusion
Career guidance issues in the modern economy should take into account the needs of the region for specialists in certain professions [7,8]. The Junior Skills project was developed for the interaction of employers and schoolchildren in the framework of the choice of a profession to guarantee their subsequent employment and obtain the necessary professional skills.

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