Gamification techniques for introducing Russian and Arab schoolchildren to aquatic life

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Abstract. The article analyzes gamification techniques that can be used to overcome the deficits in the education of schoolchildren (primary school) in relation to aquaculture. It is shown that the modern content of teaching on the subject “World around” for elementary school does not allow to form ideas about aquatic organisms and their cultivation on farms. To fill the deficits, it is proposed to use the potential of computer games. Computer games developed in Arab countries and the Russian game “Aqua Farm” are analyzed. It is concluded that gamification increases knowledge about aquaculture.

1 Introduction

Familiarization with the outside world is an essential component of the formation of a holistic picture of the world among elementary school students. Thanks to information and impressions received in real life and on the basis of information included in the content of school subjects, children have patterns of personal perception of the social world. Value judgments are formed regarding the surrounding reality, the attitude to the world of nature and culture, in general [1]. At present, the importance of forming the ideological foundations of behavior through a complex of knowledge of the natural sciences and social and humanitarian cycles is determined by the fact that the new Federal educational program of primary education at the level of compulsory federal work programs includes the academic discipline “The World Around” along with the “Russian language” and “Literary reading”. The academic discipline “The World Around” is studied for 4 years, it is implemented in the unity of classroom and extracurricular activities. The content of this discipline includes a block “Man and Nature”, which is

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2 Materials and methods

The hypothesis: The hypothesis of the study was the assumption that the problems of aquaculture are important, but not yet fully didactically worked out thematic blocks that do not arouse strong interest among Russian primary school students.

The purposes of the study: to determine the possibilities of using gamification techniques in order to familiarize younger students with aquaculture objects.

The research methodology: general logical methods—analysis, synthesis, generalization, interpretation, as well as theoretical methods—comparative analysis, content analysis. As an empirical method, an oral survey was used, followed by recording and analyzing the answers. The specifics of using the content analysis method will be described in the relevant section of the article.

The source base of the study were the texts of a set of textbooks on the subject “World around” for primary school, included in the federal list of textbooks; didactic materials of various types and types used to implement the thematic block “Man and Nature” in the context of the formation of a knowledge system about hydrobionts.

To solve each of the tasks set, its own methodological approach was determined, which will be described in detail in the corresponding section (thematic block of the study).

3 Results and discussion

At the first stage of the study, the task was to determine whether the content of textbooks on the subject “World around” will contain materials on aquaculture as a practice of growing aquatic organisms in controlled environmental conditions, on their artificial and commercial reproduction.

Content analysis was the method of studying textbook texts. The semantic category of the content—analytical study was the concept of “aquaculture.” It included hydrobionts as biological objects, various aspects of managing processes and systems with biological objects, as well as technical objects (infrastructure) that ensure the reproduction of aquatic organisms.

The units of account in the content analysis were images of processes and phenomena (or their parts, fragments) belonging to the category “aquaculture.” The data were calculated separately for each academic year and entered into the coding tables of the ECXEL program for their subsequent visualization. The results are shown in Figure 1.
As shown in Figure 1, the distribution of educational material on the issues under consideration is very uneven.

In the first class textbook, a definition of fish is given — “Fish are aquatic animals, the body of which is covered with scales. Fins help them move. With the help of gills, fish breathe oxygen dissolved in water” [5, p. 87]. In the second class, information is given about aquarium fish and their maintenance. The fourth class expands the understanding of the breeds of aquatic inhabitants — fish, mollusks, arthropods. A minimum of information is contained in the textbook for the third class, which gives an illustration of a pond farm in the “Livestock” section (along with an apiary, a pasture poultry farm, and a livestock farm).

An analysis of the textual material accompanying the illustration “Pond Farming” showed that only one phrase is devoted to it, stating that “Domestic fish — carp — are bred in ponds” [5, p. 57]. There were doubts that this information is sufficient for studying the educational topic.

To clarify this issue, we conducted a diagnostic survey among schoolchildren who completed their education in primary school. The survey participants were students of a summer school camp who took part in the quiz “What is it?”. Number of respondents — 22.

To compose the questions, we used, among other things, 5 drawings from the textbook illustrating the topic “Livestock”. One of the cards was placed a drawing of a pond farm from a textbook (Figure 2).
The results of the survey, conducted in the form of a quiz, show that 100% of children correctly identified the apiary and livestock farm, 80%—the poultry farm. The results of recognizing a water body in the form of a pond farm: 14 schoolchildren used the terms "fishing", 12—"river", 14—"lake". Thus, we concluded that this material has not been mastered even at the level of recognition of the name by the term "pond farming", "fish farming", "fish farming".

At the second stage of the study, the idea was experimentally implemented that it is possible to increase the level of students' interest in aquaculture, in general, as well as in its objects and products, if the didactic potential of a computer game is actively used [6]. An analysis of modern foreign practice of implementing gaming technologies in the educational process has shown that in European countries [7] and in the countries of the Arab East, didactic material in printed form has been accumulated [8], and thematic computer games have been developed and actively used [9, 10, 11]. They, as it seems at first, do not represent the most popular branch of animal husbandry [12, 13]. However, data from the Food and Agriculture Organization of the United Nations suggests that innovative aquaculture helps sustainability meet growing demands in the Arabic lands deserts.
Fig. 3. Game design of Arabic computer games dedicated to aquatic life.

Fig. 4. Thematic computer games support motivation and provide feedback to the playing student to adjust the learning process with a gradual immersion in the topic without losing the user's attention. The transition to a higher level is accompanied by the receipt of bonuses in the form of points. In general, these games are based on the idea of developing the skills of recognition, identification, systematization, and naming of aquatic inhabitants. Many of these tasks have already been solved in the Russian educational program. According to the current federal educational standards of primary general education, it is important to focus on the process of keeping and producing hydrobionts. Therefore, to fill in the earlier deficits found in schoolchildren, we chose the Russian computer game - Akva Ferma simulator (https://akvaferma.ru). It was developed by oceanographer V. Krasnoborodko. The mission of the didactic game: "Make learning fish farming simple and fun." The game is made in the genre of economic strategy (Figure 4).
The concept of the game is designed in such a way that in a virtual format it allows you to get the experience of raising fish. The player will get acquainted with the choice of the type of fish that makes sense to grow due to their natural manufacturability and stable market demand (sturgeon and trout). He also gets acquainted with the conditions for a successful business - aeration, the calculation of feed rations, stocking density of fish in the pool, factors that affect the appearance of stress in fish. The technological side of the computer game “Aqua Farm” provides for elements of competition. This happens thanks to the scoring system, when the correct action is taken, the winner will be the one of the players who first reaches the goal of the game - to build a farm for breeding caviar. Achieving the goal is associated with the transition to new levels of knowledge and activities based on them. One of the methods for developing motivation for both the game and the study of the process of breeding hydrobionts is the prize system (Figure 5).

Fig. 5. Reward system in the “Akva Ferma” computer game.

There is a rational reward system in the game: passing pennants (“Leader in fish growth”, “Leader in fish sales”, “Leader in fish purchase”) are awarded, similar to foreign badges and others. Players earn coins by selling fish (“points”). They receive gifts from each other, which corresponds to the positions of “communication” and “cooperation”. These techniques are related to the elements of gamification due to hidden content, the development of which is stimulated by the “virtual economy”. The participants of the game were schoolchildren who completed the development of the main educational program of primary education. The inclusion in the computer game took place during the holidays during a stay at a summer school camp. For the game, both school computers and tablets and laptops belonging to schoolchildren were used. Of the 22 schoolchildren who participated in the quiz, 18 junior schoolchildren took part in the game. 4 students did not master the rules of the game and stopped participating in it.
Of those who completed the game, each was declared the winner in one of the nominations. At the same time, it was found that teachers are not fully prepared to manage computer games when they are used for educational purposes [16].

The repeated participation of schoolchildren in the survey at the level of determining the type of occupation presented in the illustration from the textbook showed that 10 players easily named the type of animal husbandry, the place of action and the type of activity of the worker.

4 Conclusion

The study of the subject area “Social science and natural science” is an important stage in the formation of the foundations of the worldview of a younger student.

The academic subject “World around” should provide initial ideas about natural and social objects as components of a holistic world, economic activities of the population. The thematic block related to animal husbandry as a branch of agriculture in terms of aquaculture is currently not sufficiently developed in the content of education in primary school.

Additional types of cognitive and gaming activities and, in particular, the introduction of thematic computer games into the educational process can make up for the lack of knowledge of younger students. The study showed that computer games have been developed in the countries of the Arab East. The analyzed games have a pronounced didactic nature, teaching the recognition and naming of aquatic inhabitants, but not focusing on their preservation and reproduction.

The Russian game “Akva Ferma” is based on the contextual introduction of educational material as part of the implementation of an economic strategy. It has shown its effectiveness, as evidenced by new knowledge in the field of fish farming technology and the life of aquatic organisms. In addition to the introduction of gamification elements into the educational process, which increase the interest of students in the problems of aquaculture, it is necessary to make certain changes to the system of didactic support for this thematic block.

It is desirable to post new photo illustrations that give an idea of the modern process of breeding and growing aquatic organisms using appropriate innovative equipment. The topic of fish farming should be complemented by controlled cultivation (“farming”) of crustaceans, mollusks, algae and other organisms such as aquatic plants. Explanations for illustrations should not be limited to one phrase. It is necessary to prepare teachers for the management of schoolchildren’s computer games. This will attract interest both to the problems of aquaculture, will contribute to the formation of the foundations of environmental consciousness and economic literacy of schoolchildren.

References

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