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THE USE OF DIDACTIC GAMES IN BIOLOGY LESSONS

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Summary

The article highlights one of the topical topics – the use of didactic games in biology lessons. This study was conducted at the "Bilim-Innovation Boarding School for gifted girls of Pavlodar region" in the 2021-2022 academic year. The experiment involved 22 students of the 7th "A" class, 24 students of the 7th "B" class, a total of 46 schoolchildren. Quality of knowledge of two classes (experimental and control) in dynamics was compared. At the beginning of the school year, taking into account the data of the zero slice, the 7 "A" class was taken as a control, and 7 "B" as an experimental class, in which biology lessons were conducted using various didactic games. The positive effect of systematically incorporating games into the learning process of 7th grade "B" students has been confirmed. After using didactic games frequently in class, the initially inferior experimental class managed to increase students' learning quality by 38% and achieved 1% higher results than the control class at the end of the school year.

Key words: *Didactic games, modern teaching methods, cognitive interest, biology lesson, pupils.*

Introduction. As a result of this, the choice of teaching methods in the modern didactic system depends on: the goal and objectives for education, as well as the complexity or novelty of materials that are used at school. The teacher himself is capable of determining its own personal capabilities to help students learn more effectively [1].

In present-day Kazakhstan, a novel education system is being articulated with an emphasis on conforming to the world's educational milieu. The aforementioned procedure is accompanied by noteworthy alterations in both pedagogical theory and practice. In order to effectuate qualitative transformations in any domain, particularly in the realm of education, it is imperative to cultivate a novel perspective among educators regarding their locus and function in the instructional mechanism. The successful implementation of updated content and teaching technology, incorporating novel forms of assessment that are aligned with the competency-based approach to teaching, is a daunting task that may prove difficult to execute without the teachers' comprehension of the new objectives and goals. Hence, it is imperative for the instructor to be prepared to embrace the methodology and content of the upgraded state secondary general education. This entails modifying the educational process's software and methodological support while also adjusting the objectives and techniques of pedagogical endeavors [2].

The evolution and alteration in the pedagogical landscape of modern education, encompassing the transition from the conventional educational model to a novel framework and the adoption of novel methodological approaches in curriculum development, necessitate an enhancement in the didactic and methodological resources for instruction [3].

The recently established state standards of the Republic of Kazakhstan accentuate

the premise that a student should not be relegated to a mere "tape recorder" for the purpose of recording transmissions, but rather be encouraged to partake in the creation of projects, assume a managerial role in their activities, collaborate with peers, and solicit the guidance of a teacher-counselor as required. It is imperative for contemporary educators to endeavor towards the reorganization of their teaching methodologies. Specifically, there is a need to depart from pedagogical methods that hinge solely on oral transmission of information from instructors to learners. Rather, the primary focus should be on the cultivation of learners' ability to independently seek, comprehend, and effectively apply knowledge in practical settings. The role of the teacher has undergone a significant shift. Historically, the teacher was primarily responsible for relaying information and monitoring student behavior. However, the contemporary educational landscape demands a more supportive and dynamic approach from educators. In this regard, modern teachers are expected to actively engage with their pupils, providing guidance and mentorship, while fostering their personal development as individuals. This signifies a radical departure from the traditional instructional model, requiring teachers to serve as a constant source of motivation and instrumental support in facilitating students' educational journeys [2,4].

The resolution of this dilemma is significantly aided through the integration of dynamic teaching strategies in the realm of education. Paramount among these approaches are educational games, which afford pupils the chance to construct understanding via robust self-directed cognitive endeavors while simultaneously fostering the enhancement of their individual creative proficiencies [5].

The game emerges as a persistent companion that endures the lifespan of an individual and even the span of human existence as a whole. As such, it is imperative to utilize the potential inherent in games as an effective tool for facilitating education. According to psychologists, engaging in game activities has the potential to serve as a mechanism for self-restoration, self-enhancement, and a catalyst for positive affective states. Alternatively, game-based learning is a promising avenue for pedagogy due to its objectively vast potential. Such an approach amplifies cognitive tension, stimulates a myriad of mental faculties, enhances scholarly curiosity, cultivates memory retention, and much more [6].

The objective of this investigation is to ascertain the practicability of incorporating didactic games as an instructional tool in the context of seventh-grade biology education.

Material and methods. This study was conducted at the "Bilim-Innovation Boarding School for gifted girls of Pavlodar region" in the 2021-2022 academic year. The experiment was conducted in 7"A" and 7 "B" classes throughout the school year. 46 schoolchildren participated in the experiment, including 22 students of the 7th "A" class, 24 students of the 7th "B" class.

At the onset of the academic session, an assessment was conducted to evaluate the baseline competence level of the pupils. This was carried out through a zero slice method. The objective of the present study was to evaluate the extent of comprehension among 7th-grade students of the subject matter encompassing the natural science curriculum taught in the 6th grade as prescribed by the fundamental school program. Furthermore, the study aimed to identify the specific components of the course material that pose significant challenges for the learners. At the onset of the academic year in September 2021, the 7th grade class labeled as "A" was utilized as the control group while the 7th grade class labeled as "B" was allocated as the experimental group. The experimental

class engaged in didactic gaming to supplement their lessons, while the control group did not receive this intervention. This allocation decision was made with an awareness of the data revealed in the zero slice assessment.

The students were presented with an examination document comprising two alternative sets, with each set containing 10 items and encompassing three sections. In consideration of the zero slice, the ensuing duties were tendered as delineated in Figure 1. These obligations encompassed two distinct parts, whereby Part I (A) consisted of five tasks whereby participants were presented with multiple answer alternatives, and were required to select one choice out of the four provided. All tasks at the foundational level of complexity. Section II (B) comprised three tasks that presented a moderate level of difficulty, with the aim of determining compliance through said tasks. Part III (C) comprised two tasks of escalated intricacy: Task 1 entailed constructing a food chain using the suggested living organisms, while Task 2 consisted of designing an ecological pyramid. The undertaking of a heightened degree of intricacy necessitated that students engage in logical and analytical reasoning.

Towards the culmination of the academic year, the terminal segment of knowledge was assessed, mirroring the initial segment in its presentation of multi-tiered assignments (refer to Figure 2). The first component, denoted as Part I (A), comprised of a total of five tasks, each requiring the selection of a single answer from a pool of four potential options. All tasks at the rudimentary level of complexity. Part II (B) comprised two duties, namely the completion of a table and a task with multiple correct responses. The third section, specifically subcategory C, comprised two inquiries that necessitated a comprehensive response. The aforementioned tasks exhibit a heightened level of complexity.

The calendar and thematic plan and lesson plans were prepared in accordance with the Order of the Minister of Education and Science of the Republic of Kazakhstan dated October 30, 2018 No. 595. "On approval of Standard rules for the activities of educational organizations of appropriate types and types" and the instructional and methodological letter "On the features of the educational process in secondary education organizations of the Republic of Kazakhstan in the 2021-2022 academic year" [7,8].

A lesson plan has been created encompassing topics concerning the systematics of living organisms. These include the general characteristics of the five kingdoms of living organisms namely prokaryotes, protists, fungi, plants, and animals. Furthermore, the lesson plan invovles the main systematic groups of plants and animals, such as their respective kingdoms, types, and classes. The significance of plant and animal classification is also addressed in the lesson plan. In accordance with the aforementioned themes, the instructional sessions incorporated the utilization of various games, including but not limited to: "Solve the Charade," "Botanical Relay Race," "Guess a Living Being," and "Take Ten Steps and Name a Plant from the Families for Each Step" (Figure 3).

In order to examine the impact of didactic games on biology students' performance at the intermediate levels of experimentation, an assessment comprising of 3-4 tasks was administered. The test papers were administered with identical tasks for all participants. The evaluation of students' academic performance was conducted in alignment with the principles and standards of ZUN-based (comprehensive assessment of knowledge, skills, and abilities) assessment in the field of biology. In this framework, a score of "excellent" was

Zero cut in biology
7 class

A.

1. Cytology is the science of...
a) cell
b) tissues
c) organs
c) processes

2. Photosynthesis is carried out in …
a) roots
and) leaves
c) flowers
c) fruits

3. The sieve tubes in plants move ...
a) water and mineral salts
b) organic substances
c) inorganic substances
d) all answers are correct

4. Dense formation that restricts the cell determines its shape
a) cytoplasm
b) pores
c) membrane
d) plastids

5. Qualitative changes in the body that contribute to its complication are called
a) development
b) growth
c) irritability
d) heredity

B.

1. Establish the correct correspondence between organisms and their characteristics

1) Organisms capable of creating organic substances from inorganic	a) parasites
2) Organisms that feed on ready-made organic substances	b) saprotrophs
3) Organisms that feed on decomposing organic substances	c) autotrophs
4) Organisms that feed at the expense of other living organisms	d) heterotrophs

2. Correlate the cell organoids with their characteristics

1) 1) A cavity filled with cell juice	a) Leucoplasts
2) 2) Colorless plastids	b) Vacuole
3) 3) Colorless thick substance filling the cell	c) Membrane
4) 4) Restricts the cage from the outside	d) Cytoplasm

3. Correlate the respiratory organs from the 2nd column with the representatives of the animal world from the 1st column

1) Hydra	a) Gills
2) Fish	b) Lungs
3) Reptiles	c) Trachea
4) Beetle	d) Body surface

C.

1. What amount of plankton (in kg) is necessary for a pike weighing 7 kg to grow in the reservoir? (food chain: plankton---roach ---pike). Write down your decision.
2. Make an ecological pyramid using organisms: owl, acorns, mice

Figure 1. Example of tasks of the zero section of the subject content of the natural science course for the 6th grade

The final section in biology
8th grade

A.

1. Specify the producer in the food chain: cabbage – caterpillar – tit – hawk
a) Cabbage
b) Caterpillar
c) Tit
d) Hawk

2. What abiotic factor can lead to a sharp reduction in the population of river carp?
a) Drying of the reservoir
b) Heavy rains in summer
c) Lack of light
d) Increase in the number of aquatic plants

3. Choose an organoid that is not inherent in an animal cell
a) Mitochondria
b) Ribosomes
c) Vacuole
d) Core

4. Taxonomy is a science that studies
a) the historical development of organisms
b) adaptation of organisms to the environment
c) diversity and classification of organisms
d) relationship of organisms and the environment

5. During photosynthesis:
a) carbohydrates are formed
b) O2 is absorbed
c) water is released
d) CO2 is released

B.

1. Analyze the table. Fill in the empty cells of the table using the terms and concepts given in the list. For each cell marked with letters, select the appropriate term from the suggested list.

Structure	Location in the woody stem	Function
Sieve tubes	(B)	Carrying out organic substances
Cambium	Between bark and wood	(C)
(A)	Wood	Ascending current of water and mineral substances

1) the growth of the stem in thickness
2) downward current of organic substances
3) isolation of metabolic products
4) lube
5) bark
6) educational fabric
7) vessels
8) core

2. What signs are non-hereditary? Choose a few correct answers.
a) Athletic build
b) Body weight
c) Hair color
d) Susceptibility to diseases

3. Fill in the table

Type	Haploid set of chromosomes	Diploid set of chromosomes
of tomato	(A)	24
man	(B)	46
cat	19	(B)

C.

1. Explain phototropism by example.

2. Write down what earthworms breathe

Figure 2. Example of tasks for the final section in biology for the 7th grade

Short-term plan

Lesson topic : Taxonomy of living organisms

Chapter:	Classification of living organisms	
Full name of the teacher	Zholdasbekova M.S.	
Date:	22.09.2021	
Class: 7 «B»	Number of people present:24	Number of missing: 0
Lesson topic	Taxonomy of living organisms	
Purpose of training according to the curriculum	7.1.1.1 - explain the meaning of taxonomy, 7.1.1.2 - determine the systematic position of living organisms	
Purpose of the lesson:	All students know the concept of systematics based on the five kingdoms; Most students determine the systematic position of living organisms Some students compare and identify the features of the main systematic groups of plants and animals	

	The "Think –Unite-Share" strategy Using the textbook and other sources of information determine: 1) distinctive features of the classification of plant and animal organisms; (complete the diagram (A4 format). Mutual evaluation in the group "+" and "-" 2 min 2) systematize the types of living organisms and enter the data in the table. Checking by the "Carousel" method 2min			
End of the lesson 10 min	**Pinning.** The teacher makes a wish for an animal. Student: Consists of many cells? Teacher: No. Student: Reproduces sexually? Teacher: No. Student: has organoids of movement? Teacher: it is impossible to answer unequivocally. Student: does he move with the help of pseudopods? Teacher: yes. Student: It's an amoeba.	Students must guess the animal using 10 questions. The answer may be "yes", "no", "it is impossible to answer unequivocally"	3 points	presentation

Figure 3. A fragment of the lesson plan on the topic "Classification of living organisms" using a didactic game for 7th grade

assigned to students who demonstrated 90-100% proficiency in the assigned tasks, a score of "good" was bestowed upon those who performed at a level of 71-89%. For students who completed 50-70% tasks correctly, their work was appraised as "satisfactory," whereas those who performed below 50% were rated as "unsatisfactory". Test work No. 1 on the topic "Cell biology", No. 2 on the topic: "Breath", No. 3 on the topic: "Coordination and regulation", No. 4 on the topic: "Reproduction. Growth and Development". After summarizing each section, we calculated the quality of students' knowledge based on the results of the test work.

Results. According to the results of the study, the quality of knowledge at the end of the zero cut in schoolchildren of the 7th "A" class was 59%, and in schoolchildren of the 7th "B" class 54%. Since in grade 7 "B" the indicators of the zero cut were slightly less, this class was taken as an experimental class, during the subsequent academic year didactic games were used in the lessons, as well as when studying new material, and when fixing, as well as when interviewing material.

The quality of knowledge based on the results of intermediate data in each quarter was 73% and 71% in the control and experimental classes in the 1st quarter; 81% and 79% in the 2nd quarter; 86% and 83% in the 3rd quarter; 91% and 92% in the fourth quarter. At the end of the year, we conducted a cross-section of knowledge for the year on the main topics of the curriculum for the 7th grade. According to the test results, it turned out that the quality of training was 91 and 92%, respectively (Figure 4).

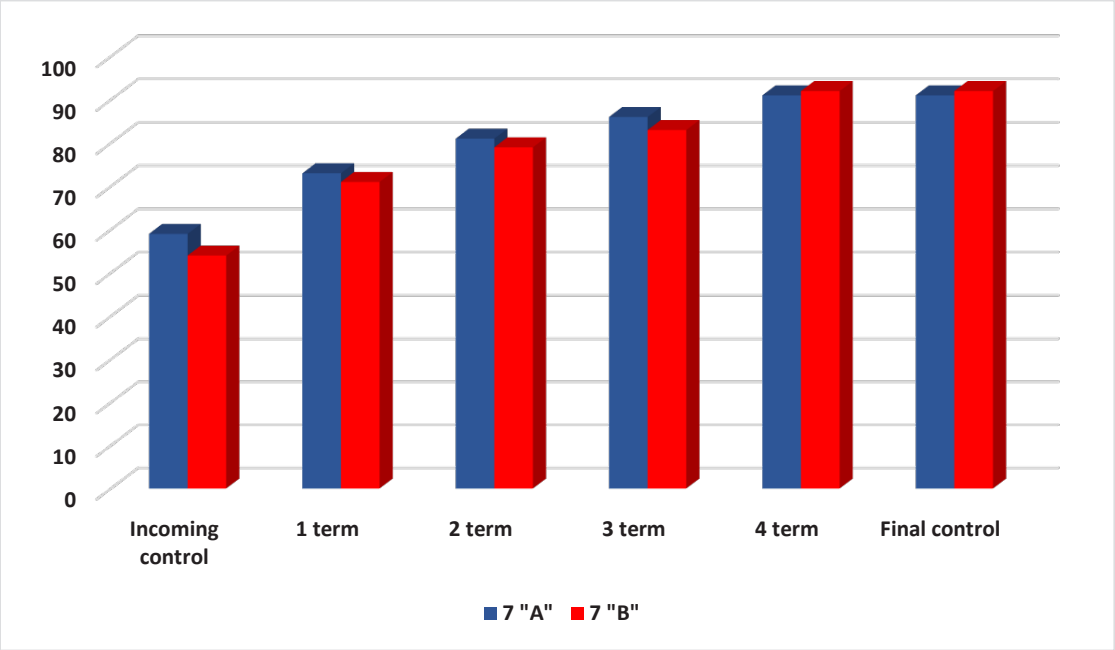

Figure 4. The results of the test work of students of grade 7 "A" and 7 "B" (in dynamics)

In the control class, 13 students (59%) out of 22 students received positive grades in the zero section, 8 of them received "excellent", which is 36%, 5 students (23%) completed the work for the "good" grade. Failed to cope with the zero cut, i.e. received a grade of "unsatisfactory") in the class of 41% (9 students).

In the experimental class, 13 students (54%) out of 24 students received positive marks in the zero section, 4 of them received "excellent", which is 17%, 9 students (37%) completed the work for the "good" grade. Failed to cope with the zero cut, i.e. received a grade of "unsatisfactory") in the class of 46% (11 students).

Discussion. In the works that were carried out at the initial stage of the study, the difficulties were with the tasks in parts B and C. Since these tasks are of medium and high difficulty.

According to the results of the final cut of knowledge at the end of the academic year, we can say that most of the students coped with the tasks. In grade 7 "A", 20 students out of 22 received positive grades (91%), which is 32% more than at the initial stage, of which 2 students received "unsatisfactory", which is 9%, 10 students (45.5%) completed the work for the grade "good" and 10 students coped with the test work on "excellent", which was 45.5%. The 7th "B" class, in which lessons were conducted using didactic games, showed the following results on the final cross-section of knowledge from 24 students, 2 students received a grade of "not satisfactory", which is 8%, 7 students (29%) completed the work on the grade of "good" and 15 students coped with the test work on "excellent", which was 63%.

In her article, Polushkina uncovered a significant finding indicating that traditional methods of presentation result in no more than 20% assimilation of the provided information by students. On the contrary, when educational material is delivered through games, the assimilation rate reaches 90%. Furthermore, this approach offers the potential to curtail the time spent

studying the mandatory coursework by 30-50%, all while enhancing the effectiveness of educational content assimilation. The veracity of the aforementioned assertion is substantiated by our empirical investigation [9].

The analysis of the research results showed that the qualitative academic performance of schoolchildren of grade 7 "B" according to the results of the experiment increased by 38% compared to the zero cut that was taken at the beginning of the school year.

Conclusion. The findings of the current study indicate that the integration of didactic games within the pedagogical framework results in a noticeable enhancement in the quality of students' learning outcomes, further stimulating their cognitive engagement and fostering their intrinsic motivation towards the subject matter. In the context of contemporary education, we posit that this carries significance, given the overall dearth of enthusiasm with regards to academia. Throughout the academic year, the scrutiny of the pupils within this particular class revealed a marked elevation in cognitive engagement during lessons featuring diverse didactic games. The prevalence of social media usage among young adults has been a topic of interest in recent years. Many studies have shown that social media has become an integral part of their daily routines. However, concerns have been raised regarding the effects of excessive social media use on their mental health and well-being. Despite these concerns, social media continues to be a popular mode of communication among young adults. Therefore, it is important to continue research in this area to fully understand the impact of social media on their lives.

Throughout the course of the experimental training, the potential of integrating game technologies within the school's biology curriculum was unveiled. In light of this discovery, a series of lesson plans incorporating didactic games were devised for future deployment during biology classes.

The positive effect of the systematic inclusion of games in the process of studying biology for girls of the 7th grade on improving the effectiveness of the learning process has been established. Students of the 7th "B" class, which lagged behind in the quality of knowledge of students of the 7th "A" class by the end of the school year with the constant use of didactic games in the classroom, showed a result of 1% more.

Notwithstanding the game's relevance and magnitude in the context of the biology discourse, it is considered not to be an ultimate objective per se, but rather a tool to foster engagement towards the subject matter. Evidently, this phenomenon may elucidate the equivocality of instructors' disposition towards the employment of pedagogical games within instructional settings.

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Дидактикалық ойындарды биология сабағында қолдану

Аңдатпа

Мақалада өзекті тақырыптардың бірі – биология сабақтарында дидактикалық ойындарды қолдану туралы айтылады. Осы зерттеу 2021-2022 оқу жылында "Павлодар облысының Дарынды қыз балаларына арналған "Білім-Инновация" Лицей-интернатында" өткізілді. Экспериментке 7 "А" сыныбының 22 оқушысы, 7 "В" сыныбының 24 оқушысы, барлығы 46 оқушы қатысты. Динамикадағы екі сынып оқушыларының білім сапасына (эксперименттік және бақылау) салыстырмалы сипаттама жүргізілді. Оқу жылының басында нөлдік кесу деректерін ескере отырып, 7 "А" сыныбы бақылау сыныбы ретінде, ал 7 "В" сыныбы әртүрлі дидактикалық ойындарды қолдана отырып биология сабақтарын өткізген эксперименттік сынып ретінде қабылданды. 7 "В"оқушыларының биология сабақтарында оқу процесіне ойынды жүйелі түрде енгізудің оң әсері анықталды. Бастапқыда оқу жылының соңына дейін бақылау сыныбынан білім ретінде артта қалған эксперименттік сынып, сабақтарда дидактикалық ойындарды үнемі қолдана отырып, нәтиже 1% - ға артты, ал бұл оқушылардың сапалы үлгерімі 38% - ға өсті.

Түйінді сөздер: *Дидактикалық ойындар, оқытудың заманауи әдістері, танымдық қызуғышылық, биология сабағы, оқушылар.*

Материал баспаға 17.04.23 түсті.

Использование дидактических игр на уроках биологии

Аннотация

Статья освещает одну из актуальных тем – использование дидактических игр на уроках биологии. Настоящее исследование было проведено в «Лицей-интернат «Білім-Инновация» для одаренных девочек Павлодарской области» в 2021–2022 учебном году. В эксперименте участвовало 22 ученика 7 «А» класса, 24 ученика 7 «В» класса, всего 46 школьников. Была проведена сравнительная характеристика качества знаний учеников двух классов (экспериментальной и контрольной) в динамике. В начале учебного года, учитывая данные нулевого среза, 7 «А» класс был взят как контрольный, а 7 «В» - как экспериментальный класс, в котором были проведены уроки биологии с использованием различных дидактических игр. Установлено положительное влияние систематического включения игры в процесс обучения на уроках биологии учеников 7 «В». Экспериментальный класс, который изначально отставал в качестве знаний от контрольного класса, к концу учебного года при постоянном применение дидактических игр на уроках показал результат на 1% больше, а качественная успеваемость у данных школьников повысилось на 38%.

Ключевые слова: *Дидактические игры, современные методы обучения, познавательный интерес, урок биологии, школьники.*

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