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Educational And Experimental Area And Its Role In The Development Of Students' Biological Knowledge

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ABSTRACT

The educational and experimental area is part of the school, which contributes to the implementation of creative, project-based activities, facilitates the development of students' personality through a system of constant observations, experiments and creative projects, that is an effective continuation of the teaching and educational process as well.

Contemporary pupils should be ready for independent life in society, being engaged in experimental and project activities, they get an idea of their own capabilities and abilities to plan and carry out actions, learn to perceive themselves as a participant of activities focused on self-cognition and self-education. In other words, the pre-school educational and experimental area at this stage should be transformed as much as possible to provide opportunities for pupils to conduct experimental work.

Educational and experiential work in the preschool plays an important role in improving the quality of the pupils' knowledge on biology, ecology, and inspires and develops their various cognitive interests. It introduces them with the implementation of science into the practical human activities, and serves as a means of introducing pupils to independent research and consolidation of knowledge. It helps them to improve their practical skills and introduces with the scientific fundamentals of agricultural production. Moreover, it inspires an interest to agriculture.

KEYWORDS: educational and experimental area, educational and experimental work, pre-school area, agriculture, educational and research platform, educational program.

INTRODUCTION

In recent years there have been significant changes in the social life of society that have required a review of the former system of education. One of the competences of the modern student should be the ability to set and solve certain educational, and scientific problems, to find ways and means to formulate and analyze them. Biology as a subject requires a connection with the learning material studied at school with the wildlife.

This feature, being different from other subjects, has contributed to the problem of incorporating the living objects of school sites into the educational process. Defining new guidelines in the process of education and the development of the child's personality requires from the teacher to rethink the pedagogical and educative process in biology. In this case, the formation of students' biological and ecological knowledge on the basis of the educational and experimental site, which contributes to a deeper comprehension of theoretical material by the pupils and its application in non-standard situations, is of great importance. This creates conditions in which the intellectual potential of each learner is realized [1; 4163].

The analysis of school practices has shown that in the process of teaching biology not enough attention is paid to the issue of using the base of the educational and experimental plot for the formation of biological and environmental knowledge of students. The educational and cognitive function of the school teaching and testing site has decreased, although the ecological and practical orientation of biological courses requires work on experimental teaching and testing site. Ineffective methods of conducting practical classes lead to the fact that learners develop only a superficial knowledge of biology and ecology.

From the experience of foreign teachers: an educational and experimental area was used in the Republic of Belarus as a greenhouse for growing seedlings and vegetable products and flower crops, in Tajikistan schools are provided with unheated greenhouses by drop irrigation. The conditions for the development of ecological research and practical skills of learners in growing environmentally friendly products are created. A Turkish government aid agency has installed greenhouses in five schools in the southern African kingdom of Lesotho to help learners to acquire skills in agriculture and agribusiness. They include a water tank and drop irrigation system with seedlings and other agricultural material [2; 1].

It is no secret that biology is a science where theory and practice are inseparable; a science where practical work, laboratory classes are one form of stimulation and activation of cognitive and research skills of pupils such as: observation, analysis, comparison, the ability to confirm or refute scientific phenomena and hypotheses by experiment. The development of skills will contribute to a better assimilation of knowledge, and therefore will raise the quality of education. Schools need more hands-on activities in nature, more information is needed where learners can visually reinforce theoretical knowledge in practice.

For this purpose, the school territory should represent an experimental area where it is possible to organize a training and experimental space for learners and conduct not only theoretical but also practical and laboratory work. They are carried out with the help of special equipment, natural objects, which enables to quickly and clearly obtain the necessary results. A particular role in the formation of pupils' skills in biology lessons is occupied by laboratory work. They are carried out with the use of special equipment, natural objects, which allows to quickly and clearly getting the necessary results [3; 3].

The project method is very popular, especially in the study of subjects of the natural cycle, and it also allows to implement an activity-based approach to biological excursions. This method of organizing pupils' independent work to solve educational, biological and ecological problems has a personal meaning for learners. In Kazakhstan, the project method of teaching got a new life with the introduction of an updated program, where learners defended mini projects; this method is aimed at the development of creative, cognitive and critical thinking, the ability to independently obtain knowledge and apply it in practice.

Due to their age peculiarities, pupils in the 5th-7th grades perceive didactic material with bright visual objects much more effectively, because for their age sensual perception of the world prevails over the logical one. During the course of the biology study, the pre-school educational and experimental area was used for a more detailed and in-depth formation of concepts, assimilation of biological and ecological characteristics of plants, practical application of knowledge in growing cultivated plants, practical application of knowledge in growing cultivated plants in the area.

The main activities of the learners at the experimental area were to grow plants, observe their growth and development. Learners learned how to record, collect, pick, analyze, compare the collected material and present the results of their research. The research method is an observation carried out during specially organized activities within the framework of the existing system of training with the use of active forms and methods of teaching [4; 178].

The aim of the study is to identify appropriate methods of biological and environmental knowledge formation of learners on the basis of educational and experimental area.

Objectives of the study: to identify the pedagogical conditions for the formation of biological and environmental knowledge of students, based on school teaching and testing area.

Hypothesis of the study: in accordance with the aim, the hypothesis that predicts the formation and development of biological and ecological concepts in the system of lessons on the basis of the educational and experimental area, and which contributes to the identification of effective methods of classes in the area, including a system of observations and experiments, has been put forward. Such approach stimulates the cognitive interest of learners, and should help to improve the quality of biology and ecology education of schoolchildren.

The practical significance of the work lies in the fact that the results of the study can be used to improve the methodology of teaching biology on the basis of educational and experimental area. They can also be used in improving the professional, methodological and practical training of teachers.

Table 1 Methods used during the experiment

№	Research Method	Application
1	Observation method	The study of the phenological phases of development of cultivated plants
2	Visual method	The assessment of the condition of crops, land areas
3	Comparison method	Statistics processing: analysis of indicators from the control and experimental areas.
4	Description method	Description of the morphologies of plants
5	Systematization and classification method	Partitioning of traits, plants
6	Degustation method	Determination of taste
7	Method of field photography	Photographing the plant under investigation
8	Literary Research Method	Acquaintance with plants, description of its characteristics and agro-technology
9	Yield Assessment Method	Commercialization, the use of their own products in the school canteen

Before starting the work of the educational and experimental plot, a technological map of work in the pre-school area and a diary of observations were developed (Table 2) [5; 136].

Table 2 A technological map of work on the school experimental area

Stages of agrotechnology	Implementing rules and quality requirements	Timeframe
1 Pre-sowing seed preparation: selection of seeds, germination of seeds	Selection of fresh seeds: wash seeds in 3-5% NaCl solution, stir, after 3-5 min remove the seeds that have settled on the bottom and dry them. Soak the seeds in a 1% solution of KMnO4 for 20 min and rinse thoroughly with water; keep on a wet base until the spout of the plant appears	March: germination 1-2 days until planting
2 Soil preparation and planting: recultivate the soil and apply fertilizer, preparing rows, sowing seeds	Apply humus to the soil, record the sowing date, taking into account the seeding rate, the depth of sowing, soil temperature, assess soil moisture, determine the seeding pattern and distance between the rows	April - May
3 Plant care Weeding, seedling thinning, watering, feeding, pest and disease treatment, plant formation (picking)	Seed germination depends on the culture: in sunny weather in 7-10 days, in cloudy weather - 12-15 days Before flowering, water 2-4 times a week, during the fruiting period - according to the state of the plants; dissolve in 10 liters of water ammonium nitrate 10-20, superphosphate 20-30, potassium sulfate 15-20, the rate of 10 liters per 3 m	The whole season
4 Harvesting	During sunny weather	August - September

Special sections were organized to carry out the work on the pre-school educational and experimental area:

- field plants section: fodder and grain crops that are of production importance in the area, as well as similar crops that are interesting in educational terms, should be placed here.
- vegetable section: it is necessary to grow vegetable crops in both open and closed ground conditions, taking into account crop rotation. It is recommended to divide the area of the section into two parts and use each part in one year as an experimental, in the other as a collection.
- the fruit and berry section: a smaller part is set aside for berry plants and orchards, and a larger part for a fruit garden. When creating a fruit and berry garden, one should remember that mature trees are of less interest for observation than rapidly changing young trees that can be moulded.
- the medicinal plants section can be grouped into different areas, for example: medicinal-food crops; herbs used to treat a particular disease; a garden for dried flowers; an alpine hill, etc. Involving learners for creating a medicinal section allows children to gain agronomic experience in cultivating certain crops. Plants from the medicinal section are used to decorate a herbarium, which then is used as a handout for laboratory work.
- the section of plant biology plays an important role in the courses of zoology, botany, and general biology. Here they perform experiments that clarify the most important biological laws.
- flowering and decorative section: both annual and perennial plants are planted, which serve for the aesthetic design of the schoo [6; 216].

The learners were assigned to each section. Each unit had the required number of tools, and an observation diary was drawn up (Table 3) [7; 80].

Table 3 Observation diary form

Date	Subject of experiment	Purpose of experiment	Experiment scheme	Size of the experimental unit	Biological characteristics of the experimental plant	Brief description of the crop	Calendar of experiments	Name of work, how to perform, deadline	Observations of plants	Performance Assessment

DISCUSSION

In the process of carrying out practical lessons in biology, on the basis of the training and experimental area, all didactic requirements are distributed, which are presented for a lesson (purposefulness, effective amount of educational material of lessons, its integrity and completeness; keeping didactic stages of a lesson, compliance of methods of teaching with the content of material and pedagogical purposes of a lesson; rational use of the educational time; implementation of an individual approach). Compliance with these requirements, as school practice has shown, contributes to the effective formation of students' biological knowledge and skills on the site [8; 244].

Our research allowed us to identify and substantiate a number of requirements for the content and structure of practical lessons in the educational-experimental area, in compliance with which the quality of biological knowledge and practical skills of pupils increases. These requirements include: compliance of the goals and objectives of teaching with the content of biological knowledge; consideration of the logical structure of the transmission of educational information, peculiarities of the educational process in the educational and experimental area; consideration of didactic requirements; consideration of the age specifics of pupils in grades 5-7 of a rural secondary school.

In the course of the work, we paid attention to the stages of development of the concepts in the formation of knowledge, skills and abilities of students. For this purpose, we selected such methods and methodological techniques which would take into account the peculiarities of the content of the classes at the site and would contribute to the specification, expansion, and generalization of the concepts. For each specific lesson, we made a list of concepts in accordance with the content of the topic under study, selected methods and techniques, identified opportunities for using the site base in the formation and development of knowledge. At the same time in the course of training on the area base a combination of different methods of training (conversation, explanation-demonstration of experiments, natural volumes-observation, recognition and identification of objects) was used [9; 19].

CONCLUSION

In our research we came to the conclusion that the learning process on the basis of the educational and experimental area is more effective by combining the following methods: verbal explanation with sensual knowledge of pupils of objects and phenomena of nature and practical influence on them [10; 165].

All this provides an opportunity to deepen and specify biological and ecological concepts. For example, in practical lessons in the area, the processes of life activity of cultivated plants are initially considered as phenomena, and then their essence is clarified. Observing the plants of the educational and experimental area, the pupils fix the growth, that is, the increase in the mass of the plant, but the nature of the biologically important process can not be explained. Therefore, the teacher explicates the process of plant growth by connecting the observations on the teaching and experimental unit.

From the analysis of the results of the study it follows that the formation of biological knowledge on the basis of the school training and experimental area is more successful with the implementation of methods that provide:

1) The use of natural objects of the educational and experimental area, observations and experiments as a source of knowledge.

2) Using a variety of methods to organize learning activities on the school experimental area.

3) Using the most appropriate combination of methods and techniques for the development of pupils' intellectual activity.

4) Practical application of the acquired knowledge in biology to the school experimental field [11; 133].

The inclusion of practical biology classes has been identified as the basic foundation for a good science program that allows pupils in school to have experiences that meet the goals of scientific competency. Practical biology is an important part of biology education, and if it is not taught properly, it can have a negative impact on pupils' learning of other sciences. Consequently, experiential learning is very important to biology instruction; pupils who are taught biology theoretically without a hands-on aspect tend to lack scientific inquiry skills [12; 45]

The effectiveness of the teacher of biology in the formation of a scientific worldview of pupils is manifested in the following: in the way pupils think and respond, which is manifested in the ability to establish phylogenetic relationships; to identify the interaction of phenomena and rules of nature; to give a scientific explanation of phenomena; in pupils' ability to apply knowledge of general provisions to explain specific phenomena; information searching and ability to work with the text; to draw independent conclusions from the studied material; to defend and prove their views and beliefs [13; 55].

Having studied the experience of leading methodologists and teachers, analysis of pedagogical and methodical literature, as well as from my own observations, we can conclude: the school teaching and experimental plot is a proven methodology that is suitable not only for rural but also for urban schools. The theory is easily confirmed by constant practice. The main thing is that children acquire knowledge and skills and can apply them immediately in practice in the schoolyard.

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