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DEVELOPING

CREATIVITY OF BIOLOGY TEACHER

DESARROLLANDO LA CREATIVIDAD DEL PROFESOR DE BIOLOGÍA

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ABSTRACT

Creative activity is an interesting psychological phenomenon that is not limited only to human beings, although undoubtedly in modern times it plays a key role in areas of our lives such as science and education. For a long time, there has been a tendency of a certain apathy on the part of many students towards school, which is why there has been an increased interest in finding new methods to reverse this process. This is also common in biology, and since a certain correlation has been found between student motivation and teacher quality, the objective of this work is to discuss various aspects in order to improve teacher activity from a creative approach. Thus, the work recommends various activities that can be carried out by teachers, and the impacts that these can have on students while increasing creativity by facing tasks from a different perspective.

Keywords: Creativity, biology, education, methodology.

RESUMEN

La actividad creativa es un fenómeno psicológico interesante que no se limita solo al ser humano, aunque indudablemente en los tiempos modernos desempeña un papel clave en áreas de nuestra vida como la ciencia y la educación. Desde hace tiempo existe la tendencia de cierta apatía por parte de muchos estudiantes hacia la escuela, por lo que se ha incrementado el interés en buscar métodos novedosos para revertir este proceso. Lo anterior es también común en la asignatura biología, y como se ha encontrado cierta correlación entre la motivación de los estudiantes y la calidad del docente, el objetivo de este trabajo es discutir diversos aspectos para desde un enfoque creativo mejorar la actividad de los docentes. Así, en el trabajo se recomiendan diversas actividades que pueden ser llevadas a cabo por los docentes, y los impactos que estas pueden tener en los estudiantes a la vez que se incrementa la creatividad al enfrentar tareas desde una perspectiva diferente.

Palabras clave: Creatividad, biología, educación, metodología.

INTRODUCTION

According to Kalogiannakis et al., (2021) technological advancements and their rapid development always create new and exciting ways to engage students learning and meet the growing needs of education. At the same time, traditional teaching methods or even applications that are still used today always prove to be, at least, insufficient (Baeten et al., 2013). Science education is widely considered one of the most integral parts of today's education, according to the National Research Council (2010), since it is responsible for creating scientifically literate citizens and promoting crucial 21st century skills like adaptability or problem-solving. Consequently, there has been a great interest in tools and means that facilitate scientific thinking and the educational theories implemented in them (Landers et al., 2015; Morris et al., 2013).

However, as pointed out by Wulandari et al., (2020) recent global trends in science education research reveal that few students choose science at the secondary school level (So et al., 2019). In addition, unsatisfactory learning outcomes of science and negative attitudes towards science subject matter remain a problem in science education (Mthethwa-Kunene et al., 2015; Yamtinah et al., 2017). The same problem is experienced in the biology subject as part of science. Students tend not to like biology and have unsatisfactory learning outcomes in biology. In this regard a research report identifies that lack of teacher competence becomes a source of poor student performance in science including biology (Bravo & Cofré, 2016; Mthethwa-Kunene et al., 2015).

Nevertheless, in addition to pedagogical content knowledge (PCK) the teacher must employ other tools, methods, etc. to motivate students, and in this sense, creativity plays an important role. As Lamb (2022, p. 218) highlight, many teachers understand the need for creativity, but also acknowledge the limitations, such as insufficient time and rigid curricula, that prevent them from prioritizing the development of creativity in their classrooms (Olszewski-Kubilius et al., 2016). Teachers may also mistakenly believe they are developing creativity through commonly used pedagogical practices, such as recall and evaluation (Rubenstein et al., 2018), when they are actually discouraging creativity altogether. Other teachers develop students' creative potential by focusing on the product aspect of creativity at the end of a learning unit (Kettler et al., 2021). In turn, they may neglect other important facets of creativity, such as the environment or the process.

Essentially, teachers are tasked with educating and preparing students within a system that does not reflect real-world values and demands. In this case, they are teaching

within a system that was not built with creativity in mind. (Lamb, 2022). Taking the above into consideration, the objective of this paper is to discuss the importance, benefits and possible difficulties of using creative methods for teaching and learning biology, highlighting the role of the teacher in this process.

DEVELOPMENT

What does creativity mean? Why should we develop this in students? Creativity is the sum of the thinking process and the personal skills associated with innovation. The important parameters of creativity include problem detection, its composition, the ability to create other ideas for this problem, etc. At the same time, originality and stereotyped questions and answers, the ability to go beyond questions are also included here. Modern studies describe creativity as a high level of intellectuality and competence. Different approaches to define creativity can be consulted in Dow (2022).

There are 2 types of creativity: verbal (with words) and non-verbal (signs, schemes, pictures, new original images, etc.). At the end of modern research, it became known that creativity is a high level of intellectuality, initiative, the ability to generalize events, the ability to switch from one solution method to another. The personal meaning of creativity is that a person is always active and searching in life. From this we can conclude that creativity is not only a potential ability, but at the same time it means actualized skills and always being ready to find new non-standard methods for solving various problems.

The importance and significance of the formation of creativity in education is shown below:

- Social. That is, new human forms with special thinking.
- Scientific and intellectual. One who understands and learns the ability to create.
- Practical. Using new training technologies for the constant development of creativity.

We believe that creativity is intellectual and social at the same time. That is, creativity is not only intellectual, but also a personal characteristic. In the process of intellectual activity and communication, creativity is involved as the ability to solve the situation in maximal, profitable ways for oneself and others.

It should be noted that "creativity" specifies the category of "ability" in the context of the phenomenon of the concept. A person can be grouped into 3 categories:

1. Lack of creativity. It arises from the lack of necessary conditions for the creative activity of a talented, qualitatively very important personality.

2. Creative as a free factor independent of intelligence. That is, there is very little correlation between intelligence and creativity levels. If IQ (intelligence coefficient) is lower than 115-120 outside the theory of intellectuality, then creativity and intellectuality are within one factor, but if IQ is more than 120 creativity is more dependent on the intellectual factor.
3. A high level of intelligence which leads to a high development of creativity or vice versa. The creative process is not a specific function of mental activity. Thus, the concept of "creativity" is a set of universal abilities that belong to every person.

In modern times, there is a need to form creative personalities who are able to perform non-standard tasks that are relevant in conditions of uncertainty. It is very important to approach the parameters of the processes in a maximally realistic manner in setting each problem, and to develop creativity skills in the successful mastering of topics. Being creative is key since it is a form of control over psychological activity. Nevertheless, in general the problem of formation of creativity in higher pedagogic schools, although it is very important, has not been fully worked out yet.

In the opinion of Sirajudin et al., (2021) traditional teaching couldn't improve students' creative thinking skills and therefore, an alternative is needed. One alternative learning activity that can be used as a means of improving the basic skills needed in this century is STEM education, although there are other innovative teaching methods (Sivarajah et al., 2019). In general, the objectives and benefits of the STEM learning model are expected, among others: to develop creative and creative thinking skills, logical, innovative and productive; instill a cooperation spirit in solving problems; introduce the perspective of the world of work and prepare it; utilizing technology to create and communicate innovative solutions; media to develop the ability to find and solve problems; media to realize 21st-century skills by connecting experience into the learning process through increasing the capacity and skills of students; and standard technology literacy.

Since there is a connection between scientific intellectual and social (pedagogical) creativity a teacher with creative thinking can behave creatively with students. This also refers to the main modern pedagogical method. In the creative activity of the teacher, creativity develops and is combined with the leading motive. Thus, it is functionally strengthened in the structure of the teacher's personality and manifests as a skill in creating new pedagogical issues. At the same time, it examines the creative methods of activity. Pedagogical creativity is also characterized as a determinant of the creative process.

The quality of pedagogical creativity is one of the most important issues of the teacher in the formation of didactic principles. When a teacher works with students, it should be considered that the factor of creativity is the most important. Creativity in students can be created with the help of individual approach. Creativity is embedded in the structure of creative potential and develops in various forms every day. If the creative process leads to the creation of a new form, then creativity means that a person tries something new and unfamiliar at the expense of his internal resources.

Taking the above into account we believe that the following are creative things that can activate the student's interest in learning the teaching methodology of biology (Ledovskaya, 2018, p. 2):

- Preparing posters related to interesting topics and ideas in the educational material
- Collecting interesting information about the work experiences of teachers related to the teaching of biology and including it in the history of the development of this subject
- To prepare crosswords, questions, games, etc. related to the teaching of biology to carry out their activities
- Making, showing and discussing video films about the topics included in the teaching of biology (lecture materials)
- Preparing and presenting projects related to the holding of quizzes and events related to teaching biology in high school
- To prepare and present interesting materials related to the age psychology of schoolchildren

Students perform these tasks with great enthusiasm, so the teacher should have no qualms about giving this kind of assignment. It is important to notice that students should not be penalized even if they do not perform well in these research projects since it is the first time that he has mastered his specialty and is studying it. On the contrary, the teacher should address the student with appropriate words to create self-confidence. It is necessary to convince him that the task he is working on is exclusive, unique and original.

Creative works help in the implementation and development of creative abilities. At the same time, it creates conditions for students to be more active and freer. Within the framework of the new model, more specialized requirements are placed before a student who has a higher education, who is a specialist in his field. Among these requirements, the student's orientation towards innovation, initiative, and dynamism are taken as the basis. Creative

activity is the basis of innovative thinking. Creative thinking is the ability to see alternative options in solving any problem. A person with innovative thinking looks at events and things in a more original way than usual. The ideas of a creative person are always far superior to those who prefer standard, outdated methods. A creative person usually succeeds in his work and demonstrates his skills and abilities very easily. Extracurricular activities also develop creativity in students (Wasserman, 2015, p. 134).

Based on all this, it should be said that the student should acquire knowledge, skills and habits related to creativity. A biology teacher also must be creative. If we want to naturalize students to think creatively, this can certainly be done by a teacher who thinks creatively. Therefore, we should try to develop these knowledge, skills, and abilities in the future teacher. In this sense an important task of a modern biology teacher is to arise interest during the teaching of biological topics in class, to approach students with different tasks and information.

There are several reasons for developing creative thinking in a student studying biology teaching methodology:

- students need innovation in teaching
- students encounter problems when looking for stimuli
- they can change their ideas and ways of thinking very quickly and easily
- they experience pleasant feelings during activities related to their interests

The term "scientific pedagogical creativity" is used to define the characteristics of scientific activity in the pedagogical field. At the same time, this process of self-awareness is carried out in unevenly directed conditions, and the self-aware and un-aware feeling reflects figurative, emotional and volitional components (Ryndak, 2009, pp. 638–639). According to psychologists, creativity is present in all people. But those who fully believe in it use it. This means that we have to convince our students that they can approach the problem in a non-standard way. For this, the teacher needs a non-standard approach to the student's organizational activity. To be able to do this, the student must identify the problem situation and consider the formulated problem. He should understand the importance of this problem. In his work, the teacher should be able to influence the student's emotions with innovations, unusual ideas, non-standard methods, different from previous teaching.

Research shows that creativity develops at a young age and especially in students. It manifests itself in the integration of intelligence and creative activity. The situation in education itself requires the development of the student's

thinking. Students should be able to look at the problem from different angles and find answers in solving non-standard issues related to education. In order to develop students' creative abilities, it is very important to give them non-standard tasks of a creative nature. For example, a student prepares a lesson model for teaching biology. At this time, he uses creativity to make the lesson more interesting. With the help of yellowed or green plant leaves, you can create a beautiful natural landscape on paper or do creative work with various natural tools (plant seeds, fish ears, herbariums, etc.). Creativity arises from each person's personal thinking, and it refers to giving more different, interesting, surprising ideas about any topic. Integrative relationships are often used in the assignment of creative tasks from biology. For example, when biological knowledge is taught, creativity can be manifested through the help of music, painting, poetry, skits, as well as with the help of physics, chemistry, geography, etc.

However, there are students who solve problems by looking at problems as usual, i.e. by looking at them in the usual way, choosing a non-active position in the educational process and becoming a passive listener. Such a student can be made more active in class with the help of active learning methods. According to the principles of active learning, the teacher should be active during the research as well as the student. During the developing creativity, the sum of personal qualities becomes integrative, the associative image of thinking, sensitivity to innovation forms in the student such qualities as creative imagination and fantasy, the ability to compare ideas with each other. It is important to highlight that the most ordinary subject can be taught creatively.

Ryndak (2009) pointed out four directions for achieving more optimal results in the field of education:

1. Creative education
2. Creative teaching
3. Creative technologies
4. Uninterrupted creative development

In our opinion the project method plays a major role in the formation of the student's creative thinking and professional self-education. The project method is focused on the joint activity of the student and the teacher. Project technology gives a great direction to the development of the student's personality, their independence, creativity.

While developing creative thinking, the student acquires the following qualities and characteristics:

1. Original thinking
2. Increasing the value of intelligence

3. Being ready for innovation
4. Professionalism in the chosen field of activity

It can be said that it is very important to develop both innovation and creativity in students. High school teachers should always work for this to form the following abilities and qualities in students (Shalova, 2011, p. 3):

- Desire to acquire knowledge.
- Originality of thinking.
- Flexibility of thinking.
- Critical thinking.
- Ability to think independently.
- Productivity in generating ideas.
- Lightness in creating new ideas.
- The ability to accurately process ideas.
- Expressing ideas easily in words.
- Initiative.

CONCLUSIONS

Creativity can be manifested in different areas, and it shows the features and abilities of a person. It manifests itself in communication, action and even thinking and feelings. Related to this there is a concept called associative thinking, which is common in persons with very high thinking, literacy, and ability. The difference in such thinking means finding common ground between objects and processes, based on communication, logic, and analysis. Creative people are able to accept new ideas and perform tasks in an unusual way; a creative person is different from others in this regard, and it has been showed that everybody have this potential although not in the same areas.

In the teaching of the different fields of STEM, among which biology can be located, the importance of using creative methods with the purpose of motivating students as well as for a more effective teaching/learning has been demonstrated. Due to this, it is important to prepare the teachers of the subject so that they are more proficient in this aspect. In the article, recommendations were made for possible activities to facilitate the work of the teachers, although in the sense of the subject analyzed we left open the possibility of using other activities born of the "creativity" of the teachers.

REFERENCES

- Baeten, M., Struyven, K., & Dochy, F. (2013). Student-centred teaching methods: Can they optimise students' approaches to learning in professional higher education? *Studies in Educational Evaluation*, 39(1), 14–22. <https://doi.org/10.1016/j.stueduc.2012.11.001>
- Bravo, P., & Cofré, H. (2016). Developing biology teachers' pedagogical content knowledge through learning study: The case of teaching human evolution. *International Journal of Science Education*, 38(16), 2500–2527. <https://doi.org/10.1080/09500693.2016.1249983>
- Dow, G. T. (2022). Defining Creativity. In *Creativity and Innovation Theory, Research, and Practice* (2nd ed., pp. 5–22). Routledge. <https://doi.org/10.4324/9781003233923-2>
- Kalogiannakis, M., Papadakis, S., & Zourmpakis, A.-I. (2021). Gamification in Science Education. A Systematic Review of the Literature. *Education Sciences*, 11(1), 22. <https://doi.org/10.3390/educsci11010022>
- Kettler, T., Lamb, K. N., & Mullet, D. R. (2021). *Developing Creativity in the Classroom: Learning and Innovation for 21st-Century Schools*. Routledge. <https://doi.org/10.4324/9781003234104>
- Lamb, K. N. (2022). Teachers and Creativity. In J. Plucker (Ed.), *Creativity and Innovation Theory, Research, and Practice* (2nd ed., pp. 217–248). Routledge. <https://doi.org/10.4324/9781003233923-18>
- Landers, R. N., Bauer, K. N., Callan, R. C., & Armstrong, M. B. (2015). Psychological Theory and the Gamification of Learning. In T. Reiners & L. C. Wood (Eds.), *Gamification in Education and Business* (pp. 165–186). Springer International Publishing. https://doi.org/10.1007/978-3-319-10208-5_9
- Ledovskaya, D. S. (2018). Study of the creative activity of students in extracurricular work at the university. *Young Scientist*, 16(202), 270–272.
- Morris, B., Croker, S., Zimmerman, C., Gill, D., & Romig, C. (2013). Gaming science: The "Gamification" of scientific thinking. *Frontiers in Psychology*, 4. <https://www.frontiersin.org/articles/10.3389/fpsyg.2013.00607>
- Mthethwa-Kunene, E., Onwu, G. O., & de Villiers, R. (2015). Exploring Biology Teachers' Pedagogical Content Knowledge in the Teaching of Genetics in Swaziland Science Classrooms. *International Journal of Science Education*, 37(7), 1140–1165. <https://doi.org/10.1080/09500693.2015.1022624>

- National Research Council, Division of Behavioral and Social Sciences and Education, Center for Education, & Board on Science Education. (2010). *Exploring the Intersection of Science Education and 21st Century Skills: A Workshop Summary*. National Academies Press.
- Olszewski-Kubilius, P., Subotnik, R. F., & Worrell, F. C. (2016). Aiming Talent Development Toward Creative Eminence in the 21st Century. *Roeper Review*, 38(3), 140–152. <https://doi.org/10.1080/02783193.2016.1184497>
- Rubenstein, L. D., Ridgley, L. M., Callan, G. L., Karami, S., & Ehlinger, J. (2018). How teachers perceive factors that influence creativity development: Applying a Social Cognitive Theory perspective. *Teaching and Teacher Education*, 70, 100–110. <https://doi.org/10.1016/j.tate.2017.11.012>
- Ryndak, V. G. (2009). On the issue of creative education: The state and directions of development. *News of the Samara Scientific Center of the Russian Academy of Sciences*, 11(3–4), 635–639.
- Shalova, S. Y. (2011). Scientific and pedagogical creativity of students at the university. *Bulletin of I. Kant Baltic Federal University*, 11(6), 37–42.
- Sirajudin, N., Suratno, J., & Pamuti. (2021). Developing creativity through STEM education. *Journal of Physics: Conference Series*, 1806(1), 012211. <https://doi.org/10.1088/1742-6596/1806/1/012211>
- Sivarajah, R. T., Curci, N. E., Johnson, E. M., Lam, D. L., Lee, J. T., & Richardson, M. L. (2019). A Review of Innovative Teaching Methods. *Academic Radiology*, 26(1), 101–113. <https://doi.org/10.1016/j.acra.2018.03.025>
- So, H.-J., Ryoo, D., Park, H., & Choi, H. (2019). What Constitutes Korean Pre-service Teachers' Competency in STEAM Education: Examining the Multi-functional Structure. *The Asia-Pacific Education Researcher*, 28(1), 47–61. <https://doi.org/10.1007/s40299-018-0410-5>
- Wasserman, V. I. (2015). Formation of the creative personality of a student in the process of studying at a university. *Journal of the Herald*, 7(160), 132–134.
- Wulandari, S., Rustaman, N. Y., Widodo, A., & Aryantha, I. N. P. (2020). The role of biology teacher's Pedagogical Content Knowledge (PCK) on the quality of learning: A review. *International Conference on Mathematics and Science Education of Universitas Pendidikan Indonesia*, 5, 27–33. <http://science.conference.upi.edu/proceeding/index.php/ICMScE/article/view/250>
- Yamtinah, S., Masykuri, M., Ashadi, & Shidiq, A. S. (2017). Gender differences in students' attitudes toward science: An analysis of students' science process skill using testlet instrument. *AIP Conference Proceedings*, 1868(1), 030003. <https://doi.org/10.1063/1.4995102>