Does the Teaching Strategy Affect Understanding the Concept of the Balance of Nature?

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Abstract

Understanding and sharing knowledge about the balance of nature in living communities is essential for the survival of humanity. In the research, we wanted to examine whether teaching strategy affects the conceptual understanding of the balance of nature among fourth graders. In doing so, fourth-grade elementary school students were randomized in three groups where the same teacher taught the first group about the balance of nature relying on presentation alone, the second group watched a video along and listened to the teacher's presentation without additional explanations, while the third group had a guided video viewing accompanied with explanations. Students' knowledge was tested before and after the education. Using a two-way factorial ANOVA, no significant differences between groups were identified in knowledge on living communities, whilst education appeared to be effective for both. This indicates that collaborative learning and active cooperation of students are important and help students gain the required conceptual understanding of certain contents without ICT support.

INTRODUCTION

The concept of the balance of nature is taught in the following science-based classes: Science and Social Studies, Science, Biology, and Geography. The curriculum of the subject Science and Social Studies (Ministry of Science, Education and Youth, 2019) defines the subject area by describing what children should be taught in the first four grades of elementary school: "...different living beings are organized into communities where they meet their needs and fulfil their roles... In the constant development of the living world undergoing constant changes, it is important to notice the interdependence of humans and all other organisms and the environment. Through their actions, humans often disrupt the balance of nature, leaving visible consequences. Their actions should be in accordance with sustainable development." The curriculum contains four basic concepts (Organization of the world around us, Changes and relationships, The individual and the society, and Energy) with descriptions of the educational outcomes the student should achieve when learning about living communities and the balance of nature. The outcome to be achieved in Grade 3 is to be able to draw conclusions on changes and relationships in nature and the mutual dependence of living beings using examples from student environment and highlighting the interdependence of plants, animals and humans. In Grade 4, by learning about the concept of *Organization of the world around us*, students should draw conclusions about the organization of living communities. It is recommended that students should explore living communities during out-of-school classes. Within the concept of *Changes and relationships*, students should be able to describe the importance of a responsible relationship toward nature to protect the living world and evaluate the impact of humans on plants and animals and their role in the preservation of endangered and protected species. Moreover, students should be able to analyse and connect living conditions and the diversity of living beings in different habitats and describe cycles in nature, living communities and nutritional relationships. Again, it is recommended that living communities be explored during field classes.

An analysis of textbooks for Grade 4 of elementary school, approved by the competent Ministry of Science and Education of the Republic of Croatia, shows that the topic of living communities, relationships in them, and the balance of nature (BN) is treated in different ways. Some textbooks only list animals, their characteristics (appearance, diet), and plants without explaining the balance of

nature in a particular living community. The concept of the food chain is mentioned, where its participants are described using the terms plants, herbivores, carnivores and omnivores, accompanied with a photo representation of the food chain and food web. The textbooks contain a simple description of the life cycle of plants and animals and give an example of invasive species introduced by humans that cause damage to a certain animal community. Only one textbook (Štambak et al., 2021) features a separate lesson *The organization of the living world* with descriptions and graphical representation of the two fundamental relationships among living beings: reproduction and nutritional relationships. Furthermore, only the aforementioned textbook, in addition to the detailed explanation of life cycles and living communities, includes a lesson on nutritional relationships and the balance of nature. The Lotka-Volterra model was used to illustrate the topic, and the concept of the balance of nature or ecological balance was explained in detail and illustrated with figures (predator-prey model), adding that humans also affect the ecological balance through their actions.

The term balance of nature or ecological balance refers to the theory according to which ecosystems are usually in homeostasis, so a minor change is corrected by a negative feedback loop to bring the system back to balance (Root, 2019). Ecosystems are described as a set of populations in a certain habitat that are in a nutritional relationship (Van Valen, 1973; Cutter-Mackenzie and Smith, 2003; Vannevel and Goethals, 2020). In their descriptions of ecological balance, ecologists tend to use theories of catastrophe and chaos because constant disturbances lead to dynamic changes in nature (Simberloff, 2007). Populations of predators and prey are interdependent, and their sizes change depending on the relationship between the population and its food source, as shown by the dynamic balance model made by Alfred Lotka and Vito Volterra (Botkin, 2012).

The theory of ecological balance has been promoted in public by many organizations for the protection of the environment and animals, and the balance of nature is one that occurs naturally, without human influence (Botkin, 2012). It is precisely the basis of biological education to give students a scientifically correct representation of the image of nature. An example of a long-observed predator-prey relationship was recorded in North America from 1959 to 2010, where a dynamic balance of nature was described on the relationship between wolves and moose. Botkin (2012) states that the predator's goal is to regulate the prey's population size, and in the presence of predators, the Lotka-Volterra model occurs (Berryman, 1992).

THE EFFECTIVE TEACHING METHODS

The concept of the balance of nature is taught in schools around the world. In Dutch schools (Hallstrom, 2019), some textbooks mention the self-regulation of the ecosystem, with the prevailing concept of a stable balance of nature, probably because when imagining a stable and balanced ecosystem, students find it easier to understand what happens once the balance is disturbed. In secondary school, it is important to learn about dynamic balance because nature is constantly changing. All textbooks mention disorders that can be caused by humans, and the concept of self-regulation is rarely encountered in textbooks.

Through various activities, people damage ecological systems and disrupt the balance of nature, which can nevertheless be restored to its original state with positive activities (Rumambi, Assa and Wibisono, 2021; Hill and Nelson, 2011). One of the reasons why people cause damage can be their ignorance, and this is why additional efforts should be invested in the education of young people. There are several pedagogical models that can be used to promote environmental education in elementary school. Some authors (Dobson, 2003; Pallett, 2017) emphasize environmental awareness, while others point to environmental knowledge (Frick, Kaiser and Wilson, 2004), which can be developed through formal, non-formal and informal education. Most importantly, along with receiving proper and effective environmental education, students should actively participate in preserving the environment (Hadjichambis and Reis, 2020). This confirms the importance of education in understanding the consequences of actions and shaping positive environmental awareness (Jeladze, Pata and Quaicoe, 2017). Although many textbooks include teaching content about ecosystems and children do learn about preserving the balance of nature, this is not entirely successful, because destructive activities still exist today. Even the 2030 Agenda (United Nations, 2016) of sustainable development says that we should provide quality education while protecting plants and animals; that is, the nature around us. To develop ecological awareness among students, it is necessary to use effective teaching strategies, and the teaching material itself should provide students with enough information for correct actions and conclusions, whether they learn about living communities and ecological systems in or outside the classroom using different work methods and learning models (Fonseca, Conde and García-Peñalvo, 2018).

Paul Freire's eco-pedagogy (Freire, 2000) advocates the involvement of citi-

zens in environmental issues with the adoption of participatory pedagogy, and thus it is important to actively involve students when discussing such topics during classes. Problem-based learning (PBL) is a socio-constructivist teaching and learning strategy where students solve real environmental problems while acquiring knowledge (Reynolds and Hancock, 2010). Of course, collaborative activities (collaboration) also improve learning (Balažinec, Radanović and Bulić, 2024), because collaboration is necessary for solving a wide variety of environmental problems (Laal and Ghodsi, 2012) and critical reflection. This has proven to be a good strategy and is used by teachers in primary education. When choosing a teaching strategy, it is necessary to consider the teacher's strengths and experiences, students' needs and experiences, the content of the material being taught and the learning objectives (O'Reilly, Wang and Sabatini, 2019). Environmental topics can be taught outdoors, during field classes or in the classroom. If teaching takes place in the classroom, the abilities and competencies of the teacher are foregrounded. The teacher is the creator of the teaching process, and needs to prepare teaching materials, select the most effective teaching methods (verbal, visual or practical) in a particular lesson stage and maintain students' motivation and attention. All of the above requires finding effective active learning strategies to increase students' knowledge about ecosystems (Amend and Salamat, 2003).

Nowadays, research-based and problem-based classes have been replacing lecture classes with the increasing support of ICT (Fernández-Batanero et al., 2021). It has been shown that by using a computer during a virtual walk-in nature, students in Slovenia have become aware of the need to preserve nature and learn about the balance of nature (Puhek, Perše and Šorgo, 2019), which indicates that multimedia materials are useful for gaining knowledge in natural sciences. A teacher who uses a wide variety of multimedia content directs the student's attention to the important part. By choosing the teaching method of video presentation, students are placed in the context of active learning, i.e. open teaching, and this results in the constructive creation of students' knowledge. The use of educational videos in classes has numerous advantages, for example, they help in problem-based learning because teaching contents that seem complex, difficult and abstract to solve and understand become simple, interesting and understandable (Wijiasih, Rusdarti and Purwadi, 2019). Octaviantari et al. (2020) claim that videos are interesting and stimulating for students because they combine two components: an auditory component that in-

cludes listening and a visual component that includes watching. By including both components, the student's attention is focused on the teaching content. This is exactly how students are stimulated as their interest in learning increases and their attitudes are affected. This also helps in better understanding and reasoning about certain processes seen in the video (Lange and Costley, 2020). On the other hand, the auditory component, which includes sounds, music, and sound effects, the narrator's voice and speech attracts students' attention, enables the transfer of information and highlights important information.

It can be said that the student's learning experience (Vanlommel et al., 2020) depends on the teacher's decisions and the selection of the correct strategy for class work and methods that require active class participation (Bulić and Blažević, 2022). The teacher should be familiar with the cognitive functioning of her/his students and their abilities and motivation (Eggen and Kauchak, 2013; Bulić and Blažević, 2020). Elaborate use of technological, pedagogic and subject knowledge enables teachers to make decisions about teaching the whole class or have individualized instruction because students should have the chance to learn in the most effective way possible (Mishra and Koehler, 2006).

In this research, we wanted to see if the application of a certain teaching strategy (watching videos) affects the understanding of the concept of ecological balance, and if there is a significant difference if the video is accompanied by teacher's explanations or if the students only watch the video without additional explanations. The aim of the conducted research was to analyze the effectiveness of certain strategies for learning about ecosystems in the classroom. The research hypothesis was set:

There is significant difference in students' knowledge of the balance of nature depending on using videos in classes of Science and Social Studies.

MATERIALS AND METHODS

Participants

Sample used in research consisted of N=52 pupils attending Grade 4 who were randomly assigned to 3 groups (groups 4a, 4b and 4c). Although there was a total of 55 students (32 boys and 23 girls) one boy and two girls were eliminated from the research because they were present only at the first writ-

ten test, and then they were absent due to illness. The final sample therefore consisted of 31 male and 21 female students. Their parents were informed in detail about the aim of the research and gave their written consent. The parents were also informed that their child could withdraw from the survey in any time without any consequences. The entire research was carried out in accordance with the Declaration of Helsinki. The Ethics Committee of the Faculty of Humanities and Social Sciences in Split approved the research implementation protocol.

Instruments

The written knowledge test is an instrument developed for testing the required concept. Validity of the test was checked before the research in direct communication with 6 teachers where each of them had more than 25 years of experience in teaching science. Reliability was assessed on randomly chosen sub-sample of 22 students using the test-retest method. Within-subjects t-test revealed high reliability of data ($p=0.722$).

All students wrote a test about the balance of nature and living communities before starting the research (P1). After the research, they wrote the second test (P2). The test contained seven questions about the living community of the forest and the balance of nature based on the Lotka-Volterra model.

Description of the experimental procedure

The research design was quasi-experimental, pre-test and post-test was written by the control and experimental group. The experimental groups (4b and 4c) had active work methods and collaborative learning with video lessons about the balance of nature and the Lotka-Volterra model, while the control group (4a) had lessons in the classroom based only on active work methods and collaborative learning. Students in 4a learned about the balance of nature, used their textbooks and listened to the teacher to work collaboratively. Due to the possible influence of the teacher competency on student results all three groups were taught by the same teacher.

The research lasted two weeks. Students from all groups wrote the P1 knowledge test during the first school hour, after which they studied for two school hours about the living community of the forest and the balance of nature. This

was followed by a lesson of repetition, and then student knowledge was tested. During the lessons of learning new content, students used active learning and problem-solving methods. They had identical worksheets with problem situations to be solved during lessons of this type. Students in 4a watched no videos, while students in 4b and 4c watched three videos. The first was *Our wild animal*s, which is an educational program about stags, roebucks, hinds and does. Students listened to roaring stags and roebucks and watched scenes from the forests of Baranja, produced by Natura Film and the Croatian Hunting Association 2012 (https://www.youtube.com/watch?v=x7ehV4MseYs). In the second video entitled *How Wolves Change Rivers (*https://truenaturefoundation.org/research/how-wolves-change-rivers/). The importance that wolves had in respect to the entire ecosystem when they returned to Yellowstone National Park after 70 years was explained to students in a simple and appropriate way. The students could observe how the introduction of predators brought the excessive population of large herbivores under control and the system returned to balance in just a few years. Students had the opportunity to understand how important each animal is in the life of a living community (Sustainable Human, 2014). The third video entitled *Intact Nature of Croatia 2010* showed the relationship between bears and does in the forests of Croatia (Naturfilm, 2010) (https://www.youtube.com/watch?v=2-JGsnu986M). In 4b, the teacher played the videos to the students without additional explanations. In 4c, the teacher accompanied the video with her speech, she talked to the students, asking them to predict what would happen in a certain situation and they actively participated in watching.

Statistical Analysis

Descriptive statistics parameters were calculated for all data: arithmetic mean, standard deviation, minimum and maximum. The data normality was tested using Kolmogorov Smirnov test and it was determined that the results did not deviate significantly from the normal distribution ($p>0.20$). Furthermore, in order to identify the main effect of within-subjects factor *Group* (4a, 4b, 4c) and main effect of within-subjects factor *Treatment* (P1, P2) and their interaction two-way 2×3 factorial ANOVA was used. Partial eta squared (partial η^2) was used for effect size assessment. The results were considered significant if $p<0.05$. All statistical calculations were carried out using the data analysis software package Statistica 14.0.0.15 (TIBCO Software Inc., 2020, Palo Alto, CA, USA).

RESULTS

To determine the influence of videos during classes of Science and Social Studies on the knowledge of research participants, i.e. fourth-grade elementary school students, identical written tests P1 and P2 were used. Table 1 shows the results of descriptive statistics of all variables, i.e. tasks by groups (4a, 4b & 4c) for written tests before and after the lesson (P1 & P2). As descriptive indicators, the arithmetic mean, standard deviation, minimum and maximum were calculated.

Table 1 Descriptive statistics results for written tests P1 and P2

		4a		4b		4c	
Q	**PP**	**M±SD**	**Min-Max**	**M±SD**	**Min-Max**	**M±SD**	**Min-Max**
1.	P1	0.65±0.42	0.0-1.5	0.66±0.41	0.0-1.0	0.84±0.60	0.0-2.0
	P2	1.97±0.12	1.5-2.0	1.39±0.61	0.0-2.0	1.50±0.63	0.0-2.0
2.	P1	1.94±0.73	0.5-3.0	1.84±0.41	1.0-2.5	2.00±0.68	1.0-3.0
	P2	2.71±0.40	2.0-3.0	2.32±0.42	1.5-3.0	2.44±0.63	1.0-3.0
3.	P1	0.76±0.53	0.0-1.5	0.76±0.48	0.0-1.5	0.94±0.81	0.0-2.5
	P2	2.03±0.45	1.0-2.5	1.50±0.55	0.5-2.5	1.59±0.63	0.0-2.5
4.	P1	1.41±1.28	0.0-3.0	0.89±0.88	0.0-2.0	0.94±1.18	0.0-3.0
	P2	2.06±1.25	0.0-3.0	1.42±1.22	0.0-3.0	1.25±1.18	0.0-3.0
5.	P1	0.24±0.44	0.0-1.0	0.37±0.50	0.0-1.0	0.12±0.34	0.0-1.0
	P2	1.71±0.69	0.0-2.0	0.47±0.61	0.0-2.0	0.69±0.70	0.0-2.0
6.	P1	2.79±1.21	1.0-4.5	3.05±1.17	1.5-5.0	3.50±1.26	1.0-4.5
	P2	3.71±0.79	2.0-4.5	3.74±0.90	2.0-5.0	3.72±1.40	1.0-5.0
7.	P1	0.29±0.59	0.0-2.0	0.16±0.50	0.0-2.0	0.19±0.54	0.0-2.0
	P2	0.76±0.75	0.0-2.0	0.84±0.60	0.0-2.0	0.88±0.62	0.0-2.0

Q= question; P= written test; M ± SD – arithmetic mean ± standard deviation; Min – minimal value; max – Maximal value

A two-way factorial ANOVA was applied for the variable that describes the results of all students for the test questions 1 – 6 (Table 2).

Table 2 Two-way factorial ANOVA for questions on living communities

	F	p	η^2
Group	1.462	0.242	0.056
Treatment (Time)	333.339	<0.001	0.087
Group×Treatment (Time)	15.692	<0.001	0.390

F – ANOVA test value; p – level of statistical significance; η^2 – effect size assessment trough partial eta squared

When analysing the main effect of the *Group* factor, it can be seen that there is no significant difference in students' knowledge of living communities with regard to their group (p=0.242). The *Treatment* (*Time)* factor shows a significant difference in students' knowledge before and after learning about ecological balance and living communities. There is a significant difference in the interaction between the factors *Group* and *Treatment (Time)*, because students have more knowledge about the ecological balance after the learning process, regardless of the applied strategy in classroom or the use of videos.

Although the students in group 4a did not watch videos during the lesson, they had more initial knowledge about living community and ecological balance, in absolute terms, than the students in the other two groups, and the same modality is observed at the end of the research. However, there is no significant difference between them, which indicates that all students successfully understood the concept of the balance of nature and living community, regardless of the applied strategy of using videos in the classroom. It was certainly important that the students who did not watch videos used active work methods and collaborative learning to solve problem questions. The three groups show greater knowledge in the second measurement, and this is significant, indicating that educational outcomes have been achieved after the teaching process.

As for the hypothesis, whether there is a significant difference in knowledge about Natural balance between students who watched (4b, 4c) and who did not watch (4a) videos, the same modality of results can be observed for general knowledge about the living community of the forest. It can be seen that there is no significant difference in knowledge about the balance of nature between 3 observed groups, as shown in table 3. The conceptual understanding of the balance of nature was tested on question number 7 in the written knowledge test (Table 3).

Table 3 Two-factor ANOVA for the question on the balance of nature

	F	p	η^2
Group	0.020	0.980	0.001
Treatment (Time)	53.777	<0.001	0.523
Group × Treatment (Time)	0.730	0.487	0.029

F – ANOVA test value; p – level of statistical significance; η^2 – effect size assessment trough partial eta squared

As for the *Time* factor, it can be seen there is a significant difference regarding the concept of the balance of nature, because before learning the new content, students did not know this concept, and after the lesson, they had significantly more knowledge.

However, when observing the mutual interaction of all factors, progress in knowledge can be seen in all groups. Still, students in group 4a show less progress in their knowledge about the balance of nature compared to 4b and 4c, although the difference is not significant. It is assumed that the videos shown to 4b and 4c contributed to their progress to a certain extent. It can be concluded that there is no significant difference in knowledge about the balance of nature between 3 observed groups.

DISCUSSION

The results of the conducted research show that fourth-grade elementary school students (approximately 10 years old) can successfully learn about living communities and maintaining the balance of nature. Regardless of the use of videos in the classroom, with active student participation and collaborative learning, students achieved the desired educational outcomes (Saitua-Iribar, Corral-Lage and Peña-Miguel, 2020). They recognize the forest as a living community of plants, animals, fungi and micro-organisms, they understand that the balance of nature can be disturbed by internal or external factors and that humans can also disrupt the balance of nature through their negative influence. Most importantly, they show knowledge and a positive attitude about how people can take action and help bring the ecosystem back into balance. Such results show that students of the mentioned age can and must develop ecological awareness and the need for a positive impact on nature and sustainable development. This is one of the most important sustainable

development goals (SDGs) to be achieved by 2030. Monte and Reis (2021) state that ecological citizenship should be promoted from primary school education in accordance with the principles of sustainable development established in the Tbilisi Declaration. This is significant because it helps children adopt proper ecological habits for everyday life (Pedroso, 2018; Otto et al., 2019; Činčera et al., 2020). Therefore, primary school education is important for laying such foundations so that in the future students can be active and responsible toward the preservation of nature and the environment (Hadjichambis and Reis, 2020; Chawla, 2018). In this research, where the students wanted to be involved in thinking and drawing conclusions about the balance of nature and the possibility of influencing it, it was necessary to develop students' empathy toward nature and living beings in order to understand how everything in nature is connected, because a single bad decision can have big consequences on other living beings. With this approach, students can develop moral and ecological values and adopt responsible and desirable behaviours in their daily life (Cho and Lee, 2016).

The durability of knowledge, along with the use of videos, is also supported by the theoretical concept of the „Cone of Experience" and choice of media for optimal learning by Edgar Dale (Matijević, 2006). According to him, there is a 30% – 50% probability that students will remember what they learned after two weeks if they use only visual messages received through videos, but a 70% probability if they, for example, watch the video and participate in the discussion. An educational video is of great help in conveying the teaching content that is difficult for students to understand (Sukmanasa, Novita and Majid, 2019), because by combining the auditory and visual components, the information is immediately processed in the working memory and transferred to the long-term memory. Therefore, videos can really help in achieving the prescribed educational outcomes. In addition, videos make lessons more interesting if the teacher's explanation is accompanied by images and sounds.

Education about the environment and preservation of the balance of nature is important for sustainable development (Petrigna et al., 2022) and achieving economic, social and ecological balance. There are several pedagogical models involving students in environmental activities. In this research, we wanted to influence their ecological awareness and knowledge about the environment. Everything was done using problem-based learning and collaborative student work. It was the teacher who was an important factor in helping students achieve the desired educational outcomes. The teacher's words, presentation, textbook,

worksheets and guided discussion on the topic (with the application of active learning) proved fruitful in this grade, and the students achieved the required educational outcomes and showed an understanding of the balance of nature. As usual, it is up to the teacher to provide appropriate material to encourage communication and dialogue between students, using strategies such as educational games, films or photo presentations. In the phase of explaining facts and structuring ideas, it is important that students present their own experiences, and that the teacher encourages their communication. A recent study showed how students constructed their knowledge both by collaborating with the teacher and using the media (video presentation) (Matijević and Topolovčan, 2017).

In research by Rumambi et al. (2021), some students learned about the ecosystem outdoors, and others in the classroom, using traditional instruction in which the students were passive. It was observed that the students who learned outside the classroom showed better knowledge about the ecosystem. In the open air, the students could observe, smell, listen and touch, and the brain had more stimuli in interaction with the environment, so the students were actively researching, and the teacher only guided them (Rumambi et al., 2021). The aforementioned authors state that in outdoor learning, students see real objects by looking at them and touching them, and thus remember more compared to students who only hear descriptions of these objects without actually seeing them. The research presented here has shown that student – using active work methods and collaboration to learn about the ecosystem – can learn in the classroom as well. The teacher brought sprigs of forest plants to students in all groups, everyone listened to the sound recording of forest animals and looked at their photos, and everyone actively worked on the tasks. There was a good learning atmosphere in the classroom and students could freely discuss and express their opinions and questions. It was this kind of active teaching that contributed to the required understanding of the balance of nature and the living community of the forest.

In future research, we definitely recommend making a comparison of the research on this topic on two groups of students, with one learning about the ecosystem outdoors, in field classes, and the other learning the same content in the classroom, but using active learning methods. It would be desirable to have a larger sample of respondents, and it is important that everyone is taught by the same teacher, because each teacher has different working methods and knowledge, and perceives the importance of a particular topic differently, all of which can affect students' conceptual understanding.

CONCLUSIONS

It can be concluded that the students in the fourth grade of elementary school successfully achieved the required educational outcomes related to the living community of the forest and the balance of nature, regardless of whether they watched videos in the classroom or not. After two weeks of learning about the living community of forest and the balance of nature, the students showed significant progress in knowledge and achieved the required conceptual understanding of the concepts. The work of the teacher who applied appropriate teaching strategies and collaborative learning in the classroom was crucial. This is precisely why it is necessary to invest extra efforts in working with today's teacher practitioners, but also in the quality education of future teachers, because they will have a key role in the methodical design of science lessons, and thus will influence the necessary and important science literacy of students who should be active citizens and have a sustainable lifestyle.

Although the issue of environmental protection and promotion of sustainable development has gained importance recently – where children learn about nature maintenance, biological diversity and the balance of nature in several science-based subjects – it is not enough to just expand the teaching content. We must also adapt the methods of work in the classroom. Through effective teaching about the balance of nature, it is necessary to train students for critical thinking, problem thinking, problem solving and understanding the conflicts of a changed way of life, as well as enhancing their social, economic and technological development.

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Utječe li strategija poučavanja na razumijevanje pojma prirodne ravnoteže?

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Ključne riječi:
nastavne metode, nastava Prirode i društva, prirodna ravnoteža

Sažetak

Razumijevanje i dijeljenje znanja o prirodnoj ravnoteži u životnim zajednicama osnova je opstanka čovječanstva. U provedenom istraživanju željelo se ispitati utječe li strategija poučavanja na konceptualno razumijevanje prirodne ravnoteže kod učenika četvrtih razreda. Pritom su učenici četvrtog razreda osnovne škole (N=52) podijeljeni u tri skupine, u kojima ih je sve poučavala ista učiteljica; prvu skupinu poučavala je o prirodnoj ravnoteži oslanjajući se samo na prezentaciju, druga je skupina uz to gledala i videozapis bez dodatnih pojašnjenja, dok je treća skupina imala vođeno gledanje videozapisa uz objašnjenja. Provjeravano je znanje učenika na početku i nakon procesa učenja. Koristeći dvofaktorsku ANOVA-u, nisu utvrđene značajne razlike između skupina u znanju o životnim zajednicama (glavni učinak faktora Grupa: $p=0,242$; $\eta 2=0,056$) i prirodnoj ravnoteži (glavni učinak faktora Grupa: $p=0,980$ $\eta 2=0,001$), dok se učenje pokazalo učinkovitim za oboje (glavni učinak faktora Učenje: $p<0,001$; $\eta 2=0,387$ i $p<0,001$; $\eta 2=0,523$). To ukazuje na to da su kolaborativno učenje i aktivna suradnja učenika važni i pomažu učenicima steći potrebno konceptualno razumijevanje određenih sadržaja i bez IKT podrške.