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Juris Porozovs*, Laura Liepniece, Daina Voita

Evaluation of the Teaching Methods Used in Secondary School Biology Lessons

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Abstract: The teacher's skills in conducting the lesson and choice of teaching methods play an essential role in creating students' interest in biology. The aim of the research was to study the opinion of secondary school students and biology teachers regarding the most successful teaching methods used in biology lessons and viable options to make biology lessons more interesting. The research comprised polling students and biology teachers from several schools, namely: 2 secondary schools in Jelgava, 2 in Riga and 1 in Vecumnieki. The responses revealed that 58% of students find biology lessons interesting. 56% of students indicated that their ability to focus attention during biology lessons depends on the task presented to them. Most of all they prefer watching the teacher's presentations, listening to their teacher telling about the actual topic as well as performing laboratory work and group-work. Many students like participating in discussions, whereas a far smaller number would do various exercises, individual tasks, fill out worksheets or complete projects. Least of all students wish to work with the textbook. The methods most frequently applied by teachers are as follows: lecture, explanation, demonstration, and discussion. Teachers believe that their students prefer laboratory work and discussions as well as listening to their teacher and watching presentations or films. They also indicate at the necessity to link theory with practice and to involve information technologies. While teaching their subject biology teachers try to establish relationship between theory and real life in order to develop their students' interest in natural processes.

Keywords: biology lessons, teaching methods, interest, secondary school students, teachers.

Introduction

Students' academic success and learning motivation, to a significant extent, depends on the teacher's ability to engage students' interest, choice of teaching methods, and their skill of conducting the learning process. Successful application of teaching methods allows for students to better acquire the subject.

Natural science problems are a fundamental part of comprehensive curriculum. Broad and deep understanding of those problems not only facilitates school graduates' career related decisions but also provides for an educated society and sustainable development (Gedrovics, Praulīte & Cēdere, 2012). Even though the majority of school students in Latvia do not demonstrate great interest in natural science subjects (Цедере, Гедровицс & Можейка, 2014) and in many European counties the interest has recently decreased, too (Osborne, Dillon, 2008), research has proven that in general students prefer biology to, for instance, physics or chemistry (Holsterman, Bögeholz, 2007, SjØberg, Schreiner, 2010).

The most popular biology teaching organisation method is a lesson. In Latvia biology lessons have to ensure the realisation of ideas included in all conceptual education related documents (Praulīte, 2008).

***Corresponding author: Juris Porozovs,** Riga Teacher Training and Educational Management Academy, Latvia
Laura Liepniece, Daina Voita, Riga Teacher Training and Educational Management Academy, Latvia

Lessons have to take place in appropriate environment - biology lab. However they can be conducted also in the nature or at a museum. The choice of teaching organisation techniques is defined by the content of the material to be acquired and of the aim to be reached. For the purpose of acquiring the desired result, the teacher selects adequate themes and methods, as well as ensures the availability of visual aid (Praulīte, 2008). Teaching methods envisage the teacher's aims and actions in accordance with available means and resources. If those lead to adequate students' aim, the learning process is ensured – the student acquires the material and the set aim has been reached (Albrehta, 2001).

A variety of biology issues (cell structure, botany, zoology, human anatomy and physiology, etc.) are taught as early as elementary school, however only on a general level. Whereas in secondary school the material is analysed more extensively, thereby stimulating students' interest. It is highly important that theory be related to practice (Prakop, Prakop & Tunnicliffe, 2007). Equally significant is communication between students and their teacher (Crista, Savesco, 2014). A biology teacher who is motivated to ensure a successful learning process can be of great help to his students (Zion, Sadeh, 2007). An experienced teacher, who understands their students' interests and knows how to choose appropriate methods, can greatly influence the development of students' interest in biology.

The Aim of the Study

The aim of the work was to study secondary school students' and teachers' opinions regarding the most successful methods to be applied in biology lessons and possibilities to make biology lessons more interesting.

Materials and Methods

In order to gain information about secondary school students' and teachers' opinion regarding the most successful teaching/learning methods and ways to make biology lessons more interesting a range of students and teachers were polled. Research questionnaires were given to respondents in 2 secondary schools in Jelgava, 2 - in Riga and 1 – in Vecumnieki. The total of 279 students, aged 16 to 19, and 6 teachers took part.

Results

The study revealed that 58% of students-respondents find biology an interesting subject while 24% deem it uninteresting, with the remaining 18% having provided different answers: e.g. 'depends on the theme', depends on complexity', etc. (see Figure 1). The largest numbers of those disliking biology (38%) are among the10th year students. Many explain their lack of interest with unwillingness to relate their future career with the subject. Among the 11th year students 59% like biology because modern information technologies are often used during lessons and the themes discussed (e.g. genetics) are related to life.

34% of secondary school students state that they have no difficulty focusing on work during biology lessons – listening to the teacher and concentrating on the visuals, completing individual tasks, filling out worksheets, doing laboratory work, etc. (see Figure 2). The majority of students (56%) point out that their ability to concentrate closely correlates with the task presented to them. Only 6% out of total find it hard to concentrate. The remaining 4% have chosen a variety of other answers, e.g. their ability to focus depends on how they feel themselves or on what exactly they wish to do during the lesson. In general senior year students find it harder to concentrate during biology lessons. One of the reasons might be the complexity of material or little interest in the respective subject as they would rather pay more attention to subjects that are closely connected to their future profession.

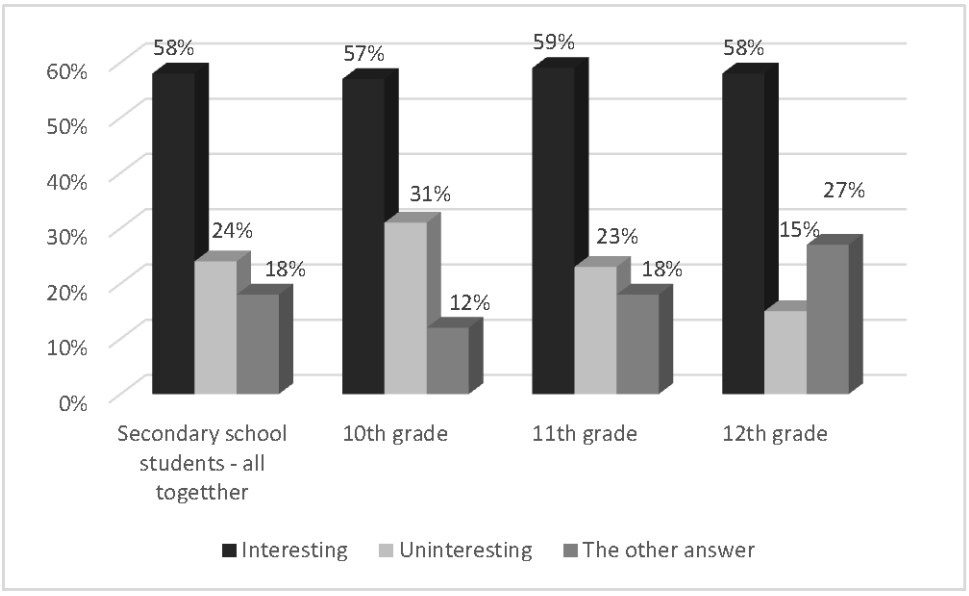

Fig. 1. Students' interest in biology (in % out of total number of respondents)

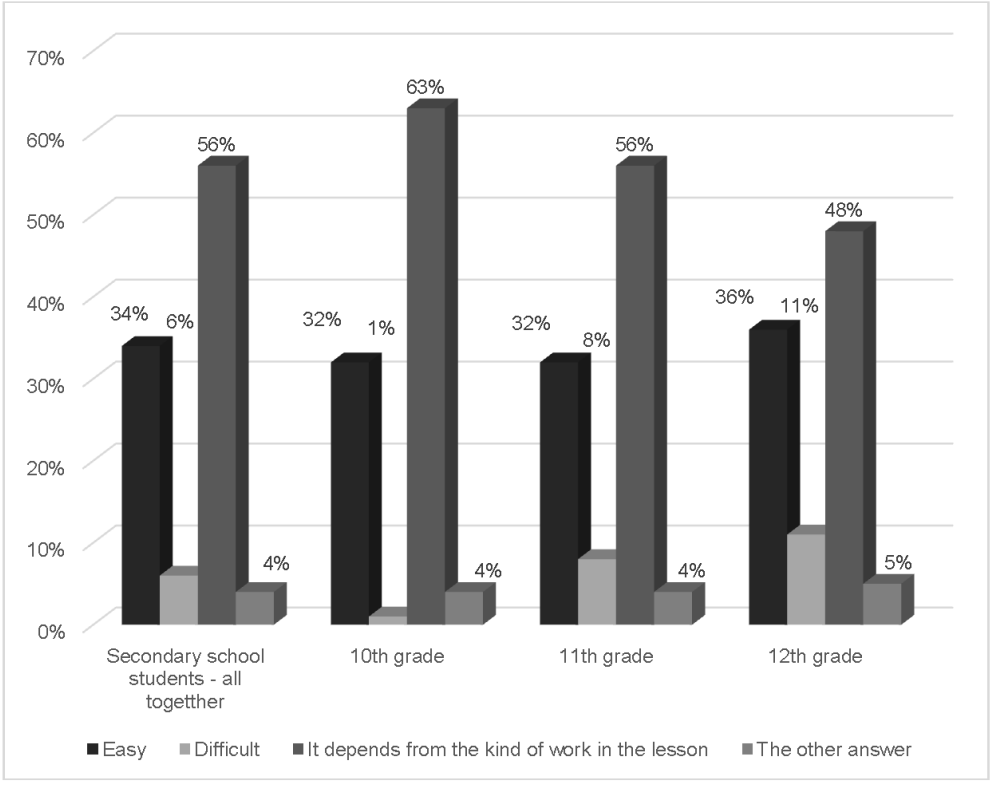

Fig. 2. Students' ability to concentrate during biology lessons (in % out of total number of respondents)

Table 1 presents the students' preferences regarding the best methods applied during biology lessons (ranking from 1 (most preferred) to 8 – (least preferred). The 10th and 12th year students best of all like

presentations prepared by the teacher and the teacher's explanations, while 11th year students would rather do lab-work. All groups of students have ranked group-work as their second preference. 11th and 12th year students highly value discussions. Fewer respondents like fulfilling exercises, individual tasks and filling out worksheets, as well as doing project-work. The least popular method is working with the textbook.

Table 1. Popularity of teaching/learning methods among students

No. from highest rank to lowest	10th year	11th year	12th year
1.	Teacher's presentations and explanations.	Laboratory work.	Teacher's presentations and explanations.
2.	Group-work.	Group-work.	Group-work.
3.	Laboratory work.	Discussions.	Discussions.
4.	Individual work and filling out worksheets.	Teacher's presentations and explanations.	Laboratory work.
5.	Discussions.	Project-work.	Individual work and filling out worksheets.
6.	Completing exercises.	Individual work and filling out worksheets.	Completing exercises.
7.	Project-work.	Completing exercises.	Project-work.
8.	Working with textbook.	Working with textbook.	Working with textbook.

Figure 3 presents the methods most frequently used by teachers (ranking from 1 (most frequently used) to 5 (least frequently used). Most of all teachers deliver lectures, explain and demonstrate. Teachers' responses reveal that discussions are also popular. Least frequently they use pair-work, group-work and individual work.

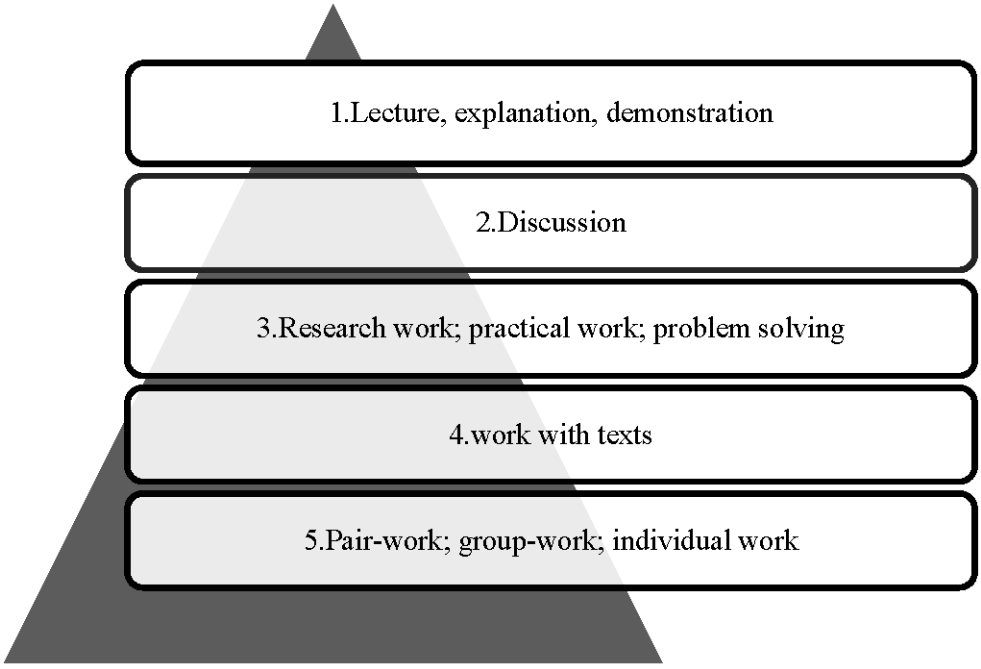

Fig. 3. Methods most frequently used by biology teachers

Students were asked to offer 3 suggestions of how to make biology lessons more interesting. The responses provided show that students would like laboratory work, research, experiments and lessons in the nature. They deem certain topics unnecessary as those lack connection to life. Among other things they have suggested such methods as building models (in smaller groups of whole-class), making presentations (stating that having to explain the material to others would help to better learn and understand it themselves).They would also like to be informed which jobs demand for knowledge of biology; moreover students wished for someone working in the field to be invited to class as this person could tell them about the latest discoveries in biology and their practical application.

Teachers have noticed which methods their students find most appealing. Their opinions are presented in Figure 4. Teachers believe that first of all their students prefer laboratory work (21%), as second most popular they rank discussions (17%), while the 3rd and 4th place are shared by two methods: listening to the teacher and looking at material provided by the teacher, and watching films (both 14%). Further follow: individual work (10%), project-work (7%), group-work (7%), and research (7%). The lowest ranking methods among the teachers are completing exercises (3%) and working with textbooks (0%).

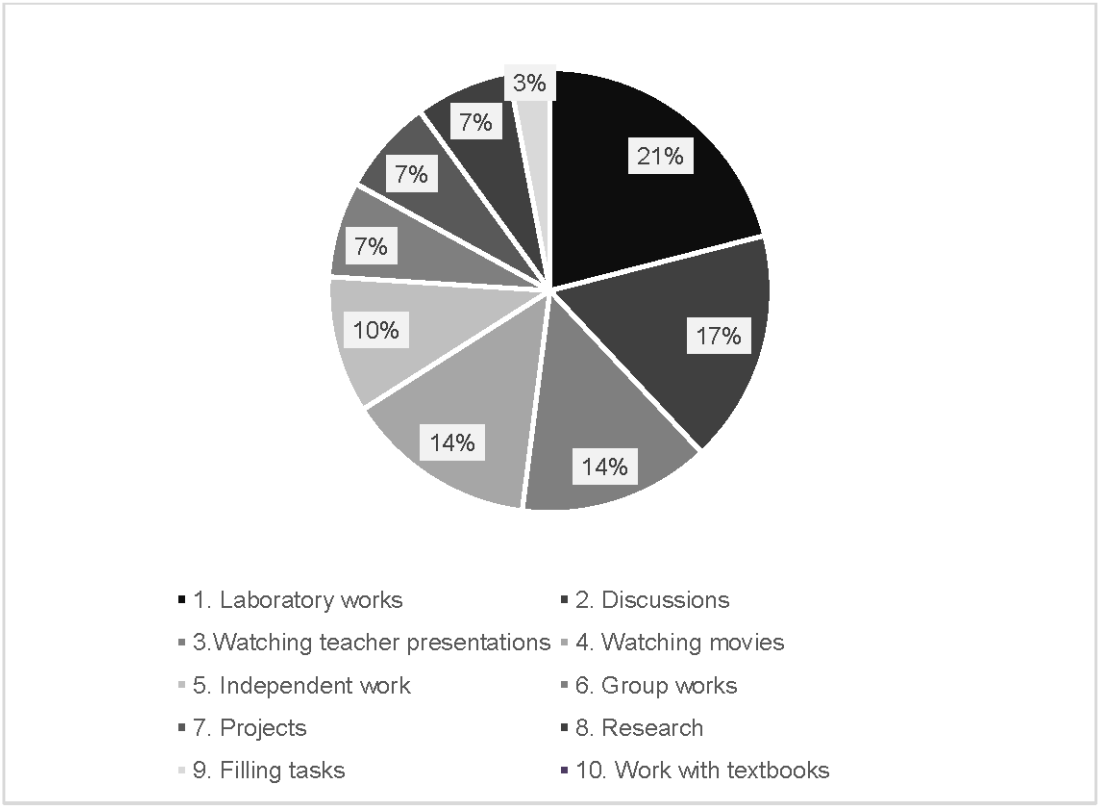

Fig. 4. Teachers' opinions regarding methods most popular among students (in % out of total number of responses)

To the question how they try to keep students' interest during biology lessons teachers' answers are varied. They attempt to create such working atmosphere that the students would feel like scientists who have to research, study, find proof and make conclusions. The teacher's role is to consult, manage time, and conduct the processes. Equally important is to diversify learning environments and teaching methods. With each new topic its connection to real life must be established as this is highly essential for students. If there are video materials available on the topic, the teacher has to demonstrate those. Teachers-respondents indicate that students are most active during practical and laboratory work as well as when working with

interactive board (IWB) while completing tasks in pairs or individually providing answers to questions by means of remote control.

Figure 5 presents teachers' answers to the question what their most important aims with teaching biology as a subject are (ranking from 1 (what teachers consider most important) to 5 (less important). Most important for the teachers is that their students were able to relate acquired knowledge to real life. Therefore during lessons they would present questions like: "Where do we observe this in the surroundings?", "How is this useful?", "How can we practically apply this?". Teachers want to develop interest in the processes taking place in the nature. In general educators believe that students should learn every topic presented to them rather than learn themes selectively (only one particular topic or just the topics that interest students). The study of teachers' responses showed that they teach not only to ensure that their students receive good marks of examination results, but also to develop interest in natural sciences.

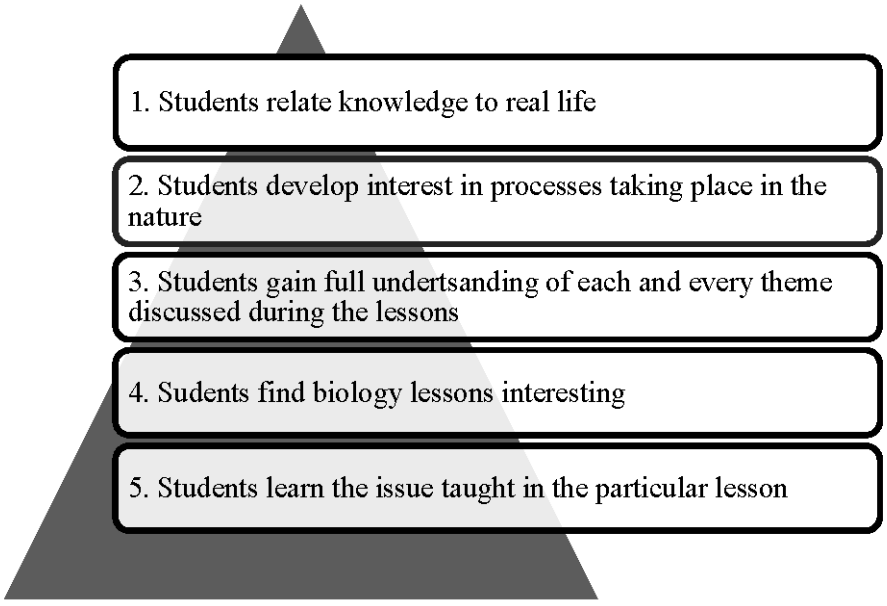

Fig. 5. What teachers wish to achieve while teaching biology

Conclusions

58% of students-respondents find biology lessons interesting. Among secondary school students most show dislike towards biology in the 10th year. 56% point out that their ability to concentrate correlates with the type of task presented to them.

Most of all during biology lessons students like to watch teachers' presentations and listen to them explaining the material. Students also like laboratory work and group-work. Most of them highly value discussions; relatively fewer like completing exercises, doing individual work and project work, and filling out worksheets. Least of all students like working with textbooks.

Students believe that biology lessons could be made more interesting by introducing more laboratory work, research and experiments as well as conducting lessons in the open air. Students are interested in the recent scientific discoveries in the field of biology and they would love to discuss those during lessons.

Methods most frequently applied by teachers are: lecture, explanation, demonstration and discussion. Teachers use also research work, practical tasks and solving problems. Less frequently applied methods are: working with texts, group-work and individual work.

Teachers believe that during biology lessons students prefer doing laboratory work and engaging in discussions as well as listening to the teacher and watching presentations and films. They consider that least of all students like completing exercises and working with textbooks.

Teachers try to keep students' interested during biology lessons by ensuring such working environment that their students could feel like researchers; additionally they consult students and conduct the teaching-learning process. Teachers' aim is to establish connection between knowledge and real life and develop interest in processes taking place in the nature.

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