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Kako pomembna so stališča dijakov do biologije?

Izvleček

Biologija je eno od naravoslovnih področij, ki je v zadnjih desetletjih doživelo največji razcvet. Sočasno z njenim skokovitim razvojem pa se soočamo z upadanjem zanimanja dijakov za ta predmet. V prispevku predstavljamo stališča dijakov Gimnazije in veterinarske šole Ljubljana do poučevanja biologije, biologije kot šolskega predmeta ter biologije kot vede. V ta namen smo uporabili vprašalnik, ki je temeljil na 5-stopenjski Likertovi lestvici. Primerjali smo stališča dijakov gimnazijskega programa s stališči veterinarskih tehnikov glede na spol in leto šolanja. Rezultati so pokazali, da imajo dijaki na začetku izobraževanja enaka stališča ne glede na smer šolanja, saj so se v vseh treh kategorijah stališč opredeljevali enako. Razlike med njimi so se pojavile v drugem letniku, in sicer pri dveh kategorijah stališč. V tretjem letniku pa so bile razlike statistično pomembne pri vseh treh kategorijah stališč. Dijaki gimnazijskega programa so se namreč do biologije opredeljevali bolj pozitivno kot veterinarski tehniki. Pri dijakih gimnazijskega programa so se ocene stališč od prvega do tretjega letnika znižale le pri komponenti poučevanja biologije, pri dijakih veterinarske smeri pa pri vseh treh komponentah. Znotraj posameznih smeri šolanja razlik med ocenami fantov in deklet skoraj nismo zaznali. Pomen rezultatov študije je v diskusiji.

Ključne besede: biologija, poučevanje, stališča

How important are students' attitudes toward biology?

Summary

Biology is one of the disciplines of science that has flourished in the past decades. At the same time, however, there has been a shortfall of interest among prospective students to study biology. This paper presents the attitudes of secondary school students of two programmes (baccalaureate v. veterinary sciences) toward 1) biology as a school subject, 2) biology as a science discipline, and 3) biology instruction. The questionnaire used was based on a 5-point Likert Scale. The data was contrasted according to the education programmes, students' gender, and the year of study. Results show that as they begin their studies, students of both programmes have similar attitudes toward biology, as their answers in all three of the above-mentioned categories were similar. The differences between the two education programmes appeared among second year students and in two of the three categories, but they only became statistically significant among third year students. Third year students of the baccalaureate programme displayed more positive attitudes in all three categories than their veterinary counterparts. As they progressed from the first to the

third year their attitudes showed lower values in the third category, i.e. biology instruction, while the veterinary students' attitudes deteriorated on all three attitudinal dimensions. There were almost no differences in attitudes between genders. The implications of the study are discussed.

Ključne besede: biologija, poučevanje, stališča

Keywords: biology, teaching, attitudes

1. Introduction

Biology is one of the disciplines of science that has flourished in the past decades. At the same time, however, there has been a shortfall of interest among prospective students to study biology. The same applies to all science subjects (Štraus et al., 2007; Abrahams, 2009). Moreover, research conducted in Slovenia has shown that among primary and secondary school students knowledge of biology is the weakest among all science subjects (in: Strgar, 2010).

One of the reasons for this can be found in the way teachers present contemporary biology topics to the students. Namely, the manner in which teachers teach can greatly influence students interest and motivation to learn (Prokop et al., 2007a). The authors agree that changing the way we teach science (biology), and what topics we include, is an ongoing professional concern. They believe that biology instruction should move away from traditional methods and adopt a more student-oriented approach.

But looking at our renewed curricula, we find that this is not the case. Šorgo and Špernjak (2012) wrote the following about the Slovenian Biology syllabus:

“On the other hand, a reading of the Biology syllabus reveals that it was not written from a recognition of the student as active participant in constructing knowledge; instead, this syllabus is teacher-centred. Teachers are given full autonomy to organize their teaching and use various teaching methods and strategies, among them practical work with students. However, from the list of goals and didactic recommendations, we can deduce that practical activities are predominantly regarded as functioning to clarify concepts and illustrate the science content of the subjects and not as intended learning outcomes. Students are not given a role in constructing their teaching experiences according to their interests.”

The authors also maintain that this is contrary to the aim of having laboratory and fieldwork as the dominant forms of school work (Šorgo and Špernjak, 2009). On the other hand, practical activities can greatly influence students' situational interest in a given topic but not necessarily lead to the development of a personal interest that could lead them to a lifetime of engagement in science (Abrahams, 2009). The solution for teachers is to incorporate different teaching methods in their instruction and make use of well-structured practical activities in order to make the most of all dimensions of students learning (Duit & Tesch, 2010).

It is evident that much too often gauge the effects of instruction solely on the amount of information students can recall, while neglecting other dimensions of their knowledge. In 2006, the European Parliament published a framework of eight key competences for lifelong learning. Each competence is presented as a set of knowledge, skills and attitudes. As biology is one of the disciplines dealing extensively with organisms, it should not be limited to a traditional type of instruction. For example, Morgan (1992) finds that only a balanced amount of information and level of involvement lead to forming pro-environmental attitudes. It is therefore necessary to design such instruction methods that would build on all three components of competences, i.e. knowledge, skills and attitudes.

1.1 Purpose of the study

The present study aimed to find whether there are differences in secondary school students' attitudes toward biology depending on their:

- gender,
- study programme, and
- year of study.

2. Materials and Methods

This paper presents the attitudes of secondary school students of two education programmes (baccalaureate v. veterinary sciences) toward 1) biology as a science discipline, 2) biology as a school subject, and 3) biology instruction. The data was contrasted according to the study programmes, students' gender, and the year of study.

2.1 Participants

Table 1 shows the distribution of students according to the study programme, study year and gender. Although the sample of students of the baccalaureate level is relatively low, it still allows us to conduct basic descriptive and inferential statistics in order to form some meaningful conclusions about the topic researched.

Table 1: Distribution of students according to the study programme, year of the study and gender

Programme	N	%	year	N	%
	72	34.8			
Baccalaureate			1	23	31.9
			2	27	37.5
			3	22	30.6
	135	65.2			
Veterinary			1	52	38.5
			2	50	37.1
			3	33	24.4
TOTAL	207	100.0			
Gender					
Male	71	34.3			
Female	136	65.7			

Source: Own research

2.2 Instrument

The questionnaire used was based on a 5-point Likert Scale. A similar questionnaire had already been used with a large sample of primary school and university students (Prokop et al., 2007c; Uşak et al., 2009). Based on factor analysis, the items in the questionnaire were grouped into three categories (Table 2). The attitudes were categorised in following order: (1) biology as a school subject, (2) biology as a science discipline and (3) biology instruction. Cronbach alphas for all categories were satisfactory. Some items needed to be reversed because of their negative connotations.

2.3 Statistical analysis

Initially, factor analysis was used to gain interpretable categories. Then, basic descriptive (means and standard errors) and inferential statistics (t-test and ANOVA) was used to assess possible statistically significant differences between students' attitude ratings. All the data were analysed with the SPSS for Windows 18.0 statistical software.

Table 2: Distribution of items according to factor analysis

ITEM	FACTOR		
	1	2	3
Cronbach alpha	0.87	0.69	0.70
Biology as a school subject			
I hate biology lessons. (Z)	0.80		
I like biology more than other subjects.	0.75		
I would like to have biology lessons more often.	0.72		
I find nature and biology strange. (Z)	0.68		
Biology is not as important as other school subjects. (Z)	0.66		
I find biology lessons very difficult. (Z)	0.64		
I find biological processes very interesting.	0.63		
I get bored during biology lessons. (Z)	0.57		
Nobody needs biology knowledge. (Z)	0.57		
Biology helps me develop my conceptual skills.	0.55		
I frequently learn biology by heart. (Z)	0.48		
Biology as a science discipline			
The progress of biology as a science improves the quality of our lives.		0.78	
Biology is our hope for solving many environmental problems.		0.63	
Biology is an important part of our lives.		0.60	
Working with living organisms in biology lessons is very interesting.		0.52	
Knowledge of biology is essential for understanding other science topics and natural phenomena.		0.47	
Biology instruction			
We often conduct experiments in biology lessons.			0.77
We often work with live organisms in biology lessons.			0.75
We often make field trips as part of biology lessons.			0.73

In biology lessons, teachers mainly talk when
they introduce us to the new topics.

0.62

Note: Z – reversed item.

3. Results

The results showed that as they began their studies, students of both programmes had similar attitudes toward biology (Figure 1a). The differences between the two education programmes showed among second year students (Figure 1b), and by the third year (Figure 1c). Statistically significant differences between students of the two study programmes were present on all three dimensions; most notably, veterinary students expressed more negative attitudes in all three dimensions than their counterparts. The students generally agreed that biology as a science is important, even in our everyday lives, and that biology as a school subject can be interesting, but they did not believe the same about biology instruction. Biology instruction scored the lowest, with average values on the negative side of the scale (i.e. the students disagreed with most of the statements, e.g. “*We often conduct experiments in biology lessons*”).

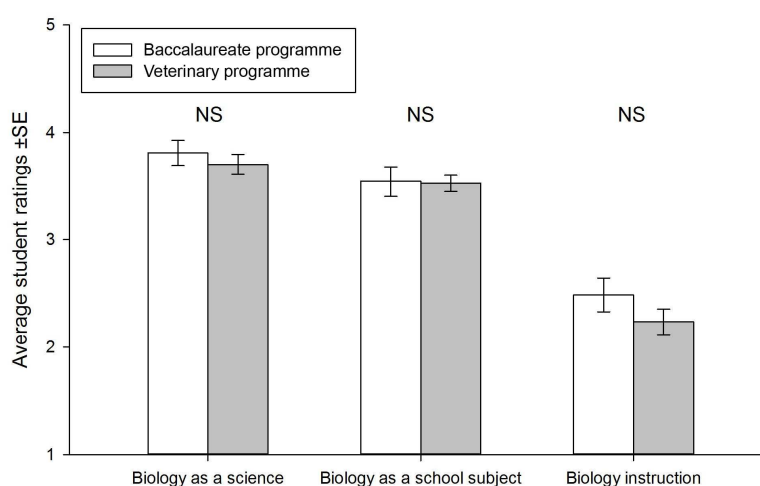


Figure 1a: Students attitude ratings as per study programme and year of the study - first study year. NS=not significant; *- $p<0.05$; **- $p<0.01$; ***- $p<0.001$

Source: Own research

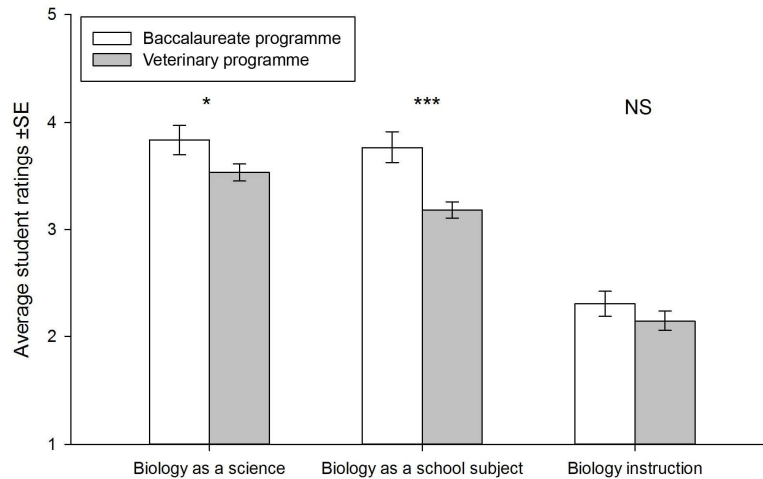


Figure 1b: Students attitude ratings as per study programme and year of the study - second study year. NS=not significant; *- $p < 0.05$; ** - $p < 0.01$; *** - $p < 0.001$

Source: Own research

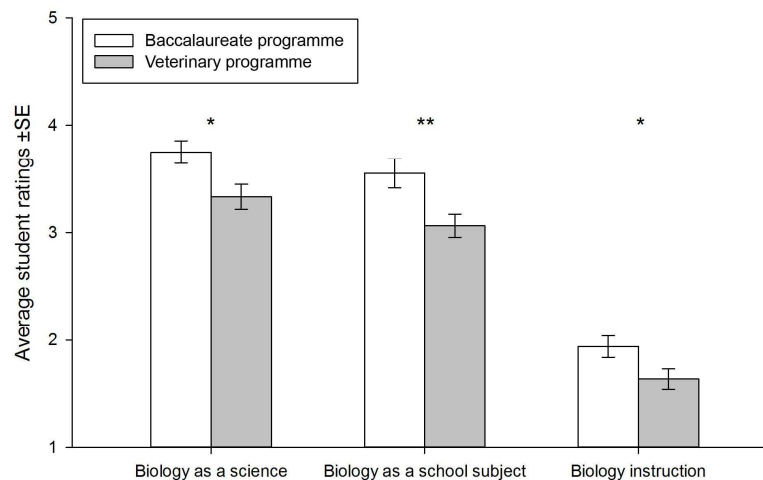


Figure 1c: Students attitude ratings as per study programme and year of the study - third study year. NS=not significant; *- $p < 0.05$; ** - $p < 0.01$; *** - $p < 0.001$

Source: Own research

As they progressed from the first to the third year, veterinary students showed less and less positive attitudes in all three attitudinal dimensions (Figure 2b), while baccalaureate level students' attitudes deteriorated only as regards biology instruction (Figure 2a). Both groups, however, believe that biology instruction includes less and less practical work in each senior year (see discussion).

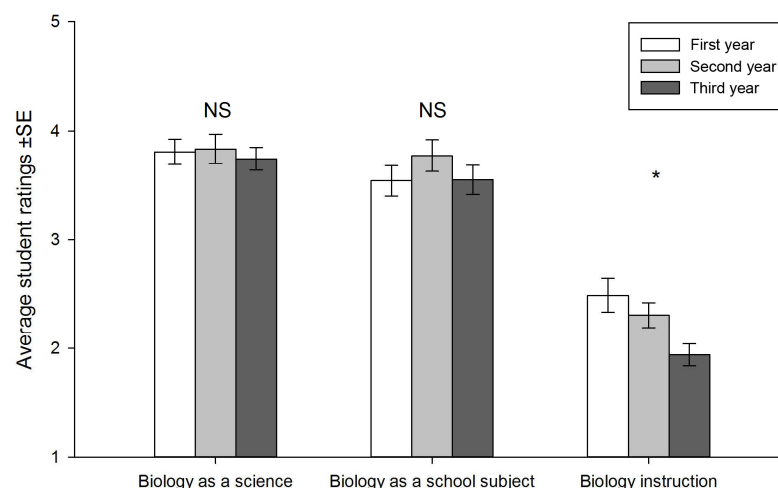


Figure 2a: Students' attitude ratings according to study year and study programme –
baccalaureate programme. NS=not significant; *- $p<0.05$; **- $p<0.01$; ***- $p<0.001$
Source: Own research

There were almost no differences in attitudes between genders, and for this reason the results are not presented in graphical form.

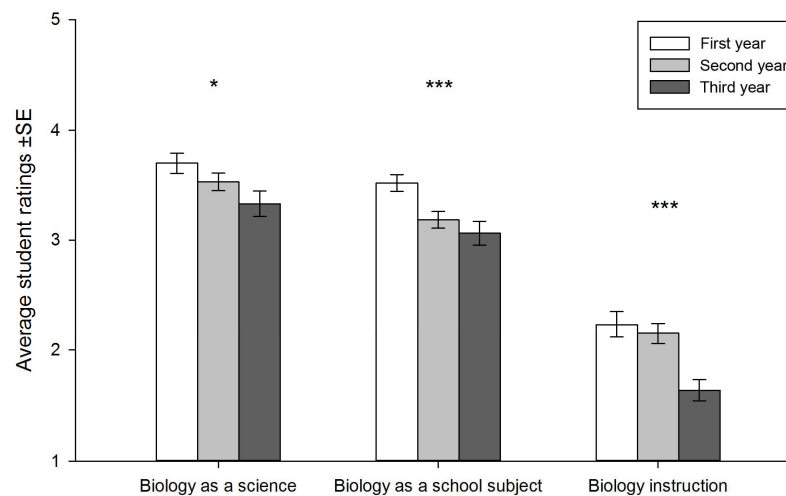


Figure 2b: Students' attitude ratings according to study year and study programme –
veterinary programme. NS=not significant; *- $p<0.05$; **- $p<0.01$; ***- $p<0.001$
Source: Own research

4. Discussion and conclusions

Recent years have seen a growing interest in the research of attitudes in different fields of biology and environmental education. One of such fields is biology education (Prokop et al., 2007a, 2007b; Uşak et al., 2009). This study was based on the research carried out by the above-mentioned authors. However, one more dimension was added, i.e. the attitude toward "biology instruction". Although students perceive the science of biology as important for our

everyday lives, they also believe the same about biology as a school subject. This is in accordance with the research by Prokop et al. (2007c), who found that students generally do not make a distinction between the professions of a biology teacher and a biologist. Prokop et al. also found that teacher characteristics play a significant role in students' attitudes toward biology. Moreover, they claim that students take biology teachers as a model for deciding about their careers. This can be an advantage because biology teachers have in this sense a great power to influence students' decisions; to get them to like biology or even become biologists. The authors of this study believe that it is important that biology teachers, in vocational schools in particular, guide students so that they may become environmentally responsible citizens. Biology can provide a unique perspective on nature and environments in which these students will play an important part (e.g. agriculture, animal breeding, veterinary medicine.).

On the other hand, the results of the study suggest that students who are likely to work with, for example, living organisms (vocational programme – veterinary science) tend to lose interest in biology as they progress with their studies. The reason for this probably lies in the fact that in later years of their schooling they have more practical subjects, while at the same time they may have been introduced to biology in a more theoretical fashion rather than through practical work. The explanation for this comes from the third category (Biology instruction) which was seen by the students as predominantly theoretical. The differences between students of different study programmes could also have appeared because vocational students (veterinarians) do more practical work in other, vocational subjects and thus do not see biology as a subject that particularly abounds with practical work. Therefore, it would be worthwhile to consider including more practical work into biology instruction in order for students to make connections between what they are learning about and their everyday lives - future occupation. Namely, Prokop et al., (2007b) found a significant and positive increase in students' knowledge of ecology, and attitudes toward biology, the natural environment and a prospective career in biology already after students were taken on a short single-day field trip.

Most studies that find gender-related differences in attitudes toward biology included primary and secondary school students (in: Prokop et al., 2007a; Uşak et al., 2009; Uitto et al., 2010). Although our study included secondary school students, no significant gender differences in attitudes toward biology were identified. Uşak et al. (2009) also found almost no gender differences in ratings on any attitudinal dimension, except for university students. The results in this sense are quite diverse and therefore do not yield themselves to any definitive conclusions regarding the impact of gender on attitudes toward biology.

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