



DO WE NEED BIOLOGICAL SKILLS FOR OUR FUTURE LIFE? THE ELEMENTARY SCHOOL PUPILS VIEWS ON THE IMPORTANCE OF BIOLOGICAL SKILLS

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Abstract

The problematic of the biological skills is in the region of Czech Republic investigated on the very low level. The definition of the biological skill should be come out from the definition of general skill, but there are differences in the defining of this concept. Our research was focused on the importance of acquired skills in the biology at the end of the elementary schools according to pupils. The sample size contained from the 91 pupils from all grades of elementary schools in the Czech Republic. The age of respondents was from 11 to 16 years. The measurement tool was a questionnaire included 61 Likert type items dividing into four categories following: 1. Identification of biological questions and problems; 2. The acquiring of biological information; 3. The processing of biological information and 4. The evaluation of results and the determining of conclusions. All items were in the positive meaning. The effect of year of study, gender and final mark from biology was measured on the perceiving importance of biological skills. There was used methods of quantitative evaluation, from descriptive statistics it was mean score and standard deviation and from inductive statistic it was ANOVA, MANOVA and Cronbach's alpha coefficient.

Keywords: biological skills, elementary school pupils, questionnaire.

INTRODUCTION

The problematic of skills is becoming more and more important. The amount of studies of popular and mainly scientific character is growing up. Skills and their acquiring are the part of political programmes, educational aims and competencies. The increased interest is influenced by the change of education at the end of 90th years of twentieth century. The interested parties considered for the necessary to change content, strategies and create general and specific skills, which should be important for the young people in their future life. These changes were aroused by the increasing amount of new knowledge and with the development of information and communication technologies.

Definition of skills

The definition of the biological skill should be come out from the definition of general skill, but there are differences in the defining of this concept. The concept skill is very much used in the educational system, but there is still a problem to find an unambiguous definition in pedagogical and psychological literature. The definitions of skills are changing from country to country. Older definitions explained the skill as fill or partially automatic part of our activity. The newer ones explained the skill concept as an eligibility of pupil to make some concrete activity (e.g. Lawson et al 2000).

The biological skills in research studies

The biological skills are investigated on very low level. However, the investigation of skills could be hidden in the research works focused on the knowledge about and attitudes of respondents toward different biological topics (areas) (e.g. Turkmen 2007). The research literature provides investigation of critical thinking skills in biology, which enable students to use newly acquired information in both academic and nonacademic situations (Moll & Allen 1982). The research studies regarding the problematic critical thinking skills in biology are focused on the developing of project, which should be increase this kind of skill and finding out the influence of this project on the critical thinking skills (e.g. Zohar & Tamir 1993; Zohar, Weinberger & Tamir 1994). The studies had got an empirical character, the method of experiment was used in the investigation.

Purposes of study

The question, what pupils consider for important in their future life from biology should be in the interest not only researchers, but also creators of curricular programs could be show the interest about this problematic. The opinions of pupils are taking into consideration only very marginally. So our study is trying to fill the gap in this area partially.

The main aim of the study is to find out, the importance of the biological skills from the view of elementary school pupils. From this main aim were created additional aims

1. To find out the influence of year of study on the importance of biological skills.
2. To find out differences between boys and girls in the importance of biological skills.
3. To find out, if the final mark from biology had an influence on the results.

From these additional aims were created research questions

1. Had pupils' year of study an influence on the results?
2. Was there difference on the view on the importance of biological skills between boys and girls?
3. Had the final mark the significant influence on the perceiving of biological skills importance?

The hypotheses were not formulated, due to character of investigation. It was done as pilot study.

On the basis of the results the hypotheses will be formulated in the next investigation.

METHOD

Participants

The sample size consisted of 91 respondents from two Czech elementary schools. Both schools were from town with the average number of 20 pupils in the class. For the all school was typical traditional teaching characterized by concerned with the teacher being the controller of the learning environment. Selection of participants was not intentional, but was based on teachers' willingness to administer questionnaires in selected schools. In all cases, teachers administered questionnaires to all pupils in classes. The participants ranged from 11 to 15 years ($\bar{x} = 13.33$; $SD = 1.01$), 16 pupils were from the 6th grade, 26 from the 7th grade, 34 from the 8th grade and 15 from the 9th grade. The sample consisted of 48 females and 43 males. The final mark A from biology obtained 48 pupils, final mark B 34 pupils and final mark C obtained 9 pupils.

The construction of questionnaire

The pupils' importance of biological skills was measured on a 5-point Likert-type scale questionnaire of own construction. The questionnaire was divided into three parts. The first part consisted of demographic variables such as gender, age, year of study and final mark from biology, while the second part consisted of items measuring importance of biological skills. The third part was created by three items regarding to difficulty of items from the second part for the pupils. The original form of the questionnaire was developed in Czech and then was translated into English for publication purposes with the assistance of a native speaker. The second part was created by 5-point Likert type items. These items were divided into four categories: 1. Identification of biological questions and problems (e.g. To incorporate the problem in to specific biology discipline (e.g. botany, zoology, geology ...)); 2. The acquiring of biological information (e.g. To work with microscope.); 3. The processing of biological information (e.g. To connect information from the new text with previous known information from different sources (like books, atlases,...)) and 4. The evaluation of results and the determining of conclusions (e.g. To discuss about own results and compare them with other results.). The second part consisted of 61 items, scoring 1 (strongly disagree) to 5 (strongly agree). All items were in the positive meaning. The total score of individual participants provided a composite index of perceiving of biological skills importance. A low score reflected a relatively negative perceiving of importance and a high score reflected a relatively positive perceiving of biological skills importance. The validity of the questionnaire was established through review by experts in the field of science education and experts on questionnaire development. Reviewers were asked whether the items were relevant to the aim of the study. Revisions were based on their comments and suggestions.

Procedure

Copies of the questionnaire were administered at two Czech elementary schools. Pupils were informed that the questionnaire was anonymous and that it was not a test, but rather a research attempt to explore the perceiving of biological skills importance. Administering of the questionnaires was random. No time limit was given for the finalization of the questionnaire, but the longest time taken to complete it was approximately 20 minutes. The distribution of the questionnaires was done teachers who were instructed about its distribution. All questionnaires (n = 91) were filled out correctly and were included in the analysis.

Statistical Procedure

The reliability of the questionnaire was calculated using Cronbach's alpha coefficient. The value of reliability was high ($\alpha = 0.99$), which indicated acceptable reliability of the questionnaire (Nunnally 1978). The high value of reliability coefficient in our study implied that the instrument used for investigation of pupils' perception of biological skills importance was reliable and its usage for further analysis was appropriate. Values of Cronbach's alpha for categories are presented in Table 1.

Analysis of Variance (ANOVA) with the results for whole questionnaire and Multivariate analysis of Variance (MANOVA) with the results for specific areas as dependent variables and demographic variables (gender, year of study and final mark from biology) as independent categorical variables were also conducted. For more detailed results we used Tukey post-hoc test. Tukey post-hoc test was used in the analysis of independent variables grade and favorite, because these two variables included more than two groups, i.e. 4 years of study and 4 kinds of final mark from biology. Post-hoc tests (in our case Tukey post-hoc test) were used, because we did not know how the means differ, we just know that the means are not equal to each other. To solve this little mystery, we could use post-hoc tests. Post-hoc means "after this" as this is a test we conduct after we already know that there is a difference among the means we are comparing. Results showed statistically significant differences on the levels: $p < 0.05$; $p < 0.01$ and $p < 0.001$.

FINDINGS

The overall mean score of pupils' perception of biological skills importance was 3.95 (SD = 0.59). This suggests that pupils see the importance of biological skills for their future life. Our proposition follows the fact that pupils achieved score higher than 3.00 in all categories (table 1). There was no significant difference found between boys and girls ($F = 0.89$; $p = 0.35$). Girls achieved slightly higher score ($\bar{x} = 4.00$; SD = 0.07) in comparison with boys ($\bar{x} = 3.90$; SD = 0.08). A statistically significant difference was found among pupils' year of study ($F = 8.92$; $p < 0.001$). The pupils attending 7th year of study achieved the highest score, whereas the pupils attending 9th year

achieved the lowest score (figure 1). Tukey post-hoc test showed that pupils attending 9th year of study achieved statistically significantly lower score in comparison with other grades (9th vs 8th $p < 0.05$ and 9th vs 7th, 9th vs 6th $p < 0.001$). The effect of final mark was not significant ($F = 0.21$; $p = 0.81$). The differences in the score was minimal, the trend was expected in the score, the pupils with final mark "A" from biology achieved the highest score ($x = 3.98$; $SD = 0.07$) and the pupils with final mark "C" from biology achieved the lowest score ($x = 3.88$; $p = 0.17$).

Table 1 Basic statistical characteristic of the categories.

Categories	M	SD	α
Identification of biological questions and problems	3.97	0.57	0.90
The acquiring of biological information	4.13	0.55	0.98
The processing of biological information	3.90	0.58	0.98
The evaluation of results and the determining of conclusions	3.75	0.68	0.98

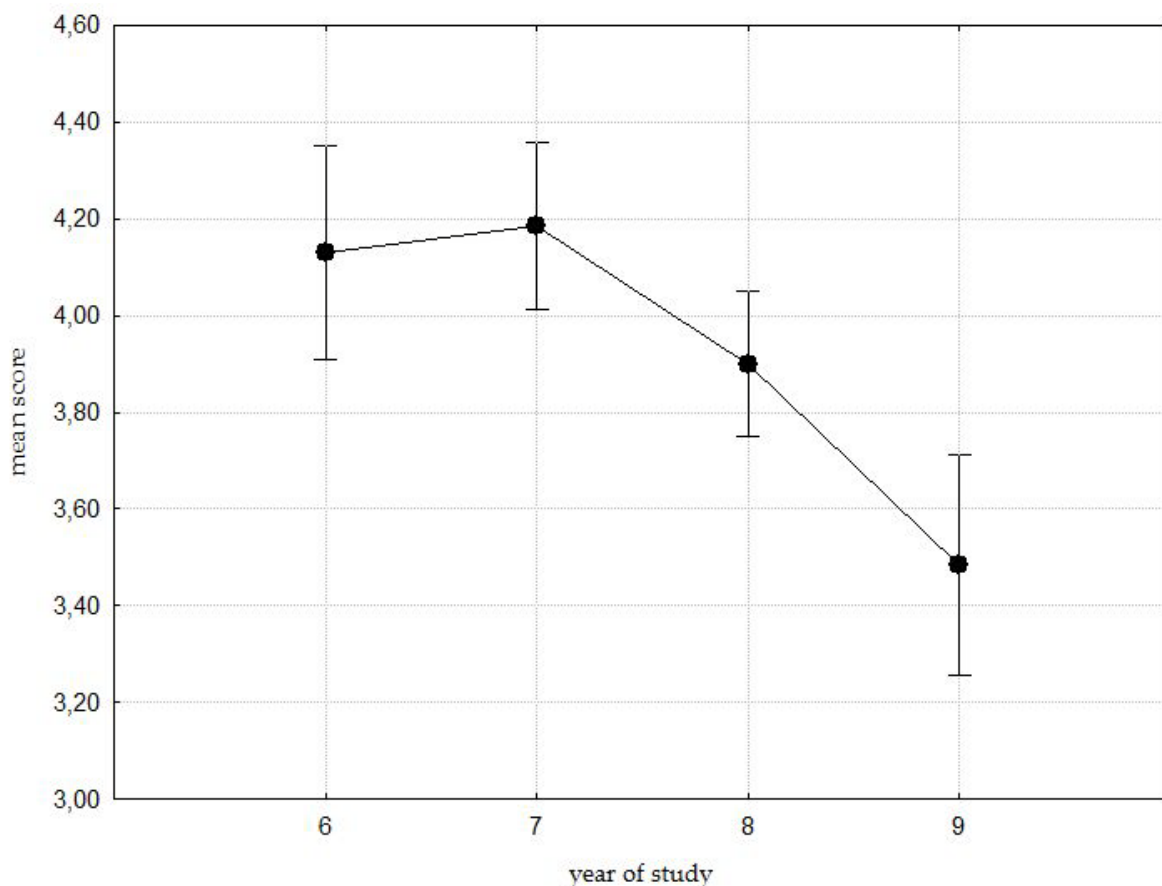
M – mean score

SD – standard deviation

α – Cronbach’s alpha coefficient

size 11, Palatino Linotype

Figure 1 The mean score of pupils with the respect to year of study.



The effect of gender on the categories was not significant ($F = 0.29$; $p = 0.89$). In all categories was similar trend. Girls achieved higher score in comparison with boys and a difference between genders in all categories was also similar. The effect of final mark from biology was also not significant ($F = 0.30$; $p = 0.96$). The score was similar in all categories except the category 4 "The evaluation of results and the determining of conclusions", where the pupils with final mark "C" achieved relatively lower score ($x = 3.61$) in comparison with the pupils with final mark "A" and "B", where the mean score was higher than 3.70 in both groups. The effect of pupils' year of study was significant ($F = 2.39$; $p < 0.01$). In all cases achieved pupils attending 9th year of study the lowest score and pupils attending 7th year of study achieved the highest score except the category 4 "The evaluation of results and the determining of conclusions", where the pupils attending 6th year of study achieved the highest score.

DISCUSSION

The result of our study showed, the pupils see the importance of biological skills for their future life, because they achieved relatively higher score in our investigation. In our research we tried to answer on three research questions. We found out, the year of study had got an influence on the pupils perceiving of biological skills importance. The oldest pupils achieved significantly lower score in comparison with younger pupils. The reason could be caused by the decision of oldest pupils for their future education and the significant part of them did not decide for the study of biology or science subjects. The younger pupils are not decided about their future education, so they could attach the similarly high importance to all subject. The other two variables (gender and final mark from biology) had not got significantly influence on the perceiving of biological skills importance.

CONCLUSION

The contribution was focused on the finding out the pupils perceiving of biological skills importance. As the measurement tool was used the questionnaire with 61 items. The effect of gender, pupils' year of study and pupils final mark from biology was evaluated by the descriptive and inductive statistical methods. The investigation was as pilot study, so the sample size was created by 91 pupils from the two Czech elementary schools. The reliability of measurement tool was high, so the questionnaire could be used in the main investigation, not only in the conditions of Czech Republic, but also in the other countries.

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