

**Questionnaire analysis related to the lesson:
“Optical microscope since the first to the contemporary one”**

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Annex 3

The survey on awareness of students in the substance of research and understanding the nature of science and its importance for society and themselves, developed by the Partner of HIPST project (Annex 2) was carried out before the lesson in two classes of vocational school (2nd grade) and in two classes of junior high school (2nd and 3rd grade). Altogether, 49 students took part in the survey. After the lesson there were only 22 surveyed students from 2nd and 3rd grade of junior high school. A small number of students involved in the survey conveyed after the lesson was due to the fact that the lesson "Optical microscope since the first to the contemporary one" took place in June, the end of school year. The survey consisted of two parts. The second part was slightly changed by us- adapted to our conditions.

PART I

The first part of the survey consisted of general statements. The students responded to the questions using the Likert scale choosing from among five answers: strongly disagree, disagree, neither agree nor disagree, agree, strongly agree.

Surprise for me was the fact that most of the students think that “in science, most of the questions have only one correct answer”. Before the lesson 20% of 2nd grade students, 50% of 3rd grade junior high school students and 75% of 2nd grade vocational school students chose the answers: strongly agree, or agree. After the lesson many students changed their answers from strongly agree to agree, but the percentage rate hasn't changed. On the question “anything that they have ever read in scientific books is true” 40% of 2nd grade students, 32% of 3rd grade junior high school students and 10% of 2nd grade vocational school students answered that they neither agree nor disagree. But most students, 60% of 2nd grade students, 55% of 3rd grade junior high school students and 90% of 2nd grade vocational school students, answered - I agree or strongly agree. In the survey conducted for the second time 100% of 2nd grade students and 69% of 3rd grade junior high school students stated that anything that they have ever read in scientific books is true. Most of the students agreed that “science helps understand the world” but there were some to disagree (at the first and second time the survey was conducted- 20% of 2nd grade students, for the first time 23% of 3rd grade junior high school students and for the second time 6% of them). It was hard for the students to say whether national policy, the economy, financial and family situation, religion and art influence the scientists. ” 80% of 2nd grade students, 45% of 3rd grade junior high school students and 45% of 2nd grade vocational school students chose the answer – neither agree nor disagree, similarly in the second survey. The vast majority of the students agreed that in science there is always one truth – in the first survey 100% of 2nd grade students, 60% of 3rd grade junior high school students and 55% of 2nd grade vocational school students, and in the second survey 88% of 2nd grade students, 56% of 3rd grade junior high school students. In the first survey 100% of 2nd grade students, 72% of 3rd grade junior high school students and 95% of 2nd grade vocational school students agreed that scientist can explain one thing in a variety of different ways. In the second survey in the 3rd grade the amount of these answers rose to 82% . “ Scientists start research having an idea in their minds” – with this statements agreed 60% of 2nd grade students, 40% of 3rd grade junior high school students and 90% of 2nd grade vocational school students, and in the second repeated survey 84% of 2nd grade students, 69% of 3rd grade junior high school students chose this answer. Students believe that a way of explaining something scientific may change over time – before the lesson 40% of 2nd grade students, 63% of 3rd grade junior high school students and 95% of 2nd grade vocational school

students agreed with this statement while after the lesson the rate dropped from 40% to 33% in 2nd grade and to 56% in 3rd grade. I was surprised with this drop.

Interesting are responses to the statement: “ all scientists use the same scientific method” illustrated by diagram (Fig. 1a and 1b).

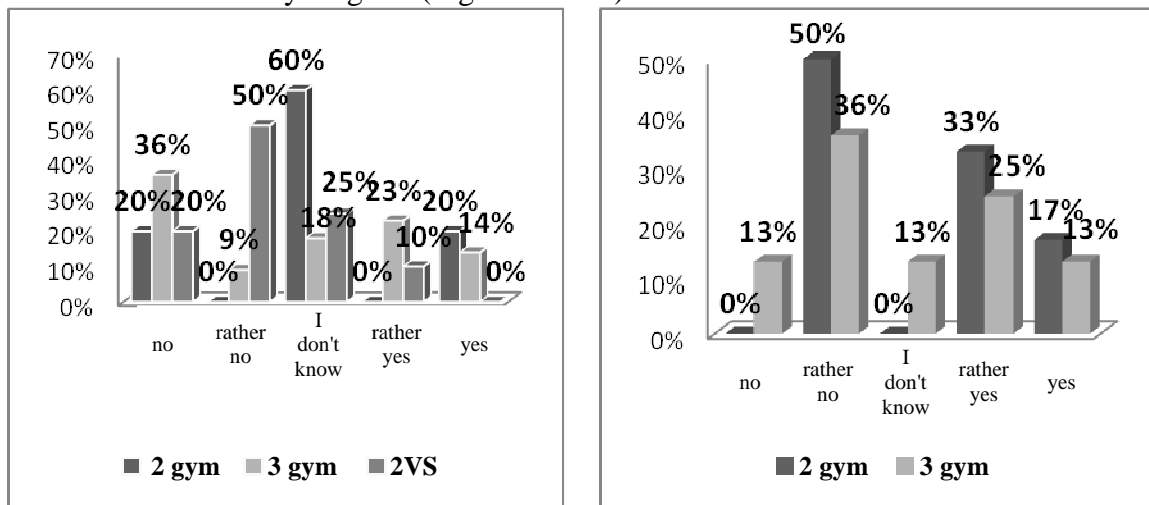


Fig. 1 Answers of students on the question: „All scientists follow the same scientific method” a) before lesson b) after lesson

Most students believe that scientists conduct scientific research in different ways, 80% of 2nd grade students, 77% of 3rd grade junior high school students and 95% of 2nd grade vocational school students chose the answer – I agree, I strongly disagree. However, in the second survey the number of these answers rose to 88% in 2nd grade and to 82% in 3rd grade.

An interesting distribution of students’ responses is observed on statement that science helps to make our life, healthier, easier and more comfortable – Fig.2.

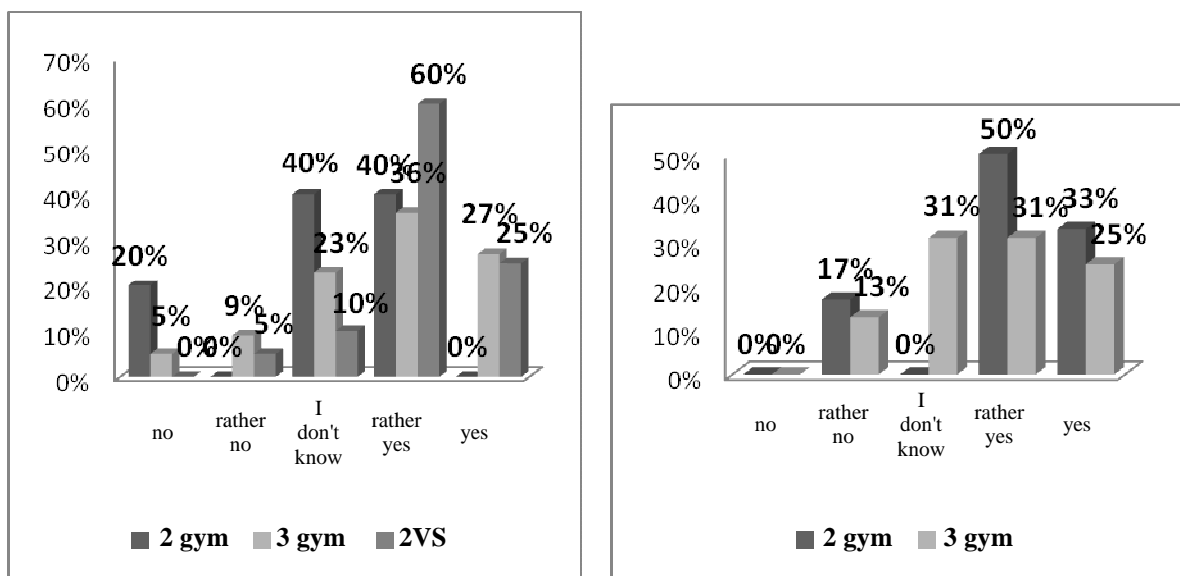


Fig. 2. Answers on the question: „Science helps to make our life healthier, easier and more comfortable” a) before lesson b) after lesson

The students answered that science is both for men and women. Most of them didn't agree that "science is only for talented people". On the statement: “Anything that we learn thanks to science can considerably help us to make decisions in everyday life” only 20% of 2nd grade students, 23% of 3rd grade junior high school students and 10% of 2nd grade vocational school students chose the answers – strongly disagree and disagree before the

lesson. Opposite view had 80% of 2nd graders, 64% of 3rd graders of junior high school and 75% of 2nd grade vocational school students. In the survey conducted after the lesson the answers were alike. Over 50% of the total sample of students questioned both before and after the lesson agreed that we should know anything about science no matter whether it will be helpful or not in our jobs. The answers were as follows: before the lesson , 20% of 2nd grade students, 59% of 3rd grade junior high school students and 90% of 2nd grade vocational school students and after the lesson 66% of 2nd graders and 63% of 3rd grade junior high school students. Both before and after the lesson comparable percentage of students chose the answer – neither agree nor disagree – for the statement: “ The way scientists work is influenced by what people consider important”. (Fig.3)

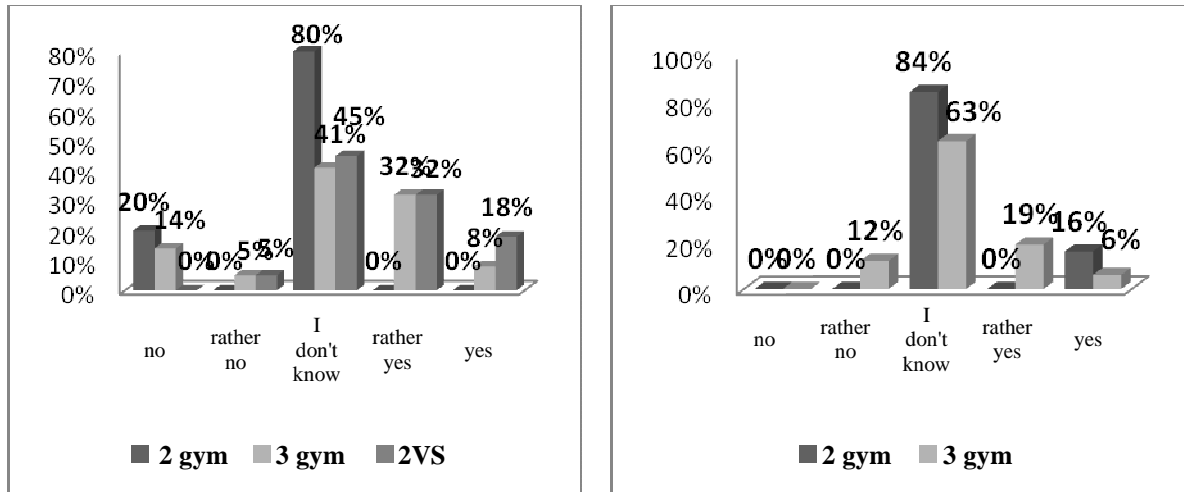


Fig. 3 Answers related to: „The way scientists work is influenced by what People consider important „, a) before lesson b) after lesson

The students had also different opinions of the statement: “ we are all responsible for the way scientific research results are used in everyday life” – Fig. 4.

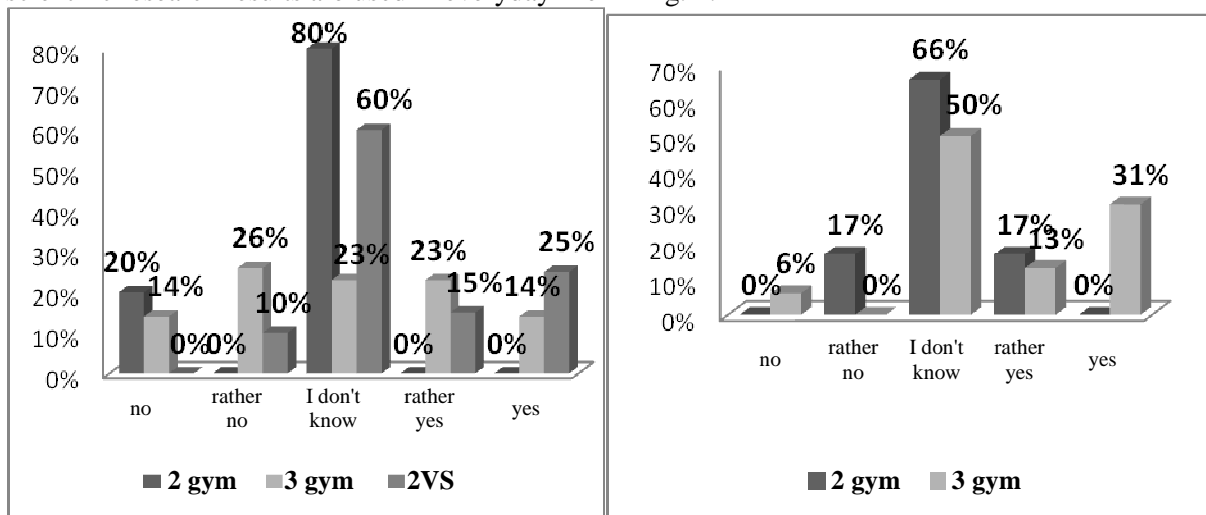


Fig. 4. Answers related to: „We are all responsible for the way scientific research results are used in the everyday life” „, a) before lesson b) after lesson

PART II

The questions in the second part of the survey related directly to the students. There were five responses to choose from: describes me perfectly, describes me moderately, neither agree nor disagree, disagree and strongly disagree. It turned out that in all classes students like discussing their ideas with teachers – before the lesson 40% of 2nd grade students agreed, 64%

of 3rd grade junior high school students and 60% of 2nd grade vocational school students and after the lesson the same opinion had 66% of 2nd graders and 59% of 3rd graders. Surprise the fact that the students like teachers to explain them what to do in science course. Their opinion has not changed after the lesson. This is worrying as it shows that students prefer to reconstruct the knowledge rather than to explore it on their own. The students of both schools indicated in both surveys that they do not like to find out the topic of the lesson on their own. The results of the survey show that some junior high school students and some vocational school students like working alone in science course and the rest of them like working with friends – Fig. 5 and 6, the results were identical in both surveys.

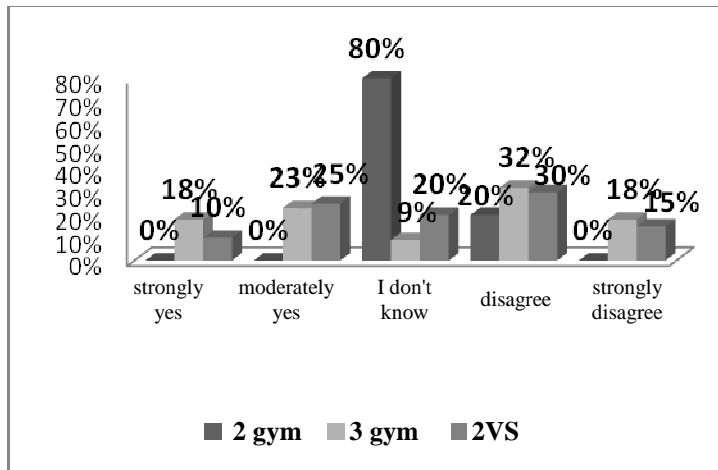


Fig. 5 Answers on: „Some People like working alone in science courses”

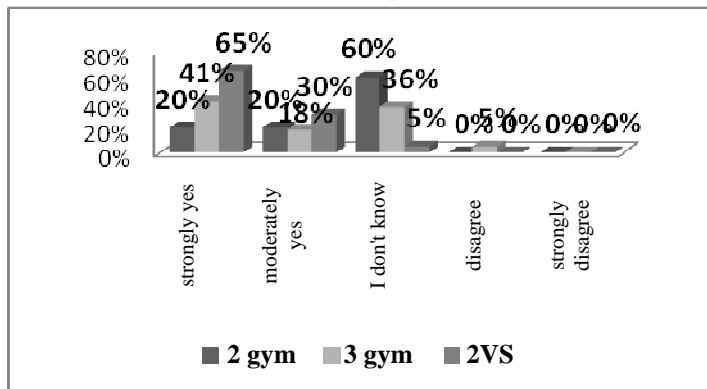


Fig. 6. Answers on: „Some People like working with friends in science courses”

On the basis of this survey it can be assumed that the students also like discussing their ideas with friends. 40% of 2nd graders, 35% of 3rd graders and 95% of vocational school students state that this statement refers to them strongly or moderately. 34% of 2nd graders, 47% of 3rd graders and 50% of vocational school students agree with the statement that “young people believe that it is hard to explore new things in science courses”. Many students, namely 20% of 2nd graders, 50% of 3rd graders and 30% of vocational school students believe that they have to do too much work in science courses. 2nd grade students state that they do not do well in science courses. On the contrary 68% of 3rd graders and 45% of vocational school students do very well. The analysis of the results of the survey show that the students are not very fond of science courses. None of the 2nd graders stated that science course is one of his favorite subject. About 38% of 3rd grade students and 30% vocational school students says that it is one of their favorite subject. Very interesting are the opinions of students about doing well in exams and tests in science courses. Fig.7.

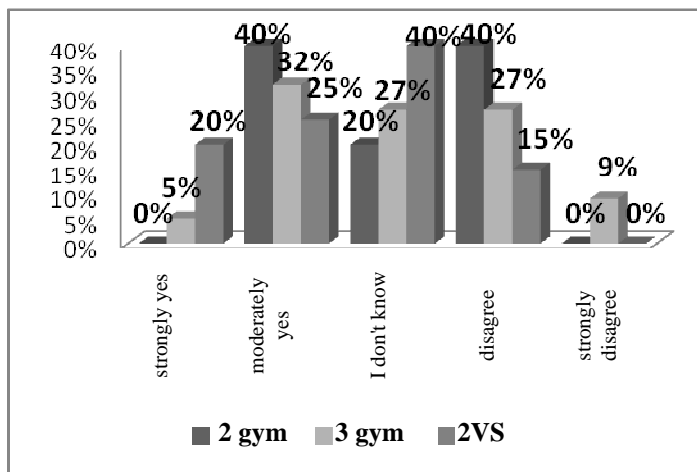


Fig. 7. Answers on: ‘Some People usually do well in exams and tests in science courses’

I was positively surprised at the answers to the statement that: “some people like science courses”

Fig.8

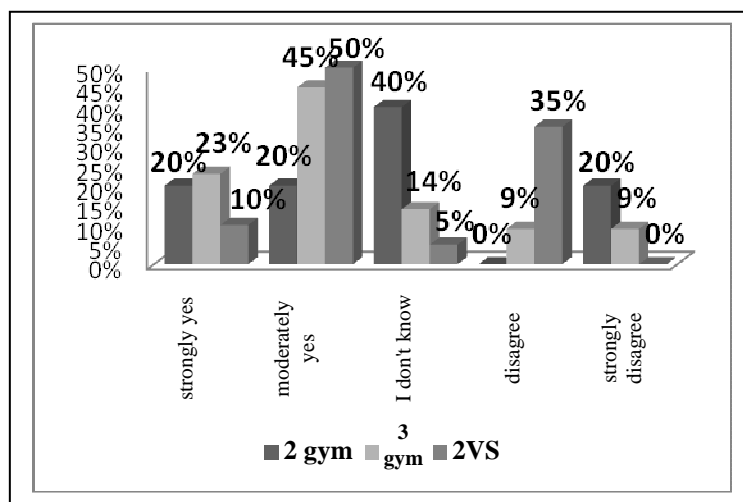


Fig. 8. Answers related to: „Some People like science courses”

SUMMARY

Elements of the history of physics put into lessons contributed to a growing students' interest in its content. Innovative themes increased the activity of students. Students in the talks expressed its appreciation and satisfaction with the form of lesson, which differed significantly from the traditional ones.

However, if it comes to students test results conducted on the basis of the above „nature of science” surveys, given the fact that this type of research had place for the first time, it can be assumed, that the results can be unreliable, as particularly at the junior high school level. It seems that after only one lesson conducted in such a way, the views of students on the nature of science can not fundamentally change. In our view, it should be as often as possible to reach the physics teaching both by incorporating elements of the history and philosophy of science, as well as apply adequate to this subject matter the active teaching methods.

However, according to the analysis of the responses of students to the conducted re-survey after the lesson in some cases awareness of students about the nature and importance of science has changed positively.