A focus group study of physics teachers' views of physics in upper secondary school

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Summary

This chapter gives a summary of the background for the research, the research method, the main findings, and the conclusion to be drawn based on the findings.

Background for the research

This qualitative research with teachers in physics in high school was performed during fall 2001. It is based on findings from the quantitative research project FUN, performed by the Physics Education group at the Department of Physics, University of Oslo, and on Guttersrud's qualitative research with pupils taking physics in high school.
The goal for this research was to find out what the teachers in physics thought about the syllabus in physics, the methods they used in their teaching and also their opinions about what may be done to recruit other groups of students than the groups traditionally choosing physics as a subject. Comparing this qualitative research with the FUN-research and Guttersrud's qualitative research, may open a broader understanding of how the subject works at the high school to day.

The research method used

This focus group research is based on 42 teachers in physics from 27 high schools in Southeastern Norway. All teachers (respondents) had experience from teaching the courses 2FY and 3FY with the syllabus from the high school reform in 1994. Six focus groups were organized. The focus group discussions lasted about one and a half hour each. Focus groups are a qualitative research method, where the goal is to uncover the different views and opinions the respondents have on a topic. The data from the focus groups are not intended to be representative for the population from which the participants are recruited, but aims to generate knowledge and insight about the different views and opinions the participants (respondents) have.

The main findings

- The respondents claimed that the teachers' influence throughb their lessons is an important factor when the students' motivation for a subject is formed. Therefore, well educated and qualified teachers in physics at the lower secondary school level are important to influence the students' interest for the subject as early as possible. The "best" teachers in physics should in the integrated science course in the first year of high school, or at least the physics part of the subject.
- The advisory service (advisors and subject teachers) at the high school should be strengthened to inform the pupils about the choices of subjects, the syllabus, further possibilities of higher

education in physics and career opportunities. Such information should be given before the students are going to choose their special subjects.

- Visits and use of science centres, museums, popular scientific radio- and/or TVprograms and articles from popular scientific magazines should to a larger degree be prioritized, since these may be an eye-opener and create curiosity and astonishment in the pupils.
- The respondents claim that the 2FY course is experienced by the pupils as a difficult, mathematical and work demanding subject. Regardless of which topic the teacher starts with in 2FY, the topic quickly becomes difficult for the pupils. Possible reasons for this could be that the transition from the first to the second year is large. The first year at the high school level has a lot of repetitions of the lower secondary school syllabus. Many pupils have more lessons a week in the second year than in the third year, giving a larger work load.
- Findings indicates that the mathematics take up too much of the time available, especially in 2FY. This is due to the pupils' lack of basic mathematical knowledge, especially algebra. The time spent on the mathematical problems is at the expense of the time spent on the qualitative sides of physics.
- Many respondents wanted to reduce the number of topics, especially in 2FY. 2FY should contain only a few topics. In this way 2FY will appear as a more uniform subject for the pupils. This will also reduce the time pressure many teachers experience today.
- Findings indicate that more practically oriented physics should be included in the curriculum. In this way, physics could be more in accordance with the students' every day life.
- The respondents claimed that they in their teaching are using a qualitative approach with discussions of terms and concepts more frequently than the pupils in FUN claimed. Possible reasons for the pupils' view could be:
    - Pupils and teachers may have different view of what a qualitative discussion is.
    - Most of the teachers claimed that they often started with qualitative discussions when new terms were introduced. It was what they talked about, while the mathematical terms followed and often were written down on the blackboard. This could be a possible reason why the pupils believed that the mathematics had the focus.
    - The understanding, or the qualitative side of the subject, was overshadowed by the mathematics.
    - The textbooks had focus on the mathematical formulas and the use of them, both in the theoretical part and in the exercise part of the books.
    - Qualitative questions are underrepresented both in progress checks and exams.
    - The time pressure due to a lot of theoretical subject matter both in 2FY and 3FY, resulted in the qualitative sides often yielding to the mathematical sides.
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- The experimental side of the physics subject has, according to the teachers, an important and integrated place. The pupils claim it is interesting and fun to perform experiments; however, according to FUN the pupils consider it not to be very important or characteristic for the subject. Possible causes for pupils' opinions are, according to the teachers:
    - The teachers do not always give a clear purpose for performing the experiment
    - The teachers are not always conscious about why the experiment should be performed
    - Most teachers do not grade the pupils' experimental work. This may be one of the reasons why the pupils do not consider experimental work as important, because it is not important for the grade the pupils get in the subject.
    - Some teachers claimed that because the syllabus does not any longer specify a certain number of exercises to be performed, one was more free to adjust the time used on other things.

- Many teachers agreed with the pupils that more time could be spent discussing terms in the whole class, instead of in groups. This is a method many used in their teaching.

Conclusions

On the background of the problems to recruit pupils to science at all levels in the educational system, it is obvious to emphasise that more students should be given the opportunity to experience physics as an interesting subject. Both the teachers and the advisors are and will be an important factor when the students make their decision about the subjects to choose. In this study, the respondents' clear advice was to raise the teachers' competence, both for the teachers in science at the lower secondary school level and also for the advisors at all levels. A very important point for the teachers in physics is to kindle the pupils' interest and curiosity in physics as early as possible in the educational system, and to give the pupils positive information about the subject's possibilities before they make the decision about which branch of study to choose.

Most of the teachers in physics claim that given today's physics curriculum, the recruitment potential for 2FY is already nearly fully realized at the schools where they are working. More respondents claim that the problem is that too many students do not continue with 3FY, and further to physics related higher education.

To be able to recruit more students to 2FY, many teachers claim that the physics curriculum needs to be revised; 2FY needs to emerge as a more uniform subject. Fewer topics, where the use of mathematics is reduced and a more qualitative approach is chosen, is preferable. If 2FY appears as an interesting and more ordinary subject, more pupils will be motivated to chose the subject, possibly resulting in more students continuing to physics-related higher education. 3FY is in this study described as a subject containing too many topics for the time available, this on the expense of the qualitative approach and therefore on the expense of essential understanding of the physics.

Some claimed that two varieties of 2FY should be offered. One variety could be for the pupils not planning to continue with physics. 2FY could contain topics suitable for pupils continuing with chemistry, biological and/or health related studies like medicine. The other variety could be aimed at pupils continuing with 3FY and further to physics-related higher education. These pupils will have the necessary background from the recommended mathematics courses, and this will enable the pupils to understand and use the mathematic needed in 3FY so that 3FY could be a course preparing for physicsrelated higher education.