

Prof. Dr. Mojca Čepič
Faculty of Education, University of Ljubljana
Kardeljeva ploščad 16
1000 Ljubljana
Slovenia

Studijni oddeleni-doktorske studium
Univerzita Karlova v Praze
Matematicko-fyzikalni fakulta
Ke Karlovu 3
121 16 Praha
Czech Republic

Referee report on Doctoral thesis by Ms. Marie Snetinova

I was appointed by the corresponding Subject Board of the Matematicko-fyzikalni fakulta as the referee of the Doctoral Thesis with the title "Quantitative Physics Tasks" submitted by Ms. Marie Snetinova.

After a thorough examination of submitted thesis I state the following:

a) General

The presented thesis extends over 273 pages. The work is divided to 4 Chapters describing the present state of art, the motif for the study, the study in schools and conclusions in details and 5 Appendices reporting the tools designed by the candidate and used in her study. The work includes tables and figures where appropriate and adds an extensive list of cited literature.

b) The content

The first Chapter reports in details on existing reports on solving physics tasks that is a well-known problem worldwide. The problem is enlightened from several aspects. The situation in Czech Republic is discussed with respect to the reports of authors discussing this situation. As the semantics in the studied area is still rather vague, the candidate added a very useful short vocabulary of terms and their meanings, which lifts the possible ambiguities in the continuation. The chapter is concluded with the problem and the research plan for work.

The second chapter reports the state regarding the "Solving physics tasks" assessed by questionnaires filled-in by students and their professors. The questionnaires are authored by the candidate and present her original scientific contribution. The analysis of responses has shown a similar situation as everywhere. Students predominantly use methods that do not rely on understanding but fit variables to equations with almost non-existent consideration of physics background. The results are crucial for the most important part of the work, for development of seven different activities that help students develop efficient methods based on understanding the physics behind the task.

The third Chapter reports the seven activities entitled: careful reading, conditions of law's applicability, principles needed for solution, classifying the equations, reasonableness of the answers,

solving aloud and creating own solving plans. Each activity is constructed with the aim to clarify one of specific problems indicated in the analysis of the questionnaires. The activity consists of instructions to the teacher, well-stressed aims and working sheets for students. All activities were tested qualitatively and students and teachers reflections are given. Teachers involved in the study welcomed activities and they intend to use them in future as well. All activities and modes of their evaluation are an original contribution of the candidate.

The fourth, the last Chapter is the summary of the whole work.

Appendices include all the materials needed for the study. In this way, the reader is able to form her/his own opinion on materials. Materials are also publicly available.

c) Presentations and publications


The candidate has published the work related to the submitted thesis in 4 publications: the collection of physics tasks in electricity and magnetism, the scientific paper and two publications in Proceedings that accompanied active presentations on GIREP seminars. She presented her work at various occasions as well, for example, she has a lecture on the topic during her stay at the Faculty of Education, University of Ljubljana.

d) Conclusions

The submitted work of Ms. Marie Snetinova answers demands of modern physics teaching, it is original and could be applied for teaching purposes in future. The problem of non-scientific approach to solving tasks used by majority of secondary school students is approached very innovatively. It opens a wide range of applicability in teaching and learning physics. I intend to introduce and discuss activities to our student at didactics of physics as well.

To resume, the work of Ms. Marie Snetinova presents an original contribution to physics education research and has a strong application value for teaching and learning of physics in future. The content of the thesis undoubtedly proves the ability of Ms. Marie Snetinova to continue her research as a creative and independent mind.

Therefore I suggest the author is invited to defend the thesis and obtain the corresponding title.



Mojca Cepič

Prof. Dr. of physics education (habilitation Faculty of Education, University of Ljubljana)

Prof. Dr. of physics (habilitation Faculty of Mathematics and Physics, University of Ljubljana)

Ljubljana, 10th August 2015