Physics education

Non-formal physics education

supervisor: doc. RNDr. Marián Kireš, PhD.

study form: full time

Annotation: It's become apparent that popularization activities competitions science centre activities (Inquiry science laboratories) and summer science camps have positive influence on attitude to physics education. All mentioned activities are included into non-formal education, which meaning and contribution is rapidly grooving lately. PhD student will be participated on running activities under national project IT Academy. The core activity will be to develop student`s portfolio for future carrier selection in science and technology studies. The series of activities will be developed and verified. The influence on non-formal educational activities on attitude to scientific carriers will be evaluated by using of didactical research methods.

Literature:

[1] Kennedy, T. J.; Odell, M. R. L.: Engaging Students in STEM Education, Science Education International, v25 n3 p.246-258, 2014, dostupné: http://files.eric.ed.gov/fulltext/EJ1044508.pdf

[2] Avery, Zanj K.; Reeve, Edward M.: Developing Effective STEM Professional Development Programs, Journal of Technology Education, v25 n1 p55-69 Fall 2013, dostupné: http://files.eric.ed.gov/fulltext/EJ1020199.pdf

[3] The Coalition for Reform of Undergraduate STEM Education: Achieving Systemic Change: A Sourcebook for Advancing and Funding Undergraduate STEM Education, Association of American Colleges and Universities, 2014, dostupné: http://www.aacu.org/pkal/sourcebook

Formative assessment in physics teaching at secondary school.

supervisor: doc. RNDr. Zuzana Ješková, PhD.

study form: full time

Annotation: Formative assessment is one of the most effective educational interventions to influence students´ achievements in their process of learning. Formative assessment is aimed at providing feedback (from teacher to student and from student to teacher) to assist students´ learning. The main thesis goal is to analyse available formative assessment tools and consider their implementation to support learning in physics. The PhD student is expected to design a set of formative assessment tools for inquiry activities that will be consistently implemented into the inquiry-based learning scenario in order to develop understanding as well as inquiry skills so that learners assume more responsibility and become more independent in their own learning. The effectivity of the designed model will be evaluated by pedagogical research.

Literature:

[1] P. Black and D. Wiliam, Assessment and classroom learning, Assessment in Education 5, 7, 1998

[2] E. Etkina, A. Karelina, S. Murthy and M. Ruibal-Villasenor, Using Action Research to Improve Learning and , Phys.Rev.St Phys.Educ.Res 5, 010109, 2009

[3] W. Harlen, Assessment & Inquiry-Based Science Education: Issues in Policy and Practice. [online]. Global Network of Science Academies (IAP) Science Education Programme (SEP), 2013

Interactive methods and technologies in teaching physics of the microworld.

supervisor: doc. RNDr. Jozef Hanč, PhD.

study form: full time

Annotation: The thesis is focused on physic education research in the new curriculum (content and approaches) in teaching physics using the latest interactive teaching methods and digital technology. The new curriculum should more reflect current scientific knowledge and technological progress as traditional. At the same time it should provide the necessary foundation for future natural scientists and engineers who will be working on such problems as the design of new conductive materials, data storage of high density and access speed, new communications technologies, nanoscience and nanotechnology, alternative energy sources, quantum computers, computer drug design, and modeling of complex systems involving extreme climatic and geophysical phenomena.
The work of a PhD student will be concentrated on study, selection and preparation of educational activities in physics of the microworld, supported by experiments. The main goal will be research dealing with the implementation of the new content in the micro-world physics in the school curriculum with subsequent analysis of the impact and effectiveness of selected methods and technologies.

Objectives:
1. Study the current state of education in modern physics applications using interactive methods and digital technology.
2. Design and preparation of educational activities and experiments in physics of the microworld.
3. Implementation and subsequent analysis of educational research on the effectiveness of selected methods and technologies and the possibility of implementing a new content in the area.

Literature:

1. Chabay, R., & Sherwood, B. (2010). Matter & Interactions (3rd ed.). New York: Wiley.
2. Jones, M. G. (2007). Nanoscale Science: Activities for Grades 6-12. NSTA Press.
3. Moore, T. A. (2003). Six Ideas that Shaped Physics: Units C, N, E, T, R, Q (2nd ed., Vols. 1–6). Boston: McGraw-Hill.
4. Prutchi, D. (2012). Exploring Quantum Physics through Hands-on Projects. John Wiley & Sons.