

4. Introduction of Current Scientific Results into Education: Metastudy and Towards a Theoretical Framework

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Students consider physics as boring, abstract and detached from everyday life, and they are not aware of ongoing research. However, our society and almost all of its welfare is based on research results, where applicative potentials were recognized. The society being thoroughly familiar with current research is rather specific. Researchers are usually not involved in education except at graduate levels, and usually they do not feel a desire or an obligation to transfer the new knowledge to younger students or to the lay public. Nevertheless, this step toward non trained researchers is crucial in order to get a support for a research from a general citizen and a taxpayer and to increase a motivation of best students to pursue scientific careers.

We have recently developed a module that has introduced current research results on liquid crystals into education [1]. The module consists of lectures and laboratory work in chemistry and physics. Several problems have arisen during the development of the module, for example: goals and an expected conceptual level of understanding had to be defined; a necessary preliminary knowledge of students had to be determined; most appropriate methods for teaching novel concepts had to be chosen; the research topic had to “translate” from professional language of researchers to semi - several experiments for illustrations and support for conceptual understanding; tests for assessment had to be developed and several other smaller problems had to be solved. Introduction of new research results into education is an interesting and a difficult research problem by itself.

Inspired by our experiences during an introduction of current research results into education for a case of liquid crystals, we tried to find similarities or differences in existing approaches to a transfer of new scientific knowledge into education. There were not many reports on introductions of new topics. Reports mainly considered designs of new laboratory experiment (in advanced optics and similar), only few modules were found (on tribology, semiconductors), sometimes topics aimed for teachers are presented (nanotechnology, superconductors) and only one example on semiconductors was found where a module was developed and evaluated [2].

This contribution reports on results of this metastudy and we will share detailed results on (a) Considerations and steps that were used at introduction of a topic »liquid crystals« to education at all levels [1].

(b) Metastudy of reports on introduction of other topics: superconductivity, tribology, semiconductors, advanced optics and other modern topics.

Based on this data, we shall suggest a pilot theoretical framework for introduction of current research results into education with an emphasis on physics. The theoretical framework will consist of criteria for the choice of a modern topic, for determination of teaching goals, of prerequisites required from students and from teachers, a suggested procedure of module construction and implementation and finally, a suggestion for assessments of goals.

References

- [1] J. Pavlin, N. Vaupotič, M. Čepič, Liquid crystals: a new topic in physics for undergraduates, *Eur. J. Phys.* 34, 745-761 (2013).
- [2] A. Garcia-Carmona, A. M. Criado, Introduction to Semiconductor Physics in Secondary Education: Evaluation of a teaching sequence *Int. J. Sc. Ed.* 31, 2205–45 (2009).