

An International Research Collaboration in the Teaching and Learning of Einsteinian Physics

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This presentation outlines the motivation, approach, and future directions of the International Einsteinian Physics Education Research (EPER) collaboration based on bridging research and practice by involving science educators, teachers and physicists. Facing the challenges of the 21st century, we must teach students our most contemporary scientific understanding of the Universe, while at the same time finding new ways of conducting physics education research on a global scale.

In the early 1900's, discoveries by Einstein and others revolutionized our understanding of physical reality. The theories of quantum mechanics and relativity, collectively termed 'Einsteinian physics' (EP) unleashed the technological revolution that underpins modern civilization, forming the basis for computers, mobile phones and GPS. However, physics in schools worldwide remains dominated by the classical Newtonian standpoint, with EP only explored superficially.

To address this gap in worldwide physics education, educational researchers, teachers, and physicists from 8 countries participated in an international workshop in Perth, Australia. The aims of this workshop were to: 1. Share existing EP learning resources, 2. Develop novel learning resources for all levels of education, 3. Develop resources for teachers, 4. Investigate students' conceptual understanding of EP, and 5. Disseminate best-practice examples and research results by building an international research network.

The participating research groups have each pioneered different approaches to researching teaching and learning in EP, but encounter the similar obstacles in implementing the fruits of their research in schools. The EPER collaboration was established to bridge the gap between research and practice by utilising these complimentary research backgrounds. To align our efforts in this way, the Model of Educational Reconstruction (MER) [1], which was originally developed to bring novel fields of science into the educational mainstream, has been employed as a unifying framework. This framework is well suited to pool the efforts of various international research teams, because it entails a variety of education research methods.

EPER is a developing project that will lead to jointly conducted research in the field of teaching EP. The next steps involve applying for an Australian Research Council Linkage grant and participation at

conferences and workshops such as GIREP to share our current research results. Four of these results will be presented in a GIREP symposium on the teaching of EP at upper secondary school level.

By sharing this model of an international physics education collaboration and by raising awareness for the need of introducing EP to physics curricula, we hope to offer valuable impetus to the field of physics education that will inspire researchers and teachers alike.

Keywords

International Collaboration, Research, Einsteinian Physics

References

[1] R. Duit et al (2012) *Science Education Research and Practice in Europe*. 5 13