

Preface

The book presents selected contributions from international conference GIREP EPEC 2015 Wrocław, Poland. The volume's aim is to acquainting readers with the discussion about problem of looking for strategies and tools to improve physics teaching and learning. Physics educators, university lecturers and physics teachers of various education levels are expected to be the primary audience of the book.

The Conference GIREP EPEC 2015 of International Research Group on Physics Teaching (GIREP) and European Physical Society—Physics Education Division (EPS PED), recognized by EPS as Europhysics Conference, was organized by University of Wrocław (UWr) (Institute of Experimental Physics, Physics Teaching Department and Foundation for University of Wrocław) at the time of the Jubilee of the 70th Anniversary of the Polish Academic Community in Wrocław. It belongs to a series of GIREP conferences organized on regular basis since 1966. The conference was held in Wrocław, in City Haston Hotel and Congress Centre, between 6 and 10 July 2015. This conference was organized and supervised by Prof. Ewa Dębowska (Chair of the Organizing Committee) and Dr. Tomasz Greczyło (Chair of the Local Organizing Committee), both from Institute of Experimental Physics of University of Wrocław in scientific cooperation with the international advisory board. The event was sponsored financially by GIREP, EPS—Physics Education Division, University of Wrocław and Polish Physical Society. The conference was attended by 157 participants representing 36 countries from around the world.

The central theme of the conference was Key Competences (KC) in Physics Teaching and Learning understood as knowledge, skills and attitudes that are fundamental ones for every individual in a society. The essence of KC is that they should be acquired by young people at the end of their compulsory education and training. The KC are all interdependent and intertwine different aspects such as critical thinking, creativity, initiative, problem solving, risk assessment, decision taking and constructive management of feelings. All of them appear crucial in nowadays educational environment. The most impending area to support the

process of teaching and learning seems to be directly related to the Information and Communication Technology (ICT). A great impact of ICT in various educational processes is especially visible in physics teaching and learning. Physics is considered as a subject whose main interest is directly and strongly connected not only to digital competence but also to several other Key Competences. The conference offered the opportunities for in-depth discussions of the Key Competences issues such as

- New research approaches: new methods, innovative learning strategies, new models.
- KC changing pedagogy: formative assessment, teacher role, student role, KC oriented assessment, shared pedagogy, KC oriented pedagogy.
- Good practices in KC developing.

The scientific conference's program offered 5 invited talks, 15 oral sessions with 60 presentations, 3 symposiums with 18 presentations, 8 workshops, 2 EPS sponsored Workshops "Specialist Physics Teacher Shortages and the Preparation of School Leavers for Further Study" and 4 poster sessions, grouped 2 by 2, with 32 posters in each group. The EPS workshops were run in conjunction with Horizons of Physics Education (HOPE) and aimed to our understanding of teacher shortages and their effects on pupils across Europe.

Like in previous GIREP conferences, a lot of attention went to engaging teachers in taking part and establish better networks between teachers and researchers. This time the format of a preconference consisted of 6 workshops organized in 3 parallel sessions. They were attended by 35 individuals.

The conference was the unique occasion to provide the participants with an international forum to exchange scientific ideas, inspire new research, and create new contacts for closer cooperation in physics education.

After the conference the Organizing Committee received about 70 submissions, many of which were of a very high quality. Due to diversity of proposals and richness of the subjects suggested by the authors the selection involved some very careful decisions and appeared to be not an easy task. All of that resulted in preparation of two publications—the printed collection of chosen papers and the electronic proceedings. Each paper went through a rigorous review process by at least two reviewers. The papers were subsequently revised by the authors according to reviewers' comments and all accepted papers are reported in this book or in the electronic proceedings. The collection, the one you are reading now, contains about 20 % of contributions recognized as especially 'recommended' for the printed version of the proceedings. It includes the papers prepared by all invited speakers and the ones dealing with more general, not very narrow subjects. All other papers which were accepted by reviewers are available in the electronic version of the conference proceedings.

The organizers are grateful to the authors for their enthusiasm and to all the reviewers for their painstaking work and the time they gave to the evaluation process.

We have tried to do our best to group authors' proposal thematically following both, domains:

- Researching formation of Key Competences in physics teaching and learning—new research approaches, new methods, innovative learning strategies, new models;
- Key Competences changing pedagogy—formative assessment, teacher role, student role, KC oriented assessment, shared pedagogy, KC oriented pedagogy;
- Developing of Key Competences—examples of good practices;

and groups:

- Research (physics education research on the empirical and theoretical levels);
- Research and development, (including classroom ideas, practical issues, development, etc. being more substantial than research);
- Classroom ideas, teaching and learning practices (no or minimal research part).

As a result of the grouping process three chapters were created:

- I. Towards Shaping Key Competences,
- II. Educational Research and Development,
- III. Classroom Ideas and Teaching-Learning Practice.

We hope that the book will offer the reader the opportunity for deep comprehension of the Key Competences to improve physics teaching and learning and to help students to acquire many of them.

Wrocław, Poland

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