IPER 2022 – A study conference on Physics Education Research in Italy

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Abstract. Italian Physics Education Research (IPER) groups decided to create a Community (CooFIS08) to share and compare studies, to promote the role of PER at all levels. Despite international recognition, PER in Italian Physics Departments lacks adequate domestic support, relying on external funding. In 2022, Angela Bracco, President of the Italian Physical Society, endorsed CooFIS08's proposal for a Udine conference to discuss IPER's research and bridge the research-practice gap. The sixteen research contributions covered content, teaching, social, epistemological aspects, teacher education, physics history, informal education, and collaboration, aiming to support PER in Italy. This presentation will delve into them.

Introduction

Italians Physics Education Research (IPER) groups are active since long time, evident through publications in prestigious journals, participation in key international committees like EPS-PED, ESERA, GIREP, and MPTL, and recognition from ICPE-IUPAP. However, within Italian Physics Departments, where the majority of them have affiliation, support for PER remains insufficient, relying heavily on European or regional funding rather than national support from 2009.

The importance of Physics Education Research was once more highlighted at the EPS International Forum in Paris, where Italian speakers participated in discussions on school-university physics education relationships. Angela Bracco, President of the Italian Physical Society (SIF), accepted the request for help from the president of CooFIS08 to support the Italian PER line, proposing to organize a conference to discuss research outcomes in the perspective of a selected paper publication in the Nuovo Cimento Journal. This initiative materialized in a conference held in Udine on November 25-26, 2022, featuring presentations from twenty active PER groups. The conference aimed to present and discuss the different research approaches, with an editorial board overseeing the evaluation and selection of contributions for publication. The commitment of the editorial board nominated was to meet regularly. In addition to the 2022 conference in which research and methods were discussed, another conference was held in Naples in December 2023 to explore the new research carried out by young people. In the 2022 Conference, sixteen research contributions emerged, covering various areas such as content research, teaching strategies, social and epistemological aspects, teacher education, history of physics, informal education, and collaborative efforts. This event sought to bridge the gap between research and practice, fostering support for PER within the Italian physics community.

Original aspects of Italian PER

Papers from various IPER groups underscore typical features of Italian physics education research, delineated along three main lines: a strong emphasis on disciplinary content in mathematics and physics, likely reflecting the robust disciplinary focus in Italian high schools; research into cultural and societal perceptions of physics; and quantitative and qualitative analysis of data coming from trialling of research proposals. Across these lines, additional research perspectives form a grid that characterizes much of Italian research. Notably, there's a widespread use of the history of physics in professional contexts, often involving original article excerpts and detailed analyses of historical texts. Another significant aspect is the meticulous attention to internal coherence at both macro and micro levels, encompassing disciplinary and pedagogical methodologies with frameworks marked by structural and procedural coherence. Lastly, research methods spanning formal, non-formal, and informal education are utilized across school and university levels. Concrete examples from works published in the special issue Il Nuovo Cimento C 46(6) (2023) will be examined in this presentation to elucidate these key aspects of Italian PER.

Findings

Papers from various PER groups shed light on typical characteristics of Italian physics research. In content research, Italian units have provided valuable insights across educational levels. Udine PER Unit has studied conceptual vertical learning pathways for three decades, by means of entangled research methods [1, article 196], while Bolzano integrates humanities with science education, particularly for prospective teachers [1, article 197]. Naples University emphasizes inclusive teaching methods for dynamics, focusing on visual aids and simplified math for high students [1, article 198]. Palermo University's Teaching-Learning Sequence address liquid surface phenomena, focusing on dimensions of learning addressed by the sequence [1, article 199], and Milan and Rome universities reconstruct Quantum Mechanics education, introducing formal concepts in high schools with historical grounding [1, article 200]. Pavia University explores conceptual understanding [1, article 201], and Napoli employs quantitative analysis for learning progression assessment [1, article 202]. Bologna University explores epistemological approaches, aligning teaching with societal shifts [1, article 203]. Trento and Salerno units focus on experimental methodologies, with Trento's COSID-20 project on remote labs [1, article 204] and Salerno's emphasis on Inquiry-Based Learning [1, article 205]. Polytechnic of Milan investigates peer learning's efficacy [1, article 206]. Historical perspectives come from Naples [1, article 207] and Verona [1, article 208], while Padova concentrates on teacher education, especially through the CoLLabora project for in-service teachers [1, article 209]. Cagliari emphasizes constructivist strategies [1, article 210], and collaborative projects like those in Pavia foster community engagement and scientific identity development [1, article 211]. This diversity enriches IPER, providing insights for teaching practices. This special issue aims to bridge research and practice, fostering support within the broader physics community.

References

[1] M. Michelini ed., Selected papers of the Conference of Italian Physics Education Research Lines, *Il Nuovo Cimento C* **46(6)** (2023), https://www.sif.it/riviste/sif/ncc/econtents/2023/046/06