

Embracing an inquiry stance in physics teacher professional learning

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Abstract. Physics teachers often consider what is the influence of their teaching methods and strategies on their student learning, motivations, and achievements. However, teachers often report that they lack the ability or time to systematically examine their own professional practice. This study examines teachers embracing an inquiry stance in their own professional learning.

Introduction

Physics teachers often consider what is the influence of their teaching methods and strategies on their student learning, motivations, and achievements. However, teachers often report that they lack the ability or time to systematically examine their own professional practice. This study examines teachers embracing an inquiry stance in their own professional learning. Over the past two decades, physics teachers have been encouraged to adopt inquiry-based learning (IBL) approaches in their classroom practices. IBL promotes holistic student development by activating all three domains of learning: cognitive, psychomotor, and affective – in one inquiry process [1]. An IBL approach (cycle) provides a structured approach to scientific investigations: A problem or phenomenon is presented to students, a tentative explanation(s) for the features of the phenomenon is(are) formed, experiments that test the explanation are suggested, and based on the experimental results the tentative explanation is pursued or discarded. This process is supported by a teacher, who takes the role of a mentor/supervisor steering the students' work with questions and hints. Investigations are usually carried out in groups of students, therefore this approach also fosters collaborative work of students, sharing responsibility and supporting development of other soft skills important for teamwork [1].

Teacher engagement in continuing professional learning and reflection on their own practices is widely considered the most crucial factor for improving the quality of student learning [2]. Practitioner Inquiry (PI) is a form of teacher professional learning defined as the systematic intentional study by teachers on their own practice [3]. Teachers (=practitioners) engage in systematic reflection and take action for change by asking questions ("inquiries"), analysing the data, making evidence-informed changes in their practice, and sharing their learnings with others. There are many variations on how to do a PI that can be found in literature, and these all tend to have recurring characteristics. It is intentional: it is about improving the classroom practice and is part of the teachers' role. A PI must be carried out systematically and involve the students in the PI process [3]. Conducting a PI can be done on your own but there is a lot of evidence that impact on students' learning is greater if it is done collaboratively through forming professional learning communities (PLC) of teachers who meet regularly to learn from practice through structured dialogue and engage in continuous cycles of inquiry [4].

Methodology

The participants in this study are a cohort of 55 in-service science and mathematics teachers completing the Professional Diploma in Teaching Physics (PDITP) programme in Ireland. The PDITP programme is delivered as a blended learning programme over a two-year period and teachers complete 15 ECTS of physics pedagogy alongside 60 ECTS of physics lecture and laboratory modules. The goals of the PDITP programme are that teachers: (1) Acquire the theoretical and experimental knowledge of physics as well as pedagogical content knowledge that is necessary for effective physics teaching at the second level; (2) Demonstrate an ability to connect physics content modules and the school physics curriculum; (3) Develop a high standard of practical competence in physics teaching as reflective practitioners. During a week-long online summer school at the end of year one, teachers are introduced to the concepts of (1) Inquiry Based learning (IBL), (2) Practitioner Inquiry (PI), and (3) Professional Learning Communities (PLCs). Teachers are facilitated to reflect on their understanding of each of the three concepts and how their thinking has changed. This study presents a thematic analysis of the teacher's reflective diaries (completed one month later) and examines the role of inquiry in the teacher's professional learning.

Findings

This study presents the findings from a thematic analysis of teacher's reflections on their understanding of each of the concepts, IBL, PI and PLC. Teachers consider the use and role of IBL in the physics classroom and discuss the role of the student and teacher in an IBL classroom. Teachers reflect on how they can design IBL activities to support students' learning across the domains of knowledge, skills, attitudes, and values. Teachers discuss the challenges in carrying out a PI, e.g. coming up with a good PI question, deciding on how and when to collect data, deciding on how to analyse and make sense of their findings. Teachers also discuss the similarities and differences between IBL and PI processes. Teachers reflect on the importance of peer-collaboration and exchange alongside challenges in maintaining a PLC. This study will share how teachers' experiences of embracing an inquiry stance has influenced their understanding of the role and importance of IBL in physics student learning and PI in physics teacher professional learning.

References

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