

Promoting "Learning Centered" Considerations Within a Community of Physics Teacher Leaders Through Collaborative Lesson Planning

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Doctor of Philosophy

by

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Summary

The purpose of this thesis is to study how to promote "learning-centered" teaching among physics teachers, in which teachers are aware of their students' learning processes, follow their progress and make informed teaching decisions how to proceed. The research investigated a professional development program that focused on developing teachers' "learning-centered" considerations" using the KI (Knowledge Integration) conceptual framework. This framework guides teachers in providing their students opportunities to practice four main learning processes: elicit ideas, add new ideas, develop criteria, and connect ideas (Linn & Eylon, 2006, 2011) .

In recent years, learning-centered activities, based on this framework, have been developed in the department of science teaching at the Weizmann Institute of Science.

The professional development of teachers to implement these activities was carried out in professional learning communities (PLCs) in which teachers learnt about these activities and about strategies for using them in the classroom. The teachers found great value in these activities, integrated them into their teaching and some continued to use them even after the specific professional development activities have ended .

However, teachers experienced difficulties in adapting these learning-centered activities to different content topics and skills, although the theoretical aspects learning-centered teaching and the conceptual framework of "knowledge integration" were discussed as a rationale for the activities and the teachers shared through a reflective discourse their class experiences .

This phenomenon is consistent with findings from the research literature about the challenge that teachers experience in connecting theoretical ideas and teaching practice in an operative and flexible manner. Akiba and her colleagues emphasize the need for research on teacher professional development programs aimed at developing teachers' competencies to connect between theoretical constructs and specific teaching practices in the classroom (Akiba et al., 2019). Koellner and Jacobs highlight the need for knowledge about the structure, content, and design of effective teacher professional development programs that aim to develop teachers' decision-making processes in applying flexibly general principles in a variety of contexts (Koellner & Jacobs, 2015). Coburn and Penuel, discuss the need for research examining strategies, routines, and tools that promote teacher learning (Coburn & Penuel, 2016).

This thesis addressed the issues raised here in the context of promoting learning-centered teaching in physics classrooms. The research addressed the question: how to develop teachers' learning-centered considerations" that connect flexibly between theoretical ideas on learning centered teaching and teaching practice?

The research and development were carried out in the community of 19 physics teacher leaders who mentored through a "fan model" about 200 teachers in regional professional learning communities (PLCs) across Israel.

The research was conducted in two phases:

Phase 1 - Pilot study: This phase was carried out in a school-based PD program of high-school teachers. The program included 16 teacher leaders from different disciplines who mentored about 70 teachers. The program of the teacher leaders involved a frequent reflective discourse on their and their colleagues' lesson planning and teaching practices using the KI conceptual framework .

Research on the teacher leaders' learning processes revealed challenges and opportunities in the program's execution. Issues and insights from the pilot study were systematically researched in the second phase .

The pilot study led to two key insights: One regarding the design of "tools, strategies and routines" to support the teacher leaders' learning and the other regarding ways to enhance the externalization and conceptualization of learning-centered considerations.

Phase 2 - The main research: This phase involved a PD program implemented in the teacher leaders' community. The program included 5 monthly, face to face meetings lasting 2 hours, as a part of a 60 hours yearly program .

Due to the short length we had to improve the efficiency of the learning processes .

We hypothesized that collaborative lesson planning in the light of learning-centered considerations" articulated in a common language accessible to teachers, may bridge the gap between the theoretical ideas of "learning- centered" teaching and teachers' practices in the classroom.

The program involved two central mechanisms :

Background mechanism- collaborative lesson planning: lesson planning is a daily practice of teachers; therefore, it has the potential to impact their knowledge, practices and perceptions. The planning process summons frequent dilemmas in the choice, sequencing and execution of teaching and learning resources. The collaborative lesson planning is intended to create opportunities to discuss with peers the considerations involved in planning. The externalization of a process which is usually internal, encourages explication of the considerations, deepens them, and raises awareness .

Common language mechanism: this mechanism aims to support the teachers' externalization processes. It can foster the connection between theory and practice by encouraging teachers to relate theoretical constructs to actual teaching practices. For example, terms such as "what", "how" and "why" were embedded in all the activities: The "what" and "how" were used regarding teaching practices, the "why" referred to the considerations in choosing resources and deciding how to use them .

These concepts in the common language, and others like "junction" that refers to the process of monitoring students' knowledge, were designed to make the theoretical ideas of "knowledge integration" accessible as considerations in lesson planning.

The research involved qualitative and quantitative methods and analysis of various sources of data, including session recordings, case study interviews and portfolios of teachers. The research did not include observations of the teachers within their classes, nor measurements of the students' achievements.

The findings of the main study indicate the impact of the program on the teacher leaders in three aspects:

Knowledge: The teacher leaders acquired knowledge about the framework of "knowledge integration", became familiar with the four learning processes of the framework and knew how to express them both with the help of the concepts learned and in their words. In the teachers' discourse that took place in the community meetings and in the in-depth interviews, we found evidence that the teacher leaders integrated the knowledge they acquired with considerations for planning and evaluating their teaching and thus demonstrated a high level of "understanding performances."

Perceptions and attitudes: The findings suggest that some of the teacher leaders have undergone a conceptual change. We found evidences that the teacher leaders attached great value to the learning that took place and some even referred to "learning opportunities" and "junction" as teaching goals. In addition, the teacher leaders reported on a contribution to their professional development in the areas of teaching and learning, which was enhanced by the collaborative planning with colleagues. They noted an increase in their self-efficacy as teachers and facilitators.

Practice: The teacher leaders reported that learning-centered considerations serve them as an operative tool for decision-making on teaching and consequently affect both the practice of lesson planning and the teaching and learning in the classroom.

The findings of the study show improvement during and after the program in the ability of the leading teachers to externalize and conceptualize their considerations, especially learning-centered ones. These considerations were reflected in planning, implementing, and evaluating teaching. We found evidences that the leaders adopted the common language of "what, how and why" as a "habit of mind" and applied it as part of their thinking about teaching planning even in contexts outside the program .

In addition, we observed a change in the way of externalizing the considerations, from considerations that express the teacher's personal preference to considerations related to teaching and learning. This change that began during the program was also observed after it and may indicate both an increase in teachers' awareness of their considerations and changes in their conceptual abilities.

These findings suggest the feasibility of implementing professional development programs for teachers with adaptive characteristics (Koellner & Jacobs, 2015), within professional learning communities. The research and development carried out in the present research respond to some aspects in the challenges raised in the beginning of the abstract:

Theoretical-practical aspect: how considerations in lesson planning enable teachers to connect theoretical constructs and teaching practices responding to changing conditions and contexts.

Practical-design aspect: what mechanisms, tools and strategies can support teachers' learning, engagement and awareness in adaptive PD programs.