Session 6c
Paper

Experimental work and student learning: university professors' perspective

Program text
What do students actually learn from experimental work in the laboratory? Which comprehensive evidence has been substantiated? What do university professors make of such evidence?

Abstract
Introduction
Physical presence of students and teachers in the laboratory is a prerequisite for performances of experimental work. The growing literature in laboratory education research highlights the importance of scientific attitudes such as curiosity and critical mindset as desirable goals. However, student learning has been a subject of longstanding debates. A systematic review has been conducted to synthesize comprehensive evidence available of learning outcomes associated with experimental work in chemistry teaching laboratories at university level (Agustian et al, forthcoming). The present paper is its contextualization (Gough, Oliver, & Thomas, 2012) aimed at elucidating ways in which laboratory instructors at professorial level make meaning (Siry & Gorges, 2020) of educational constructs substantiated in the review in the context of pharmaceutical sciences.

Method
Focus groups involving 31 (associate) professors at a university in Denmark were conducted in November 2020. Using Zoom as an online platform, they deliberated an abbreviated list of learning outcomes derived from the systematic review in breakout and plenary rooms. More than 300 pages of verbatim transcripts were subsequently analyzed using thematic analysis.

Results
Data analysis results reveal that the laboratory instructors could relate to all five large clusters of learning outcomes, but the extent to which specified constructs within each cluster was observable varied (Agustian et al., forthcoming). Experiment design was considered an advanced competence, compared to more basic laboratory skills. Problem solving and critical thinking were primarily more observable in upper-division and postgraduate. Positive students' experience in the laboratory was reflected in student retention and preferences for advanced laboratory exercises. There seems to be a promising shift towards focus on reasoning and argumentation skills.

Discussion
Analysis results point to the multidimensionality of learning in the laboratory identified in the review. The (associate) professors assigned a high value on open inquiry, which they observed to manifest in a later stage of the study program, however, it was still unclear whether and how the transition between predominantly expository instruction in the first year and full inquiry in the third year was facilitated adequately.

Author(s)
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Literature

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