

## A Valid Professional Development Framework For Supporting Science Teachers In Relation To Inquiry-Based Curriculum Units

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**Abstract :** The science education community is increasingly calling for learning experiences that mirror the work of scientists. Although inquiry-based science education is aligned with these calls, the implementation of this strategy is a complex and daunting task for many teachers. Thus, policymakers and researchers have noted the need for continued teacher Professional Development (PD) in the enactment of inquiry-based science education, coupled with effective ways of reaching the goals of teacher PD. This is a complex problem for which educational design research is suitable. The purpose at this stage of our design research is to develop a generic PD framework that is valid as the blueprint of a PD program for supporting science teachers in relation to inquiry-based curriculum units. The seven components of the framework are the goal, learning theory, strategy, phases, support, motivation, and an instructional model. Based on a systematic review of the literature on effective (science) teacher PD, coupled with developer screening, we have generated a design principle per component of the PD framework. For example, as per the associated design principle, the goal of the framework is to provide science teachers with experiences in authentic inquiry, coupled with enhancing their competencies linked to the adoption, customization and design; then the classroom implementation and the revision of inquiry-based curriculum units. The seven design principles have allowed us to synthesize the PD framework, which, coupled with the design principles, are the preliminary outcomes of the current research. We are in the process of evaluating the content and construct validity of the framework, based on nine one-on-one interviews with experts in inquiry-based classroom and teacher learning. To this end, we have developed an interview protocol with the input of eight such experts in South Africa and Germany. Using the protocol, the expert appraisal of the PD framework will involve three experts from Germany, South Africa, and Cameroon, respectively. These countries, where we originate and/or work, provide a variety of inquiry-based science education contexts, making the countries suitable in the evaluation of the generic PD framework. Based on the evaluation, we will revise the framework and its seven design principles to arrive at the final outcomes of the current research. While the final content and construct a valid version of the framework will serve as an example of the needed ways through which effective inquiry-based science teacher PD may be achieved, the final design principles will be useful to researchers when transforming the framework for use in any specific educational context. For example, in our further research, we will transform the framework to one that is practical and effective in supporting inquiry-based practical work in resource-constrained physical sciences classrooms in South Africa. Researchers in other educational contexts may similarly consider the final framework and design principles in their work. Thus, our final outcomes will inform practice and research around the support of teachers to increase the incorporation of learning experiences that mirror the work of scientists in a worldwide manner.

**Keywords :** design principles, educational design research, evaluation, inquiry-based science education, professional development framework

**Conference Title :** ICIBESE 2022 : International Conference on Inquiry-Based Education and Science Education

**Conference Location :** Tokyo, Japan

**Conference Dates :** September 08-09, 2022