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► **To cite this version:**

Pierre-Vincent Quéré. Bridging the gap between mathematics courses and mathematics in the workplace: the example of a study and research path for future engineers. INDRUM 2020, Université de Carthage, Université de Montpellier, Sep 2020, Cyberspace (virtually from Bizerte), Tunisia. hal-03113909

HAL Id: hal-03113909

<https://hal.science/hal-03113909v1>

Submitted on 18 Jan 2021

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Bridging the gap between mathematics courses and mathematics in the workplace: the example of a study and research path for future engineers

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Keywords: Teaching and learning of mathematics for engineers, Novel approaches to teaching, Study and Research Path

INTRODUCTION

The work presented here refers to the Anthropological Theory of the Didactic (ATD). I consider engineering schools and the workplace for engineers as two different institutions, where mathematics is present in different components of the praxeologies (Chevallard, 2017).

In a recent research (Quéré, 2017) I have evidenced that French engineers encounter different types of mathematical praxeologies in the workplace. I have classified them in two main categories: “proper” praxeologies (Basic, Statistic and Specific) or “transversal” praxeologies (Modelling, Reasoning, and Communication and Documentation). Whereas some of them seem to be taught in the engineering studies, the Modelling and the Communication and Documentation praxeologies are declared as lacking by the engineers I’ve met through the research. This suggests the need for specific innovations in the preparation of future engineers.

In this poster I describe and analyse the design and implementation of a Study and Research Path (SRP, Barquero, Bosch, & Gascón, 2008) in Chemistry and Statistics, in an engineer school in France. I try to show how this kind of innovative teaching can be a way to bridge the gap between mathematics courses for future engineers and mathematics in the workplace.

THEORETICAL FRAMEWORK AND RESEARCH QUESTION

An SRP can play several roles. Here I focus on its role as a teaching model for an inquiry-centred education based on a generating question Q_0 . It is aimed to make the teaching getting out from the usual *monumentalism* of the mathematical teaching (Barquero et al., 2008). The ATD framework provides efficient tools to analyse the global and mathematical praxeologies of the students during the progress of a SRP, with in particular 9 dialectics (for example, between questions and answers, Parra & Otero, 2018). The main research question I shall try to answer here is “Can a SRP be an answer to the concerns of motivation, mobilisation of mathematical knowledge, lack of connection between diverse disciplines, satisfaction of both teachers and engineering students?”

METHODOLOGY

The SRP described in this poster starts with the following generating question Q_0 written by the chemistry teacher supervising the SRP with me: "*In the pharmaceutical industry, how do you make sure that the product (medicine) meets the dosage on the package?*"

To answer this question the aim for the 14 participating students is to provide a website that will be accessible for the future students of the next year. At the beginning of the experiment, we have all together planned a number of 6 working sessions for the two coming months before the students have to present their work to the other students of the class.

To monitor the global and mathematical activity of the students, I've firstly filled a personal diary with my observation notes during the working sessions. After each of these sessions, designated students leaders had to fill an online diary detailing their actions (meetings, research, topics, resources, etc.). At the end, each student had to fill a personal questionnaire about her or his own experience. Moreover, I have recorded and transcribed a final interview with the chemistry colleague.

RESULTS

An important result is that this SRP has allowed students to develop some praxeologies usually lacking in the training of engineers and useful in the professional context (for example, documentation and communication). Moreover, the students and the teachers have emphasized codisciplinarity as a real asset.

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