

A Tentative Attempt for Professional Development: Contingent Moments in Teaching Mathematics with Historical Resources

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This presentation focuses on ongoing research related to the professional development of master students, regarding teaching mathematics with historical resources. The participants of the study are seven in-service and pre-service teachers enrolled in a master course on the historical and philosophical perspectives on school mathematics. We present a tentative analysis of challenges of master students' written responses to two (imaginary) contingent moments regarding student queries/ideas while teaching mathematics - particularly teaching algebra - with historical resources. Our tentative analysis implies two categories: surface content knowledge and neglecting student knowledge and student thinking.

Introduction and Theoretical Framework

Recent research has confirmed that historical resources (HR) can be considered in the professional development (PD) of mathematics teachers and teacher educators (Jankvist, Clark & Mosvold, 2020). In this research, we follow the same direction and focus on in-service and pre-service mathematics teachers' teaching with HR and their PD regarding this. To support teachers' PD, we adopt the "Contingency" dimension of the theoretical framework *Knowledge Quartet* (Rowland, Huckstep & Thwaites, 2005) as a heuristic tool. Contingency or contingent moments refer to unexpected moments, situations, student queries and/or deviation from the teacher's plan for teaching a specific topic. After several selected historical topics were taught and discussed in the classroom (as part of the master course), we asked the participants to consider a few (in the present presentation, we focus on two) contingent moments regarding students' queries/ideas. Then, we reflected on in-service and pre-service teachers' work to support their PD by explaining how they might have responded to students' queries and ideas.

Research Question and Methods

In this research, we focus on the following research question: What aspects of mathematical knowledge in teaching are evident when in-service and pre-service teachers respond to students' inquiries and ideas while teaching mathematics with HR? The participants of the research were 3 in-service (with 6, 17 and 24-year experience) and 4 pre-service (one works as a substitute teacher for 2 years) teachers. After teaching

the Babylonian Square Root method and methods of Al-Khwarizmi for solving quadratic equations, we proposed the following tasks (Figure 1).

Task 1: Think about a student, who thinks a bit different from Al-Khwarizmi and s/he asks a question: “If I have $x^2 - 2x = 8$, can I draw a square and then remove two rectangles from this square, will I be able to solve $x^2 - 2x = 8$? What can I do?” S/he shows a drawing (see the figure on the right) while asking her question. How would you reply to this student?

Task 2: Think about a student. S/he would like to calculate $\sqrt{16}$, s/he guesses 1 for $\sqrt{16}$. Can s/he use Babylonian Square Method for this, what would you suggest to her? Justify your explanation.

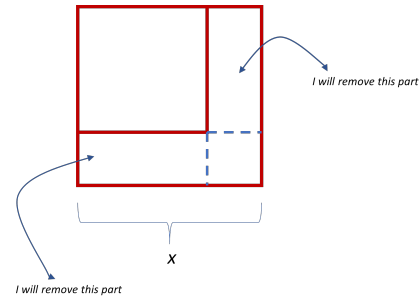


Figure 1. Proposed tasks including contingent student queries/ideas

Analysis of the data still goes on and we try to categorise the responses in terms of mathematical knowledge in teaching.

Summary of Findings

Our tentative categorization comprises mostly challenges of the teachers: (i) surface content knowledge, (ii) neglecting student knowledge and direction (see Table 1).

Category	<i>Surface Content Knowledge</i>	<i>Neglecting Student Knowledge and Thinking</i>
Exemplary Cases	<ul style="list-style-type: none"> – Not focusing on how methods work – Neglecting the historical development of the method – Generalisation of the methods 	<ul style="list-style-type: none"> – Neglecting student challenges/misconceptions regarding algebra – Missing orientation, not building on student thinking – Providing a new argument based on their (own) thinking

Table 1. Tentative categorization and associated exemplary cases

Discussion, Conclusions and Further Research

We are aware that teachers' written work not necessarily reflects the nature of their teaching in a real setting. However, it gives us some clues regarding their approach. Our tentative results show us what to focus on in our teaching to support teachers' PD.

References

Jankvist, U.T., Clark, K.M., & Mosvold, R. (2020). Developing mathematical knowledge for teachers: Potentials of history of mathematics in teacher educator training. *Journal of Mathematics Teacher Education*, 23, 311–332.

Rowland, T., Huckstep, P., & Thwaites, A. (2005). Elementary teachers’ mathematics subject knowledge: The knowledge quartet and the case of Naomi. *Journal of Mathematics Teacher Education*, 8(3), 225–281.