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Primary sources in the elementary school

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The poster reports on the design and the implementation of a pilot teaching intervention – part of my ongoing research – with two historical texts. The sample was a small group of Greek students of the 6th grade. On the poster I present the texts, the design, and photos of student's activities.

Keywords: Primary historical sources, elementary education.

The historical texts belong to Liu Hui, a renowned Chinese mathematician of the 3rd century CE. The first one is his commentary (Lay-Yong & Tian-Se, 1986) on a problem of a circular field which is included in the ancient Mathematical Canon *'The Nine Chapters on the Mathematical Art'*. The area of the field is the unknown, but the data assumed π to be 3. The Canon offered four algorithms and the solution. Liu Hui proved the correctness of the first algorithm and gave a more precise value of π . The second text is the preface of Liu Hui's commentary on the canon. In this text Liu Hui reveals his reasoning and pedagogical considerations (Siu, 1993).

OBJECTIVES – DESIGN AND IMPLEMENTATION

The objectives are for students to: 1. make a transition to the more theoretically oriented geometry of middle school; 2. appreciate mathematics as a human creation and of different cultures; 3. engage in meta-level discussions about in issues and meta-issues of History (Jankvist & Kjeldsen, 2010). For addressing the objectives I designed a historical module (Jankvist, 2009) with the use of MKT (Ball, Thames, & Phelps, 2008) as the overall framework under which I tried to coordinate domain specific frameworks (i.e. proof in the elementary school's settings).

The implementation of the module had three phases: Introduction, Analysis and Synthesis (Jahnke, 2000). In the *introductory part*, I provided historical

information about the socio-historical context and the mathematics at the time of Liu Hui. The use of History was under the conceptual dipole *'History as a goal'*-*'History'* (Tzanakis & Thomaidis, 2011) and partly the second objective was addressed. In the *analysis part*, and for the first objective (*'History as a tool'*-*'History'*), students were reading small excerpts of the first text, and were decoding the commentator's guidelines. During the teaching students were encouraged to develop reasoning and communication skills (i.e. to explain and justify using deductive reasoning). In order to prove the geometrical face of the proof (the correctness of the first algorithm) students had tactile experiences and constructed geometric figures with conventional and digital tools. For the arithmetical face of Liu Hui's proof (the reason that π is 3.14), which is not highlighted in the Greek textbook, students made process pattern generalizations and filled in and interpreted tables and spreadsheets. In the *third part* I tried to address the last two objectives. I gave information about the commentator's philosophical context and with a more playful activity under the name *'the cards of philosophy'*, I engaged students in meta-issue discussions about the relationship between Liu Hui's work and philosophy (*'History as a goal'*-*'History'*). In this activity I incorporated the second text and students discussed about Liu Hui's internal factors, by reflecting on the first text's activities. Also, following Liu Hui's concept of the discipline of mathematics as a *'tree'*, students created their own *'tree'* connecting mathematical topics that they had used while they were dealing with the proof. In the end students presented to peers a synthesis of their work.

The integration of primary sources in the elementary school's mathematics may seem challenging for various reasons. Yet, if we want to stay true both to the commitments of mathematics education and of the History of mathematics (Fried, 2007) it is worthwhile to explore the possible ways to do so.

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