# ENGAGING PRE-SERVICE MATHEMATICS TEACHERS WITH HISTORICAL SOURCES: THE "MODERATOR IN DIALOGUE" ATTITUDE AND SOME ANTINOMIC ASPECTS OF EDUCATIONAL PRACTICES

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## ABSTRACT

In this paper, I discuss the "moderator in dialogue" attitude introduced by Michael Fried in his plenary talk at the 2021 HPM meetings. The talk was about Edmond Halley, particularly about his posture towards the work of Apollonius. Fried qualified Halley's view of the past as "moderator in dialogue," since Halley recognized both the potential of modern mathematics and the thoughtful study of the past when done deferentially, without imposing modern ideas. Fried draws a parallel with mathematics educators who may also adopt this attitude towards the past. Based on research findings in mathematics education and my own experience as a teacher educator, I examine more closely the tensions surrounding Fried's proposal and highlight some of the antinomic aspects of these educational practices, particularly regarding the use of original historical sources in this context.

## *1 Introduction*

The 2021 HPM meeting was held online and, due to the pandemic, was reduced to a series of five plenary lectures. The first was given by Michael Fried (2021) and entitled: *Edmond Halley's posture towards Apollonius's works and its relevance for teaching historical material in modern mathematics classroom*s. The talk addressed the HPM theme *Theoretical and/or conceptual frameworks for integrating history in mathematics education*. I will summarize the presentation and focus on its main object, the "moderator in dialogue" attitude that Fried described in the work of Edmond Halley. The talk was very inspiring and raise many questions on the very relation between the study of the history of mathematics and mathematics education, but also important questions related more precisely to, as I will try to show, the role of the teachers and the way to accompany learners in the encounter with the history of mathematics.

## *2 Halley as a moderator between past and present*

Edmond Halley (1656–1742) was a Savilian Professor in Geometry at Oxford University. In his talk, Fried focused on Halley's reconstruction of Book VIII of Apollonius's *Conics* and on Halley's way of relating to the past. The main idea of Fried was that Halley "brings out questions to a historical approach to mathematics education and ways of pursuing it." He observed that Halley, on the one hand, regards the work of mathematicians from the past "with great interest and faithfulness" and, on the other hand, understands the great advantage of modern tools. For Fried, it is necessary to resist the temptation to impose modern ideas on the past or to devalue the present in relation to the past, but rather to maintain a "healthy position" between the past and the present. He found in Halley a good example of this position.

### 2.1 Halley's way of relating to the past

To describe Halley's way of relating to the past, Fried closely examined Halley's additions and comments to Apollonius's work. Fried was attentive to the tone, to how these additions and commentaries were stated by Halley, and to the types of expressions Halley used. Fried found in Halley a kind of middle ground between historical sensitivity and mathematical interest. As introduced above, Halley avoids treating the ancients as inferior while, at the same time, appreciates modern mathematical conceptions and tools. Halley found in the past, particularly in Apollonius's work "a font of intelligent treatments of problems and ideas by thoughtful people." For Fried, Halley was, in a way, in search of broadening his own horizon in mathematics.

### 2.2 Knowledge, self-knowledge, and the humanist perspective

In his talk, Fried's aim was to explore how educators who are interested in the history of mathematics and want it to be included in their classrooms could or should deal with the past. Elsewhere, Fried has elaborated on the need to develop such thinking, particularly in the context of building appropriate theoretical and conceptual frameworks in the field (see Fried, Guillemette, & Jahnke, 2016).

More precisely, the attention given by Fried to the "healthy position" between the past and the present is also echoed in his earlier works on the notion of *self-knowledge* (see Fried, 2007). Indeed, he has suggested that the back and forth movement and dialogue between modern mathematical understand-

ings and ancient understandings can bring learners to a deeper understanding of themselves: "… a movement towards self-knowledge, a knowledge of ourselves as a kind of creature who does mathematics, a kind of mathematical being" (p. 218). He proposes that this self-knowledge, the knowledge of oneself as a "mathematical being," should be the primary objective of all forms of mathematics education based on the history of the discipline. Fried does not hesitate to emphasize the background of his thinking around these considerations by stating that "[Education], in general, is directed towards the whole human being, and, accordingly, mathematics education, as opposed to, say, professional mathematical training, ought to contribute to students' growing into whole human beings" (p. 219).

### 2.3 The "moderator in dialogue" attitude towards the past

Fried noted that Halley "gives a fair chance to the old and learns from it." To do so, there is the need to establish a kind of dialogue between the old and the new and to "represent faithfully, respectfully and fairly the works of the mathematicians from the past." Such an attitude, as discussed above, would allow seeing all human practitioners of mathematics as "a genuine human community with all of its wealth and all of its diversity." This is what the "moderator in a dialogue" attitude towards the past seems to imply. In this sense, it is not a method or an approach, but simply an attitude, or a way of being, that Fried invites educators to adopt.

## *3 In search of a moderator attitude for mathematics teachers*

At this point, I would like to acknowledge my agreement with Fried's proposal and the need to question and problematize how we relate to the past as educators. As teacher educators and researchers, we try to position ourselves as moderators in the dialogue and generally share this view of the role and potential of the history of mathematics. The following section is not intended to be critical, but to share my own experience of trying to achieve these goals, and to examine more closely the tensions surrounding this perspective, partly from research, but also from a kind of introspection and analysis of my own practice.

### 3.1 Some empirical and theoretical research findings

My research with pre-service teachers has shown that engagement with mathematicians of the past does not happen automatically. Maintaining an "empathetic relationship" with past mathematicians is challenging, and students have a strong tendency to read historical texts synchronically (from a modern synchronic plan) and have much difficulty engaging with these mathematicians on their own terms. (Guillemette, 2017). There is a serious need to find ways to support and guide learners to avoid what we have called the "violence of modern synchronization." Other studies have made similar observations (e.g., Arcavi & Isoda, 2007; Fried, 2000).

Furthermore, in teacher education, we have found that there is a certain nuance and complexity to be brought to bear when seeking a kind of middle ground between historical sensitivity and mathematical interest. Indeed, we have argued that educators seem to read texts *differently*, displaying a different form of engagement and answerability, notably by focusing on the potential estrangement from historical texts and on the vicarious aspects around different ways of *being* in mathematics and *doing* mathematics. (see Guillemette & Radford, 2022). It seems that there is another possible position, neither that of historians nor that of mathematicians, but that of educators, and that there is a need to investigate more closely how mathematics teachers, for example, engage with the past.

### 3.2 Making the moderator in dialogue attitude more effective

The above remarks are important if we want pre-service teachers or learners to adopt this moderator in dialogue attitude themselves, and if we consider, as teacher educators, that it is not enough to simply show this attitude in the presence of learners. One could say that as educators we should situate ourselves as moderators between the past and present in preparation for the encounter with the past in our classroom. But again, this dialogue between the old and new must engage the class if we want learners' horizons to expand. We would like the whole class to dialogue with the past.

To do this, we must face the difficulties that lie in the experience of "otherness" inherent in encounters with the past. These difficulties are numerous and include types of language, notations, unusual argumentative or discursive forms, implicit theorems, new definitions, unusual arguments, unusual typography, and so on. These are direct barriers that must be "surmounted" to understand historical texts. Moreover, there is much to know about the histori-

cal, cultural, social, and mathematical context of the period of historical texts if we are to embrace past mathematicians on their own terms. Personally, in the context of teacher training, I feel more like a *facilitator* than a moderator.

## *4 Tensions and problems*

Indeed, it is as if the attitude of "mediator in a dialogue" towards the past seemed somehow ancillary to the attitude of "facilitator" towards the learners. These tensions could possibly be linked to antinomic aspects of pedagogical practices linked to the exploration of the history of mathematics in mathematics teaching, especially around the reading of historical texts.

First, there is a need to prepare the learner for this encounter. As reported extensively in research (see Clark et al. 2016), the reading of historical texts cannot be done without a minimum of introductory instructions or explorations around the historical, cultural, or mathematical context of past mathematicians. Second, there is a need to set the encounter pedagogically, to *feel* a distance, a fruitful *disorientation* in the classroom (*cf*. Barbin, 1997), in order to highlight the terms specific to the mathematicians.

On the one hand, if the encounter with the text is too "prepared," the experience of otherness may be diminished, since students would be presented with a predetermined entity, and the reading activity would be reduced to a matching or identifying game. On the other hand, if the encounter is not sufficiently prepared, there is a risk that the encounter itself will fail due to a far too great semantic distance between the students and the text, making it impossible to engage with distant voices.

## *5 Conclusion*

The "moderator in dialogue" attitude towards the past, as Fried describes it in Halley, is inspiring but raises important questions. Indeed, how do we prepare the encounter between students and texts? How do we guide students in the experience of otherness? In what contexts or types of courses should historical reading take place? Should it remain in the hands of the educator?

We hope to have highlighted the importance of these questions for the research community.

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