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► To cite this version:

Ildar Safuanov. The role of genetic approach and history of mathematics in works of Russian mathematics educators (1850-1950). CERME 10, Feb 2017, Dublin, Ireland. hal-01938799

HAL Id: hal-01938799

<https://hal.science/hal-01938799v1>

Submitted on 28 Nov 2018

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The role of genetic approach and history of mathematics in works of Russian mathematics educators (1850-1950)

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Keywords: Russian mathematics education, history, genetic approach.

Introduction

The aim of this poster is to present the study of the history of the development of genetic and, in particular, historic-genetic approach in works of Russian mathematics educators of the second half of the 19th century and first half of the 20th century. It is important because the genetic approach and the history of mathematics are used in mathematics teaching nowadays (e.g., Fauvel & van Maanen, 2000). The role of genetic approach and history of mathematics for mathematics teaching is important today and it has been investigated by many authors (e.g., Furinghetti & Radford, 2008). The role of genetic approach and history of mathematics in works of Russian mathematics educators also needs a systematic research. In our study (work in progress), we use books and articles written by Russian mathematics educators of the past, notes of their lectures, and proceedings of Congresses of mathematics teachers held in the beginning of the 20th century.

Genetic and historic-genetic approach to the teaching of mathematics in works of Russian mathematics educators

Progressive Russian mathematics educators developed ways of using history and genetic approach in mathematics teaching since the middle of the 19th century.

Russian mathematics educator Petr Semyonovich Guryev (1807-1884) was acquainted with works of F.W.A. Diesterweg. As early as in the middle of the 19th century he insisted on the use of elements of genetic and concentric (Safuanov, 1999) teaching. He wrote (Guryev, 1857, p. 176):

It is necessary that theory would develop like concentric circles... It is more appropriate and in accordance with the progress of development, that the definitions should be given at the end rather than in the beginning of the teaching of elementary arithmetic and geometry.

Viktor Viktorovich Bobylin (1849-1919), in his report on the 7th All-Russia congress of scientists and doctors he explicitly argued that it is necessary to use genetic method in geometry teaching and, in particular, to base the methods of teaching on the history of mathematics (Bobylin, 1886, p. 31).

At the end of the 19th century and in the beginning of the 20th century, one of the leading figures in the development of Russian mathematics education was Semyon Shokhor-Trotsky, author of mathematical textbooks for elementary mathematics. He invented the "Method of expedient tasks" which was essentially similar to genetic method. He wrote in one of his methodical guidebooks for mathematics teachers (Shokhor-Trotsky, 1935, p. 9):

The true method consists in that we should put a child in conditions at which human mind started inventing arithmetic, we should make him a witness of that invention. But it is not sufficient today. Nowadays we should aim at putting a child in conditions at which she/he would become not only a witness but rather the active participant of that invention.

Most interesting was the development of didactic ideas of Nikolai Izvolsky. Beginning with the method of “combination of mathematical representations” (Reports of the First Russian Congress of Mathematics Teachers, 1913, pp. 148-157), he eventually came to the profound expression of the genetic approach (not reduced to the historical one) to geometry teaching: “...A view of geometry as a system of investigations aiming at finding answers to the consequently arising questions” (Izvolsky, 1924, p. 9). He elaborated an original version of the genetic approach.

Conclusion

Thus, we see that in Russian mathematics education many researchers, mathematicians, as well as mathematics educators, strongly contributed to the development of the genetic teaching of mathematics. N. Izvolsky articulated the idea of indirect genetic teaching prior to O. Toeplitz. We think that ideas of Russian mathematics educators, especially those of S. Shohor-Trotsky and N. Izvolski, would be useful for the further elaboration and improvement of the genetic approach in future. The development of ideas of Russian mathematics educators will be presented in the poster via the use of images and schemes.

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