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Review of the methodology used in the research on the mathematics-related affective domain

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Introduction

Mathematics-related affective domain we understand using the framework of Hannula (2012) as having three different types of affect: cognitive (e.g. beliefs), motivational (e.g. values), and emotional (e.g. feelings). All these three aspects of mathematics teachers' affective domain are important to determine if they lead their students to an active and creative approach to mathematics learning (Boaler, 2015). Therefore, we decided to research key points during the university study, which influence affective domain of future mathematics teachers. In this poster we prepare a theoretical background for our research. We do this by reviewing methodology of related journal articles to identify methodological practices in the research on this topic. We hope that our paper will inspire discussion about the best methods to study mathematics-related affective domain and also possible collaboration with our team in this subject.

Literature Review

To obtain the journal articles suitable for our review we performed the search in the Web of Science Database on 18th July 2021. The search terms were 'mathematic*' combined with a Boolean operator AND with the terms 'teacher*' and with three words characterizing affective domain combined with a Boolean operator OR: 'attitude*', 'belief*', 'affect*'. The refined specifications of the search were that articles need to be open access and the publication years should be 2020 or 2021, to include just the newest and accessible papers. The papers were carefully studied, with the focus on the methodological parts and the finding were compared and discussed by both authors.

Results

Altogether, based on the search in the Web of Science database, 15 journal articles were included in this methodology review. One article was excluded because of focus on primary students instead of teachers. The list of the articles with complete references is because of the page limitation of the poster here: www.comae.sk/reference1.pdf. The most used research approach was quantitative (10 articles - for example Jeong & Gonzalez-Gomez, 2021, published in the journal *Mathematics*), followed by mixed approach (3 articles - for example Liebendorfer & Schukajlow, 2020, published in the journal *Educational Studies in Mathematics*). The least used approach was qualitative (2 articles - for example Lo, 2021, published in the journal *International Journal of Instruction*).

Following topics were researched in articles using **quantitative approach**: (1) self-efficacy - relationship with other constructs, impact on intention to leave profession, (2) (epistemological) beliefs about the nature of mathematics, (3) beliefs about teaching and learning mathematics, (4) development of attitude towards mathematics and (5) attitude to students' struggle when learning mathematics. In all 10 quantitative studies, a questionnaire was used as an instrument for data collection, containing various statements scaled by a Likert scale. Statistical methods were used to analyze the quantitative data, mostly analysis of variance and various correlation analysis methods.

Following topics were researched in articles using **mixed approach**: (1) perception of attitudes towards mathematics, (2) interest in mathematics and (3) attitude to student's struggle when learning mathematics. All three articles in this category used a questionnaire as an instrument to gather quantitative data. In these articles, additional qualitative data was gathered as a support either to ensure validity of the interpretations of the questionnaire data, or to uncover new themes (variables), which could be then analysed quantitatively. Open-ended items in questionnaires, written reflections and semi-structured interviews were used to gather such qualitative data.

Following topics were researched in articles using **qualitative approach**: (1) beliefs about mathematics and language and (2) beliefs about teaching mathematics. The only method used to gather qualitative data was a semi-structured interview. In both articles, the interviews were audio-recorded, transcribed and analysed either thematically or inductively.

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