A phenomenological study about the effect of Covid-19 pandemic on teachers' use of teaching resources about reasoning & proving in mathematics

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1 Introduction

If we study the history of societies, we can find several pandemic events such as smallpox, cholera, plague, and SARS [1, 2]. Each one of these pandemics events affected human life in many aspects from health to the economic sphere [3], education is one of these aspects. The SARS-CoV-2 pandemic (Covid-19) has had a massive impact on Education: many students of different countries have been affected by school and university closures due to the Covid-19. Italy was the first Western country to suffer a coronavirus emergency. On March 4, 2020, the Italian Prime Minister announced a strict lockdown and the immediate closure of all schools and universities to contain the spread of the virus. This phenomenon then extends to other countries as well all over the world. In response to school closures, UNESCO recommended the use of distance learning programs and opened educational applications and platforms that schools and teachers can use to reach learners remotely and limit the disruption of Education. These proposed "solutions" had involved all levels of Education [4, 5]. According to [6] the Covid-19 has shown different everyday situations and different related emerging problems around the world; new pedagogical and didactic perspectives about competencies are needed [7, 8].

2 The *MaTeK* research framework

In the last two years several researchers investigated teaching practice and their own response to the crisis [7, 8]. Steed and Leech [9], discussed the US teachers' difficulties in personal interactions with students and their inadequate resources. Hu et al. [10], painting the Hong Kong Covid teaching scenario, provided evidence of barriers

including difficulty engaging students in online activities and highlighted inadequate support from several parents for learning activities. Nikolopoulou [11] highlighted teachers' negative feelings in particular, at the beginning of online education in Greece. Brunetto et al. [12] proposed a new teaching model for describing and analysing a new teaching system in Covid 19 Time. Several Researchers in [5] put in evidence as pandemic was for many teachers and students an opportunity to re-examine their teaching/learning. Very few of these works look to the effect of Covid-19 pandemic on teachers' use of resources. Since January 2021, the MaTeK (*Enhancement of Research Excellence in Mathematics Teacher Knowledge*) Horizon 2020 project Consortium is investigating these phenomena. The Consortium is, in fact, conducting an international research focused into the use of resources by 8th grade mathematics teachers from different countries to prepare and implement their lessons and conceptions, particularly about Reasoning & Proving in Mathematics. With the aim to study the "repercussions" of the Covid-19 about these themes a pilot study defined by an open-ended questionnaire was deigned. The research was carried out during the 2020-21 academic year, and it involved 110 voluntary teachers from several different school institutions of all five MaTek countries. The questionnaire is made up of Twenty-three items aimed to focus on some key aspects in studying teachers use of resources in mathematics, for refreshing or improving their personal knowledge in mathematics, for inspiration or ideas for teaching mathematics, for preparing assessments, for finding materials to be used with your students in class. Six more question were dedicated to particularly analyse teacher's conceptions about Reasoning & Proving and the related of teaching resources. The last part of the questionnaire was dedicated to collect demographic data such as age, experience, etc. The survey was quantitatively (e.g. by cluster analysis [13, 14]) and qualitatively analysed. In this paper we refer only to the data interpretation by the K-means clustering.

3 First conclusion

According to our results not all teacher seemed to be aware about the important of the use of teaching resources in Reasoning & Proving. Interesting correlation was found between their culture, their teaching experience and the declared school teaching grades. We think that these data can be useful to highlight in Higher education (such as in in-service and pre-service teacher training programs) interesting international comparison on some potentialities, critical aspects and challenges about future research on educational methodologies, use of teaching resources and assessment activities in digital learning environments.

Acknowledgment

This abstract was supported by the H2020 project no. 951822, MaTeK. https://www.projectmatek.eu/. We would like to express our special thanks to our colleagues in the project: Işıl İşler Baykal, Erdinç Çakıroğlu, Iveta Kohanová and Jakub Michal

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