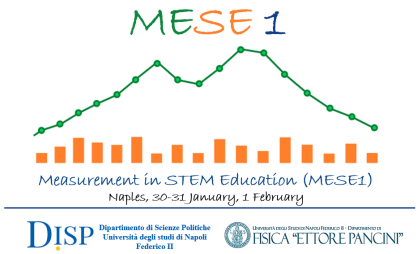

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An extensive questionnaire about emergency remote teaching: more than 3000 engineering students respond about their perceptions on online didactic activities.

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By 11 March 2020, the phrase "COVID-19" had officially entered everyday life across most of the word. Each level of education suddenly faced new changes and new challenges. Emergency remote teaching became widespread, and new methodologies to deliver classes and courses were adopted by educational institutions. In February 2020, the Politecnico di Milano introduced a series of focused and systemic actions in order to support the passage to completely online teaching and to ensure the continuity of the activities that were previously developed in the classroom. In our work, we focus on the impact of the remote learning experience on STEM disciplines, by analysing the perceptions of engineering students enrolled at the Politecnico di Milano. The subjects were recruited from all engineering courses, from the first to the fifth year, and were asked to complete a multidimensional survey. The questionnaire was proposed in July 2021 at the end of the second semester, referring to the didactic activities held in the 2019-2020 and 2020-2021 academic years. More than 3000 students completed the entire survey, by answering the questions that were proposed in a Likert scale, from 1 to 5. This large sample was composed of 66% male and 33% female students. Almost the 70% of the students were attending Bachelor's degree courses, while the remaining were attending Master's degree courses. The survey was composed of 66 questions regarding the perceptions and the challenges of online education, compared with the "state of the art" before COVID-19, divided into 6 main groups: Remote Teaching, Subjective Well Being, Metacognition, Self-Efficacy, Identity and Socio-Demographic information. In this work we described the entire survey and we focused on the items concerning Metacognition and Self Efficacy but we also gave a first glance to the results concerning the remote teaching section. We performed preliminary analysis, by computing frequency distribution and descriptive statistics concerning the remote teaching section, then, by using Cronbach's alpha test, confirmatory factor analysis and the t-test, we performed a more in-depth analysis concerning the outcomes of metacognition and self-efficacy. Data analysis shows that students clearly appreciated how the Politecnico di Milano dealt with the organization of the mandatory online courses, but in the same time the results indicates that they complained about their relationships with classmates during remote teaching. Data also suggests an improving in effective learning strategies performed by students. We can say that students, in some sense, overcame the difficulties due to the emergency remote teaching by improving their cognitive processes. Potentially, this last result could have an important impact in teaching methodologies, adding a point in favour of distance learning. But the topic is so sensitive and discussed that it surely needs to be investigated in more details.

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