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Pre-service chemistry teachers' perception of the educational processes during the COVID-19 pandemic

Dragica D. Trivic* & Vesna D. Milanovic

University of Belgrade, Faculty of Chemistry, Serbia

*Corresponding author: dtrivic@chem.bg.ac.rs

The COVID-19 pandemic and the suspension of face-to-face learning at the University of Belgrade - Faculty of Chemistry (UBFC) influenced the education of all chemistry students. The realization of the experimental part of the studies presented a major challenge within all study programmes (Huang, 2020; Youssef *et al.*, 2020), while the realization of school practice was an additional challenge within the education of pre-service chemistry teachers. In order to examine the pre-service chemistry teachers' views on the quality of the educational processes during the pandemic, we developed a voluntary anonymous online survey using Google Forms. Six pre-service chemistry teachers, students of the fifth year of the integrated undergraduate and graduate academic studies at the UBFC, participated in the research. The survey consisted of four parts with 42 questions altogether. In the first part, the students' demographic data were collected. In the second part, the respondents were given several sets of questions regarding ICT. In the third part, using a five-point Likert scale, the respondents expressed and then explained their views regarding the general impact of the pandemic on their learning, the effectiveness of online lectures and theory exercises within different chemistry and chemistry didactics courses, and the effectiveness of assessments. In addition to this, they estimated the effectiveness of the laboratory exercises, which were conducted face-to-face during one part of the semester, and the school practice in the pandemic circumstances. In the last part, the respondents assessed the advantages and disadvantages of online teaching and its impact on the development of teacher competencies. They put forward some suggestions on how to improve online teaching and their views on the combination of online and face-to-face teaching in the future. Respondents had no experience with online teaching/learning before the pandemic, but now they spend two to eight hours a day engaged in these activities. All students usually use the PDF and PPT presentations which accompany lectures, five of them use the Faculty's e-platform, while YouTube videos, e-books, educational applications and web sites and the recordings of online lectures are used less frequently. The effectiveness of online instruction within chemistry courses was rated 4 (Agree) by most students (five out of six). Similarly, students rated the effectiveness of the online instruction within chemistry didactics courses as 4 (three out of six) and 5 (two out of six). The effectiveness of online theory exercises was rated the same for both chemistry courses and chemistry didactics courses: grade 5 was given by three out of six students, grade 4 was given by two students and grade 3 by one student. Three out of six students rated the effectiveness of school practice as 3, two students as 4, while one student rated it 5. The students singled out the lack of contact with pupils at schools as a major obstacle. However, the preparation for online teaching helped them gain some useful experience for their future practice. None of the students fully enjoyed online teaching and most of them were more comfortable during face-to-face instruction due to better social interaction.

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