

CHAPTER 3

Pre-service Biology Teachers' Use of Science Process Skills in the Context of a STEM Activity; Nano Pharmaceuticals

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INTRODUCTION

We witness advancements in science, industry, and technology in a global scale which leads to the growing need for individuals who can think innovatively, possess advanced observation skills, and meet the requirements of the era (Aydın, 2013). In response to this need, educational objectives are continuously being updated in local and international contexts, and new teaching and learning approaches are being developed such as project based learning, inquiry, argumentation and STEM education.

STEM (Science, Technology, Engineering, and Mathematics) education, born in the United States in the 1990s with the hope to fulfill the gap in interest to STEM careers. STEM education aims to achieve better results through innovative thinking and different research approaches, was initially referred to as SMET but was later transformed into STEM due to speech difficulties (Breckler, 2007). The acronym STEM was first used in 2001 by Judith A. Ramaley, the former director of the National Science Foundation, to denote curricula in science, technology, engineering, and mathematics (Breckler, 2007). Since then STEM education has been under spotlight and our understanding of STEM education has been evolving.

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It was determined that a significant portion of activities related to nanotechnology is directed toward high school teachers and students. It is emphasized that the most suitable level for learning nanotechnology is at the high school level (Yıldırım T, 2021). However, the inadequate knowledge and application skills of high school teachers in nanotechnology lead to their inability to convey these topics to their students (Schank et al., 2007; Greenberg, 2009; Jones et al., 2013).

Pre-service teachers' scientific and technological literacy can be supported through inclusion of basic concepts of nanotechnology in teacher education programs, such biology, physics and chemistry teacher education (Furlan, 2009). In this study, pre-service biology teachers encountered nano-drug concepts for the first time and experienced the scientific research process in the nanoscience and nanotechnology context. This activity motivated pre-service biology teachers and enabled them to actively participate in the learning process by conducting the experiment design process. Therefore, the use of science process skills by pre-service biology teachers in the nanotechnology context facilitated our understanding of their level of ability. The incorporation of STEM activities utilizing innovative technologies into pre-service and in-service teacher education will contribute to the integration of these topics into high school, and even middle school, science curricula. This, in turn, will contribute to the development of science process skills.

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