

# INVESTIGATION OF THE EFFECTS OF STEM EDUCATION APPROACH ON SECONDARY SCHOOL STUDENTS' ATTITUDE TOWARDS SCIENCE, INTEREST IN STEM PROFESSIONS AND SCIENTIFIC PROCESS SKILLS<sup>1</sup>

Özlem BADEM<sup>2</sup>

Betül TİMUR<sup>3</sup>

## 1. INTRODUCTION

All countries are now aware of the fact that the key to development of a country is education. Science has crucial role not only for the development of technology, but also it enables individuals to develop their mental and creativity aspects (İşman, Baytekin, Balkan, Horzum and Kıyıcı, 2002; Tezel and Yaman, 2017).

A student who masters science learns how to reach scientific knowledge, how to use it and how to solve the problems of daily life by combining it with technology (Yıldırım, 2016). These are 21<sup>st</sup> century, science literacy skills that all qualified individuals should have, which is a need for all countries today. However, it is not possible to teach these required skills with the current science education which focuses only teaching concepts (Ceylan, 2014). In this regard, it has become imperative to implement new applications and define approaches (Ministry of National Education [MNE], 2009; Ceylan, 2014). One of these new approaches is STEM education which aims to teach 21st century skills holistically (Ceylan, 2014).

The reason why the United States of America initiated a new reform named STEM is because it lost its competitiveness in engineering and technology due to the decreased number of students in STEM fields and it seeks to increase the

<sup>1</sup> This paper was derived from the first author's master thesis.

<sup>2</sup> Ministry of National Education [MNE], ozlem\_yaran@hotmail.com ORCID: (0000-0001-7695-3295)

<sup>3</sup> Doç. Dr., Çanakkale Onsekiz Mart University, betultmr@gmail.com ORCID: (0000-0002-2793-8387)

## REFERENCES

- Aydođdu, B, Tatar, N, Yıldız, E & Buldur, S. (2012). The Science Process Skills Scale Development for Elementary School Students. *Journal of Theoretical Educational Science*, 5 (3), 292-311.
- Bozan, M.A. (2018). *STEM Focused Professional Development Process Of Elementary School Teachers: An Action Research* (Master Thesis). Eskişehir Osmangazi University, Institute of Educational Sciences, Eskişehir.
- Bozkurt, E. (2014). *The Effect Of Engineering Design Based Science Instruction On Science Teacher Candidates' Decision Making Skills, Science Process Skills And Perceptions About The Process* (Ph.D. Thesis) Gazi University, Institute of Educational Sciences, Ankara.
- Büyükoztürk, Ş. (2007). *Deneysel desenler: Öntest-sontest kontrol grubu desen ve veri analizi*. Ankara: Pegem. [in Turkish]
- Ceylan, S. (2014). *A Study For Preparing An Instructional Design Based On Science, Technology, Engineering And Mathematics (Stem) Approach On The Topic Of Acids And Bases At Secondary School Science Course* (Master Thesis). Uludağ University, Institute of Educational Sciences: Bursa.
- Çepni, S. (2017). *Kuramdan Uygulamaya STEM+E+A Eğitimi.*, Ankara: Pegem Akademi. [in Turkish]
- Dabney, K. P., Tai, R. H., Almarode, J. T., Miller-Friedmann, J. L., Sonnert, G., Sadler, P. M., & Hazari, Z., (2012). Out-of-School Time Science Activities and Their Association with Career Interest in STEM. *International Journal of Science Education, Part B: Communication and Public Engagement*, 2(1), 63-79.
- Doğanay, K. (2018). *The Effect of Science Festivals Upon with Problem Based Stem Activities on the Student's Science Attitudes And Academic Achievements* (Master Thesis). Kastamonu University, Graduate School of Natural and Applied Sciences, Kastamonu.
- Dugger, W. E. (2010). Evolution of STEM in the United States. *The 6th Biennial International Conference on Technology Education Research presented paper*, Gold Coast, Queensland, Australia.
- Duygu, E. (2018). *The Effect of Stem Education On Science Process Skills And STEM Awareness In Simulation Based Inquiry Learning Environment* (Master Thesis). Kırıkkale University, Graduate School of Natural and Applied Sciences, Kırıkkale.
- Erođlu, S., & Bektaş, O. (2016). Ideas of Science Teachers took STEM Education about STEM based Activities. *Eğitimde Nitel Araştırmalar Dergisi-Journal of Qualitative Research in Education*, 4(3), 43-67.
- Gazibeyođlu, T. (2018). *Investigation of The Effect of STEM Applications on Achievement in Force and Energy Unit and Attitudes Towards Science Course of 7th Grade Students* (Master Thesis). Kastamonu University, Graduate School of Natural and Applied Sciences, Kastamonu.
- Gonzalez, H. B. & Kuenzi, J. J. (2012). Science, technology, engineering and mathematics (STEM) education: A Primer. Congressional Research Service. Erişim <https://www.fas.org/sgp/crs/misc/R42642.pdf>
- Gülhan, F. & Şahin, F. (2016). The effects of science-technology-engineering-math (STEM) integration on 5th grade students' perceptions and attitudes towards these areas. *International Journal of Human Sciences*, 13(1), 602- 620
- Gökbayrak, S., & Karisan, D. (2017). Exploration of Sixth Grade Students' Views on STEM Based Activities. *Journal of Subject Teaching Research (ALEG)*, 3(1), 25-40
- İşman, A., Baytekin, Ç., Balkan F, Horzum, B., & Kıyıcı, M. (2002). Science education and structuralist approach. *The Turkish Online Journal of Educational Technology*, 1(1), 41-47.
- Karakaya, F, Avcın, S. S. & Yılmaz, M. (2018). Middle School Students' Interest in Science-Technology-Engineering and Mathematics (Stem) Professions. *Ihlara Journal of Educational Research*, 3(1), 36-53.
- Karışan, D., & Yurdakul, Y. (2017). The Effects of Microprocessors Based Science Technology Engineering and Mathematics (STEM) Investigations on 6th Grade Students' Attitudes Towards These Subject Areas. *Adnan Menderes University Faculty of Education Journal*, 8(1), 37-52.
- Kier, M. W., Blanchard, M. R., Osborne, J. W. & Albert, J. L. (2014). The Development of the STEM

- Career Interest Survey (STEM-CIS). *Research in Science Education*, 44(3), 461-481.
- Knezek, G., Christensen, R., Tyler Wood, T., & Periathiruvadi, S. (2013). Impact of environmental power monitoring activities on middle school student perceptions of STEM. *Science Education International*, 24(1), 98–123.
- Koyunlu-Unlu, Z., Dökme, I., & Unlu, V. (2016). Adaptation of the science, technology, engineering and mathematics career interest survey (STEM-CIS) into turkish. *Eurasian Journal of Educational Research*, 63, 21-36.
- Ministry of Education. (2009). *MEB 2010-2014 strategic plan*. Ankara, Ministry of National Education, Strategy Development Directorate.
- Nuhoğlu, H. (2008). The Development of an Attitude Scale for Science and Technology Course. *Elementary Education Online*, 7(3), 627–639.
- Rehmat, A. P. (2015). *Engineering the path to higher-order thinking in elementary education: a problem-based learning approach for STEM integration*. UNLV Theses, Dissertations, Professional Papers, and Capstones.
- Shapiro, S. S., & Wilk, M. B. (1965). An analysis of variance test for normality (Complete samples). *Biometrika*, 52(3/4), 591–611.
- Tabachnick, B. G. & Fidell, L. S. (2013). *Using multivariate statistics* (Sixth edition). Pearson Education, USA.
- Tabar, V. (2018). *Content Analysis of STEM Education Research in Turkey* (Master Thesis). Van Yüzüncü Yıl University, Institute of Educational Sciences, Van.
- Tezel, Ö., & Yaman, H. (2017). A Review of Studies on STEM Education in Turkey. *Journal of Research in Education and Teaching*, 6(1), 135–145.
- Yamak, H., Bulut, N. & Dündar, S. (2014). The Impact of STEM Activities on 5th Grade Students' Scientific Process Skills and Their Attitudes Towards Science. *Gazi University Journal of Gazi Educational Faculty*, 34(2), 249- 265.
- Yaşın, C. (2003). Sampling Problem in Political Research. *Gazi University Faculty of Communication Academic Journal*, 18, 147-172.
- Yıldırım, B. (2016). *Science, technology, engineering, mathematics (STEM) applications integrated into 7th grade science course and examination of the effects of matery learning*. PhD Thesis, Gazi University, Institute of Educational Sciences, Ankara.
- Yıldırım, B., 2018. *Teoriden Pratiğe STEM Eğitimi: Uygulama kitabı*. Nobel Yayınevi, Ankara. [in Turkish]