COMMENTARY

Flipped Learning Model: An Effective Approach to Primary School STEM Education

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"Change is the End Result of All True Learning." –Leo Buscaglia

As early as 1986, the US National Science Board published *Undergraduate Science, Mathematics, and Engineering Education*, which is regarded as the initiation of STEM education (NSB, 1986). In October 2005, the National Academy of Science, National Academy of Engineering, Institute of Medicine, and National Research Center jointly submitted to the Congress of the United States *Rising Above the Gathering Storm: Energizing and Employing America for a Brighter Economic Future*, a report that put forward relevant recommendations to promote STEM education (Bybee, 2010). In October 2007, the US National Science Board issued *A National Action Plan for Addressing the Critical Needs of the US Science, Technology, Engineering, and Mathematics Education System*, proposing to expand STEM education from colleges to primary and secondary schools (NSB, 2007). In 2009, former President of the United States, Barack Obama, emphasized the need for the nation to prioritize the development of STEM education. Since then, the US federal government has heavily invested in STEM education research across all levels, from kindergarten through higher education. Educational communities in other countries have also begun researching and implementing STEM education practices. Numerous studies and extensive practice have demonstrated the potential of STEM education in promoting students' cognitive development, enhancing their critical thinking, problem-solving, and creativity skills, as well as improving their emotional and spiritual well-being.

The traditional science education approach predominantly consists of lecture-style presentations. However, the limitations of this method have become increasingly evident in the 21st century. To effectively implement STEM education, new teaching models are required that can integrate new technologies to improve the efficiency of classroom teaching. In this context, the flipped learning model has emerged and garnered widespread attention in educational communities. This model blends the strengths of face-to-face instruction and distance learning, utilizing the advantages of both environments. In essence,

flipped learning is a combination of in-person classroom education and learning activities that students perform outside of the classroom using various online tools. This approach enables students to customize their learning experience by adjusting the time, place, and pace of their learning to meet their individualized needs (Staker & Horn, 2012). By implementing the flipped learning model in STEM education, students' learning resources are greatly enhanced. They are given access to videos, slides, and texts related to the subject matter, allowing them to learn at their own pace in a personalized environment. As a result, more time can be devoted to active classroom activities, including discussions, leading to a considerable improvement in the efficiency of STEM teaching.

The majority of previous studies on the flipped learning model have focused on its application to foreign language and computer knowledge learning, with few examining its use in science classes. Moreover, the effects of STEM education assisted by the flipped learning model have not been adequately examined at the primary education level. *A Review on the Effects of STEM Activities Conducted with the Flipped Learning Model on Primary School Students' Scientific Creativity, Attitudes, and Perceptions Towards STEM* in this issue is an empirical study conducted by a Turkish researcher that investigates the effects of flipped learning-supported STEM activities on fourth-grade students' science education. The research findings indicate that STEM education supported by the flipped learning model has positive effects on primary school students' scientific creativity and perceptions about STEM. The flipped learning model also increases students' engagement in STEM activities, improves classroom efficiency, and reduces their anxiety towards science learning, making it more enjoyable (Erkan & Duran, 2023). This study provides valuable experience in implementing STEM education in primary schools.

References

Bybee, R. W. (2010). What is STEM education? *Science*, 329(5995):996. DOI: https://doi.org/10.1126/science.1194998

Erkan, H., & Duran, M. (2023). The effects of STEM activities conducted with the flipped learning model on primary school students' scientific creativity, attitudes and perceptions towards STEM. *Science Insights Education Frontiers*, 15(1):2175-2225. DOI: https://doi.org/10.15354/sief.23.or115

National Science Board. (1986). Undergraduate graduate Science, Mathematics and Engineering Education. Available at: http://www.nsf.gov/nsb/publications /1986/nsb0386.pdf

National Science Board. (2007). A national action plan for addressing the critical needs of the US science, technology, engineering, and mathematics education system. Available at: http://esdstem.pbworks.com/f/National%20STEM%20Action%20Plan.pdf

Staker, H., & Horn, M. B. (2012). Classifying K-12 Blended Learning. Mountain View, CA: Innosight Institute. Available at: http://www.christenseninstitute.org/wp-content/uploads/2013/04/Classifying-K-12-blended-learning.pdf

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