Conference Name: EduCon Tokyo – International Conference on Education, 20-21 January 2025
Conference Dates: 20-Jan- 2025 to 21-Jan- 2025
Conference Venue: TKP Ichigaya Conference Center, Building 2F, 8 Ichigaya Hachiman-cho, Shinjuku-ku, Tokyo 162-0844
Appears in: PUPIL: International Journal of Teaching, Education and Learning (ISSN 2457-0648)
Publication year: 2025

Yawei Wang, 2025

Volume 2025, pp. 85-86

DOI- https://doi.org/10.20319/ictel.2025.8586

This paper can be cited as: Wang, Y.(2025). Based on Large-Scale Surveys A Research on the Impact of Scientific Attitudes on Science Achievement Among Primary and Secondary School Students: The Mediating Role of Participation in Informal Science Learning Activities. EduCon Tokyo – International Conference on Education, 20-21 January 2025. Proceedings of Teaching and Education Research Association (TERA), 2025, 85-86

Based on Large-Scale Surveys A Research on the Impact of Scientific Attitudes on Science Achievement Among Primary and Secondary School Students: The Mediating Role of Participation in Informal Science Learning Activities

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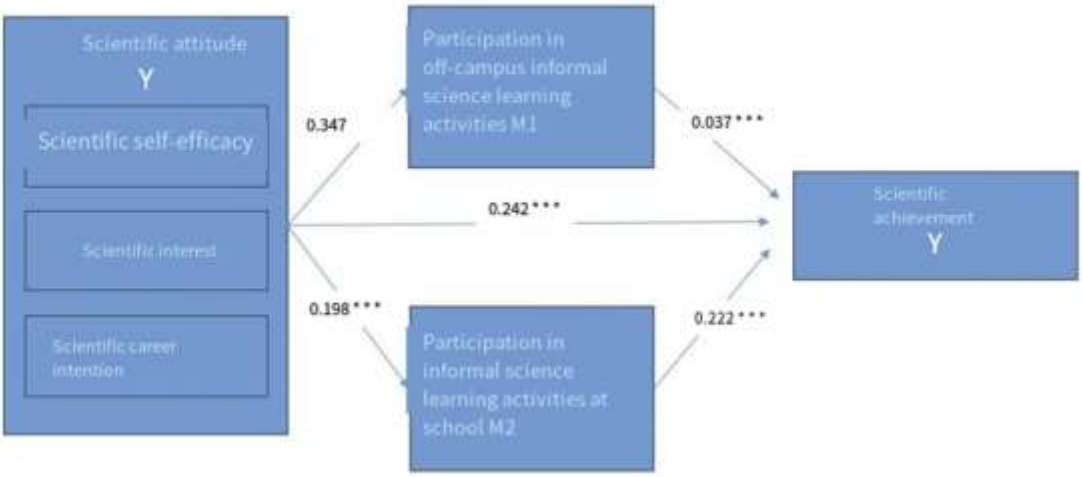
Abstract

As China continues to implement its national strategy to strengthen the country through science and education, the Ministry of Education has called for greater emphasis on improving the quality of science education. This includes leveraging public platforms to promote scenario-based and experiential science practice activities that engage students beyond traditional classroom settings. In this study, a comprehensive nationwide survey was conducted using questionnaires and interviews, analyzing 847,720 valid student responses collected from 107 sample counties across 31 provinces. The results show that student satisfaction with out-of-school informal science education is generally low. Specifically, satisfaction rates for key aspects such as accessibility, diversity, professionalism, interactivity, and learning support all fall below 50%. Furthermore, students' attitudes toward science play a significant positive role in shaping both their academic achievement in science and their participation in informal science learning activities. Quantitatively, a one-unit improvement in scientific attitude

corresponds to an increase of 0.242 units in science achievement, a 0.347-unit rise in participation in out-of-school activities, and a 0.198-unit increase in participation in in-school activities. However, the study also identifies contrasting effects of informal science activities on academic outcomes. While out-of-school informal science learning activities exert a small but positive influence on science achievement, in-school activities have a significant negative effect, with an impact size of -0.222. This negative influence is primarily attributed to poorly designed activities that lack rigor and consume time meant for formal science learning. To maximize the benefits of informal science learning, it is essential to enhance the quality and design of these activities while establishing a balanced schedule for in-school participation. This approach can help unlock the full potential of informal science activities in supporting students' academic and personal growth in science education.



Keywords:

Informal Science Education, Structural Equation Modeling, Scenario-based Learning, Large-Scale Surveys