ICRAMCS 2026

THE EIGHTH EDITION OF THE INTERNATIONAL CONFERENCE ON RESEARCH IN APPLIED MATHEMATICS AND COMPUTER SCIENCE
April 23-24-25, 2026 | Marrakech, Morocco

Study of the Impact of Graph Theory on the Problem-Solving Process in Secondary Education

Communication Info

Authors:
Adil FOUIMTIZI[1]
Mohamed EL KOUACHE[2]
Brahim FAHID [2]
Driss BENNIS [3]

[1] FSK UIT, Kenitra, Morocco
[2] EST UIT, Kenitra, Morocco
[3] FSR UM5, Rabat, Morocco

Keywords:
(1) Didactics of mathematics
(2) Graph theory
(3) Problem-solving process
(4) Mathematics competitions

Abstract

In mathematics curricula, problem solving remains a central objective, but it frequently encounters difficulties in modeling, strategy selection, and result verification. Graph theory, as a language of representation and structured exploration, offers a potentially effective framework for supporting these stages of reasoning. The objective of this study is to evaluate the impact of a teaching sequence based on graph theory on the effectiveness of the problem-solving process among learners. A quasi-experimental design was implemented in the following progression: pre-test, diagnosis of difficulties, teaching sequence based on graph theory concepts, and post-test. Performance was compared before and after the intervention using indicators of success, effectiveness, and quality of the approach. The results show a significant improvement in performance on the post-test, accompanied by a decrease in representation and interpretation errors and better mastery of solution-finding strategies. In conclusion, formal teaching of graph theory appears to be a relevant didactic lever for strengthening the effectiveness of problem solving and structuring mathematical reasoning.

References

[1] D. Ferrarello, M. Gionfriddo, F. Grasso, and M. Mammana, "Graph theory and combinatorial calculus: An early approach to enhance robust understanding", ZDM-Mathematics Education, vol. 54, 2022, pp. 847-864.

[2] P. Intaros, M. Inprasitha, and N. Srisawadi, "Students' problem solving strategies in problem solving-mathematics classroom", Procedia-Social and Behavioral Sciences, 116, 2014, 4119.

[3] L. K. Lazarova, N. Stojkovikj, A. Stojanova, and M. Miteva, "Application of graph theory in teaching and understanding of the mathematical problems", 2022 IEEE Global Engineering Education Conference (EDUCON), 2022, pp. 1594-1601.

[4] A. T. Prayitno, T. Nusantara, E. Hidayanto, and S. Rahardjo, "Identification of graph thinking in solving mathematical problems naturally", Participatory Educational Research, vol. 9, no. 2, 2022, pp. 118-135.

[5] K. P. Thilagavathy, "Graph Theory: A Strategic Tool for Problem Solving", Transforming Education for the 21st Century-Innovative Teaching Approaches, 2024, 215.