



Evaluate soft skills: *Problem Solving*

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Abstract:

The research aims to investigate problem solving competence at theoretical and empirical level, such as the ability to identify possible and best solutions to the problems that arise. On this subject since the last century (Polya, 1945) a vast literature has been produced and in recent years it has assumed an ever greater importance (Funke, 2012), both because it represents one of the eight key citizenship competences identified by the European Commission (CE, 2006, 2018), and because it is the object of analysis of the last three PISA surveys conducted by the OECD (2004, 2012, 2013, 2017). In particular, the research intends to assess the students' problem solving competence in classes that have decided to adhere to an experimentation promoted by Indire and that implies the use of technologies (coding, 3D printers, robotics) in a guided context of methodological approaches such as Think Making I Prove and Design Thinking.



Research questions

- 1) Do innovative methodologies such as coding, use of the 3D printer and robotics, guided by a methodological/didactic approach (TMI and DT), used in everyday teaching, promote problem solving skills in students?
- 2) Are there significant differences in the acquisition of problem-solving skills among students who use innovative methodologies to carry out normal teaching activities (the experimental group) and those who carry out teaching activities through a traditional method (the control group)?
- 3) Are there significant differences in the acquisition of problem solving competence with respect to gender differences?

Hypothesis

The use of innovative methodologies require the implementation of complex cognitive processes such as: exploring and understanding, representing and making predictions, planning and acting in situations, monitoring the results and reviewing the interventions carried out. It is assumed that the introduction of technologies in teaching with an approach led by teachers (Think-Make-Improve and Design Thinking) can foster the development of transversal problem-solving skills in students. It is also assumed gender difference in the acquisition of problem solving competence in favor of male compared to female students.

Objectives

- 1) To investigate competence of problem solving as an ability to identify possible and better solutions to the problems that arise
- 2) To understand whether the introduction of innovative methodologies in the practice of daily teaching boosts problem solving skills acquisition
- 3) To understand if there are significant gender differences in the acquisition of problem solving competence

Reference sample

Three classes will be selected in schools that adhere to an experimentation promoted by Indire and three classes that have similar characteristics in the same schools, but do not participate in the experimentation.

Methodology

The methodology is based on an experimental design which provides for the comparison between three classes (experimental group) and three classes from the same school (control classes). To make a comparison we intend to use a test aimed at detecting the competence in problem solving. Two tests will be administered: one at the beginning of the research and one at the end to detect possible changing. The tests, partly derived from the literature and partly constructed ad hoc, will be submitted to both the experimental and control classes. Before the experimentation begins, a questionnaire will also be administered to all the class teachers of the sample with the aim of detecting the perceptions and expectations of the use in class of technologies associated to innovative methodologies.

Stages of research

- November / December 2019: selection of the sample
- January 2020: questionnaires given to the teachers of the sample
- February 2020 start of testing and administration of tests aimed at detecting the entrance problem solving skills
- May 2020 end of experimentation and delivery of the final test
- June / December 2020 data analysis
- January / June 2021: drafting of the overall research report

References

- Bloom, B. S.(1950). *Problem solving Processes of College Students*. Chicago: University of Chicago Press
- Funke, J. (2012). Complex problem solving. In N. M. Seel (Ed.), *Encyclopedia of the sciences of learning* (Vol. 38). Heidelberg: Springer.
- Greiff, S., Holt, D., & Funke, J. (2013). Perspectives on problem solving in educational assessment: Analytical, interactive, and collaborative problem solving. *Journal of Problem solving*
- Peterson, T. O. (2004). So you're thinking of trying problem based learning? Three critical success factors for implementation. *Journal of Management Education*, 28(5), 630-647.
- Polya, G. (1945). *How to Solve It: A New Aspect of Mathematical Method*. Princeton: Princeton University Press