

Digital skills among students: a statistical analysis to explore inequalities and determinants

Background

In the last few decades, information and communication technology (ICT) has become essential for studying, working and social interacting. Digital skills such as computer and information literacy (CIL) and computational thinking (CT) are fundamental competencies of the 21st Century and provide the basis for lifelong learning. Besides, among the reforms required by the National Recovery and Resilience Plan (NRRP), digital transition plays a fundamental role to reduce gaps and to make the system more resilient, inclusive, and sustainable. Households are often required to use digital technologies effectively for their financial, labour, and consumption choices. Also, strong digital skills are required especially for post-secondary education. For these reasons, the development of digital skills should be promoted among both young people and adults.

The international survey *International Computer and Information Literacy Study* (ICILS) conducted by the International Association for the Evaluation of Educational Achievement (IEA) on grade 8 students is an example of survey conducted to investigate how well students are prepared for study, work, and overall life in a digital world (Fraillon et al., 2020). According to the assessment framework of ICILS (Fraillon et al., 2019), computer and information literacy (CIL) is defined as “an individual’s ability to use computers to investigate, create, and communicate in order to participate effectively at home, at school, in the workplace and in society.” Besides, computational thinking (CT) is defined as “an individual’s ability to recognize aspects of real-world problems which are appropriate for computational formulation and to evaluate and develop algorithmic solutions to those problems so that the solutions could be operationalized with a computer.” In particular, this domain includes not only programming but also structuring and manipulating data sets. In addition to student achievement on both CIL and CT scales, ICILS collects a wide set of contextual data on students’ home and school environments. As a consequence, the results of such a study are able to provide education systems and policymakers with an important data source on the contexts and outcomes of CIL-related education programs.

Italy is one of the countries which participate to the IEA-ICILS program with a national sample of eight graders. Data from this study can be used to a) conduct international comparisons; b) bring out specific national gaps (e.g. gender or territorial gaps); c) investigate how background variables related to the home and school environments and national policies may facilitate or penalise a proper learning and use of digital skills in daily life.

Aim of the project and specific objectives

The purpose of this research grant is to carry out research activity related to the project “GRINS – Growing Resilient, INclusive and Sustainable”, spoke 3 “Households’ sustainability” funded by the National Recovery and Resilience Plan (NRRP) within the theme n. 9 “Economic-financial sustainability of systems and territories”.

The main aim of the project is to conduct a deep statistical analysis of Italian students’ digital competences based on the IEA-ICILS program or other specific studies. In particular, the researcher is expected to focus on investigating:

- a) specific gaps in the student achievements on both the CIL and CT scales such as gender differences and geographical differences by considering the quantile distribution of the achievement scales;
- b) the relation among the CIL and CT achievements and some contextual variables such as the student home environment, the school environment (including teacher capacity to use ICT), and the country policies and active practices.

Statistical methods to be used in the project include: quantile regression (Koenker and Bassett, 1978), multilevel regression models (Bryk and Raudenbush, 2002), classification and regression trees (Breiman et al., 1984), item response theory (van der Linden and Hambleton, 1996). Other parametric or non-parametric methods could be experienced as well.

The research activity is preliminary to the development of a computerized adaptive test for investigating digital skills among students which will be conducted within the GRINS project.

Research plan

The project is structured in the following steps.

1. Review of the relevant literature about digital competences and related national and international surveys such as IEA- ICILS.
2. Review of the literature about statistical methods to be used in the project (quantile regression, multilevel models, classification and regression trees, item response theory).
3. Statistical analysis of digital skills of Italian students coming from IEA-ICILS data or other ad hoc studies by considering specific gaps and investigating the relation between the achievements and background variables.

4. Dissemination of the results by working papers to be presented to national and international conferences or specific seminars/workshops.

References

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