VI Seminar

INVALSI DATA: A TOOL FOR TEACHING AND SCIENTIFIC RESEARCH

November 25th-28th, 2021

ROME

INTRODUCTION

The Seminar "INVALSI data: a tool for teaching and scientific research", now at its sixth edition, has become in recent years an opportunity for meeting and discussion on the use of National Surveys INVALSI results and, in general, on the world of evaluation and school. Evaluation does not only mean standardized monitoring of learning levels, but also evaluation and comparison of its functions and potential in relation to the practices and tools through which the school system is able to carry out its educational and formative mission. This year, keynotes of national and international experts were organized on issues related to the evaluation of the education system and the use of data to support school policies.

One of the objectives of the seminar was to bring the world of scientific research and schools closer together in order to build a privileged and concrete space in which enriching the debate by sharing ideas and experiences between education and research stakeholders. The variety of topics improve a multidisciplinary approach to evaluation in the educational and school field, trying to give an account of the contribution that schools can provide to society by making possible the development of knowledge and skills.

The Seminar is organised by the research group of Area 2 - Statistical Service: Patrizia Falzetti (Manager), Cecilia Bagnarol, Andrea Bendinelli, Leonardo Boulay, Emiliano Campodifiori, Michele Cardone, Silvia Donno, Paola Giangiacomo, Patrizia Giannantoni, Jana Kopecna, Giuseppina Le Rose, Francesca Leggi, Michele Marsili, Monica Papini, Veronica Pastori, Veronica Riccardi, Maria Carmela Russo, Antonio Severoni, Valeria F. Tortora.

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THEME 3. THE POSTPANDEMIC EDUCATIONAL CHALLENGES

ORGANIZER: INVALSI, SAVE THE CHILDREN
COORDINATOR: ANTONELLA INVERNO
NOVEMBER 25TH: 02.00 P.M. – 04.00 P.M. {ROOM 1– RESEARCH 1}

Mapping educational poverty: a prime example

Michele Marsili - Patrizia Falzetti - Emmanuele Pavolini - Moris Triventi

Starting from the definition proposed by Save the Children, our contribution consist in mapping a series of indicators which can help us to identify the areas of the country most affected by the so-called educational poverty. Save the children's definition of educational poverty indicates the impossibility for minors to learn, experiment, develop and let their skills, talents and aspirations flourish freely and refers to the difficult economic conditions that do not allow many children to have the same opportunities of their peers in better economic conditions. INVALSI collects a large amount of data with a high level of details that allows us to reach the single student and to get an idea of the phenomenon, analyzing it from different perspectives. Obviously it cannot provide an exhaustive idea, because it relates only to the aspects detected by the INVALSI, but if it will be combined with other indicators from different sources, it would allow targeting the interventions of the public entities, the foundations and the non-profit organizations. The first indicator created is the one that considers the percentage of the students with a level of insufficiency in the various subjects for several consecutive years (specifically the survey years 2018 and 2019 are considered). A second indicator is the one that considers the social, economic and cultural background of the students' families. Another indicator (one of which from the previous one) is the one that considers the lack of the students of tools and resources at their home, and in particular the lack of digital tools which in the pandemic situation created recently, certainly influenced the ability of the students to take part in Distance Learning effectively. These indicators aggregated at the level of a single building that has been previously geo-localized are then mapped on the territory. The result is a very varied characterization of the territory, which shows how the South is not unique and within it it is possible to intervene on well-defined and circumscribed territories and also that pockets of difficulty exist throughout the national territory. The hope is obviously to be able to combine the data that INVALSI produces with those generated by other entities, to have a more precise and more targeted view of the problem under investigation, allowing those who can to intervene more effectively.

Michele Marsili, graduated in Statistics at Sapienza University of Rome. He worked in Business Intelligence consulting, providing software development solutions for analysis and support for company's decision making in insurance and pharmaceutical industries. Since January 2018 he has been working in the Statistical Service of INVALSI.

Patrizia Falzetti, is Head of the Statistical Service of INVALSI, which manages the acquisition, analysis and return of data relating to national and international surveys on learning to individual educational institutions, stakeholders and the scientific community.

Emmanuele Pavolini, is Full Professor in Economic Sociology and Social Policy at the University of Macerata (Italy). He is a Member of the board of ESPAnet (European Social Policy Network) and co-chair of the board of Italian ESPAnet. He published articles on various journal, in Italian and English, on the welfare systems with specific attention to health care, family policies, occupational welfare, and studies, from a comparative perspective, on the Italian and Southern European welfare models. He is currently co-editor of the Journal of European Social Policy.

Moris Triventi, is Associate Professor at the University of Trento (Italy), where he teaches Social Research Methods and Sociology of Education. He is Principal Investigator of the cross-national project INEQUALITREES and Co-Director of the academic journal Polis.

The digital divide: a challenge for the schools

Rita Marzoli - Ornella Papa - Lorenzo Mancini

Introduction. Digital skills became crucial in Italian schools during the Covid-19 pandemic, contributing to an increased risk of educational poverty (OECD, 2020). In fact, in 2018 the International Computer and Information Literacy Study (ICILS) sponsored by the International Association for the Evaluation of Educational Achievement (IEA), found that Italian students did not possess adequate digital and informative literacy skills (Fraillon et al., 2020). 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" (Fraillon et al., 2019). The association found between CIL and students' socioeconomic and cultural backgrounds (Fraillon et al., 2020) is investigated to understand if and how the schools can fight the digital divide.

Object and research hypothesis. Object of the study is the relationship between in CIL achievement and students' socioeconomic background, considering the characteristics in the digital domain of the schools. The research hypothesis is that schools are effective in fighting the digital divide, in the presence of specific resources and teaching practices conducive for learning of digital and informative skills.

Data. The study refers to Italian data collected by INVALSI as part of the IEA ICILS 2018 Project, processed by the Statistical service with the integration of the school ESCS (socioeconomic and cultural background index) variable. The sample consisted of 150 schools selected with Probability Proportional to Size sampling. For each school, 20 students in the eighth grade were sampled, for a total of 2,810 students with an average age of 13.26 years.

Method. Analyses were conducted using R and SPSS software. The variables and indices contained in the database were analysed in relation to socioeconomic and cultural background; the ESCS is categorized based on quartiles: Low, Medium-low, Medium-high and High. Territorial location was classified into three macro areas: North, Central, and South.

Results. Two-thirds (67.7%) of schools with Low ESCS are in the South macro area; moreover, conditions unfavourable to digital literacy persist, such as reduced access to the internet. Differences have been identified not only in the percentage of computers "connected" but also in the availability of technical and pedagogical support for the use of ICT. CIL achievement decrease in the South macro area as well as in schools with Low ESCS. However, the students from "disadvantaged" background achieve better when digital and informative skills are learned in school setting. These results highlight the role of schools in fighting the digital divide, particularly in geographical regions with "disadvantaged" catchment area in terms of ESCS.

Rita Marzoli, is director of INVALSI Library; she graduated from the Vatican School of Librarianship. She is editorial board coordinator for 'INVALSI per la ricerca', a double-blind peer-reviewed series published by Franco Angeli. Her research interests are: systematic review, bibliometrics, open access, research evaluation, information literacy.

Ornella Papa, is Specialist in Psychological Evaluation and Researcher at INVALSI Library. She has been Subject Matter Expert at the Chair of "Introduction to Educational and Evaluative Research" at the University of Rome Tor Vergata. Her current research interests are: School libraries, Information literacy, Digital divide.

Lorenzo Mancini, is Senior Data Scientist at CROS NT. PhD in Statistical Science at the University of Bologna. His research interests involves clustering and classification methods, latent variable models and machine learning.

A framework for a trasformative evaluation for teachers and students - The Monitoring, Evaluation and Learning system of Teach for Italy

Antonio Piscopo

The activities of Teach for Italy (hereinafter 'TFI') are accompanied by a framework called MEL (Monitoring, Evaluation and Learning) aimed at to continuously monitor and evaluate the activities related to the impact of the organization, and in particular those related to the impact of its teaching-fellows.

The framework is inspired by the international practices of Teach For All and the principles of the model known as "Learning Organization". The MEL model was developed and piloted for the first time during the second half of the 2020/2021 school year. The development and continuous development of the system was carried out in collaboration with the teaching-fellows.

There are 7 MEL tools and they serve the three dimensions on which TFI wants to generate an impact: 1) Teaching-fellows; 2) Students; 3) Educational ecosystem.

The tools modeled for each of these dimensions are not only intended to "observe and report", but were designed to be transformative themselves. The transformative aspect of the tools consists in the fact that the data generated and collected are "living data", which means that they are not only restituted to those who generated them, but actively interpreted together with them and used by them. The data are taken as a cue to initiate multilevel cycles of reflections aimed at promoting learning and an opportunity for transformation for all the stakeholders involved, and for TFI as a whole organization.

Below a brief description of the impact dimensions of TFI and the MEL tools, their specific objective and how we use them.

1) The fellows (their personal and professional growth) are accompanied by pedagogical-didactic tutors (individual coaching sessions and observation cycles in the classroom). The fellows are also provided with a tool through which they monitor the growth of their students both in terms of curricular performance, and in terms of transversal skills relating to the ability of students to self-manage, to use meta-cognitive skills, to be active citizens. Reflection on these aspects, combined with information on the socio-economic background of the contexts of origin, allows the fellows to develop reflections on the risk of their students not passing the grade, of school dropout and potentially becoming a NEET. The anonymized and aggregated data related to all the teaching fellows are used centrally by TFI, made available for the fellows through processing and visualization tools, and finally interpreted together with all the fellows in special monthly sessions, called "Learning Together" .

2) Students are involved in the MEL-System through the tool we call "Student Voice". It is a questionnaire in digital and anonymous format through which students are asked to give feedback on three dimensions: on the teacher-fellow (didactic and relationship); on their psychological well-being in the class and at school; on themselves as learners (stimulation on the level of meta-skills). The results are collected anonymously by TFI and immediately returned to the teaching fellows, who on their side restitute the aggregated data to their classes, moderating reflection sessions with their students.

3) The educational ecosystem around TFI is included in our MEL system through a questionnaire to school principals. Also in this case, the collected data are aggregated and returned - that is, interpreted and discussed - together with the principals in a dedicated session.

Antonio Piscopo, (phd in Ethics) is Head of Impact and Learning for Teach for Italy (TFI) where he is developing a Monitoring, Evaluation and Learning (MEL) system designed to be the core of the Learning Organisation and transformative. He also collaborates with the global network Teach for All on the promotion of transnational approaches in education. He worked for many years for Teach First Deutschland engaging public and private sector for a more inclusive education system.

Project study for mapping on educational poverty

Maria Giulia Gentile – Barbara Baldazzi

To facilitate the analysis of the SDGs System, it is useful to adopt an approach that considers the links and interactions between the Goals and Targets, making explicit the interlinkages between the statistical indicators and constructing the relative mappings dedicated to specific themes. Linkage analysis helps to define what are the critical points and nodes of sustainable development and to identify the interrelationships between statistical indicators, in support of policies. The analyses related to interlinkages have three main purposes. The first one is to facilitate the production of statistical information.The second purpose is to make complex statistical information more accessible, through the integrated analysis of social, economic and environmental dimensions and their interrelations. The third purpose proposes the use of the identified links to facilitate the use of statistical measures for monitoring, even cross-referencing, of sustainable development objectives to support policies. Integrated statistical systems, such as the ISTATSDGs statistical platform, as well as the study of the interactions between the different domains of the SDGs and the explication of the links between indicators, were the scope of analysis of this internship.
The design study for the educational poverty mapping addresses the following points: - define educational poverty by placing it within the conceptual framework proposed by François Bourguignon in "Inequality of opportunity" (OECD, 2008); - briefly investigate regional and provincial differences - there is no development if there is inequality: one of the fundamental principles of the 2030 Agenda is "leave no one behind"; - identify the indicators (the Targets and the Goals) that can help us understand the situation in Italy; - answer the question: are the indicators in the SDGs database sufficient to describe the implications of educational poverty?

Maria Giulia Gentile, she received her bachelor's degree in Statistica Gestionale at Sapienza - Università di Roma, with a thesis called "Lavoro minorile in Perù: un'analisi sui dati Young Lives" (supervisor prof. M. Grazia Pittau). She then got her master's degree in Scienze Statistiche within the same university, with a thesis on "Metodi di clustering fuzzy per dati intervallari" (supervisor prof. M. Brigida Ferraro). At the beginning of 2021, she did an internship at ISTAT, during which she worked on the phenomenon of educational poverty in Italy. She is currently working at TIM as a data analyst.
Barbara Baldazzi, Researcher of Socio-Demographic Statistics Area at ISTAT since 1997. Researcher in SDGs Project: "Sustainable Development Goals". The United Nations Statistics Division entrusted ISTAT with the task of coordinating the production of indicators for measuring sustainable development and monitoring its objectives. In particular, in this project, she deals with analyzing, proposing, improving and monitoring statistical measures on education (Goal 4). Researcher in BES Project: "Measuring Equitable and Sustainable Well-being in Italy". In particular, she has the coordination and organization of activities of the thematic work groups of Education and Training. Project Manager of "Adult Education Survey" (2017 and 2012), in two waves of survey on households for study the participation of the adults at education and training during the life.

INVALSI tests for teaching: teachers' beliefs about validity of INVALSI tests and teaching practices implemented

Barbara Balconi - Elisa Truffelli - Daniela Maccario

This paper is part of an interdisciplinary research project led by experts from Mathematics Education, Pedagogy and Evaluation, based on a questionnaire aimed at investigating, through the voices of teachers, the relationship between INVALSI tests and teaching-learning processes at primary school. The questionnaire, divided into 3 sections, was administered in the school year 2019/20 to a large non-representative national sample of teachers (526 Italian fifth year Mathematics primary school teachers). The questionnaire aimed to investigate: teachers' awareness of the learning objectives detected by INVALSI tests, their conceptions about mistakes in Mathematics, the use of INVALSI tests in daily teaching practices, their misconceptions about standardized tests and their idea of assessment. The first phase of this interdisciplinary research project consisted in the validation of the questionnaire used. The data collected through this quantitative survey were statistically processed through the SPSS software. The first analyses carried out (Vaccaro, Faggiano and Ferretti, 2021; Truffelli and Vannini, 2021; Arzarello and Ferretti, in press; Faggiano, Monaco, Rizzo and Vaccaro, in press) raised further questions in the research team: what use is made of INVALSI tests in the classroom? What beliefs about the usefulness and validity of INVALSI tests do teachers carry? Is there a link between these beliefs and the way of use and frequency of use of INVALSI tests for teaching? Within the range of topics covered by the questionnaire, in the light of the above questions, our attention was focused first on the teachers' beliefs about the type of knowledge and skills detected by the INVALSI tests and on the validity of the tests themselves and second on the beliefs and statements regarding the teaching practices usually implemented by teachers. On these outcomes we have decided to focus the present contribution by offering an analysis and interpretation of the links that emerged starting from statistical correlations between the two blocks of variables mentioned above. Within the range of teachers' opinions and attitudes towards the INVALSI tests, we have identified a profile of teacher who recognizes the validity of the constructs of the INVALSI tests and who is therefore inclined to identify them as useful tools to analyze is teaching action, reflect on it and redesign it in a functional way in respect to learning objectives and to use the insent items more frequently in classroom evaluation practices. If we interpret these dynamics in the same manner as "habits" of practice in the professional field (Barbier, 2017), considering how they do not always give rise to mentalisation and discourse processes and may in fact have a "pre-semantic" nature, we can recognise the opportunity to deepen our knowledge and understanding of them (presumably also with sets of ad hoc tools). This is in order to focus on elements of teaching quality that can be exported and disseminated in the context of training/accompanying initiatives for the valorisation of INVALSI tests as potential tools for improving teaching and learning processes. Moreover, if, as literature suggests, they are ''ways'' of interpreting classroom work that are constructed during the activity itself, also on the basis of the relationships that the teacher has with the operational situation, it may not be useless to make an effort to reconstruct the context and the modes of participation-exchange within the communities of professional practices (Wenger, 1998) that were found to be generative (or not obstructive) with respect to "ways" of teaching, starting from INVALSI tests that could possibly be valorised as "good practices". On the other hand, it is precisely the emergence of distinctive dynamics that are potentially capable of bringing "added value" associated with using INVALSI tests in the classroom, emerging from the data, that makes it advisable to study professional interpretations of a different kind, characterised by a greater misalignment between using the tests and declared classroom teaching practices, in order to make them the object of analysis in a proactive and meliorative perspective, possibly also in and with teachers' communities. This, within the broader framework of the relationship

between INVALSI tests and didactic-assessment processes, is to be explored, prospectively, also in terms of developing innovative classroom management methods and strategies.

Barbara Balconi, researcher at the "Riccardo Massa" Department for Human Sciences at the University of Milano-Bicocca, Academic discipline: Area M-PED/03 – methodologies of teaching and special education. Barbara Balconi's research focuses on teaching and learning strategies; teacher education; general didactics and disciplinary didactics. She is member of a national research center (CERTP) for Educational Research on Teachers as Professionals.

Elisa Truffelli, associate Professor at the "Giovanni Maria Bertin" Education Studies Department, University of Bologna. Academic discipline: Experimental Pedagogy. Elisa Truffelli's research focuses on evaluation in pre-school contexts, evaluation in Higher Education and assessment for learning. Within the CSGE Center she carried out studies on the theme of Gender Education in Early Childhood.

Daniela Maccario, Associate Professor at Department of Philosophy and Educational Sciences, University of Turin, Academic discipline: Area M-PED/03 – methodologies of teaching and special education. Her research focuses on Competency based education in formal and non-formal educational contests; teachers and social educators education and training; research and development of didactic models; analysis of didactic-educational practices.

The school that works: investigation of organizational and educational characteristics in institutions with positive and negative added value

Greta Mazzetti - Amelia Manuti - Consuelo Mameli - Elia Pasolini - Davide Della Rina - Viviana Vinci Claudio Cortese - Dina Guglielmi - Loredana Perla - Roberto Trinchero - Ira Vannini

The analysis of school effectiveness' conditions within educational institutions and systems is a particularly rich field of study, open to complex questions and developments. The concept of school effectiveness - generally understood as the level of achievement of objectives by an educational institution - can be declined according to increasingly complex definitions. However, the emphasis on school achievement in terms of the product of learning and the concern to investigate those factors that significantly influence that product remains paramount. In light of this premise, the main theoretical contributions in the study of school effectiveness suggest to use multifactorial approaches that look at a dual perspective: on the one hand the institutions' organizational processes (through the analysis of specific variables in the field of organizational psychology) and on the other hand teaching processes (connected to the analysis of micro-context variables based on the educational and evaluative research). Gathering teachers' perceptions about these sets of factors may be particularly relevant in order to identify paths to promote development and empowerment. In particular, as regards organizational processes, this research started from the Job Demands/Resources Model as a theoretical framework and has identified specific aspects of work and school context that represent job demands and resources. Specifically, among the job demands, perceived workload, perceived inequity, and perceived job insecurity were identified; among the job resources, the study considered support from management, participatory decision-making, followership, support received from colleagues, professional development opportunities, and job crafting strategies. As for the educational processes, the research focused on some pedagogical constructs that national and international research has shown to be significantly related to school effectiveness and students' learning. More specifically, the research investigated planning, teaching, and assessment by focusing on the role played by teachers' beliefs, attitudes, and statements of practices. As for the outputs, the study considered the School-Effect (SE), a measure of added value proposed by INVALSI that considers the portion of the result of a test (in our case the tests in Italian language and Mathematics performed by students in the eighth grade) that does not depend on exogenous factors, i.e. all those individual and general factors related to the social and economic context and connected to previous cognitive preparation of the student that the intervention of the school cannot change. Starting from the theoretical premises outlined so far, the research aimed to compare secondary institutions with different SE levels by investigating, specifically, any differences related

to both organizational and pedagogical variables. For this particular purpose, the survey was developed by an interdisciplinary research group made up of researchers in the fields of Social and Organizational Psychology, Developmental Psychology and Teaching and Experimental Pedagogy from the Universities of Bari, Bologna and Turin, in collaboration with INVALSI and the Regional School Offices. In particular, 73 schools in three Italian regions were involved, with a total of 1,774 teachers who were asked to fill out an online questionnaire. Participants were mostly women (80%) with a mean age of 47 years (SD=10.32) and a mean teaching experience of 16.30 years (SD=11.44). In order to investigate the presence of statistically significant differences, a dichotomous variable capable of discriminating between schools with negative or slightly negative SE and schools with positive or slightly positive SE was created. With regard to organizational variables, results showed significantly higher levels of burnout among participants employed in schools with negative SE compared with participants in schools with positive SE. Among organizational resources, supportive leadership, participatory decision-making, and peer support showed significantly higher levels in participants working in schools with positive SE. As regards educational variables, confidence in the potential of teaching and initiatives for inclusion reported significantly higher levels among teachers in schools with negative SE; in contrast, natural giftedness ideology was significantly more present among teachers in schools with positive SE. The results emphasize the centrality of the manager's role, who is called upon to define a common vision, coordinate tasks, share decisions, and enhance the skills of teachers. The results related to the teaching variables are also particularly useful in suggesting how to orient teachers training practices, allowing to identify and develop skills that relate to the practices of self-evaluation and feedback and those aimed at fostering inclusion. Teachers could find a valuable support in counseling program aimed at the promotion of well-being, the development of emotional and relational skills and psychological skills and resources useful to cope with demands and changes related to their profession.

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Linking Student Achievement to Teacher Assessment Practices: Issues, Challenges, and Implications for the Italian Educational Research and Education Practice

Serafina Pastore - Gianluca Argentin

Background. The idea that schools can improve students' outcomes by focusing on a range of issues that include social justice, standards, leadership, staffing, funding, curricula, and governance has been a crucial point in the recent educational reforms at national and international level. In this perspective, teachers and teaching emerge as a lever of educational reforms. At the cornerstone of state educational policy, the use of assessment for instructional guidance (i.e., formative assessment) offers one of the most powerful ways for improving schooling. The changes undergone by national educational systems have led school personnel (first of all, principals and teachers) to face with different (and changing) assessment data, information, and methods. The accountability trend has heavily impacted educational systems, putting remarkable pressure on teachers, who are now more conscious of the need for using assessment information for decision-making in the classroom context (Darling-Hammond, 2010). With a strong emphasis on the alignment of teaching, learning, and assessment the reconsideration of assessment methods and strategies has become relevant, as well as the need for a new assessment culture more responsive to educational policy requirements, school system needs, and teacher practice instances. In this vein, for example, formative assessment has been recognized as integral to curriculum design and to the learning journey of all students. At the same time, the attention on teachers and teaching as an improvement strategy increase and led to recognize that instructional practices matter and that teachers are a key component of the instructional effectiveness. More specifically, teacher assessment practice and teacher assessment literacy have been recently recognized as crucial for teacher professionalism as well as for the improvement of student learning achievements. There is a political and institutional high-level commitment to promote an assessment design, which is holistic and aimed to student learning. Substantive research on developing practice in assessment feedback is also available (Wiliam, 2017). However, core practices in student assessment often remain problematic, and teachers face diverse challenges in using research to change and/or improve assessment and feedback practices; this aspect clearly emerged during the Covid-19. In this perspective, the recognition of the crucial role of teacher assessment literacy as a strategic support for teaching and learning within the standard-based framework of education (DeLuca and Bellara, 2013) has become more evident in policy documents and standards. However, despite the emphasis on teacher assessment literacy, recent research confirms that teachers are not prepared to effectively integrate assessment into their daily teaching practice (McMillan, 2003; Stiggins, 2010) and, that, the illiteracy in the assessment domain tends to negatively affect students' learning achievement.

Aims. Entering this lively debate, the present paper reports on a study aimed to: • Identify which assessment practices are more frequent in the Italian school system; • Understand if some assessment practices are more likely to influence student learning and therefore student performances in the INVALSI tests administration; • Analyze the relationship between teacher assessment practices, teacher professional development (in the assessment domain) and student learning achievements in the national large-scale assessment program; Specifically, we address two research questions: Research Question 1: Given the most widely teachers' assessment practices, what are the trends in students' Math and Reading achievement (grade 5 and 8). Research Question 2: Is teachers' previous attendance of professional development in the assessment domain linked to better student learning performances?

Data. In this study, we examine Math and Reading test scores from the INVALSI database, as well as data from the INVALSI Teacher Questionnaire for school years 2017/2018 and 2018/2019

Methods. In order to answer our research questions, we implement regression models and students' fixed effects models. Through the second set of models, we try to estimate a causal impact on students achievement due to teachers' assessment practice and of their previous professional development on this topic.

Results. Our results show that still Italian teachers lack skills in the field of students assessment and, even worst, they are not aware of their weakness in this domain. Negative effects derive from this, especially for students displaying weaker performances, hence increasing the risk of inequalities reproduction in the

school system. Explanations for the trends we observed will instigate a debate on the implications, as well as on the issues, criticalities and opportunities for the development of assessment literate teachers. At the same time, we address new research paths in the use of the INVALSI data within the educational assessment domain.

Serafina Pastore, PhD and Fulbright Research Fellow, is an Associate Professor in the Department of Education, Psychology, Communication, University of Bari (Italy). Her research focuses the intersections of assessment practice, teacher education and educational policy as they operating in the context of school and university innovation.

Gianluca Argentin, is a sociologist working at the University of Milan Bicocca. His research focuses on education, mainly on inequalities in the school system and on the experimental evaluation of interventions trying to reduce them.

Attitudes and beliefs of math teachers that make use of INVALSI items while implementing teaching for competences. An exploratory study in Italian primary schools

Ottavio Rizzo - Valentina Vaccaro

A teacher who is teaching for competences will require "good problems," i.e. problems which are meaningful, comprehensible, authentic and inclusive (Di Martino, 2017). In this work we plan to investigate the characteristics of teachers using INVALSI tests in such a fashion. The work is part of a interdisciplinary research project ("Gruppo INVALSI – Didattica e saperi disciplinari") led by experts both from Mathematics Education and from Pedagogy, based on a questionnaire with the goal of inquiring the relationship between the teaching practice of Italian fifth year Mathematics primary school teachers and their attitudes with respect INVALSI tests (Arzarello and Ferretti, in press; Faggiano, Monaco, Rizzo, Vaccaro, in press). There are three parts in the questionnaire: A first one about Math Education (the way teachers interpret INVALSI tests and their results); A second one about aspects of general education (which beliefs and attitudes do teachers hold, and how they affect teaching practices); A third one that collects personal data and context information. An analysis of this third section answers (N=526) given by teachers allows us to characterize the sample: 68% of the teachers was invited to fill in the questionnaire by their headmaster; 71% teaches in Piedmont or in Emilia–Romagna (two Northern regions that together represent 15% of Italian population); 90% hold permanent position. Even if such a large sample is not statistically representative, data is enough to offer many pieces of information to further reflections. Among the sets of questions of the questionnaire on teaching practices, one showed greater promise for data analysis: factor analysis allowed us to identify two factors that describe two different teacher attitudes on teaching for competences and using INVALSI tests with this goal. In order to investigate the relationship between teacher beliefs and attitudes and this teaching methodology, hence, we applied a linear regression. This allowed us to identify three indices with the best fitting for the model amongst all different teacher attitudes appearing in the questionnaire. The three indices identify a teacher that is: involved with valuation at different levels (member of leadership team, participation to training in service, professional and scientific debate), that utilizes formative assessment, that believes in the usefulness of INVALSI tests to analyse, reflect on, and design the teaching experience. Although the analyses conducted so far produced interesting results, further qualitative in-depth studies have been designed in order to confirm the results we investigated.

Ottavio G. Rizzo, is assistant professor in Mathematics at the University of Milan. His research interests include the training (pre-service and in-service) of Mathematics teachers, the use of digital resources in teaching.

Valentina Vaccaro, is a PhD student in Mathematics and is a research technical partner at INVALSI (since 2018). She performs research and training activities in the field of Math Education. Her research interests involve the use of new technologies, strategy games and Large Scale Assessment data in the Mathematics teaching/learning processes.

The stricter the better? The effect of teacher grading standards in primary school on children's competences development

Ilaria Lievore - Emanuele Fedeli - Moris Triventi

Introduction. Despite the large debate on the issue of the negative consequences of grade inflation on student effort and on time devoted for studying (Stroebe et al., 2016; Babcock and Marks, 2011), less attention has been dedicated to the consequences of teacher grading standards on student educational outcomes, especially in early stages of the scholastic career. This paper aims at filling this gap, analysing the effect of teacher grading standards on children competences development, ad its heterogeneity across students' ability, gender and socioeconomic background. Grading standards measure how stringent teachers grade their students, relatively to an objective measure of student achievement such as standardized test score. Little empirical research focuses on how teacher can manipulate students' effort and motivation adopting specific grading standards, and on the educational consequences for students whose teacher adopts higher or lower grading standards. However, previous results are controversial. From the one hand, students whose teacher adopts higher grading standards are those who need to put more effort if they want to satisfy teachers' requirements and achieve a good grade, therefore they may benefit in the long run in terms of competences. From the other hand, harder grading standards may discourage students if the level of ability needed for achieving a good grade is too high, and this can have detrimental effects on their competences. The majority of previous studies tend towards the first interpretation (Betts, 1997, 1998; Betts and Grogger, 2003; Bonesrønning, 1999, 2004; Iacus and Porro, 2008; Figlio and Lucas, 2004). Moreover, it has been hypothesized that high grading standards may have different effects for different students (Betts and Grogger, 2003) since motivation may be triggered differently according to students' characteristics (Becker and Rosen, 1992).

Research hypotheses. According to the previous literature, our hypotheses are: H1) the higher teacher grading standards in 5th grade, the higher student competences measured in 8th and 10th grade; H2) the positive effect of grading standards is different across students with different previous performance, socioeconomic background and gender.

Data. The empirical analysis in based on Italian language data collected by INVALSI-SNV. The sample for this analysis includes the cohort of students in 5th grade matched with their teachers in the academic year 2013/14. In 5th grade, information on both teachers and students are collected. The INVALSI data contain information on both teacher assessment of student ability (teachers' grades) and on student score in standardized test in Language and Mathematics (INVALSI test score). This is why they are particularly suitable for this study. Taking advantage of students' and classes' identifier, it is possible to link information on students those from their teachers in the two subjects – Language and Mathematics. Students are then followed through their academic path taking advantage of the SIDI code, a student unique identifier that allows a linkage of students with their subsequent INVALSI assessment. The cohort of 5th grade students is therefore followed in time, linking information in 8th grade in the academic year 2016/17 and in 10th grade in the academic year 2018/19. A major problem concerns the linkage with the SIDI codes, which implies a huge loss of cases and missing values due to school non-reporting, or ID misclassifications, or students who did not pass the school exams and are not attending the planned academic year. This implies a loss of about half of the sample when followed through the academic career, and a possible selection of high performing students that may affect our estimates. Our final sample includes 9,325 students.

Methods. We construct the measure of teacher grading standards in 5th grade using two pieces of information: students' grades in Language and Mathematics, as a measure of how a student stand relatively to their class mates, and students' test score in literacy and numeracy, as a measure of the student

competences relatively to all Italian students. Teacher grading standards are estimated for each class, which means that all the students in the same class have the same teacher grading standards, relying on two different regressions for Italian language and Mathematics. Grading standards estimates are obtained by regressing separately student's GPA (grade point average) in Mathematics and in Language on test score in numeracy and test score in literacy, plus a vector for classroom dummies. Coefficients on classroom dummies are the estimated grading standards in Language and Mathematics. To estimate the causal effect of grading standards on students' competences in 8th and 10th grade, we perform 2SLS regressions with school fixed effects, relying on the grading standards of other classrooms in the same schools as our instrumental variable.

Results. Results indicate that being exposed to stricter grading standards in grade 5 leads to higher students' literacy and numeracy competences in grade 8 and grade 10. The positive effect of harder grading standards is similar across students with different ability, gender and socio-economic background. Our results are particularly relevant considering the recent abolishment of grades in Italian primary schools, and they suggest the urgency to dedicate attention on the issue also in terms of educational policy making.

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From Data to Coding and responsible digital citizenship: the design of a learning journey

Francesco Maiorana - Giusy Cristaldi

Introduction. An enduring worldwide effort has been carried out by national and international institutions to identify the competencies (OECD, 2018) students must be equipped with to tackle their life and fully develop their talents for self and community benefit. Side by side to this effort educational researchers investigate how to identify and map competencies from international curricula and standards (Clear, 2020). Teachers and educators strive to identify learning paths and how to best guide students in obtaining the above-identified competencies to offer quality education to all (UNESCO).

Object and research questions. The aims of the work are: 1) to obtain a picture of Italian students' strengths and weaknesses in three different areas: Computer and Information Literacy, Civic and Citizenship Education, Collaborative Problem Solving, and their learning evolution from 2015 to 2018; 2) To obtain a picture of teachers enacted actions and outreach activities related to computing and coding and their evolution from 2014 to 2020; 3) To identify core competencies and commonalities in international curricula in 3 different areas: Computer and Information Literacy, Civic and Citizenship Education, and Computer Science; 4) To Identify a learning path that, by using data as a glue, fosters students' competencies development in the above-mentioned areas.

Used data. We will use data related to the Italian territory from: 1) The students' test in the International Computer and Information Literacy Study (ICILS, 2018); 2) The students' test in the International Civic and Citizenship Education Study (ICCS, 2016); 3) The students' test in the Programme for International Student Assessment (OECD-PISA, 2015) Collaborative Problem Solving; 4) The responses of the Italian teachers to the validated instrument MEasuring TeacheR Enacted Computing Curriculum (METRECC) (Falkner, 2019);

5) Aggregated data publicly available related to the EU code week initiatives with a special emphasis on the Italian territory We will also leverage on the Italian computing guidelines (Nardelli, 2017) and the Civic and Citizenship Education Italian guidelines to identify core competencies and commonalities among the different areas covered by the guidelines.

Method. We will use data related to the first three student tests to identify their strength and weakness and correlations among the results as emerged from data and official reports. We also analyze the test item to identify common themes related to the three different test domains. The METRECC data will be used to have a picture of enacted teachers' actions and needs related to Computer Science and Coding activities with an Italian perspective, data that will be compared with activities emerging from the EU Code Week.

Results. From the analysis of the students' test, we will derive a picture of students' performance in different areas and their evolution over time. By leveraging on competencies analysis, we will propose a learning path for K-12 education in the above-mentioned areas. Two lesson plans on data and kindness on the web covering topics and suggesting activities in the three different test areas will be shared as proof of concepts. The activities in the lesson plans will allow merging the 3 areas covered by the test with both a humanistic, scientific, and technical perspective.

Francesco Maiorana, is an active researcher in Computer Science education, medical informatics, and data mining. He has more than twenty-five years of teaching experience, including tutoring and teaching high school, undergraduate and post-graduate courses, teacher preparation courses as well as volunteer mentorship in informal education.

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Word formation in the INVALSI tests

Zuzana Toth

The present contribution examines the word formation tasks administered in the language awareness section of the INVALSI tests, starting from the first year when the tests were administered up to 2019. The objective of this revision is to gain a deeper understanding of 1) which word formation processes (e.g., derivation, composition, conversion, etc.) are put under scrutiny in the tasks; 2) how the tasks are distributed between school levels and levels of difficulty; 3) which variables affect task difficulty; 4) if the test results allow for the identification of a progression of topics, from the easiest to the most difficult. The identification of such progression would make it possible to outline a vertical grammatical syllabus, to guide the selection of topics to focus on at various school levels and the formulation of tasks in the INVALSI tests. The method of task analysis is inspired by qualitative content analysis (Mayring, 2014). The analyses reveal that most of the tasks investigate the process of derivation and that their difficulty is influenced by the interaction of several variables. The most salient variables are: 1) the lexical and morphological complexity of the words in the task; 2) the way the task is formulated (number of words to analyse, presence of metalinguistic terminology, etc.). The interaction of these variables makes it difficult to identify a progression of difficulty independent from the concrete tasks. However, it is possible to identify some guidelines, based first of all on word frequencies in language usage and the students' linguistic experience.

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The Italian regional divide in education: the role of school starting age

Giorgio Monti

Introduction. This work wants to understand the effect of students' age on INVALSI test scores. The Italian Schooling System allows parents of children born between January 1st and April 30th to enroll them to primary school in the year when they turn 5 (instead of 6). Although this rule is the same for all the Italian territory, there is a strong geographical heterogeneity in the choice. In regions in the South the 50% of student born in the initial four months of the year are enrolled earlier, against the 10% in the North of Italy. This generates a difference in average age at the moment of the test between students in the South and in the North, since the test Is administered according to the grade. Several studies show how, especially in primary school, age is a main driver of scores at standardized test and also how school entry age can affects the development of non-cognitive skills with consequences also at later stages (Fredriksson and Ockert, 2013; Bedard and Duhey, 2006; Muhlenweg et al., 2012). In this paper I want to highlight how the difference in average test scores between North and South Italy is partly due to differences in age between the two pools of students and I want to verify whether school closures in the Covid-19 pandemic period have affected more significantly students relatively younger. In the end, I analyze what are the factors that bring parents to choose the early enrollment to primary school and to understand why it is more common in the South Italy, with a particular focus on the concept of parenting style introduced in the economic literature by Doepke and Zilibotti (2017; 2019).

Object and Hypothesis of the research. This work wants to study the effects of early enrollment on stardized test scores and the characteristics of parents who make this choice. More specifically, I want to test the following hypothesis: 1. North-South gap in INVALSI test scores in primary school is partly due to the difference in average age of students; 2. Covid-19 and related school closures have penalized more relatively younger students, increasing the effect of age on scores, affecting also the North-South divide; 3. Parents who choose early enrollment are less permissive and more likely to be authoritarian/authoritative. Along with testing these hypothesis, this work wants to measure the magnitude of these effects and to study the characteristics of early enrolled students. Since this parental choice is clearly endogenous, it is necessary to control for selection and to understand how it can affect the results.

Data. For the empirical analysis I have used data from INVALSI standardized test scores in Italian language and Mathematics of students in II and V grade from 2012 to 2021. To measure the diffusion of different parenting styles I used the Italian data of the World Value Survey (Wave 5), the same used by Doepke and Zilibotti in their work, and data from the PISA questionnaire for parents (2009). To measure the correlation between the early enrollment and other economic outcomes I used data at the provincial level for the Informational Content of Surnames built by Guell and coauthors as a proxy of social mobility (2018) and data on inequality from D'Onofrio and Giordani (2019).

Methodology. To measure the portion of the North-South gap in INVALSI test scores that is due to the difference in age, I used the widespread technique of Difference-in-Difference. In this framework, this approach assumes that the month of birth is randomly distributed and that looking at students born between May and December (and hence not eligible for early enrollment) the effect of age on scores is the same in the two areas. I created two dummy variables: Eligible (=1 if the student is born between January and April and 0 otherwise), and South (=1 if the student attends a school in the South, 0 in the North if Italy). In this way I set the following linear regression: $y_i = \alpha + \beta South_i + \gamma Eligible_i + \delta South_i * Eligible_i + \varepsilon_i$ Where y is the score at standardized tests in Italian language and Mathematics of the student i. In this equation the coefficient δ is the one of interest as it measures how much the gap increases because of the higher rate of early entrants in the South. In order to have preliminary results on the effects of Covid-19 related school

closures I then compared the results from analysis on 2021 data with those from years 2012 to 2019. In the end I measured the correlation at the provincial level between the rate of early entrants and the level of social mobility and inequality, and I used data from PISA and the World Value Survey, to see heterogeneity of parenting styles across Italian regions.

Results. The empirical analysis shows that the difference in age between North and South profoundly influences the gap in test scores. In II grade the 100% of the gap is due to the difference in age, whereas in V grade this percentage is the 20%. Looking at data from 2021, the effect of age on test results seems to be larger, possibly because of closures, increasing the fraction of the score gap due to the age difference. In the end, the choice of early enrollment is more common where the share of permissive parents and social mobility are lower and inequality and returns to education is higher.

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Effect of economic, social and cultural status of students on English language learning and territorial differences

Paola D'Elia - Sabrina Girardi - Caterina Balenzano - Sergio Di Sano

The relationship between socio-economic status and school performance is a much-debated research topic of international interest. In Italy, the social and economic distance between north and south represents a historical issue, which inevitably extends to the educational level. Results in the INVALSI tests constantly confirm this evidence. The territorial differences between the northern and southern regions are mainly attributable to contextual factors, such as family characteristics - the level of education and the profession of parents -, the socio-economic peculiarities of the territory, the quality of resources, and school structures (Bratti et al., 2007; Graganese and Grasso, 2017). Following the Covid-19 pandemic, this north-south gap in school performance appears to have further worsened. In line with recent contributions (Bagnarol and Donno 2020; Russo et al., 2020) showing that needed to compare the socio-economic level (ESCS) with the educational gap likening different groups of regions, in this study, we want to examine how much the ESCS-s, which refers to the socio-economic background of the student, affect the differences in learning the English language. ECSC is a composite measure of parental information (profession and educational level) and domestic supplies information. Family may play an important role when it comes to academic achievement. Family members can be role models for the student, as they can motivate and encourage academic achievement. Stella reports (2021, p. 54) that families show the "difference between their ability and willingness to use IT tools independently and the necessity for continuous presence and assistance of adults in school activities." The results of the projects to combat educational poverty confirm what has been highlighted by numerous empirical investigations: the educational poverty of minors is associated with the lack of family support (Save the Children Italia, 2016; Sica, 2020). Moreover, the scarcity of financial resources has a stable impact on academic engagement, educational outcomes, and individual aspirations (Lohmann and Ferger 2014). According to other investigations, ESCS-s produces a significant effect on student performance on Italian language and Mathematics tests (Di Sano and Balenzano, 2021). Therefore, in this study, we investigate the influence of the ESCS-s indicator on the English Reading (R) and Listening (L) tests, comparing the different groups of Italian regions (north-west, north-east, center, south, south, and islands). For greater clarity, we investigate the internal differences (north-west, northeast, center, south, south, and islands), also relating them to the origin and the gender of the students. The present work aims to investigate the influence of the ESCS-s indicator, which detects the nature of the family background of the student on the INVALSI tests of English in both Reading (R) and Listening (L). The different groups of regions (north-west, northeast, center, south, south, and islands) are compared, and how the educational gap changes according to two variables: i) origin of the student (Italian/immigrant), ii) gender of the student

(male/female), in order to investigate whether part of the ESCS-s variance may be absorbed by these variables in the statistical model. This study bases the analysis on the sample data of grade 8 students who participated in the INVALSI English, Reading (R), and Listening (L) tests for the school year 2018/2019. Weighted data were used to take into account the representativeness of the sample. For the analysis, we used the SPSS statistical software. A first exploratory analysis, carried out through linear regression, allowed us to investigate the effect of the overall ESCS at the student level on the results of the INVALSI tests for the different set of regions of Italy, considered separately for both Reading (R) and Listening (L). We consider applying three models: the first model, to a single predictor, involves the ESCS-s indicator; it was then considered appropriate to carry out a multiple regression by adding the i) gender variable, and subsequently the ii) origin variable, as independent variables. The linear regression confirms the high impact of the ESCS-s on academic performance for the English tests. Results show significant differences among the groups of regions (north-west, northeast, center, south, south, and islands), with the northeast group reaching the highest results in both Reading (R) and Listening (L) tests. According to the multiple regression, the variable i) origin has a significant weight in the north-west, central, south, south, and islands set of regions but not in the north-east group for the Reading tests (R). There are no significant differences between immigrants and Italians in the Reading tests (R). Furthermore, immigrants score higher than Italians in the Listening tests (L). The variable ii) gender has a significant positive effect (females score higher) in every set of regions, although the territorial differences remain constant. In conclusion, ESCS-s has a significant effect on students' performance on INVALSI English tests, both for Listening (L) and Reading (R) in all the set of regions. Being an immigrant does not seem to weigh excessively on learning the English language, especially in the northeast of Italy, while being female seems to represent an advantage in all territorial groups.

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The case of Trentino: good performance levels, but thanks to what factors?

Loris Vergolini - Gianluca Argentin - Chiara Tamanini

Aims. Students and schools' performance variability across the country is a key feature of the Italian school system. Trento province traditionally displays good students' performance both in national and international standardized assessments. This positive trend did not change in 2021, after the first year of Covid-19 pandemic: once again pupils' results coming from Trentino showed to be significantly higher than the rest of Italy and also than other Northern regions. Moreover, while in the entire country students' performance showed a decline after the pandemic crisis (especially in the South and in lower un upper secondary schools), this not happened in Trentino, where mean results were stable or were even higher

than 2019 (Ricci, 2021). This set or results requires to be better understood, in order to identify which factors explain this persistent positive performance: is it the consequence of favourable contextual factors or of higher schools effectiveness? It has to be stressed that the province of Trento is characterised by a set of peculiar institutional features, among them we can mention: the school reform that introduced in 2011 a dual system (Covi et al., 2021); public investments in the teacher training; a systematic support to the learning of foreign languages and ICT skills for both students and teacher.

Data. Using INVALSI data coming from several school years (since 2015/16 until 2020/21), we compare Trentino to other regions, controlling results for a wide set of covariates (as done in Bratti et al., 2007), merging the data with the ones coming from other administrative sources.

Moreover, we use an additional unique dataset (available for the school year 2012/13) that has been constructed by Asso et al. (2015) for previous research. The peculiarity of this dataset is that the merge with administrative data occurred at school levels for an even higher set of control variables.

Method. Our analyses are based on a two-step strategy. In the first set of analyses, through OLS regressions, we model school results at province level, trying to assess to what extent the specificity of Trentino may be explained along time by contextual control variables.

In the second set of regression models, we try to isolate school effectiveness. After estimating it, controlling for a set of variables wider the one used in previous models, we compare the distribution of schools' effectiveness in Trentino's schools with the one of schools in the other Northern regions.

Results. Our preliminary results and the descriptive evidence available regarding the better school performances in the province of Trento suggest that both contextual factors and schools' effectiveness contribute to the valuable results of Trentino. These findings could also be the result of a political culture that has always considered schooling and research as a relevant asset for the development of the province. The explanation for the better school performances appears to be complex and not attributable merely to a single factor.

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Parental confidence in technology use and engagement with home-schooling in Italy: an unexpected negative relationship

Darren Hilliard

Summary. We examine the relationship between parental confidence in technology and parental engagement in home-schooling children during the Covid-19 pandemic in Italy. Data comes from the International Covid-19 Impact on Parental Engagement Study (ICIPES) 2020 conducted by the University of Bath. We constructed latent variables for parental engagement and parental confidence in technology use. We use these variables in regression analysis and find a negative relationship regardless of which control variables are included. Mediation effects of several variables were tested for using structural equation modelling (SEM), but no significant mediation effects were found.

Data. For this study, we draw on data from the International Covid-19 Impact on Parental Engagement Study (ICIPES) 2020. The ICIPES was conducted to investigate how parents and caregivers engaged with children's learning during the period of social distancing arising from the global Covid-19 pandemic. The survey was coordinated by the University of Bath who invited academic partners from 23 countries to participate in ICIPES 2020. The representative in each participating country oversaw the distribution of the questionnaire via social media networks. Participating parents completed the questionnaire online. The questionnaire included questions related to both parent and child. If parents had more than one child, they were asked to select one for which all child-related questions would relate to. For this investigation, we use data from the 517 ICIPES responses from Italy.

Variables. Parental Engagement The dependent variable used is the latent variable, parental engagement. This variable measures the extent to which parents are engaged in the home-schooling of their children. We use confirmatory factor analysis (CFA) using responses to five parental engagement items to construct the latent variable. The five items are: I follow my ideas about what my children need to learn, I mix my own ideas with the school's plan on what my children need to learn, I list and prepare the activities myself before developing them with my child(ren), my children and I have a set home-schooling timetable, and I develop with my children spontaneous learning activities not necessarily school-related such as cooking, woodwork, online games, physical activities, etc. Responses were measured on a frequency Likert scale, with scores of 0 corresponding to the response always, and scores of 4 corresponding to never. These scores were then reverse coded. Parental Confidence in the use of Technology Our independent variable is parental confidence in the use of technology, which is also a latent variable. To construct this variable, we first create three technology confidence component variables: parental confidence of using technology as a tool/resource, parental use of technology to build capacity, and parental confidence in using social technology. These three variables are constructed by summing the scores of the questionnaire items relating to each variable. We then use CFA with the three parental confidence in technology variables to construct the overall parental confidence in the use of technology latent variable.

Socio-Economic Controls. We control for three socio-economic level controls: the parent's income, job category, and years of schooling. For parental income, respondents were presented with ten income bands and asked to select which band their income belonged to. Higher bands represent higher incomes. Job category was divided into four categories: unemployed, elementary, semi-skilled, skilled, and managerial. Years of schooling is simply a measure of the years of schooling a parent has completed.

Other Controls. We also include several other controls: the gender of the parent and child, number of siblings the child has, whether the internet at home is sufficient for a child to learn remotely, and whether the parent has been given a learning plan from the school.

Method. The following model is used to estimate the relationship between parental confidence in the use of technology and parental engagement: PE= β0 + β1 CT + β2 SES + β3 X + e Where PE is parental engagement and CT is parental confidence in technology use. SES are our three socio-economic status control variables: parent's job type, income, and years of schooling. X represents a vector of individual controls which includes the gender of the parent and child, number of siblings, whether the internet at home is sufficient for a child to learn remotely, and whether the parent has been given a learning plan from the school. We tested several potential mediators and moderators but found no significant mediating or moderating effects.

Results. Results for three regressions are presented: one without controls, one with socio-economic status (SES) controls, and a full regression with all controls. We find that for each specification the relationship between parental confidence in technology use and parental engagement is negative and significant (p<0,01). No other coefficients are significant.

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The Covid-19 pandemic and school closure: learning loss in Mathematics in primary education

Lucia Schiavon - Maria Laura Di Tommaso - Dalit Contini - Caterina Muratori - Daniela Piazzalunga

Italy was the first Western country hit by Covid-19 in February 2020, responding with a tight lockdown and full school closure until the end of the school year. In this paper, we evaluate the impact of the pandemic and school closures during the spring of 2020 on the Mathematics achievements of primary school pupils in Italy. To the best of our knowledge, this is the first paper looking at the impact of the pandemic on Italian children's learning, adding to preliminary descriptive evidence available from the national assessment conducted in 2021 (INVALSI, 2021). Adopting a difference-in-differences strategy, we compare the progress over about one year of two cohorts: a pre-Covid cohort – pupils enrolled in grade 3 during the school year 2018-19 – and the Covid cohort – pupils enrolled in grade 3 during the school year 2019/20 who experienced school closure and the pandemic. We construct a unique dataset, linking the results of a standardised test administered by the research team to pupils at the end of grade 3 (named the MATHGAP test, which was designed by scholars of Mathematics education to assess Math skills acquired by children in grade 3) with information coming from the Italian National Institute for the Evaluation of Education and Training System (INVALSI), which includes the INVALSI standardised tests in Math and Italian language administered at the end of grade 2, teacher-assigned marks, and socio-demographic variables. Due to the availability of longitudinal data at the individual level, we can estimate the average impact of the Covid-19 pandemic on Math achievements with the following model: $Y_{1ikj} = β0 + β1 * C_{kj} + β2 * Y_{0ikj} + β3 * X_{ikj} + β4 * D_j + e_{ikj}$ where Y_{1ikj} is a standardized Math test set by child i of cohort k in school j at about age 8, i.e. at the end of grade 3 (MATGAP test); C_{kj} is a dummy variable equal to 1 if the child i is in the Covid cohort k, 0 otherwise; Y_{0ikj} is a vector of initial skills at about age 7, including the standardized Math and Italian language tests taken at the end of grade 2 (INVALSI tests) and the mark in Math assigned by the teachers at the end of the first term of grade 2; X_{ikj} is a vector of sociodemographic variables (age, gender, migratory background, parental education); D_j is a vector of school dummies, i.e. school fixed effects, which account for the large heterogeneity observed across schools; e_{ikj} are stochastic errors normally distributed and clustered at the class level. $β_1$ is the coefficient of interest: it captures the causal effect of being part of the Covid cohort rather than the pre-Covid cohort on Math skills at age 8, given previous performance in Math and Italian language. As the outcome variable is standardised, the impact is expressed in terms of standard deviations. The identifying assumption is that conditional on grade 2 test abilities, the Math performance of children in grade 3 in the Covid cohort would have been the same as the pre-Covid cohort had if the pandemic had not occurred. This assumption seems rather weak, given that the two cohorts are just one year apart. Since we are not only interested in the average impact of the pandemic but also in its differential impact across children with different socio-demographic characteristics, we also

estimate a similar model including a set of interactions between C_kj (the dummy identifying the Covid-cohort) and initial Math competences, gender, migratory background, and parental education. To highlight potential differences between social backgrounds, we also estimate the coefficients of such interactions separately for the children with low- and high-educated parents. Our results indicate that the school closure had a large negative mean impact on the Math competencies of pupils equals to -0.19 standard deviations. The magnitude of the loss is large, and corresponds to about 3 months of school, nearly the time that the schools remained closed in Italy. Our results end up being similar to the findings from previous research on different countries: learning loss due to school closure is about 0.01 s.d. for each week of school closure (in Italy -0.19 s.d. for 15 weeks of closure, in other countries 0.07-0.10 s.d. for about 8-10 weeks). Somewhat unexpectedly, on average we do not find evidence of increasing inequalities among children with different family backgrounds. Instead, we find heterogeneous patterns within the group of children with low-educated parents: the learning loss in that cohort was larger for the best-performing children (up to -0.51 s.d.) and for girls (-0.29 s.d.). Instead, among the children with high-educated parents, girls were less affected by school closure than boys, although the difference is not significant. Our results suggest that the children whose performance suffered most were those who normally benefit the most from attending school. The children of low-educated parents may have had little support within the family to cope with the situation, and among them, the best-performing were those who usually gain most from school attendance.

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Performance decline and stake of the test

Lorenzo Rocco - Giorgio Brunello - Lisha Agarwal

Introduction. It is now well documented that students' performance in standardised tests declines along the test, and the probability of providing a correct answer is larger for questions located at the beginning of the questionnaire and small for those towards the end. Brunello et al. (2021) provide evidence of this phenomenon using INVALSI data for grade 2 and grade 5, and document that the extent of performance decline is quite heterogenous across genders and even across students. Research Question. In this study we ask whether the performance decline depends on whether tests are low or high stakes. While in high stakes tests students are more motivated and likely more concentrated, they are also more likely to be stressed and thus to get tired faster.

Data. We use INVALSI data on Maths for grade 6 and grade 8, collected in the school years 2012/13 and 2014/15 respectively. While the test in grade 6 was low stake, the one in grade 8 was part of the exit exam from middle school and contributed to the overall grading.

Methods. Questions in INVALSI questionnaires take different positions in different booklets, and the latter are randomly assigned to students. We exploit this variation to separate the effect of a question position from that of intrinsic question difficulty by estimating a linear probability model where the probability of providing the correct answer to a question is made depending on the position of the question in the questionnaire, controlling for question and student fixed effects. Furthermore, we consider the same set of students in both grades, as we track in grade 8 students who took the test in grade 6. We also tackle the question of whether possible differences between grade 6 and 8 are due to students' differential maturity rather than the tests being low or high stakes, by including in the model the interaction between question position and students' month of birth.

Results. We find that the performance decline is, on average, much smaller in high stake tests than in low stake tests, for both genders. In high stakes test the probability of giving a correct answer declines by 0.4 percentage points if the question is moved ahead of ten positions towards the end of the test; in low stake tests the decline associated to a similar shift is equal to 1,4 percentage points, over three times larger. Both effects are statistically significant at conventional levels. This is a genuine difference which does not depend on the differential maturity of students, as the interaction between question position and month of birth attracts a very small coefficient. Our result suggests that a certain dose of inattention, lack of motivation, or boredom affects students in low stake tests. Furthermore, it also suggests that high stake tests could be extended without much harm for student performance, with the important benefit of providing a more accurate account of student's competences. Viceversa, low stake tests could provide a more biased picture of students competences the longer they are.

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A multidimensional fuzzy approach to explore the teachers' use and confidence towards ICT across Italian regions

Felice Russo - Antonella D'Agostino - Sergio Longobardi - Giuseppe Migali

Introduction. How teachers develop and exploit their pedagogical resources is essential to boost schools' educational purposes and student success. In this respect, the Information and Communication Technology (ICT) integration into teaching activities continues to be regarded as having the potential to improve the teaching and learning process (Bettinger et al., 2020). From this perspective, both the teachers' ICT-related educational beliefs and wider use of the technologies are influencing and decisive factors of the degree of integration of technological tools into educational practice. In particular, different scholars stressed that the intention to use any technical system is influenced by the potential 'users' level of acceptance of it (Pelgrum, 1993). From an educational policy point of view, the ability to correctly measure 'teachers' level of adoption of ITC and ICT-related educational attitudes is essential to build a more comprehensive improvement strategy in education. Purpose of the study and research questions This study aims to measure the teachers' use and confidence towards ICT and compare it between Italian regions. We propose to use a multidimensional and fuzzy Perspective. We seek to answer the following research questions: 1) How many dimensions of teachers' use and confidence towards ICT can be identified on the basis of the available data? 2) Do these dimensions provide a different ranking of Italian regions? These exercises may be beneficial for a policymaker aiming to obtain a concise depiction of the 'teachers' perceptions and teaching experiences regarding the usage of technologies in their classrooms. To explain the variation in our indicators between Italian regions, we also explore if there is any correlation between the indicators and, alternatively, the EU structural funding and the digital endowments of the schools.

Data. Our research draws on the 2018/19 dataset from the Teachers Questionnaire of the Grade 10 sample classes. We consider a comprehensive set of 16 variables related to integrating new technologies into the teaching practice and the level of teacher confidence in student assessment tests administered via computer. To evaluate how our indicators are correlated with the EU structural funding, we exploit the data related to the annual EU payments made by the European Regional Development Fund (ERDF) and the European Social Fund (ESF). We further integrate our data, including the results of a survey conducted by the Italian Ministry of Public Education on the digital endowments of the schools.

Methodological approach. We apply the multidimensional and fuzzy approach introduced by Betti et al., (2016). We start from the assumption that teachers' use and confidence towards ICT is a multidimensional concept that manifests itself in different shades and degrees (i.e., fuzzy concept). From an operational point of view, we first selected several items from the INVALSI questionnaire, and using Exploratory Factor Analysis (Bandalos, 1996) and then Confirmatory Factor Analyses, we identify the latent dimensions that summarise different aspects of teachers' use and confidence towards ICT. After that, a membership function with values in the [0,1] interval is defined for each latent dimension; this function is a quantitative specification of individual degrees of teachers' use and confidence towards ICT. Accordingly, the membership function's value of 0 is always associated with the lowest level, and a value of 1 is associated with the highest level. Membership function values between 0 and 1 indicate intermediate degrees.

Results. We identified three dimensions: "ICT Trust" (i.e., be able to have a positive attitude toward new educational tools); "ICT Usage" (i.e., the capacity to support teaching process using Information and Communication Technology); "ICT for student assessment" (i.e., the ability of making effective use of computer tests). Accordingly, a membership function is defined for each of them. Our findings highlight that Southern regions, with some exceptions, are characterized by higher levels of the fuzzy estimates computed for each dimension, meaning that the Southern regions are in a better position concerning the phenomenon under scrutiny. The cause of this difference is a complex matter. We computed the correlation coefficients between EU funds and our fuzzy indicators to shed some light on this issue. Main findings indicate a positive correlation between the three fuzzy estimates and ERDF and ESF funds at the national level, particularly for "ICT Trust" and "ICT for student assessment".

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A multilevel growth analysis of the performancec in Mathematics

Stefania Mignani - Silvia Bianconcini - Jacopo Mingozzi

Introduction. The INVALSI surveys allow to depict the situation of the Italian educational system both in a specific moment and over time. It is then possible to compare different schooling levels as well as tracing the temporal performance of the students to examine if and how their level of competences are changing over the school cycle. This study focuses on the longitudinal approach, that gives us the opportunity to discuss the relevant topic of lifelong learning, that is the new concept of training that accompanies the individual throughout life. Nowadays, the society requires that the individual should not acquire knowledge just at school, but that he/she should continue to learn over time so that he/she can successfully affirm himself/herself in a society that evolves continuously and constantly.

Objective of the analysis. This paper presents the results of a longitudinal analysis performed on a cohort of students observed in three consecutive occasions in the INVALSI Mathematics tests. The main aim is to highlight how Mathematical knowledge changes over time and what are the main determinants of the scoring growth trajectories.

Data. The analysis is carried out on the students who have passed the INVALSI tests of Mathematics in the school years 2013/2014, 2015/2016 and 2018/2019. The selected cohort of students has been observed since the last year of the first cycle of education (in the school year 2013/2014 the INVALSI test of Mathematics was administered during the State Examination of the First Cycle of Education) and throughout the second cycle. The available data are characterized by a hierarchical structure, as the time (level 1) is nested within the student (level 2) which are enrolled in a particular school, such that the school represents the highest level of aggregation (level 3). The cohort consists of 34.545 students attending 2.808 schools.

Method. A growth model is used to specify the temporal relationship between the response variable defined as learning performance and one or more covariates. The results allow to describe, predict and control the temporal performance, and to identify the factors that have a greater impact on groups of students characterized by different average trajectories compared to the overall average trend. The longitudinal analysis is based both on individual characteristics and also on variables related to the context from which the student comes. In this work, the multilevel growth analysis for nested longitudinal data is applied. This approach takes into account for the hierarchical structure of the available data, and overcomes the problem of dependence between observations of the same level included in classical linear regression model. The dependent variable is given by the Rasch score of the each student obtained in the three surveys and the included covariates refer to first level time-dependent variables, covariate of second level (socio-demographic, economic and cultural characteristics of students) and covariate of third level level 3 concerning characteristics of schools.

Results. The analyses confirm a gender gap at the initial level, but with a not significant difference between males and females in terms of growth rate. The ESCS (of the student and of the school) and the size of the attended institution have an influence on the initial average state but not on the rate of growth. Citizenship discriminates mainly in the initial state, in particular the Native students scores have higher initial average scores than the ones of foreigners of I, or II, or generation, while in the growth rate only foreigners of I, or II generation, have a negative slope significantly different from Italian students. The geographical macro-area discriminates both in the initial average state and in the average slope of the trajectory. These results offer interesting points of discussion on how to carry out appropriate guidance activities and for the adoption of timely school/educational policies that should help in avoiding or reducing the gaps in learning as level of school increases, especially in critical contexts.

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Financial literacy, numeracy, and schooling: evidence from developed countries

Sara Lamboglia - Massimiliano Stacchini

Financial skills are particularly relevant for young people as their decisions might have long-lasting consequences. Working lives of the youngest generation will likely develop in contexts of less stable jobs, less generous security systems and higher uncertainty in comparisons to those of previous generations (OECD,2020); for the youngest generations making informed choices is even more important than in the past. Despite its relevance, financial literacy is often reported as inadequate by scholars, especially for young people, for reasons only partly understood. This work contributes to grasp the issue by reconsidering two relevant drivers of young peoples' financial skills. First, numeracy is fundamental to capture notions such as interest rates or inflation (Lusardi, 2012). This paper offers new evidence on the transfer of competences from Math to financial literacy. The role of Math is further expanded by shading a light on Mathematics teachers' practices. In particular we test whether teaching styles shaped around "cognitive activation" foster the transfer of competences from Mathematics to finance. Cognitive activation stems, among others, from practices placing higher emphasis on cross-fertilization in searching for solutions, from deeper discussions about mistakes, or from challenging students to apply notions to solve real world's problems. Our study has been also stimulated by findings of Echazarra et al. (2016), who show that cognitive activation practises have a great influence on Math scores. Second, we investigate the role of financial education at school. Several studies document the importance of learning financial topics early in life (Lusardi, 2015) and the role of financial education at school (OECD, 2020) has been underlined since the early 2000s. This paper illustrates financial education at school in a cross-country perspective, and contributes to the growing literature (Romagnoli-Trifilidis, 2013; Bruhn et al., 2012; Cordero-Pedraja, 2019; Salas-Velasco, 2020) about its link with students' performance in financial literacy.

Object and hypothesis. We analyse the transmission of competences from Math to finance across students of OECD countries. We also test whether teaching styles shaped around "cognitive activation" of students can magnify this transfer. We expect the link between Math and financial skills to be relevant, especially for those students having teachers adopting styles oriented to such a cognitive activation. With regard to financial education, our object is to illustrate the diffusion of financial education activities across advanced economies. We also test the link between financial education and the performance in financial literacy of students. We expect a positive link between financial education and financial achievement.

Data. We use data on financial literacy among students from the 2018 Programme for International Student Assessment (PISA). PISA is a triennial survey that assesses the ability of 15 years old students in applying their knowledge in Mathematics, Reading and Science (core domains) to problems faced in everyday life. Financial literacy was introduced as an optional domain in 2012. The original survey on financial skills was completed by around 117.000 students representing 13.5 million of 15 years old resident in 13 OECD countries, plus 7 partner countries. We focus on OECD economies and investigate the survey on approximately 52,000 individuals. The list of countries includes Estonia, Finland, Canada, Poland, USA, Portugal, Latvia, Lithuania, Spain, Slovak Republic, Italy, Chile. Finally, a section of our analysis also considers the PISA assessment conducted in 2012 which includes questions asked to students about their Math teachers and their teaching styles adopted during Math lessons.

Methods. As far as the empirical model is concerned, we refer to the following general equation: $Y(i,c,s)=\Delta X(i)+\beta Z(s)+\alpha(c)+\varepsilon(i,c,s)$ The variable $Y(i,c,s)$ indicates the outcome under investigation, for instance the score in financial literacy of student i attending the school s in country c. $X(i)$ includes an array of student-level characteristics and an indicator on the students' socioeconomic background; $Z(s)$ includes school-level dummies or controls; the term $\alpha(c)$ is a vector of country-level fixed effects, used to control for

country characteristics. In our more severe specifications, country fixed effects are replaced by school dummies to fully absorb school differences in the analysis of the link between Math and financial skills. Importantly, to verify the link between financial education and financial achievements we follow Cordero-Pedraja (2019) who adapt the Difference-in-Difference methodology to the structure of PISA dataset. Specifically, individual (unobservable) components are controlled by considering the difference of two outcomes exhibited by the same individual, such as her performances in financial and Reading skills. Such a difference, that is purged by individual effects, is compared among individuals who are exposed and who are not exposed to financial education.

Results. The paper shows a sizable link between Math skills and financial achievements. The intensity is higher than the one between Reading and financial skills, and, importantly, presents heterogeneities across investigated countries. An extension based on PISA 2012 suggests that effectiveness of Mathematics in shaping financial skills can depend on Math-teaching practices. We find that practices tailored to stimulate "cognitive activation" of learners foster the transfer of competences from Math to finance, also in countries having lower levels of financial literacy. Finally, our paper shows that countries varies widely with respect to the chance offered to students to attend financial education at school, moreover having such an opportunity is valuable as it improves the financial literacy performance.

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A school effectiveness approach to good citizenship

Natalia López Hornickel - Diego Carrasco - Ernesto Treviño - Carmen Gloria Zuñiga

The global scenario demands a better comprehension of citizenship and policy measures to prepare better current generations of students for the challenges they will face (Treviño and Carrasco, 2021). The presence of authoritarian and populist figures threat democracy. The climate crisis is a challenge in front of which neither the economic nor political system has responded. Also, waves of political movements and the spread of communication through social media add complexity to these social phenomena. The book "Good Citizenship for the Next Generation. A Global Perspective Using IEA ICCS 2016 Data" contributes to this challenge by studying good citizenship from a theoretical and an empirical perspective (Treviño and Carrasco, 2021). One of the main contributions in this work is identifying citizenship norms profiles across 24 participating countries in the ICCS 2016, considering items of citizenship norms from this survey. Among these, there were included "always obeying the law," "voting in every national election," "promoting human rights," and "engaging in political discussions." Five classes were identified using a structurally homogenous model. These are comprehensive, duty-based, socially engaged, monitorial, and anomic profiles. The first profile includes students who endorse all citizenship norms. In contrast, the anomic profile is composed of

those students who do not highly endorse any of the citizenship norms. Duty-based students are highly engaged with formal participation in politics, but not in protest or participation in the local community. Socially engaged endorse active participation in protests, demonstrations, and not in formal participation as elections. Finally, the monitorial profile endorses voting and participation in protest and promoting human rights but is lesser than socially engaged (Torres Irribarra and Carrasco, 2021). Schools are traditionally considered agents of political socialization, a process in which political norms and desirable behaviours for a political system are transmitted between generations (Sigel, 1965). The role of the school is to provide learning opportunities that implement civic formation for all students because political norms are not equally distributed across all adults. However, the school's capacity to promote citizenry among students is often considered limited compared to the expected influence of the socioeconomic background of students' families. The present study, corresponding to Chapter 5 of this book, inquires if schools' differences are related to students' citizenship norms endorsement, focusing on the relationship between civic learning opportunities and open classroom discussion of schools on promoting citizenship norms endorsement among students. The present study uses secondary data from the International Civic and Citizenship Education Study (ICCS) 2016 (Schulz et al., 2018). This study uses a two-stage sampling design, where random schools are selected at the country level using a probabilistic stratified design. From these schools, a classroom is selected, and all students answered different instruments, conforming to a representative sample of grade 8 students for each participating country. In the present chapter, we include data from 24 countries: Belgium (Flemish), Bulgaria, Chile, Chinese Taipei, Colombia, Croatia, Denmark, Dominican Republic, Estonia, Finland, Germany (North Rhine-Westphalia), Hong Kong SAR, Italy, Republic of Korea, Latvia, Lithuania, Malta, Mexico, Netherlands, Norway, Perù, Russian Federation, Slovenia, and Sweden. Accounting for 93,246 students and 3,750 schools. On average, 3,885 students and 156 schools per country participate in the study (Schulz et al., 2018). All our selected variables present less than 5% missing (mean = 2%, standard deviation = 1%). To this end, a multilevel multinomial base category logit model was used, including students' and schools' characteristics specifying citizenship norms profiles as the dependent variable. Thus, citizenship norms profiles constitute a nominal variable that summarizes how students endorse 12 different citizenship norms across countries. Results suggest that schools explain a non-ignorable portion of the variance of students' citizenship norms endorsement. In addition, schools with higher opportunities for civic learning seem to promote a comprehensive profile of citizenship norms endorsement compared to other profiles of citizenship norms. Likewise, schools with higher levels of open classroom discussion are positively related to students displaying a comprehensive profile, in contrast to anomic and monitorial profiles. These findings suggest that school practices from civic education are critical variables in developing more participatory citizenship profiles. In terms of civic background, when a student is interested in political and social issues and discussing these topics outside the school increase the odds of the comprehensive profile. A similar result was found regarding students' engagement with social media for political purposes. Across schools, students who post and read political and social issues in social media environments are more likely to present a comprehensive profile of citizenship norms endorsement than other profiles. Finally, in terms of socioeconomic variables, students are more likely to present a socially engaged or duty-based profile than a comprehensive one in schools with higher socioeconomic status. Implications for civic education are discussed.

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Towards a comprehensive framework on civic competence development of teachers

Emilie Vandevelde - Ellen Claes - Maria Magdalena Isac

This study aims to develop a comprehensive model for the civic socialization process of teachers. Citizenship has become one of the main objectives for European education systems. Since the recent Italian curriculum reform, schools are supposed to pay more attention to citizenship education. Therefore, it is expected that teachers are well prepared and equipped with the necessary knowledge, skills, and attitudes to also engage students in democratic citizenship (Garcia-Esteban, 2020; De Coster et al., 2012; Silva and Mason, 2003). In this regard, many scholars have concerns about the limited and inconsistent immersion of prospective teachers in the field of citizenship during teacher training (Birzea et al., 2004; Eurydice, 2005, 2012; in Schulz, Ainley, Fraillon, Losito and Agrusti, 2016). The results of the International Civic and Citizenship Education Study (ICCS) 2009 and 2016 national contexts survey showed that, in most participating countries including Italy, civic pre-service and in-service training was provided, but in most cases, this provision was reported as non-mandatory (Schulz et al., 2010b, pp. 53–56; in Schulz, Ainley, Fraillon, Losito and Agrusti, 2016). This raises questions about teachers' readiness to teach civic education. While a lot is known about young peoples' civic competence development and how schools and teachers (don't) support this process (e.g. Schulz, Ainley, Fraillon, Losito and Agrusti, 2016; Amna, Ekström, Err and Stattin, 2009; Torney-Purta et al., 2001), less is known about how teachers themselves engage with (the teaching of) civics. Moreover, other than the civic socialization process of young adolescents that focusses on personal competence development (Council of Europe, 2016), the civic socialization process of teachers includes the development of professional civic competences. These professional competences make that they are able to prepare pupils to carry out their civic responsibilities in thoughtful ways (Silva and Mason, 2003; De Coster et al., 2012). Existing models for the civic socialization process of young adolescents do not take this dual purpose into account. Based on these observations, this paper will investigate (1)What personal and professional civic competences teachers need to effectively teach civic education and (2) how teachers acquire these personal and professional civic competences. To answer the first research question, a systematic review of literature of existing civic education frameworks was carried out. Next, this review was linked to literature on teacher training. The second research question was addressed by adapting the Octagon model (Figure 1) to the context of teachers. The Octagon model was developed by the International Association for the Evaluation of Educational Achievement (IEA). It served as the theoretical base for the ICCS, in which Italy was (and is) an important participating country. The adaptation of this Octagon model was done by carrying out a systematic review of the recent literature linking three theoretical topics involved in teachers' civic competence development: (1) theories about the civic socialization process of young adolescents, (2) Schulman's (1987) theoretical assumptions on pedagogical content knowledge (PCK) and Nogueira and Moreira's (2012) framework for civic education teachers' knowledge and (3) literature on teachers' professional development. The findings from the first literature review (research question1) resulted in a comprehensive conceptual framework describing the personal ànd professional civic competences of civic education teachers. In addition, this framework is linked to the OctagonT model

(research question 2): a model that describes the processes through which teachers acquire these personal and professional civic competences. This model recognizes that teachers' civic socialization process is influenced by interconnected variables located at different levels in a multi-level structure (the individual teacher (e.g., civic beliefs), everyday contacts (e.g., teacher educators, the intended, informal and hidden curriculum of the teacher training program, internship contacts, participation opportunities in teacher training, encounters with students and their parents, etc.) and the influence of the national educational context (e.g., vision on civic education)). The comprehensive conceptual framework and the additional OctagonT-model can be used as a knowledge base for (1) teacher training programmes in their preparation of students as future (civic) teachers and (2) professional development initiatives for in-service teachers. Certainly in the context of the Italian curriculum reform, these suggested framework adaptations could be of added value.

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Human capital in Italy and its employment outcomes: a reading through the analysis of data from the Labour Force Survey

Raffaella Cascioli

Introduction. The Europe 2020 Strategy approved by the EU in 2010 had set the objective for Member States to achieve by 2020 some targets, to be implemented into national targets, in relation to: employment; research and innovation; climate change and energy; education; fight against poverty.

In relation to education, the targets were the reduction of the early leavers form education and training rate to less than 10% and the increase to at least 40% of the share of the population between 30 and 34 years of age with tertiary education. The following complementary targets were also set: the participation in lifelong learning by at least 15% of adults; the employment rate of 20-34 year olds with an upper secondary or tertiary degree graduated from one to three years before and no longer in education and training should be at least 82 %.

The recent Council Resolution aimed at achieving a strategic framework of European cooperation in the field of education and training over the timeframe 2021-2030 has set new average European targets in continuity with the Europe 2020 Strategy.

In this context, official statistics are an essential tool, because they provide - in a harmonized manner and according to common criteria and standards - the quantitative information needed to monitor and evaluate the adequacy of national policies with respect to the objectives set for each Member State.

On the subject of education, the Continuous Labour Force Survey (RCFL) is of central importance. RCFL is the Italian official source that estimates the level of education of the resident population; it is a survey harmonized at European level and consolidated in the European Labor Force Survey. The RCFL allows for a timely and continuous monitoring over time, and the community harmonization allows for a comparison with other European countries.

Subject. The work presents the main results of the ISTAT annual report on "Educational attainment levels of the population and employment outcomes". The report provides an analysis of the phenomena using numerous indicators. The integrated reading of indicators on the supply and demand for human capital, calculated on similar domains of observation, makes it possible to have indications both of the human capital present in the country and of how the country uses and values this capital.

The function of this paper is also to highlight the potential of the RCFL data in combined analysis with other sources of data such as administrative ones. In particular, the integration of RCFL data with the Thematic Register on Education and Training (RTIF) - in the planning phase by the National Institute of Statistics - will allow to expand the potential for analyzing phenomena related to formation, growth and the enhancement of human capital. In this context, the possible comparison at the micro level with the INVALSI data source on students' competences is also of particular importance. This integration will make possible to investigate the interrelated aspects between quantity and quality of human capital, directing more precisely the efforts and investments to put in place in the education and training sector aimed at improving basic skills and reducing rates of school dropout. The study of integrated data may also contribute to the identification of effective measures for expanding the demand for university education and reducing the distance between education and work.

Data used. This contribution is based on the analysis of the RCFL's data and, as for a European comparison, on the analysis of data from the European Labour Force Survey (EU-LFS), the largest European sample survey on households.

Due to the variety of information available and the large sample size, the EU-LFS is also an important source of information for other European statistics, such as education statistics.

Methods. The results presented in the paper follow from the analysis of the RCFL's data carried out using several indicators regarding educational levels and employment outcomes, among these:

- Share of people aged 25-64 with at least an upper secondary education or a tertiary education;
- Share of 30-34 year-olds with tertiary education;
- Share of tertiary graduates 25-34 year olds with a degree in STEM disciplines;
- Share of early leavers from education and training (aged 18-24);
- Differential in employment rate of 25-64 year olds across education levels;
- Share of 15-29 year olds neither in employment, nor in education or training (NEET);
- Employment rate of early leavers from education and training aged 18-24 (ELET);
- Employment rate of 20-34 year olds with an upper secondary or tertiary degree graduated one-three years before and no longer in education and training.

Results. The main phenomena highlighted in the paper are the following. The Italy-Europe gap in the proportion of 30-34 year-olds with tertiary education is very wide. The share of female graduates in STEM disciplines is half that of male graduates. The share of early leavers from education and training (ELET) continues to decrease, but territorial differences remain very large and the early school leaving is strongly influenced by the socio-economic characteristics of the family of origin. The employment advantage of a tertiary education over an upper secondary education continues to grow. There is a wide gap with the EU in the employment rate of 30-34 year-olds with tertiary education. The employment rate of early leavers from education and training (ELET) are very low. Among young people neither in employment, nor in education or training (NEETs) just under one in two unemployed has been for a year or more. The gaps with the EU in the school-to-work transition of high school and university graduates are very wide.

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Does providing information on student academic potential reduce social inequality in track choices?

Davide Azzolini - Camilla Borgna - Dalit Contini

Introduction. Social inequalities in educational attainment are an inherent feature of modern societies. However, the degree to which individual educational outcomes are affected by social origin varies across institutional contexts. International comparisons indicate that a crucial institutional feature is how students are channeled into distinct educational pathways during secondary school. Systems that track students at an early age and where the pathways are more rigidly separated, display higher degrees of inequality than systems where secondary schooling is more comprehensive. Low-SES students tend to be disadvantaged by strict tracking because they have, on average, lower records of school performance. Moreover, teachers often display an unconscious social bias against them: there is evidence that low-SES students receive lower grades compared to their socially advantaged peers with the same performance and are less often directed towards academic pathways.

Aim of the research. Our research question is whether a school guidance service based on a standardized assessment of students' academic potential can reduce the SES social divide in track placement. Our hypothesis is that such standardized assessment of students' academic potential could reduce social biases in track recommendations, and eventually, inequality in track choices, by providing additional information to families and to the teachers, and more generally to the actors responsible for school guidance. Case study We address this research question by investigating the case study of the city of Turin, where a unique school

guidance service has been provided to lower-secondary school pupils for more than 20 years. The service is free of charge, essentially universal, and provided by school guidance professionals who work as civil servants within a branch of the Educational Services department of the Municipality of Turin (Centro per l'Orientamento Scolastico Professionale, COSP). This school guidance system largely relies on a standardized test, the Arianna test, that students take between the spring of seventh grade and the fall of eight grade. The test is a standardized assessment of students' cognitive aptitudes and learning-enhancing non-cognitive skills. Based on these test results and students' stated intentions, and upon discussion with the main class teacher, school guidance professionals formulate a track recommendation. Thus, the test does not substitute teachers' judgments and assessments of their students but provides an additional informational element to both teachers and families. This guidance service represents an exception within the Italian context (where the responsibility for track recommendations lies on teachers only and professional school guidance is generally scattered and discontinuous) because of its systematic structure, and because of the standardized nature of the assessment of the students' academic potential.

Methods. Since the Arianna test is administered to the full population of students attending a lower secondary school within the municipality, to mimic the counterfactual scenario we rely on a comparison with similar students in the Turin belt area. Turin is characterized by a vast metropolitan area, well integrated with public transportation, so that peripheral areas of the city share similar characteristics to neighboring belt areas also in terms of schools' accessibility. Assignment to treatment can be considered exogenous because families are not likely to move to/from the city to benefit/escape from it. However, school attendance within the city border vs. in the belt area may be associated with individual, family, and lower secondary school characteristics that may affect track choices. We estimate intention-to-treat effects (ITT) by matching individuals attending lower-secondary schools within the city of Turin (treated units) with comparable individuals in the belt area (control units). More specifically we use propensity score matching and CEM (coarsened exact matching) techniques. To acknowledge the existence of environmental and peer effects in school choices, our matching strategy also accounts for school characteristics, in terms of social-background composition, share of immigrant background students, and average achievement in the INVALSI tests. Since the focus is on the reduction of track choice inequalities, we estimate the average ITT of treatment as well as the ITT for different subgroups of children.

Data. We use a unique and very rich longitudinal administrative database of students' careers, linking the data of the National Register of Students (Anagrafe Nazionale degli Studenti-ANS) and the National Institute for the Evaluation of the Educational System (INVALSI), focusing on the students enrolled in the Turin area (N= 20,124). The integration of the two data sources is crucial because ASN data provides information on schooling pathways and repeated measures of school performance in terms of teacher-assigned grades, while INVALSI data contains information on parental socio-economic background and standardized test scores in Math and language assessments.

Results (preliminary). Our first findings indicate that the evaluated guidance program does not significantly affect students and families' track choices in upper secondary education, with no meaningful differences across socioeconomic groups identified by parents' education. Hence, our research hypothesis that an objective assessment of students' academic potential would have the power to decrease social inequality in track choices is not confirmed.

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Towards an integrated system for the production of relevant statistical data on education and training
Giovanna Brancato - Donatella Grassi

Introduction. Qualified human capital and interventions against educational poverty are some of the factors behind the growth of a Country and therefore require continuous monitoring by Official Statistics. For the analysis of phenomena related to education and training, ISTAT has built over time a system of statistical production processes based on survey data and administrative sources. Up-to-day, these processes are still independent one each other and organised according to a stovepipe approach. In recent years, ISTAT has launched a modernisation process of the statistical production. The main innovation is represented by an Integrated System of Registers (SIR), which guarantees a unified management of various issues and achieves an optimal exploitation of sources. The education system will also be part of this general process, through the implementation of a thematic register on education and training (RTIF). The aim of this work is to describe the characteristics and development steps relating to the new integrated system on education and training.

Scope. The new integrated system will allow to: - guarantee ISTAT current statistical production, assuring coherence of estimates with those from data providers and timeliness of the results; - widen analysis potentialities, by optimising the complementarity of the sources, further expanding the detail of information, improving territorial coverage, allowing the production of derived variables and generalised indicators; - reduce the respondent burden and the costs ; - allow to easily correlate different phenomena, primarily education and occupation, both at cross-sectional and longitudinal level; - support other ISTAT production processes.

Data sources. The current system for producing statistics on education and training is based on: - data from administrative sources (registers of schools and universities, data on the staff of schools and universities, register of the Higher level Technical Education); - data from surveys conducted by ISTAT (Labour Force Survey, European Adult Education Survey, Surveys on transitions from education to work of graduates); - data from surveys conducted by other institutions (Surveys on schools by the Ministry of Education); - aggregated data (Institutions of Higher Education in Fine Arts, Drama, Dance and Music - AFAM, Education and Vocational Training - IeFP). These sources will be integrated into the new system, after the appropriate phases of harmonisation, reorganisation and treatment. Furthermore, an attempt will be made to add other sources, in order to cover the residual segments for which no data is currently available (early childhood education, foreign schools and foreign universities) or data is available only partially or at an aggregate level. The system will also be enriched by additional sources capable of adding context information for the analysis of the phenomenon (e.g. data on INVALSI tests, scheduled access to university courses, school buildings). The process will be developed gradually, starting with the construction of the RTIF, which, being designed as one of the satellite registers of the SIR, will dialogue with the other registers of the Institute. RTIF will constitute the core of the system, to which data from surveys and new sources will be subsequently integrated. In the new context, the role of the surveys in the system will be twofold: on the one hand, they will be able to use the information of the register during the design and estimation phase (pre-filling of questionnaires, define sampling frames, editing and imputation procedures, weighting systems). On the other hand, the surveys will be integrated to the register to enrich it with contents.

Methods. The design of the new system includes a series of activities: - Review of the sources: coverage; content; release times. - Definition of the metadata system: concepts and relationships; ontologies; classifications. - Pre-treatment of sources: harmonisation; unit / variable selection; editing and imputation. - Integration and validation: data-flow and integration rules; validation; creation of work areas. - Redesign of satellite surveys: re-planning based on the information available in the new system. - Dissemination: functionalities for drawing the information according to the formats necessary for current and potential information production. For the various above listed activities, some quality indicators will be defined, for monitoring the set up and the update of the system and for assessing the quality of the final data.

Conclusions. The activities for the development of the described project have largely already been started, at least for the recognition and design phases, and are producing the first results, in particular for: i) the

review of the sources and information needs; ii) the definition of metadata and iii) the new classification on educational and training programs and qualifications. The feasibility analysis of the system is being developed and some areas for which implementation appears feasible have already been identified, so to allow the testing of prototypes on some specific segments of the population. Once implemented, the new system may prove to be fundamental for the analysis of the main aspects connected with education and training at a very detailed territorial level. Furthermore, it will make it possible to define the cross-sectional and longitudinal indicators for the analysis of the occupational performance of the various education programmes and to identify the priority areas for interventions against educational poverty.

Giovanna Brancato, has been working at ISTAT since 1996. Since mid-2020, she works in the sector of education statistics where she is responsible of coordinating the planning and development of the new Statistical Register on Education and Training. Previously, she has been in charge of coordinating ISTAT quality function.

Donatella Grassi, has been working in ISTAT for over twenty years; she has carried out research in various fields. She is currently in charge of the Education and Training project with the aim of systematizing information sources existing in this thematic area with in order to harmonizing the processes of acquisition and dissemination of data from multiple sources.

A new alliance: matching data and cognitive needs of local authorities

Lorenzo Maraviglia

Within the framework defined by national and regional norms, many crucial decisions about the articulation and concrete composition of educational supply are taken by local authorities (municipalities, conferences of municipalities, provinces). However, under many relevant issues, these institutions lack the necessary data to make informed choices. This poses a sensible issue, since decisions taken at the local level are largely the result of a negotiation process involving a multitude of heterogeneous interests. These problems are likely to exacerbate with the decline in students expected over the next few years, as schools will find themselves competing fiercely for a diminishing amount of resources. In light of these considerations, the contribution analyzes in detail the mismatch between the quantity and quality of the data made available by ISTAT, INVALSI and MIUR and the actual cognitive needs expressed by local authorities. The issue is illustrated through the presentation of concrete cases, drawn from the multi-year experience of support for school planning carried out by the Statistics Office of the Province of Lucca. In particular, the solutions adopted by the Office through the integration of ISTAT microdata, INVALSI microdata and aggregated MIUR data are illustrated and discussed. On the basis of the analysis, operational proposals are finally made for a better integration of the available data sources and for their greater adherence to the cognitive needs expressed by local institutions.

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The impact of discrimination on future performance: evidence of a self-fulfilling prophecy form the italian student population?

Paolo Agnolin

Introduction. Discrimination has emerged as a central concern of educational research. A growing literature (Alesina et al., 2018; Botelho et al., 2015) find evidence of teachers' bias in grading minorities. Previous economic research suggests that discrimination may lead to self-fulfilling prophecies by influencing the behavior of discriminated groups in the direction of the stereotypes (Glover et al., 2017). However, the literature on the effects of discrimination on future educational performance is scarce. To our knowledge, this is the first work that uses a measure of ethnic-based grading bias to estimate the impact on future school competence. This is a key research question, as evaluation biases may very well lead to gaps in future scholastic attainments by ultimately realizing the unfavorable self-fulfilling prophecy of discrimination. Research question. What is the impact of discrimination on long-term future school competence? In this study, we identify the presence of grading bias in teachers' assessment and we thus estimate its effect on the affected students, especially foreigners, as opposed to peers who are less exposed to subjective under-assessment. Put differently, we estimate the impact of having a biased teacher on future competence. The main hypothesis is that teacher bias can negatively affect future student's competence and school career by steering the investment decision in human capital. In fact, children's perceived lower competence increases the costs of investments into education and this mechanism can reinforce the gap in the accumulation of human capital between students with a native and foreign background.
Data. We use educational data on the entire population of Italian students, which is observed over three periods from primary to middle school. Specifically, the data provided by INVALSI allow us to observe the school record of a cohort of students from the second to the eighth grade.
Methodology. We compare subjective teachers' grade with students' score on standardized blindly graded tests. In this way, we compute a measure of students' under-assessment and of average teacher's bias. This measure can be considered a proxy of teacher bias, as Alesina et al. (2018) show that it is associated with teacher implicit stereotypes. We thus estimate the effect of these measures on future performance using different specifications of regression models and controlling for several observable characteristics. Future competence is measured by the performance in standardized tests that are administered in the following periods.
Results. We find evidence of grading bias against students with a foreign status. In fact, teachers give lower grades to foreign pupils compared to natives who have the same performance on standardized, blindly-graded, tests. We then estimate the impact of grading under-assessment over future performance, and we find significant negative effects. The relative performance of the pupils affected by underassessment worsens more seriously as opposed to their peers with an unbiased teacher. Grading bias seems to lead to a self-fulfilling prophecy by influencing the behavior of discriminated groups in the direction of teacher assessment.

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School related factors and gaps in educational achievements of native and immigrant-origin students: evidence from INVALSI data

Sergio Longobardi - Giuseppe Gabrielli - Alessio Buonomo - Margherita Maria Pagliuca

Introduction. Children of immigrants have, on average, lower educational performances than their native counterparts. A number of contributors in the literature identified, in synthesis, three main, possibly overlapping, risk factors that prevent students with a migratory background from achieving successful educational paths (Gabrielli and Impicciatore, 2021). First, children of immigrants are more likely to come from cultural and socio-economic disadvantaged family background. Second, migrants are low achievers because the migration process itself is disruptive (e.g., language barriers and discrimination). Third, the perception of a lack of control over one's own life experiences and the tendency to attribute educational success to factors different than personal ability do not support intrinsic motivations. Despite these vulnerabilities, the educational system in the destination country represents an extraordinary context within which to promote the integration of migrant-origin students and to remove or at least reduce the existing barriers. Existing literature suggests the relevance of several aspects of learning activity in order to overcome shortages of the origin family and encourage children of immigrants to reduce achievement gaps (Agasisti et al., 2021), including: school's environment, high-quality resources and materials (e.g. technical infrastructure), extracurricular activities, school and classroom climate, learning disciplinary rules.

Aim and Research hypotheses. Advancing the current literature, we aim to investigate the importance of teaching and school-related activities and resources in accounting for children of immigrants' penalties in Italian language and Mathematics, after accounting for individual characteristics, family structure, parents' socio-economic and educational resources. The main hypothesis is that schools, that promote the involvement of parents and students in their activities, that support learning of low-achiever students, and that invest in Information and Communication Technologies (ICT), significantly are able to favor higher educational performances among immigrant-origin students and to reduce the educational gap with their native counterpart.

Data. Our analysis draws on the INVALSI data related to the students, teachers and principals of the lower secondary school classes (Grade 8) in the school year 2018/19. A hierarchical structure characterizes our dataset. In particular, the data relating to the school performance and socio-economic background of the students, collected in the context of the National Evaluation System (SNV), were integrated with the information provided by Mathematics and Italian language teachers on some aspects of school life and on teaching practices (teacher questionnaire) and with the data collected from school principals who answer to several questions about organization, parents' participation, disciplinary climate and resources of school (principal questionnaire).

Methods. A multilevel SEM approach (Preacher et al., 2010) is adopted to analyse the gaps in educational achievements of native and immigrant-origin students. This approach includes a measurement and structural model at each level, with random slopes and intercepts. The general MSEM model splits each observed Level-1 variable into two latent (within and between) components. Furthermore, we want to know if the school factors effect on the student's performance is the same or different across immigrant-origin students and their native counterpart. Therefore, we estimate a multiple group modeling for multilevel data. The multiple group analysis compares the performance of the groups' immigrant students vs. native students. In our case, every student-level variable is treated as jointly caused by within- and between-school variation: this means that the observations referring to different students in the same school have to be considered as multiple indicators of the latent school-level construct.

Expected findings. The INVALSI data show that about 10% of lower secondary school students have immigrant background, 3.8% of this sample are first-generation immigrant students, while 6.2% are second-generation students. As also highlighted by the international surveys, the gap between natives and immigrants is statistically significant both in Reading and in Mathematics, particularly for first-generation immigrants. The multilevel SEM approach allows us to describe and explore this complex system of relationships and interrelations to highlight the educational factors such as structural and instrumental

resources, the use of ICT, the disciplinary climate, the leadership style, which can play a significant role in mitigating these differences and indirectly supporting the integration of immigrant students.

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Sense of belonging at school and students with special educational needs: evidence from TIMSS

Francesco Annunziata - Elisa Caponera - Laura Palmerio

Introduction. In the last decades, different studies evidenced that a strong sense of belonging plays a key role in inclusion at school: the students with higher sense of belonging feel accepted, included, encouraged and supported within the classroom context. These students are more motivated in learning, participate more willingly in school activities, have better social relationships and a better academic performance (Dimitrellou and Hurry, 2019; Osterman, 2000). Furthermore, for children with special education needs (SEN), feeling part of the same group along with peers without special education needs plays a key role in their development (Crouch, Keys and McMahon, 2014).

Object and research hypothesis. The objective of this study was to investigate SEN students' sense of belonging with the one of their companions without SEN.

Data used. To investigate the students' sense of belonging, data from TIMSS (Trend in international Mathematics and Science Study) 2019 - fourth grade- were used. In TIMSS, SEN students are divided in two different groups in function of their disabilities:

1) Students certified with functional, cognitive, behavioral, or emotional disabilities (from now on DIS students). They were excluded from taking the test. However, for inclusion reasons, some of these students were given the opportunity to take the test and complete the context questionnaire, but the results were not considered in the national and international report.

2) Students with specific learning disorders (SLD students). They took the test using the same aids they usually used in school activities and their data have been included in the national and international datasets. The total student sample considered in the analysis was of 196: Students who took the test regularly (97); SLD students who took the test using aids (30); DIS students exempted from taking the test (69). Students from the first two groups attended the same class as the students with SEN.

Methods. The measures used in this study are described below (for a detailed description of the measures used in TIMSS see, Martin, von Davier, and Mullis, 2020).

Measures. Sense of belonging. Four variables found in the student questionnaire were considered for the analysis: - I like being in school; - I feel safe when I am at school; - I feel that I belong to this school; - I am proud to attend this school. Students had to indicate their agreement/disagreement on a 5-point Likert scale ranging from " disagree a lot" to "agree a lot". The mean was zero, and the standard deviation was 1. An exploratory factor analysis was conducted on the overall sample: the data showed a single-factor structure explaining 53% of variance and with an adequate Cronbach's alpha (0.74). Category of students attending

school. Grade 4 Italian students who participated in the TIMSS 2019 survey, more in detail, DIS students, SLD students, and regular students from the same classes were considered in this analysis.

Results. ANOVA. An analysis of variance was conducted, with the students' category (three levels: DIS; SLD; regular) as between factor and students' sense of belonging as dependent variable. The results of the ANOVA show a difference in the sense of belonging between students in the different categories ($F[217; 2] = 3.961$; $p<0.02$). Specifically, post-hoc analysis performed using the Bonferroni method, shows that DIS students had a statistically lower sense of belonging than SLD students (-0.24 vs 0.35).

Discussion. The main aim of this study was to investigate the sense of belonging of students with SEN in comparison with their regular classmates. The results show a difference in the sense of belonging between two different categories of SEN students, DIS students and SLD students: the former report a lower sense of belonging than SLD students, who instead feel to be an integral part of the school. It should be noted that the integration of these students into school life is fundamental, even more so considering that having a severe disability - functional, cognitive, behavioral, or emotional - can make it difficult for these students to fully experience the school environment.

In order to integrate these students in the school context, it seems necessary for the school community to do further work to make them feel more involved and participate, for example, by stimulating cooperative behavior in students and encouraging a learning environment that promotes inclusion through the plan and organization of activities and spaces, such as circle time.

Some limitations of this study should be noted: as the study involves one school grade only, further studies using data from different school grades should be used to verify this evidence. The results of this work should be examined more in-depth using qualitative methods to better understand the factors that can improve the sense of belonging of SEN students.

Francesco Annunziata, a Sociology and Territorial Policies graduate from the University of Salerno, works in the International Surveys department at INVALSI, dealing with support for the administration of international tests, monitoring of tests and verification of data consistency for OECD and IEA surveys.

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Cross-National equivalence of political participation in early adolescence across 24 Countries

Daniel Miranda - Linde Stals - Emilie Vandevelde

Introduction. Against the backdrop of the continuous widening of citizen participation, two important gaps within the literature remain to be addressed. First, scholars point to a lack of a comprehensive framework that integrates old and newly emerging forms of political participation, and is both 'conceptually meaningful' and 'allows for a consistent measurement of the phenomenon' (Theocharis and Van Deth, 2018, p. 141). Second, due to the traditional focus on electoral and party politics, the political behaviour of youth and how it may be validly operationalized in comparative research has received considerably less scholarly attention. This article seeks to contribute to this field by proposing a theory-driven multidimensional conceptual model of youth political participation, to develop a measurement framework and investigate its cross-country comparability among 24 countries (or regions) across different continents that participate in the International Civic and Citizenship Participation 2016. The proposed model is described by four distinct dimensions, each measured by intended behaviour. The first two dimensions are both considered institutionalized political participation – that is, they refer to conventional activities that are organized by political actors and institutions, and correspond to the minimalist definition of political participation (Van Deth, 2014). The first dimension, electoral participation, focuses exclusively on voting behaviour (e.g. voting in national elections). The second dimension, non-electoral participation, focuses on non-electoral activities (e.g. campaign work). The next two dimensions are considered non-institutionalized political participation, describing unconventional activities that try to circumvent the core institutional context but are still targeted at (i.e. trying to influence) the political domain. Here we distinguish between legal participation (e.g. protesting) and illegal participation (e.g. stage a protest by blocking traffic), as respectively the third and fourth dimensions.

Data and methods. To test the validity of our measurement model and establish cross-country equivalence, we use multigroup confirmatory factor analysis (Brown, 2014) on a representative sample of eight grade students (14-year-old) across 24 European, Asian and Latin-American countries that participated in the International Civic and Citizenship Education Study (ICCS) 2016 (Schulz et al., 2018). The variables used as indicators for each dimension were those related to the students' political participation when its available in the used study. In analytical terms, we developed a set of invariance analyses. In the first stage, configural invariance tests whether the latent factors and the same indicators measure the same latent construct in all groups (e.g. countries). In a subsequent step, metric invariance tests whether factor loadings – that specify how well individual indicators relate to the specific factor – on the construct are equal across groups. Lastly, scalar invariance tests whether in addition to factor loadings, the item thresholds are equal in all groups. Achieving the level of metric (full or partial) invariance allows for evaluating relationships between types of participation and their association with other factors, while achieving scalar invariance allows for comparisons of levels of participation types across groups. The results will provide reliable and comparable measurement instruments and will offer important insights into the study of political participation in young adolescents across different countries.

Results. Considering then fit index criteria, CFA analyses confirmed the proposed measurement structure political participation of young students for each country. The hypothetical model measuring youth political participation received consistent empirical support. Additionally, multigroup CFA (MGCFA) was used to test invariance estimates for parameters across countries. The results indicate a good fit of the configural model (CFI = 0.971, TLI = 0.978, RMSEA = 0.071). This model fit information provided the baseline against the other levels of invariance were compared. The results indicate that the model has the same configuration across countries. The second MGCFA estimation for testing of metric invariance is constrained to equality

the factor loadings across countries. The absolute results indicate good fit indexes for the proposed model (CFI=0.973, TLI=0.976, RMSEA=0.069). In a relative comparison, the differences in CFI (Δ=0.002), TLI (Δ=0.002,) and RMSEA (Δ=0.002) were within the range of the cutoff criterion, indicating that correlational analyses can be conducted comparably. Finally, estimation for testing the scalar invariance, constraining the factor loading and thresholds, indicates that the tested model was acceptable (CFI=0.973, TLI=0.970, RMSEA=0.068), following the criteria proposed by Brown (2014). Considering the comparative criteria, the model was also found to be invariant at this level as well, that is, the difference in the CFI (Δ=0.000), TLI (Δ=0.006), and RMSEA (Δ=0.001) was within the range of the cutoff criterion. Given this level of invariance, mean comparison and relational analysis comparison with the construct are allowed.

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The meaning of political trust among 14-year-olds across 24 Countries. testing within- and cross-country measurement equivalence of political trust using multi-group confirmatory factor analysis

Linde Stals - Maria Magdalena Isac - Ellen Claes

Introduction. In the political socialization literature, the little extant research on political trust (i.e., the trust in state institutions, political parties, and representatives) mostly focusses on trust levels and how these can be related to influences from the school, peers and parents (Claes et al., 2012; Kiess, 2021; Smets et al., 2013). Although such comparative studies are highly relevant, an important first step is to ensure that existing political trust measures are valid, and that comparisons of adolescents' trust levels across groups and countries are meaningful. Previous studies have investigated across-group (André, 2014; Hooghe, 2011; Turper and Aarts, 2017) and cross-country (Breustedt, 2018; Marien, 2011; Rothstein and Stolle, 2008; Schneider, 2017; Van der Meer and Ouattara, 2019) measurement invariance of political trust in adult samples. As this has not yet been examined in youth populations, this paper will try to contribute to this gap by investigating both the dimensionality and the measurement invariance of the political trust scale employed in the International Civic and Citizenship Education Study (ICCS) 2016.

Research objects. The main aim is to contribute to the literature on the measurement of political trust among adolescents and its comparability across groups and countries. First, we propose a theory-driven (Easton, 1965; Rothstein and Stolle, 2008; Warren, 2017, 2018) two-dimensional structure of political trust among youth (i.e., separating between order and representative institutions) and compare its construct validity to that of a one-dimensional measurement model. Next, we intend to test the measurement equivalence of these measurement models across countries from different regions of the world and across groups with lower versus higher levels of political sophistication (i.e., civic knowledge). The results will focus on the Italian context in a comparative perspective.

Data. This study uses a cross-sectional sample of eight-grade students (14-year-old) from all 24 European, Asian and Latin-American countries that participated in the ICCS 2016 (Schulz et al., 2018).

Measures. To measure political trust, respondents were asked to what degree they trust the following seven institutions: the national parliament, political parties, the national government, the local government, the police, the armed forces, and the courts of justice. The former four institutions are considered representative institutions; the latter three are considered order institutions. Items are rated on a four-point Likert scale ranging from "Not at all" (=1) to "Completely" (=4). Political sophistication is measured through respondents' level of civic knowledge. Based on IRT and plausible values methodology, five plausible values were estimated for each student. These scores have an international average of 500 with a standard deviation of 100. Based on these scores, ICCS 2016 distinguishes four proficiency levels. We will focus on students reaching the highest proficiency level, level A, and on students at or below level C. Methods. Data preparation and analyses were conducted using the IEA IDB analyser (IEA, 2017) and Mplus 7.4 (Muthén and Muthén, 2017). The estimation took into account the complex sample design of the ICCS 2016 survey (Köhler et al., 2018). In a preliminary step, we focused on the Italian sample to test the validity of our two-dimensional conceptualization of political trust versus a one-dimensional. To this end, we applied confirmatory factor analysis (CFA) (Brown, 2014). The following goodness of fit indices (relevant for the categorical CFA approach with large sample sizes) were applied to evaluate model fit: the root means square error of approximation (RMSEA), the comparative fit index (CFI), and the Tucker-Lewis index (TLI) (Brown, 2014). To test the cross-country and across-group measurement invariance of our measurement models, we will use Multi-Group Confirmatory Factor Analysis (MGCFA). This technique evaluates three different hierarchical levels of invariance: configural invariance, metric invariance, and scalar invariance (Millsap, 2011). We will start with the least restrictive invariance model and gradually move towards more strict invariance models (Rutkowski and Svetina, 2017; Svetina et al., 2020).

Preliminary results. The preliminary CFA confirms the two-factorial measurement model of political trust with model fit indices indicating acceptable model fit (RMSEA=0.099; CFI=0.973; TLI=0.956). The CFI and TLI values are above 0.95, and although an RMSEA value of 0.099 is rather high, Browne and Cudeck (1993) consider 0.1 the cut-off point for acceptable model fit. Item loadings range from 0.600 to 0.822 (p < 0.001) and factor correlations indicate that the two factors correlate strongly with each other (r = 0,696). In addition, this model was superior to the one-dimensional model (RMSEA=0.162; CFI=0.922; TLI=0.883). Further results will indicate whether this factorial structure is comparable across all countries taking part in ICCS 2016 and across different political sophistication groups.

Linde Stals, is a doctoral researcher and teaching assistant at the Centre for Political Science Research at KU Leuven, Belgium. In her research, she draws on political socialization and political psychology literature to investigate the meaning of political trust and distrust and how it relates to modes and degrees of political participation among adolescents.

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Ellen Claes, is an associate professor at the faculty of Social Sciences of KU Leuven, Belgium. In her work, Ellen takes a didactic perspective on political science exploring the roles secondary schools have in shaping democratic knowledge, skills, and attitudes of young people. Recent studies focus on the civic and intercultural competencies of (student) teachers.

Citizenship norms endorsement profiles

Diego Carrasco - David Torres Irribarra

Introduction. Citizenship norms present in the International Civic and Citizenship Education Study (ICCS) are injunctive social norms (Torres Irribarra and Carrasco, 2021; Cialdini, Kallgren, and Reno, 1991). This includes norms such as voting, obeying the law, working hard, engage in political discussion among others. Injunctive norms describe what people ought to do in contrast to descriptive norms (what people tend to

do) (Cialdini and Goldstein, 2004). Citizenship norms endorsement are relevant because these predict the likelihood of students to vote, participate in protests and obey the law (Gerber and Rogers, 2009; Köbis, Van Prooijen, Righetti, and Van Lange, 2015; Rees and Bamberg, 2014; Wenzel, 2005). Previous studies in citizenship norms endorsement (Hooghe and Oser, 2015; Hooghe et al., 2016) proposed the use of latent class models to represent adherence to citizenship norms. Citizenship norms endorsement in these response models are represented with different response patterns. Previous findings have found diverse configurations of endorsement of citizenship norms (Hooghe, Oser, and Marien, 2016; Reichert, 2017), and latent groups that resemble Dalton's distinction (Dalton, 2008) between duty-based and engaged citizenship. Based on the work of Hooghe and colleagues (Hooghe and Oser, 2015; Oser and Hooghe, 2013), and the literature of latent class models for multiple groups (Kankaraš and Vermunt, 2015; Kankaraš, Vermunt, and Moors, 2011; Masyn, 2017) we discuss what latent class model specification is better suited for a comparative approach. Object and research hypothesis: In the present study our aim is to compare different responde models fitted onto citizenship norms endorsement items, to discuss their trade offs. In particular we discuss the interpretation of two latent class model specifications, the structurally homogeneous model and the partially-homogeneous model, as tools for comparative research.

Data. We used students' responses from the International Civic and Citizenship Education Study (ICCS) 2016. This study obtained responses from a representative samples of grade 8 students (Schulz, Carstens, Losito, and Fraillon, 2018). In 2016, 24 countries participated in the study from Europe (Belgium (Flemish), Bulgaria, Croatia, Denmark, Estonia, Finland, Italy, Latvia, Lithuania, Malta, Netherlands, Norway, Russian Federation, Slovenia, Sweden, North Rhine-Westphalia (Germany)), Latin America (Chile, Colombia, the Dominican Republic, Mexico and Peru), and Asia (Chinese Taipei, Hong Kong SAR, and the Republic of Korea). Variables. Students responded there adherence to different citizenship norms, using a four-point Likert-type scale, with the response options of "Very important", "Quite important", "Not very important", and "Not important at all". Examples of these indicators, are "Always obeying the law", "Voting in every national election", "Working hard", "Joining a political party" and "Engaging in political discussions". In the present study we used 12 of these indicators, to ensure comparability with previous studies (Hooghe and Oser, 2015; Hooghe et al., 2016).

Methods. In the present study we fit a series of structurally homogeneous model to analyze profiles of good citizenship across countries in order to prioritize the interpretability of international comparisons (Kankaraš and Vermunt, 2015). This models fixed the same response pattern across countries — thus ensuring comparable interpretations across them —, while the prevalence of each class is free to vary between countries. We then contrasted the selected solution under the homogeneous model with the more flexible solution offered by the partially homogenous model. We illustrate the costs in terms of interpretability associated with the adoption of a model that frees the variation of the response pattern probabilities within each country, and conclude illustrating the characteristics of the classification of individuals across countries. All estimates were produced using Latent Gold 4.5 software (Vermunt and Magidson, 2013), accounting for the study survey design, and use Taylor Series Linearization for standard error estimation (Asparouhov and Muthén, 2010; Stapleton, 2013).

Results. Overall the results of the study support the use of latent class analysis as modelling alternative for citizenship norms endorsement. The differences between the latent classes, which exhibit unordered, qualitatively distinct response patterns, indicate that these variations are unlikely to be well described by a single unidimensional structure The partially homogeneous model offers a better statistical fit than the structurally homogeneous models, yet it comes at the price of a considerably more complex model (156 versus 432 parameters). Moreover, there is no significant improvement in the classification error rates, with a non-substantial difference of ,006 of classification error difference between these two approaches. The improvement in fit from the partially homogeneous models allows the country specific response probability patterns to significantly vary from the overall average pattern that is being interpreted as representative of a given class. We contend that in the face of a trade-off between the meaningful comparison between countries and the improvement of statistical fit, it is worth accepting the short-comings of a more parsimonious, and more constrained model, to justify a consistent interpretation of the classes across countries.

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The Great Depression: students' aspirations and choices during the Great Recession

Marco Tonello - Lucia Rizzica - Eleonora Porreca

This paper analyzes whether and in which way the macroeconomic conditions when students are about the end of the years of compulsory education affect their educational aspirations and future educational choices. To this purpose, we combine individual-level self-reported aspirations about the intentions to complete high school and to enroll at university of all students attending the tenth grade of the Italian education system contained in the INVALSI SNV Students' Questionnaires, with measures of the regional labor market conditions, as a proxy for the local conditions of the business cycle. Identification of the effect of interest is achieved by using the naturally exogenous variations in the local labor market conditions and by comparing adjacent cohorts of students, within the same school, exposed to different local business cycle conditions at the time when the educational aspirations are stated. In other words, we exploit the fact that year-to-year variations in the aggregated local labor market indicators (such as the unemployment rate at the regional or LLM levels) might affect students' aspirations without being influenced by any students' or family choices. We find that students exposed to economic downturn in the last year of compulsory education are more likely to drop-out and not attain the secondary school Diploma. The effect is stronger for those from more disadvantaged backgrounds, immigrants, with lower educated parents, and attending vocational and professional schools. We urge policies aimed at combatting early school leaving by counterbalancing such detrimental effects of the economic exogenous conditions on the more fragile students.

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Explicit and implicit school leaving: how to combine the two phenomena?

Barbara Baldazzi - Patrizia Falzetti – Paola Giangiacomo

Early school leaving is a social problem that Italy, like other countries, is trying to reduce. Young people who interrupt their education at an early age face adult life with insufficient basic skills to enter the job market and, more generally, to live a quality life. Early Leavers from Education and Training (ELET), i.e. the share of 18 to 24 year olds with at most a secondary school leaving certificate or a qualification lasting no longer than 2 years and not attending a school or training course, is the indicator provided by ISTAT that defines early school leaving. This measure is agreed at European level. The European community had set a target for Italy to reach a 10% share of ELETs by 2020. In 2020, ELETs in Italy are 13.1%. However, the ELET data cannot give the exact dimension of the problem of early school leaving. Students who graduate from upper secondary school without having reached the minimum skills required for their studies are not included in the calculation. INVALSI data make this phenomenon observable and we call it implicit leavers from

education and training (ILET). Implicit school leaving is as important a problem as explicit early school leaving. Establishing the share of ILET is not easy, but since 2019 the INVALSI tests can give a first representation of the phenomenon. Those who, even if they graduate, do not reach level 3 in the Italian language and Mathematics tests and who do not even reach level B1 in Reading and Listening in English have levels of competence that correspond to the educational objectives set for eighth-grade students, i.e. far below those they should have reached. Being able to measure the overall phenomenon of school leaving provides schools and policy makers with essential information. This paper will try to estimate the overall school leaving by statistically matching data from ISTAT (for ELET) and INVALSI (for ILET). A general dispersion estimate will be obtained using ISTAT data for ELET and INVALSI data for ILET, at regional level. Statistical matching will involve choices due to sample size and the possibility of having consistent data between the two sources.

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Patrizia Falzetti, is Head of the Statistical Service of INVALSI, which manages the acquisition, analysis and return of data relating to national and international surveys on learning to individual educational institutions, stakeholders and the scientific community.

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From students' Mathematical skills to STEM degrees: an obstacle road?

Barbara Baldazzi - Patrizia Falzetti - Patrizia Giannantoni

STEM degree programs are related to engineering, geo-biological, architecture, scientific and chemical-pharmaceutical disciplines. STEM graduates in 2017 make up 26.5% of graduates for the whole year (about 276 thousand). The data show a different composition by gender: among STEM graduates the male component is higher, reaching 59%, while among non-STEM graduates women prevail (they are almost two out of three) (source: Almalaurea). Focusing attention on the choice of the university study direction become important for the study of differences observed in the employment rates of graduates by subject area. In 2019, the employment rate of the graduate population reaches the highest level for the medical and pharmaceutical area (86.8%), followed by degrees in science and technology, (STEM, 83.6%), those of the socio-economic and legal area degrees (81.2%) and finally the degrees of the humanistic and services area (76.7%) (source: ISTAT). In addition, the gender gap in employment returns is clearly against women, and remains high even among graduates in technical-scientific disciplines (STEM). Some questions are of interest: How much are the Mathematical skills developed in the school an indication of future university choices? Why the best performance of female university students, which can also be seen for STEM degrees, do not lead to an effective and equal inclusion in the world of work? Students may be influenced in their career choices by their understanding of their relative academic strengths as well as their confidence and interest in Science/Math. Using grade 13 INVALSI data and university registrations, an attempt will be made to understand what mechanisms hinder the choice of STEM subjects, particularly among girls.

Barbara Baldazzi, Researcher of Socio-Demographic Statistics Area at ISTAT since 1997. Researcher in SDGs Project: "Sustainable Development Goals". The United Nations Statistics Division entrusted ISTAT with the task of coordinating the production of indicators for measuring sustainable development and monitoring its objectives. In particular, in this project, she deals with analyzing, proposing, improving and monitoring statistical measures on education (Goal 4). Researcher in BES Project: "Measuring Equitable and Sustainable Well-being in Italy". In particular, she has the coordination and organization of activities of the thematic work groups of Education and Training. Project Manager of "Adult Education Survey" (2017 and 2012), in two waves of survey on households for study the participation of the adults at education and training during the life.

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Patrizia Giannantoni, PhD in Statistics and Demography from a multinational program with University of Rome and Lund and Max Plank Institute in Rostock. She has worked on psychometric evaluation of developmental tests in collaboration with CNR and University of Parma and participated in research projects on migration as research fellow at University of Naples. Since 2017 she has joined the Statistics Office of INVALSI, keeping her research interests on migrant integration, and educational inequalities.

The INVALSI tests: from pen and paper to the computer, who has benefited?

Andrea Bendinelli - Patrizia Falzetti

Until 2017, INVALSI had to distribute two and a half million of booklets in over 46,000 school locations, scattered throughout the national territory. Since 2018, however, tests have gone from paper to computer. This change has made it possible to avoid teachers of low and upper secondary schools from the manual insertion of answers in a special electronic format. Again, in the paper tests, all the students were presented with the same questions, in the computer ones in the other hand, the students carry out different tests, equivalent in terms of measured ability and level of difficulty, taken from a special item bank. In this way the results are more reliable. In addition, in a computer based test the results are based on a greater number of data, thanks to the tests and pretexts carried out in recent years on millions of students. In this way, INVALSI has a large database on the ability of students to answer the questions contained in the item bank: by analyzing them statistically, it is possible to calculate the probability with which, given a correct answer to one of the item of the test, a student could have correctly answered other items. In other words, it is as if the student had answered many more questions than those present in his test. The result is an even more accurate assessment than in the past, and it will become more and more so in the future when INVALSI has even more data. The substantial coincidence of the data of the sample and non-sample classes confirms the effectiveness of the CBT mode in strongly reducing cheating phenomena. This is very important not only from a statistical point of view, but also with respect to the more general educational and training plan. Regularity and correctness in the execution of the tests is in the first place an important example of respect for the rules and therefore for legality, which goes far beyond the importance of the reliability of statistical measures" (cf. The methods of sampling and decomposition of deviance in the national surveys of INVALSI). The aim of this work is to investigate the differences in performance in the transition from paper test to computer based test, verifying whether differences between subpopulations, already consolidated in the literature before the transition to the aforementioned mode of administration, have undergone particular changes as a result of the change in the mode of administration.

The first results from some simple descriptive are interesting: the territorial differences are amplified in the transition to CBT, in the 2017-18 and 2018-19 surveys. Another interesting element is that related to the differences over time between the pairs of observations before and after the introduction of CBT. While the difference between the pair 2015-16 and 2016-17 (paper administration) shows even significant fluctuations, especially in Mathematics and for some geographical areas, in the pair 2017-18 and 2018-19 these differences are much smaller; this data confirms the stability and accuracy of the estimates deriving from computerized administration. As reported in the introductory paragraph, computer administration has made it possible to significantly reduce the measurement error caused mainly by opportunistic phenomena, such as cheating, this phenomenon is historically more present in the regions of the south.

The methodology used involved the identification and creation of two groups: a control group and a treatment group. The control group covered all the students who had taken the third secondary first grade test in paper and pen mode in the years 2016 and 2017, on the other hand, the treatment group included all the students who had taken the test in CBT mode in the years 2018 and 2019. it is understood that net of repeating students, the two groups are made up of different students. The characteristics of the statistical procedure used involved the implementation of a multiple linear regression model having as a dependent variable the standardized score at the single year test and, as explanatory variables, in addition to the socio-demographic characteristics and previous skills of the students between the two groups, also the binary variable of the group that allows to evaluate the net effect of the CBT administration, this variable was then

also inserted as an interaction with the geographical variables, in order to evaluate this effect also in relation to the location of the student in one of the three major areas of the country.

The differences that emerged from the study by comparing two successive cohorts, before and after the change in type of administration could lead us to think of an effect on performance due to the data collection mode, but this does not correspond to reality because we must keep in mind the phenomenon mentioned above, namely cheating. Although the statistical correction (Longobardi, Falzetti and Pagliuca, 2020) applied by INVALSI leads to results closer to the real data, i.e. the one detected with the sample, it is not possible to completely eliminate this distortion. The data of the regions where this phenomenon is more accentuated decrease above all because with the new methodology they are more responsive to reality. As proof of this, if we compare the maps with the percentage of cheating by geographical distribution, we note how the phenomenon is localized in the regions where the effect of the new administration methodology seems to have had a greater negative impact.

Andrea Bendinelli, got master degree in Statistics and works at INVALSI's statistical service. He carries out statistical analysis activities on large databases and conducts research support activities in the assessment of students learning.

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Children left behind. New evidence on the (negative) impact of grade repetition on educational careers

Dalit Contini - Guido Salza

Introduction. There is considerable debate around the use of grade repetition – the practice to hold back under-performing students and prevent them from advancing to the next grade – as a remedial provision for poor school performance. Emphasizing this goal, many teachers, principals, and parents welcome this practice. On the other hand, there is concern that grade retention will hamper pupils' future schooling careers. Research on the causal impact of grade repetition has reached mixed findings. One major challenge is that addressing this research question requires detailed longitudinal data on individual schooling careers, with relevant information on pupils' performance before the occurrence of grade repetition, to make as best as possible like-with-like comparisons, and after retention, to analyze the consequences on different educational outcomes. Such data are generally difficult to obtain, and often need ad hoc integration of data archives. Beyond informational and methodological challenges, an additional critical element is the limited generalizability of each study across institutional contexts, because educational systems resort to the practice of grade repetition in different manners and timing.

Aim of the research. In this paper we contribute to this literature by supplying new evidence of the impact of grade repetition in Italy, where, despite being a widespread practice especially in high school, retention remains substantially understudied. Although grade repetition cyclically comes into light in the public eyes, neither scholars nor educational authorities have ever systematically addressed this issue. The reason is probably that no adequate database has existed so far to address this issue in a convincing way. To the best of our knowledge, this is the first attempt to evaluate the impact of grade retention in Italy and one of the few in Europe.

Data. This study relies on a rich longitudinal database of a population of high school students built specifically for the purpose of this research. The dataset covers the entire population of secondary-school students between school years 2013/14 and 2016/17 in the three most populated Northern Italian regions (Lombardy, Piedmont, and Veneto). It is based on the National Register of Students that follows pupils over time and records all the relevant information on their educational paths – grades, school changes, promotion or retention at the end of each school year – while keeping track of the school and class identifiers. These data were integrated with individual-level information provided by the National Institute

for the Evaluation of the Educational System (INVALSI), which administers yearly standardized tests on Reading and Math literacy to all children in different grades and collects information on their socioeconomic and migration background.

Methods. Exploiting the richness of these data, we propose a matching strategy to assess the causal impact of grade repetition in institutional contexts where a substantial degree of leeway in the pass/fail decision exists. In these cases, if the decision makers differ in terms of "severity", it is possible to find fully comparable retained and non-retained students. Assuming that severity is defined at the school level, we argue that it is not possible to find a good match within the same school, and thus, combining exact and propensity score matching, we search for each retained unit a promoted students with the same array of ability measures, in schools displaying lower degrees of severity.

Results. Our findings reveal that grade repetition raises the probability of changes to less demanding school tracks and dramatically increases high school dropout. Moreover, we find some evidence that the negative impact is larger for students with low educated parents or migrant background. Overall, grade repetition appears as an inadequate remedial policy for students' poor academic performance, and due to the disproportionate presence of socially disadvantaged kids among retained students, it also contributes to increase inequalities of educational opportunities.

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Guido Salza, has a PhD in Sociology and Methodology of Social Research at NASP (Network for the Advancement of Social and Political Studies) and is currently a research fellow at the University of Trento. His research interests are mainly in the field of sociology of education and educational inequalities.

INVALSI meets GitHub: why not?

Lorenzo Maraviglia

Research based on INVALSI data has been boosted by the policy of data accessibility adopted by the Institute. The availability and accessibility of data is a fundamental requirement for the development of research that implements the standards of reproducibility and critical control increasingly accepted by the scientific community. Another necessary component, however, is the provision of code allowing the replicatioon of results, possibly through the use of "open" (non-commercial) programming languages such as R, Python or Julia. In this regard, the creation of a repository accessible to all researchers - for example on a platform such as Github - could provide a further important push for the development of a collaborative community that exploits the potential of INVALSI data, also favoring the collaboration between INVALSI, research institutions, schools and central and local authorities. The contribution illustrates the great potential of a workflow based on the production and sharing of data and code by presenting the results of a procedure that allows to apply iteratively different statistical tests (kruskall-wallis, anova, bayes factor etc.) to all the schools represented in the INVALSI microdata (population data) in order to assess the probability that classes have been selected based on an assessment of incoming students' performance and/or skills. The results show a high degree of coherence between the different types of tests applied, pointing to the possibility that sorting procedures are applied in some types of school or in some territories of our country. Of course, the R code is also provided to allow replication or results; the code can be easily adapted to address a wide class of problems of a similar nature, thus representing a potential resource for the research community.

Lorenzo Maraviglia, attained a PhD in Sociology of Development at the University of Pisa. He manages the Statistical Office of the Provincia di Lucca and he is a member of ISTAT technical committee for the development of statistics in local organizations (municipalities etc.). He teachs Social Research at the

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The academic greenshirting puzzle in Italy. School entry anticipation, social background, and children's outcomes

Giovanni Abbiati - Fabrizio Bernardi - Moris Triventi

Introduction. Nowadays, many educational systems provide a single annual cut-off date for school entry, meaning that all children born in a given year enter at school at the same time. This implies that in the same class, those pupils born in the early months of the year are significantly older than other pupils born in the later months. There are concerns that younger pupils may have more difficulties in learning, since they might have not yet reached a sufficient level of maturity and they will be less successful in completing the same scholastic tasks. While in some educational systems the annual cut-off date for school entry is compulsory, it is not the case in other school systems. For instance, in the United States, 'academic redshirting' refers to the practice of postponing entrance into elementary school of age-eligible children in order to allow extra time for their socio-emotional, intellectual, or physical growth. In our study we analyse a related phenomenon, the early school entry, which we label as "academic greenshirting", being the opposite of redshirting and referring to enrolment in primary school when children are possibly not fully mature. In Italy early primary school enrollment is allowed to children who turn six years of age by 30 April of the reference school year. Interestingly, it seems that despite the wide empirical evidence pointing towards the potential negative effects of being relative younger in school, a non-negligible proportion of Italian parents' attach positive value to school anticipation and families are quite likely to take advantage of this opportunity when possible. In order to shed light on this 'puzzle', we aim to investigate: 1) whether children's socioeconomic background affect the probability of early school entry; 2) to what extent early school entry affect students' academic performance and 3) whether these effects vary across students' social background.

Data. Data for this study are provided by INVALSI, which collects yearly population data on Mathematics and language competences and marks, along with a rich set of socio-demographic variables describing parental education and occupation, migratory background, gender and year and month of birth for each student. We will use data from the surveys administered from 2012 to 2019 to 2nd, 5th, and 8th graders. We restrict our estimation to native and second-generation students, to ensure a degree of homogeneity in parental choice. The final database consists of roughly 10 million observations, similarly distributed across the grades and the school years. Competence scores corrected for cheating and school marks represent the dependent variables of this study. While marks are expressed in the same metric and show a similar distribution across the school years under investigation, competences scores are not directly comparable across the school years or across grades. For this reason, we standardized each competence variable within grade and school year.

Methods. The association between students' characteristics and early enrolment is estimated via standard multivariate techniques. The estimation of the effect of early enrolment requires a different specification, since early enrolees may differ from their peers in unobserved characteristics that could impact on both their parents' decision on the timing of enrolment and on their school outcomes. We propose an estimation strategy based on the intuition that the month of birth has, in all grades considered, a linear effect both on achievement and on marks. Given that students born from May to December are almost all regular enrolees, it is possible to extrapolate the linear trend for the months interested by this policy (January to April), allowing us to reconstruct credible counterfactual average values for competences and marks in absence of the policy. Counterfactual values are intended to create a fictional experimental setting in which a "synthetic" group of students (which serve as controls) is contrasted to the students actually observed in the real world (which serve as assigned to the treatment). Key to our strategy is the longitudinal nature of

INVALSI data, that allows us to compare students of the same birth cohort but taking the test in different years. Since only a (consistent) minority of students opts for early enrolment, estimation of the effect of greenshirting will be performed with instrumental variable regressions, in which early enrolment (the endogenous variable) is instrumented with the belonging to the treatment (i.e. observed) group – which is exogenous by construction. In sum, within the period January-April the effect of early enrolment will be treated as a randomized experiment with one-sided non-compliance.

Results. Results show that early enrolment is a phenomenon that characterizes the experience of Southern schools, while it is marginal in the rest of the country. This phenomenon is particularly pronounced among those born in January in the South (76% of each cohort) especially if they come from highly educated families (89%). Early enrolment negatively affects student learning in both Mathematics and language and in all grades considered. Negative effects on achievement are as high as -0.42 standard deviations in language in grade 2, about -0.3 s.d. in grade 5 and 0.26 in grade 8. The corresponding figures for Mathematics amount to -0.4, -0.28 and -0.15. Effects are similar in magnitude by educational background, indicating that by opting for early enrolment students from highly educated families lose much of their competitive advantage over their regular, but disadvantaged peers, while students worse off score lowest-low levels of achievement. Results on marks are negative but less pronounced (about 0.5 points on a 1-10 scale). Very tellingly, though, they are much twice as strong among the worse-off students then their better-off counterparts, in spite of a comparable effect on competences.

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A quantitative model for gender gap in G8 standardized Mathematics tests in Italian schools

Riccardo Orlando - Ottavio Rizzo

Introduction. The gender gap in Mathematics, i.e. the different performances of male and female students, is a well-known and well-documented phenomenon. Testing from OCSE-PISA, in particular, highlights how the gap in Italy is much larger than the international average. The didactic component of this gap has been investigated in the literature through one of two broad strategies: either large-scale, statistical analysis of test results, or item-level analysis of very few selected items with the theory of the didactic contract.

Object and research hypothesis. Object of this work is to identify which kinds of items, or which properties of items, lead to a gender gap. In particular, our hypothesis is that it is possible to predict an item's discrimination by classifying it according to appropriately-defined categories.

Data used. We use data from INVALSI standardized testing, grade 8, years 2009/2017, for a total of 8 tests each with approx. 500,000 samples, and more than 340 different items. We select this grade because the gender gap increases with the grade, and this is the latest school year where all students follow the same curriculum - with high school choice highly correlated to gender.

Methods. We group the eight tests in two sets of four: the model construction set and the model validation set. All items in both sets are scored with a discrimination metric, based on the Differential Item Functioning. We use highly-discriminating items from the model construction set to identify 16 categories, such as "Explain your reasoning", "Multiple-choice item", "Redundant information" or "Asymmetric distractors". We then classify all items from both sets according to these categories. Finally, we compute the discrimination scores of the categories using a least-squares method on the model construction set, then test them on the control set.

Results. Of the sixteen categories used, five are shown to be robust, i.e. they correctly predict item discrimination on the control set. These categories are all tied to the didactic contract, and coherent with what is already known in the literature. Therefore, this model can be used to identify the discriminating properties of items, and to guide item construction in future tests.

Riccardo Orlando, graduated with a degree in Mathematics at Università degli Studi di Milano and teaches at ISIS Einaudi near Bergamo.
Ottavio Giulio Rizzo, is a researcher in Mathematics at Università degli Studi di Milano. His research interests include the training (pre service and in service) of Mathematics teachers, the use of digital resources in teaching.

Is the sooner really the better? Age of smartphone acquisition and its effect on middle school students' language proficiency

Tiziano Gerosa - Marco Gui

Introduction. The transition from primary to secondary education is a challenging moment in the life of pre-adolescents. This educational stage is indeed characterized by a growth in personal responsibilities towards learning (Ferguson and Fraser, 1998; Spernes, 2020) and, consequently, in the relevance of individuals' ability to defer the small immediate gratifications of daily life to achieve future goals. Entering middle school, students gain greater autonomy in deciding whether to get involved in attractive leisure activities that offer immediate rewards or to delay such rewards in favor of the long-term benefits of studying. However, several studies have shown that, during pre-adolescence, the intertemporal choices between immediate and delayed rewards depend on the activation of two competing neural networks (McClure et al., 2007) which are still structurally and functionally malleable (De Luca et al., 2003; Luciana et al., 2005). Therefore, the first months of middle school represent a test bench for the exercise of cognitive abilities to defer gratifications, especially given the sensitivity of the youngest towards specific types of immediate rewards (Lee et al., 2021). Access to screen media is certainly one of the major sources of distraction to which they are exposed, with potential long-term negative consequences on their school commitment and academic achievement. Previous research confirms that prolonged use of TV and video games by children and adolescents is negatively associated with their school performance (Tremblay et al., 2011; Ferguson, 2015). The smartphone, due to its accessibility, multifunctionality, connectivity and ease of use, is perhaps the strongest distractor across all those available to the new generations (Beland and Murphy, 2016). On contrary, other strands of literature see mobile devices as tools that could even increase students' school performance by fostering individuals' engagement in online study activities (Haßler et al., 2016). To date, however, the evidence available on this device is still scarce and merely correlational (Amez and Baert, 2020), making it impossible to draw conclusions on the effects that early access can have on school performance

Aims of the study. This study aims to evaluate whether receiving the first personal smartphone between 10 and 11 years (i.e., at the beginning of middle school) affects the academic performance of students in the following years. Considering the increase of responsibility deriving from entering middle school, together with the relative malleability of pre-adolescents abilities to defer gratifications and, above all, the high distracting/engaging power of the smartphone, we formulated the following research questions: 1 – how students who received their first smartphone between the ages of 10 and 11 (early owners) perform in standardized Reading tests over time compared to those who received it from the age of 12 upwards (late owners)? 2 – Does the effect of the smartphone on the performance of early owners overtime change across groups of students who already make extensive use of screen media (TV and video games) before entering middle school and those who were less familiar with this type of activities?

Data. In the 2017/2018 s.y., all the 10th-grade students of 18 high schools involved in the Digital Wellbeing - Schools project were requested to fill a questionnaire on the possession and usage habits of several icts and digital media. The data collected on students' age of access to the first smartphone were linked to their

INVALSI Reading test scores at grade 8 (2015/2016 s.y.) and to both the test scores and INVALSI student questionnaires they answered three years earlier, at grade 5 (2012/2013 s.y.). The matching procedure allowed then the construction of a longitudinal dataset including the Reading test scores of 1,782 individuals who received their first device after having completed grade 5 (N early owners = 645; N late owners = 967).

Method. The study uses a Difference-in-Differences (DID) approach to estimate changes in Reading test scores of early owners between grade 5 and grade 8, net of those of late owners. To account for the parallel trends assumption, the analyses are carried out on groups of early and late owners students made homogeneous for a wide range of covariates measured at grade 5 through the propensity score matching technique with the nearest neighbor (with and without replacement).

Results. The analysis conducted on the entire sample suggests that smartphone age of access does not significantly affect students' performances in the Reading test over time. However, looking at the heterogeneity of the effects for screen media usage habits at grade 5, early owners who spent at least 2 hours a day using TV or videogames resulted in a significant decrease (0.2 Standard deviations) in their Reading performance over time compared to their late owners' counterpart, meaning that smartphone age of access negatively influences the school performance of heavy screen media users.

Tiziano Gerosa, is a post-doc researcher at the University of Milano-Bicocca, where he obtained a PhD in Applied Sociology and Methodology of Social Research. He is an expert in the fields of sociology of education and media sociology, evaluation of educational policies, and methods and techniques of social research.

Marco Gui, is an associate professor at the Department of Sociology of the University of Milano-Bicocca. His research interests concern social and individual differences in the use of the Internet, with a particular focus on digital inequality, youth and media, and the relationship between digital media use and well-being.

How proficiency development affects future students' performances: exploring the effects of longitudinal changes in student proficiency

Mara Soncin - Tommaso Agasisti - Melisa Diaz - Chiara Masci

Longitudinal studies examining students' progress have reported that students who are initially non-proficient in Math or Reading have a lower probability of becoming highly proficient in subsequent years than their counterparts, and thus report a larger probability to become at-risk students. Early detection of at-risk students, along with the identification of recurring personal, class or school characteristics that can support them to increase their level of proficiency over time is a matter of primary policy interest. This study examines to what extent the longitudinal change of the academic achievement of elementary school students, between the second year and the last year of primary school (grade 2, grade 5) explains the performances of the same students during the last year of lower secondary school (grade 8). The current research utilizes the administrative datasets provided by INVALSI (National Evaluation Committee for Education) in Italy in the school year 2012/2013 (grade 2), 2015/2016 (grade 5) and 2018/19 (grade 8). The first part of the study identifies the students' characteristics, as well as the class and school factors, that affects students' proficiency development during the primary school, with a particular focus on the longitudinal transitions from non-proficiency to proficiency students and vice-versa, pointing out the factors that differentiated the students who made progress toward proficiency from those who did not. The second part investigates the effect that such passage has on students' performances on the last year of lower secondary school. The availability of a broad set of individual, class and school-level characteristics makes possible to sort out the impact of other determinants and to focus on the influence of proficiency development during the primary school on future performances. Therefore, the contribution of the paper is twofold. First, we support the identification of personal and school-related characteristics to help identify students who need assistance at an early stage. Second, we test early predictive models based on multilevel mixed models and machine learning techniques that can be used to identify students with potential academic problems in the future. In this respect, we also contribute to the conceptual debate about the

importance of developing an early prediction system for identifying and supporting students with potential future academic difficulties. Finally, policy implications about factors explaining student proficiency over time are provided, supporting educators and policy-makers with means to intervene promptly.

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Melisa Diaz, is Post-Doctoral Research at Politecnico di Milano, School of Management. Her research falls within the intersection of arts management, education economics and digital innovation. She is also skilled applying quantitative techniques to large datasets in the public sector.

Chiara Masci, is Junior Assistant Professor at Politecnico di Milano, Department of Mathematics, in the statistical branch. Her research interests are in the development of innovative statistical methods in the area of mixed-effects regression and classification models, both parametric and nonparametric, and in their application in the educational field.

Do national and international surveys speak the same language?

Paola Giangiacomo - Patrizia Falzetti - Cecilia Bagnarol

The National Institute for the evaluation of the education and training (INVALSI) has been dealing with national and international surveys for years. These surveys have different focus and characteristics but also have points in common such as the assessment of students' basic skills. The purposes of the two surveys are different, at an international level an attempt is made to collect information to provide a measure of the differences existing between the participating countries, while at the national level the state of the national school system is investigated to provide self-assessment tools to schools. to improve the performance of its students and consequently of the entire Institute. The research question of this paper is based on the comparability of the two surveys, while considering the different purposes of each of them. The aim of this work is therefore to compare the results in Mathematics obtained by Italian students in the second year of secondary school who participated in PISA 2018 with those obtained by the same students in the INVALSI national tests in the same year (OECD, 2018; INVALSI, 2018). In the first part of the research, the reference frameworks of PISA survey and INVALSI surveys are analyzed to verify the differences in the setting and implementation of the two surveys. Subsequently, attention is focused on the analysis of differences in student performance through correlational methods using the average scores by gender and geographical macro-area. Both investigations took place in the spring of 2018. The analyses were conducted both at the individual student level, considering those who carried out both tests and at the territorial level, in particular detail to the geographical macro-area. A further study involved the evaluation of the score in Mathematics obtained by students in the INVALSI 2016 test at grade 8 to verify whether, even in terms of previous INVALSI score, there is a relationship in terms of prediction of the outcome achieved by the student in PISA 2018. Our study shows a close link between the performance of students at the end of lower secondary school and the results they obtain in the second year of upper secondary school. Another element to underline is the fact that the two surveys give us a coherent and correlated picture, PISA and INVALSI present, in fact, very similar results, when we consider only the students in the upper secondary grade.

Paola Giangiacomo, is a researcher at the National Institute for Educational and Educational Education Assessment (INVALSI), where she is National Manager for OECD. Her current research is in the field of Psychometrics and includes test development and validation.
Patrizia Falzetti, is Head of the Statistical Service of INVALSI, which manages the acquisition, analysis and return of data relating to national and international surveys on learning to individual educational institutions, stakeholders and the scientific community.
Cecilia Bagnarol, graduated in Statistics, Economics and Business to Alma Mater Studiorum University in Bologna. She is part of the Statistical office of INVALSI, working primarily on statistical analysis on large database from National and International surveys.

Digital and informative competences: can Maths performance be improved?

Valeria F. Tortora – Michele Marsili – Emiliano Campodifiori

Computational thinking has become increasingly relevant in recent years as a key competence for comprehensive education and for playing an active role in today's society. To prepare students for life in the digital age, it has become increasingly necessary to acquire skills in this field (Eickelmann et al., 2019; Gerick et al., 2017). Therefore useful as a guide, always in a view ofthe importance of research to support school policies, it is the availability of data from a large-scale study comparing students' digital and information skills and their contextual conditions and characteristics, such as the International Computer and Information Literacy Study 2018 (ICILS, 2018) allows for. The ICILS survey defines Computer and Information Literacy (CIL) 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, (Fraillon et al., 2018). The ICILS 2018 survey, conducted on eighth grade students, involved 14 countries in 4 continents revealing a generally critical situation, among European countries Italy shows greater difficulties (Fraillon et al., 2020). Looking at the international data shows that young people do not develop sophisticated digital skills simply by growing up with digital devices; therefore, equipping students and teachers with ICTT equipment is not enough to improve their digital skills, thus combining computer literacy, critical thinking, technical skills and communication skills applied to a range of contexts and purposes (Fraillon et al., 2020). The school questionnaire found that most students attend schools with access to word processing, presentation, video/photo and graphics/drawing software. However, despite this level of resources, on average, there was a higher percentage of students scoring below level 2 on the CIL scale than above (Fraillon et al., 2020). This paper aims to analyse the Italian ICILS 2018 data, collected by INVALSI in collaboration with the IEA, in particular whether and how much digital skills are useful for improving Mathematics learning. To this end, the results in Mathematics of the National Survey of students participating in the international survey will be analysed, also to assess whether the results obtained can be controlled by factors related to the student, the students' engagement with ICT and their socio-economic background.

Valeria F. Tortora, is a researcher at INVALSI, where she is National Manager for the International Association for the Evaluation of Educational Achievement (IEA). She is PhD in Comparative Education with a thesis on the use of OECD-PISA results by teachers to improve their teaching strategies. The most recent research concerns the study of social inequalities, the variables connected to educational performance of students.

Michele Marsili, graduated in Statistics at Sapienza University of Rome. He worked in Business Intelligence consulting, providing software develeopment solutions for analysis and support for company's decision making in insurance and pharmaceutical industries. Since January 2018 he has been working in the Statistical Service of INVALSI.

Emiliano Campodifiori, graduated in Statistics and Economics at the University of Rome "La Sapienza". Since 2010 he works for the Statistical Service of INVALSI, he performs statistical analysis of the National Assessment data.

Making Comparable National and International Student assessment: The Chilean case

Claudia Matus

We present studies conducted by Chilean Educational Quality Assurance Agency, linking national (Simce) and international assessments (PISA and TIMSS) in order to compare their psychometrical properties and appropriateness for Chilean student population, along with constructing test score concordance tables. We found that TIMSS and Simce psychometrical item properties were similar; supporting the item and ability invariance property, so we could compared national achievement standards to international benchmarks

for 4th graders. We obtained concordance tables and functions between PISA and SIMCE which were used for setting performance standards to 10th graders. We also used concordance function for predicting and explaining college access and retention among others study questions.

Claudia Matus, is Full-time professor at the University of Santiago of Chile and statistical advisor to the Head of the Studies Division of the Educational Quality Assurance Agency. Institution in charge of all school evaluations (national and international) in Chile. She holds a Mathematical Engineer degree (University of Chile) and Ph.D. Statistics (University of Pittsburgh). She has been a consultant in statistical aspects (sampling, psychometrics, educational data analysis) of several Latino American and Chilean institutions for over 20 years. She is Chilean representative before the Pisa Governing Board (PGB).

Digit@lDante: the "Divina Commedia" between digital skills and the goals of the 2030 Agenda

Caterina D'Alessio - Rosa Gubitosi

The interdisciplinary "Digit @ lDante" course was conceived and planned on the occasion of the anniversary of Dantedì. In the planning stage, the curriculum based on interdisciplinary didactics was "rethought" which aimed at the enhancement of educational practices and solutions in a digital key in order to prepare a school model "beyond the disciplines" that was redistributed between at school and didactic activities at a distance. We proceed by starting from the drafting of a shared interdisciplinary planning planned to be flexible, therefore easily replicable and transferable to other school contexts, focusing on the goals of metacognitive skills in the light of key European skills. The planning of the phases include: - Launch of the proposal and discussion in plenary about the phases and organizational methods; - Group selection and elaboration of the resources collected by teachers and pupils on Dante and his work; - Reflection and discussion of the topics analyzed through cooperative learning, learning by doing, peer to peer, group work. The use and choice of these methodologies allow the creation of personalized coaching, individual and group work, playful teaching, storytelling, interactive lessons, flipped classrooms, blended learning. The digital contents presented and tested by the students are: Web app free (adobe spark, emaze, genial.ly, biteable, story jumper, wakelet, linktree, jamboard), easily usable in teaching in the flipped classroom mode. The shared programming was planned keeping in mind: • What to do: creation of a website with different digital applications to attract students to the figure and work of the great poet in an attractive way, also through the choice shared with the students of a "special" friend, Harry Potter, such as companion of Dante. • How: Cooperative learning, peer to peer, flipped classroom, learning by doing, learning by playing. • What it is used for: It serves to understand the contemporaneity of Dante's thought; reference to the goals of the 2030 agenda and the sustainable development goals. The damned of Hell are those who transgress the rules laid down by the goals of the 2030 Agenda. The expected UDA (each UDA is a page of the work in progress website): - Dante: language and numerical symbology; - Dante and the emotions: In the middle of the way… The journey into emotions begins; - Dante and art; - Dante and Harry Potter; - Dante and justice; - Dante and the environment. The website created "E quindi uscimmo a riveder le stelle" presents a motivational question on the homepage: "And if Dante could make this journey today, who could support him? What creatures could you meet in the circles of Hell? ". The project planning therefore starts from these questions that aroused the curiosity of the children with whom we created digital content (genial.ly trivial, interactive games, adobe spark for the presentation of the great poet, padlet as a repository of digital resources, virtual art gallery with emaze, impossible interview with storyjumper, creative ebook) to get to know Dante. Interactive games greatly facilitate the inclusion process because they motivate self-esteem and passion that have always been "engines of training and educational growth". The site summarizes in a digital key the work carried out both in a school and in DAD; in both modes of intervention, an attempt made to diversify the activities, respecting the rhythms and learning methods of individuals. In DAD uses apps whose functions allow the implementation of cooperative learning and the planning of activities to be carried out in flipped mode. The following have been used: jamboard, digital whiteboard that can also be shared electronically for brainstorming and cooperative learning; wakelet, a free online digital environment that allows you to create a portfolio by aggregating many types of resources used for flipped; linktree to always have the apps you use just a click away. The digital contents created on the site respond to the digital skills provided for by DigComp 2. The aforementioned digital contents allow, not only to live the experience in a playful way, but to propose a mild evaluation, meaning with this adjective a non-sanctioning or classifying approach, but an evaluation designed at the service of the person, who works in a creative and positive context and who experiences the moment of evaluation as an opportunity for growth and remodeling of the

approach to study. The interactive games on the site represent a valid tool for learning by playing as they allow students to evaluate the skills acquired in a playful way, thus increasing their self-esteem and at the same time favoring an approach to evaluation as a moment of formative growth.

Caterina D'Alessio, is a primary school teacher, serving at the D.D. Don Milani of Giffoni Valle Piana for over 10 years. Digital animator, trainer of courses on the use of digital applications in teaching and digital Pon expert.
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If the king is naked, let us teach him how to dress

Emilia Seghetti

The teaching of Italian language in secondary school is often subordinated to the literary one, even in the first two years, as if the more "technical" part of the discipline, that is the one relating to the language, had ended with the previous school cycle. The introduction of the INVALSI tests has challenged this practice, drawing attention to the aspect of linguistic mastery (fundamental for the citizen) and has led many teachers to rethink their programming. Useful, in this phase, were the QDR INVALSI of Italian and the organization of skills into levels, materials which, with the le "Indicazioni Nazionali", were an important starting point for the reflection on what it means to know Italian, even more so where the results of the INVALSI tests were modest. With negative INVALSI data and an unsatisfactory School Effect, schools have moved by adopting various strategies, aimed at supporting precisely the aspect of language proficiency: changes to the curriculum, remedial or strengthening courses, participation in local or national competitions, training and updating of teachers, also on INVALSI tests. The pandemic, however, has called into question the positions acquired with difficulty and within a year and a half the school has generally entered into crisis, especially in Italian, that is in the area of communication, heavily penalized by lockdown. The Formative Testing that INVALSI reserved for third grades (2020/2021), and the tests of grade 13, of the same year, did not give positive results, almost in all of Italy; this will require changes to the "Piani Triennali dell'Offerta Formativa" and the PdM: a new educational challenge. In the meantime, however, some teachers from various Italian schools have formed a spontaneous network and began to reflect on a different teaching method, not based only on content, but open to skills. Starting from the QDR INVALSI, these teachers organized the skills in an overview, called TPC (Periodic Table of Competences), and built a useful format for programming, which was also used in the national project of "Curricoli Digitali". The DAD has shown once and for all that teaching often boils down to the transmission of "volatile" content, that is aimed at passing a test and soon forgotten, while society has entrusted the school with the task of training people capable of moving in the current reality, endowed with a critical sense, resilience and empathy. From the perspective of teaching by skills, the commitment of the expert teacher shifts to the planning phase: he designs environments that favor the student an active role in the construction of knowledge; accompanies students in meta-reflection, awareness and self-assessment, in a truly meaningful learning path. The suggestion of TPC is that of a map that orients the journey, a journey in which the teacher observes and records (observation grids), evaluates in a formative and, then, also summative sense. The first results are positive: the students are more enterprising, they learn to move around TPC by recognizing the skills put in place, they are also more satisfied. The results of the next INVALSI tests will tell us whether this working hypothesis has borne appreciable results.

Emilia Seghetti, teaches Italian and Latin at the "E. Fermi" high school in Bologna. She is the author of school texts and collaborates in the construction of the INVALSI tests of Italian for grade 10 and 13. She has held training courses and webinars on didactics of italian language. She has also published in the online journal Education 2.0.

Towards a quality school with INVALSI English tests (grade 13) data analysis

Chiara Cappa

Introduction. The INVALSI English tests for upper secondary school started in 2019, but in 2020 they could only be held in some Italian regions, because of the outbreak of Covid-19 pandemic. Instead, this year the INVALSI tests were regularly taken by students throughout Italy. The Liceo Scientifico Statale L. Respighi in Piacenza, being a Cambridge International School since 2013, is a centre for IGCSE international standardised tests and has been using standard tests at B1 and B2 CEFR level for all grade-10 and grade-13 students for more than a decade. As a result, this school has warmly welcomed the introduction of INVALSI national tests of English in Italian upper secondary schools. After the release of the 2019 INVALSI results, which revealed some courses being more successful than others, the Foreign Languages Department of Liceo Scientifico Respighi started a thorough data analysis. As a consequence the school, which had always been particularly interested in offering high-quality standards, arranged a series of innovative teaching initiatives aimed at getting a higher level of language competences in those courses where the INVALSI tests results had been more disappointing.

Aim and research hypotheses. The current research starts from an analysis carried out by the Foreign Languages Dept. of Liceo Respighi that, looking at the results of the 2019 INVALSI English tests (grade 13), noticed non-homogenous levels of language competence related to the different school courses: students from "Liceo Scientifico with Cambridge IGCSE" course reached a very high level, while students from Applied Science Liceo got average levels, finally students from Liceo Sportivo did not get satisfactory levels, as they were below the regional and national average. First of all, this research intends to investigate the relationship between the results of INVALSI English tests and IGCSE (that are not to be confused with Cambridge English certificates). Furthermore, the work will describe a list of initiatives arranged during the academic year 2020/21 in order to raise the level of English language competences of the students from Liceo Sportivo. In particular, the work will introduce the distance learning study support afternoon groups aimed at grade 9-10 and grade 11-12 students, plus the experimental formative assessment carefully planned for Liceo Sportivo. The final aim of the research is to test whether these teaching initiatives really had a positive impact on the school quality or not, highlight the potential and difficulties of the interventions and imagine future perspectives.

Data. Results of the 2019 and 2021 INVALSI English tests for grade 13, CEFR Companion, results of Cambridge IGCSE exams of the last 5 years, results of the 2019 and 2021 State Exams 2019

Method. Study of the CEFR levels and of the expected competences for the English language at the end of the upper secondary school, collection of data related to the results of Cambridge IGCSE exams in the school, analysis and comparison of statistical data of INVALSI tests related to the school as a whole and compared to the national results of licei scientifici, classici and linguistici for 2019 and 2021, comparison of State Exams results of 2019 and 2021, action-research through a modular re-scheduling and formative assessing of Liceo Sportivo, the enrichment of the teaching offer with the creation of distance learning study support afternoon groups lead by the English teachers of the Foreign Languages Dept.

Results. The analysis of INVALSI data has definitely boosted the innovation and quality of the school, even though only part of the expected results have been reached, due to the pandemic. The presence of a curricular course characterised by international qualifications related to specific subjects, taught following the CLIL methodology, such as the Cambridge IGCSE qualifications, has proved to be warranty of a high teaching quality and of reaching the highest language competence levels in INVALSI English tests. The re-arranging of Liceo Sportivo and the study support groups have represented quite an improvement, even if this is not visible yet in the results of 2021 INVALSI tests, since the modular experimentation of the Liceo Sportivo has been activated only with 9-10 grade students, starting in 2020-21, and not with 13-grade students. Last, but not least, the study support needs to be improved and implemented.

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Students' errors in Mathematics and the importance of the partial credit in the assessment

Stefania Pozio - Francesca Ferrara

Introduction. In large-scale international surveys like PISA (OECD, 2017) and TIMSS (TIMSS, 2015), and also in some national surveys like those conducted in the US, it is used a partial credit model for assessing Mathematical literacy. This model allows to estimate the parameters of items with more than two ordered response categories (0 incorrect, 1 partially correct, and 2 correct). The use of the partial credit therefore allows to assign a score to responses which, although not entirely correct, highlight student reasoning that fulfils the question intent or partially the required process. From the analysis of the incorrect answers given by grade 8 students to some open-ended questions, which were administered by the national assessment test in 2018, it became apparent that some of these answers actually contained important attempts towards the solution, close to a correct answer. Our attention is on these answers and on the possibility to assign them partial credit scoring, instead of treating them as any incorrect answer. In fact, we hypothesise that this will provide, on the one side, a more accurate measure of the proficiency levels of the students who give those answers and, on the other side, further elements to refine the description of the proficiency levels. Object and research hypothesis. Our research focuses on the analysis of the incorrect answers to some grade 8 closed-constructed items by respondents. Specifically, for the first time, we also investigated the kinds of incorrect answers to an open-ended question, which required to write the procedure other than a numerical result. The question has multiple possible response strategies, many of which were not even provided for in the marking guide. When analysing in a precise way the procedures reported by each student, it emerged that some of the procedures could be considered partially correct because they use most of the elements necessary to give the correct answer. One research hypothesis is that analysing the incorrect answers in the field trial phase would allow for better refining the question intent, but more importantly for enriching the marking guide with the inclusion of answers to be considered partially correct and therefore to be assigned with partial credit scoring. Another hypothesis is to verify eventual correlation between the students who give partially correct answers and their proficiency level.

Data. The subjects of our study are grade 8 sampled students who participated in the 2018 national CBT assessment of Mathematics. Drawing on the previous investigation of incorrect answers to closed-constructed items, we focus on the answers considered incorrect, given by these students to an open-ended item. Particularly, we focus on those answers which present interesting approaches to the solution, and which could be seen as partially correct answers, because of fundamental steps from a Mathematical point of view. The question under consideration furnished two response spaces: one space for the procedure followed by the student to get to a numerical result, the other space for reporting the result. The answer was evaluated as correct if both the written procedure and the result were correct.

Method. The method we used is the same as the one we adopted in the first research phase, when we analysed the incorrect answers to closed-constructed items. It is a mixed method, based on the one side on the qualitative and exploratory analysis of students' answers, for the study of their Mathematical literacy at the end of middle school, and, on the other side, on the quantitative information concerned with error percentages and the relationship with proficiency levels. It is important to emphasize that the students whose answers are analysed are part of a representative sample of the entire Italian population of grade 8 learners. From the qualitative point of view, the work consists in identifying common characteristics of the answers with respect to the steps required by a question to be solved and then, in grouping similar answers. Each group so obtained highlights a specific way of orienting towards the solution, paying attention to differences between one way and another. The analysis of the mutual relationships between the students'

proficiency levels and the type of approach used to answer, carried out through graphs from a quantitative point of view, allows for further considerations.

Results. Our study wants to characterize the relationship between different ways (based on the kinds of errors) of answering to questions of the national assessment test of Mathematics and the "distance" of these answers from a correct one. The relationship is pointed out through the aforementioned graphs. Thanks to the strength of the assessment model, these graphs provide a perspective about the distribution of the kinds of answers across the levels, and vice versa. With this additional work, we can confirm what already emerged by the analysis of incorrect answers to closed-constructed items. That is, the introduction of a partial credit scoring in the evaluation of students' proficiency levels would furnish a new, more accurate measure of the proficiency level of each student and further elements to better characterize the analytical and synthetic description of the levels.

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Francesca Ferrara, is Associate Professor of Mathematics Education at Dipartimento di Matematica "G. Peano" of the University of Torino. She deals with research projects about Mathematics education, teacher training, and third mission. She is author of several chapters and articles on national and international journals. She is a member of the Scientific Committee of the European Society for Research in Mathematics Education.

From the territory fragilities highlighted by the INVALSI data to education alliances: the experience of Edu@ction Valley in Giffoni Valle Piana

Daniela Ruffolo

"Don Lorenzo Milani" Primary School is located in Giffoni Valle Piana, in the province of Salerno, a territory characterized by socio-economic and cultural fragilities, and by a strong crisis that has been worsening because of Covid emergency.

Over the past few years the school has played a more and more decisive role in the education of the new generations, also as a consequence of parents' fragilities that are more relevant in young families. As a matter of fact, the context analysis run by the school thanks to the INVALSI data shows that the average cultural level of families is low (more than 50% of parents attended school only up to compulsory level-middle school certificate).

Therefore the kids entering both Infant and Primary School show to have inadequate prerequisites, and unfortunately the gap increases each year. The number of teenagers dropping out school is rising. The phenomenon needs immediate solution offered not only by school institutions but also by the whole education community, in order to fight educational poverty and support families in raising the new generations. For the reasons mentioned above, the project of a territory alliance has given birth to the « Edu@ctionValley » of Picentini, in which Don Milani Primary school plays the role of civic center of a sustainable education ecosystem in the territory for an economy sharing knowledge, experiences and competences.

Edu@ction Valley includes the Municipality of Giffoni Valle Piana (SA), Nisolò association, CPIA of Salerno, the Medical Council of Salerno province, the UNICEF provincial office in Salerno, Giffoni Film Festival, «Virtuoso» Vocational School for Catering, Hospitality and Tourism in Salerno, Southland, Il Gabbiano, Mondo Famiglia, Rinaldi Music Band, Giovanni II Anspi Oratory and the Proloco of Giffoni Valle Piana. More and more organizations are joining Edu@ctionValley. The education community cooperates to support schools and promote school and social inclusion, providing strategic proposals to overcome the education and cultural differences within the community.

The local educational alliance has triggered many virtuous examples of participatory planning within the community: - the sharing of the booth offered by Giffoni Film Festival during the event (July 2019) with activities organized by the partners (Edu@ction Valley is born), Participatory planning of teachers, experts, local policymakers, parents and pupils of Don Milani for the refurbishing of an Infant school with the Kyoto fund for schools in order to meet children's educational needs, always in line with the school educational strategies (innovative learning spaces) – Participatory planning involving the school, Local Authorities, Social Services and the Third Sector to answer the following calls of proposals in 2021: Fighting Educational poverty Territorial Cohesion Agency Project @we dream (Project Leader – Oratorio Giovanni Paolo II ANSPI-ETS APS); Educating together - Presidency of the Council of Ministers - Family Policy Department Project - Learning to the Future 2030 (Project Leader – DD Don Milani); Con i bambini Call of the Educational Communities 2020 Project EduAction (Project Leader – Il Gabbiano Onlus) - Participatory planning of the School Learning Offer with the Third Sector, together with some courses financed by the project of Social Cohesion Con i Bambini L'ora di Lezione Non basta and by POR Scuola Viva Campania project. Three past editions, the fourth one ongoing (courses of chess, ceramics, astronomy, in cooperation with the experts of Edu@ction), and the fifth year in co-planning - Participatory planning of social and educational activities during Christmas holidays and the whole year (local curriculum for families and pupils, especially the most fragile ones) – Reuse and creation of meeting places both inside and outside the school premises, to enhance dialogue and confrontation aware and active citizens (with the fund of the project of Social Cohesion Con i Bambini L'ora di Lezione Non basta DD Don Milani school bought a bioclimatic porch to be lodged in the school courtyard for pupils, Edu@ction partners and CPIA school for adults) – Encouraging service learning to safeguard and improve the community assets (school premises, monuments, green spots, libraries, sport facilities) – active citizenship and learning city, in particular thanks to the young members of the Scout Group CNGEI, of Soccorso Montano, of Il Gabbiano, Southland e Oratorio Associations- Creation of a website www.eduactionvalley.it and of a facebook profile where the community shares experiences and proposals. The partners in Edu@ction have been adopting a common language, working in synergy, co-planning medium and long term integrated educational interventions, participating also to the school training activities so as to share educational strategies (Training sessions on the Restorative Practices by Senza Zaino within the project Con i Bambini for Don Milani teachers and shared with the other partners). Thanks to Edu@ction supporting lifelong learning and the NEET recovery, the CPIA of Salerno has started courses for young and adults to get the middle school certificate and the first two years of secondary school at Don Milani for the fourth year. Thanks to the contribution of the Social Services of Giffoni Municipality that monitors fragile pupils and families, Edu@ction carried out the Piano Estate 2021 in synergy Don Milani school in July and August 2021, with co-planned intervention to fight educational poverty and support families. Edu@ction is also a space where teachers and the experts of the associations experiment new teaching strategies; an example is the action research done by Nisolò Association at Don Milani school (article Playing with numbers and characters. An enhancement experience in an inclusive context, DIS 2020-Vol.1, n.1).

Daniela Ruffolo, has been the school principal of Don Milani Primary School in Giffoni Valle Piana (SA) since 2010 and of Patroni Comprehensive School in Pollica since 2019. She is graduated in Russian language and Literature and taught English in secondary schools from 1994 to 2010. Since 2013 she has been dealing with school evaluation and improvement, experimenting the CAF and Marchio S.A.P.E.R.I. models in her school. She is a Marchio Saperi auditor, member of the School Principals' Evaluation Units in Campania and Molise regions, teacher trainer of PNFD and expert in Io Conto 2017 project.

Big Bug Hunt! Students Get Hands On INVALSI Math Items

Ivan Graziani - Stefano Babini - Chiara Saletti

Research in teaching has been affirming for years how in Mathematics, and not only, it is very important to address problems in a laboratory way, even in small groups and leaving room for argument from the years of childhood (Baccaglini Frank et al., 2018; Di Martino, 2015; Bartolini and Bussi, 2012). Moreover, it is essential that the error is also valued for its importance in Mathematics and consolidated learning (Zan, 2010; Popper, 1972). Already in 399 Socrates had a vision of educational error and not punitive, subsequently with Popper but mainly thanks to the rereading of the same that offers Perkinson from 1971 through his text The Possibilities of error the possibility of inserting the error in teaching at school as a living subject in the process of teaching and learning has become a reality. Currently Elon Musk (2018) argues that "The most precious thing you can do is a mistake: you will learn nothing from being perfect". The consolidated learning, therefore, is mainly realized as a result of multiple errors that will then lead to the much desired correct response, and it is right there that a knowledge becomes concrete becoming competent.

For this reason we wanted to do a vertical activity proposing to the students some items to check with them what might be the difficulties that occurred.

To do this we have selected, thanks to the platform Gestinv 3.0, some items presented as easy, also for the results of the national sample, or level 1 according to the classification INVALSI, and other more difficult items, or level 5, selected in accordance with the same methodologies.

We gave second grade primary students, grade 2, items of their grade, but considered difficult even by the students themselves, and a couple of easy items, of the higher grade, always selected according to the indications derived from Gestinv. The same was then done for the following grades, 5, 8 and 10. Once the papers were completed we shared them, analyzed them and discussed them with the students to bring out their different methods and solutions strategies. Particular attention was paid to the observation and analysis of errors in the tests. After the sharing activity, we asked the students to highlight the difficulties that led them to make mistakes in the answers.

Based on the evidence that emerged, we then proposed to students to try to modify the questions in order to make them more understandable and accessible. We then asked the students to think about how items could be modified to make them more difficult and allocate them to grades or later classes.

The mistakes made by the students involved have always been less than the National Reference Champion INVALSI. Despite this, the types of errors were such as to allow students to carry out the analysis that we had proposed.

The aim of our research was in fact to transform the error into a positive and proactive protagonist and observe how the students, putting into practice their metacognitive abilities, were able to determine the real difficulties they encountered and what strategies they put in place to overcome them.

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Chiara Saletti, teacher of primary school, graduated in Literary Subjects, Tutor Coordinator UNIFI, author of school texts. She collaborates with Giunti editore as author and consultant on evaluation. Included in the INVALSI regular list of SNV experts, she deals with evaluation with training acquired at INVALSI and Politecnico di Milano.

Pythagoras and more.... This is a problem!

Ivan Graziani - Stefano Babini

A knowledge is really consolidated when it also becomes competent and "expendable" in very different contexts and situations. Often in textbooks the Pythagorean Theorem is presented as a simple exercise and not as a real problematic situation as it should actually be. In INVALSI items the situations are less "scholastic" and therefore can offer teachers a further moment of verification of the concrete acquisition of competence by their students

We wanted to use for our research a "hybrid" paper, half paper and half digital, as in the CBT tests, typical of secondary schools.

We wanted to use for our research a "hybrid" paper, half paper and half digital, as in the CBT tests, typical of secondary schools.

To simulate this particular type of administration, we have included in Google modules some questions, appropriately selected thanks to the platform Gestinv 3.0, among the types of multiple or unique response. While aware of the differences of Google Modules compared to the platform used by INVALSI that offers greater possibilities of manipulation by students, one of our purposes was to observe any differences between two approaches, paper and digital, in the resolution of problematic situations related to the theorem of Pythagoras.

The hybrid dossier was composed of 10 questions, all linked to applications of the Pythagorean theorem, found thanks to the platform Gestinv 3.0 (www.gestinv.it), among the tests released for grades 8, 10 and 13. Two tests were then assigned and administered, row A and row B, in which five questions were paper and five were digital; in the two tests the two parts were inverted the questions were selected, taking into account the National Indications for the first cycle and the INVALSI Framework of Reference. The questions were chosen mainly in the dimensions of "Knowing" and "Solving problems".

Research in Mathematics teaching has for years maintained that the greatest difficulties in solving problems are mainly related to reading, often hasty, and understanding of the text, even with the decoding of useful and useless data, to the organization of the resolutive strategies and also, very important, to the verification of the plausibility of the obtained result (D'Amore, 2003; Polya, 1976; Russo, 1998; Zan, 2016).

"Everything about the very idea of competence seems to be more naturally linked, in the process of teaching-learning, to the intentions, the potentialities, the volition of the subject that learns" (D'Amore et al., 2003).

The aim of our research was to test the competence related to the applications of the Pythagorean theorem, but also to verify if there were differences between the results of the paper and digital parts.

As for skills, the results have shown that for some items the results, and also the types of errors, of online queries are similar to the same carried out in paper form. Above all, there are difficulties related to the comprehension of the text, linked to hasty and partial readings, but also to the lack of verification of the result obtained.

On the other hand, for others, the results of online queries were worse than those given in paper form. With regard to the two different types of administration, also because of the familiarity with the CBT typology we notice some differences, even if statistically not significant, more in the first cycle than in the second. In any case it emerges the need to review how the Pythagorean Theorem is introduced, in particular from the textbooks, to avoid that a Mathematical fact becomes a rule to be learned and that a possible problem, better if real, turns into a series of repetitive exercises.

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Mathematics argumentative items: analysis, reflections and open problems

Rossella Garuti

Introduction. Since many years, Mathematics education research has dealt with teaching and learning argumentation and proof (Hanna, 2007). The importance of argumentation in Mathematics education was perceived also at the institutional level and has led to important changes in the orientation of different countries curricula (from primary to secondary school) all over the world. Also in Italy, in the National Guidelines (NG) we find attention to this aspect of Mathematics education, indeed in the goals for the development of competences at the end of the primary school and at the end of the lower secondary school there is explicit reference to argumentative competences in Mathematics. Furthermore, the SNV Framework defines what type of Mathematics is assessed by the SNV tests and how it is evaluated. It identifies two dimensions along which the items are built: the Mathematical content, divided into four major areas (Numbers, Space and Figures, Relations and Functions, Data and Uncertainty), and the Mathematical processes involved in solving the items (Knowing, Problem Solving, Arguing and Proving). In this paper we examine how Italian Mathematics standardized tests try to assess specific aspects related to argumentation skills: we analyze two items selected from grade 5 (primary school) national standardized tests. We use theoretical lenses taken from research in Mathematics education in order to highlight the argumentation features that these two standardized items focused on.

Object and research hypothesis. As stressed before, considering the National Guidelines suggestions, INVALSI tests aim to assess also argumentation skills. Therefore, our research questions are: which aspects related to argumentation skills can be assessed by a standardized test? And in which way? These are very general questions that we faced starting from a more specific investigation about which elements were considered in the construction of some INVALSI argumentative items. A standardized test cannot assess all the argumentative skills quoted in the NG (e.g., formulating hypotheses or exploring a problem situation in order to produce conjectures), but it can propose tasks that ask students to support his/her statements, to show examples and counterexamples, and to recognize the logical consequences of a correct argument. In INVALSI tests, two item-format types are used to assess the argumentative skills: open constructed-response items and selected-response (multiple-choice) items. The first may ask the student to explain how the answer was reached or to justify the answer of a given statement; the second requires selecting one response among a few options. In order to describe the structure of Mathematics argumentations, as texts produced, different studies use Toulmin's model (1958). In the next paragraph we show some interpretative tools proposed by this model. In Toulmin's basic model an argument comprises three elements: the Claim (C), i.e., the statement; the Data (D), i.e., the data that justify the claim C; and the Warrant (W), i.e., the inference rule which allows data D to be connected to claim C. In our study we focus on written texts, INVALSI multiple-choice items in which students have to choose among different sentences. In this frame, we refine our initial research questions: can we identify common structures in the different answer options in INVALSI tests? How can we carry out a posteriori analysis of the argumentative items by using some interpretative tools coming from Toulmin's model? INVALSI results tell us that the percentage of correct answers in argumentative items is quite low (in CBT tests these items often end up in levels 4 and 5). If argumentative competence is so central in the curricular indications and consequently in the Math NVALSI framework, then it is also necessary to try to construct argumentative items that can intercept an

adequate percentage of correct answers (and that for the CBT can also be placed in the lower levels). Therefore, we can express a further research question: can Toulmin's model become an a priori analysis tool for argumentative item construction?

Method. We analyse and compare two argumentative items, administered in the fifth grade of primary school, using Toulmin's model to analyse their results, the choice of different options, the argumentative structure and the characteristics of the justifications to be chosen: context, pertinence and truth. In this case, Toulmin's model is used as an a posteriori analysis tool. After this, one of the items is modified based on this analysis and two different versions are created to be sent into the field in a pre-test on a representative sample. In this case, the Toulmin model is used as an a priori analysis tool.

Results. The analysis through Toulmin's model allowed us to focus on the structural characteristics of this type of item (multiple choice) allowing us to identify some characteristics of the justifications (warrants) that allowed us, in a second phase, to modify the items considering this analysis. The results of the sample lead us to say that this could be the way to construct argumentative items that are accessible to almost all levels of proficiency and that could help us to more accurately analyse a skill considered fundamental in curricular directions.

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Standardized assessments and Mathematics education research: quantifying solid findings

Giorgio Bolondi - Federica Ferretti

We report an example of a research approach aimed at gathering quantitative pieces of evidence of solid findings in Mathematics education. The main goal of this project is to provide an additional perspective on solid findings in education, to be used by teachers and by researchers in their work. As a case study, we present a situation of "loss of meaning" in algebra, exploring it with data coming from a large-scale assessment interpreted by means of theoretical lenses. We are able to give information about the extent of the phenomenon and to highlight how the phenomenon is relevant also for high-level students. This approach can provide a link between large-scale assessment results, educational research, and teachers' practices, and suggests further research issues.

Giorgio Bolondi, is a Mathematician, Phd in Algebraic Geometry, is interested in how Mathematical knowledge goes from generation to generation and from person to person. He teaches at the Free University of Bozen/Bolzano; his current research activity is focused on the assessment of learning and the professional development of Mathematics teachers.

Federica Ferretti, PhD in Mathematics. She is Researcher in Mathematics Education at the Department of Mathematics and Computer Science, University of Ferrara. Her main research interests concern the Didactic Contract at all school levels, formative assessment in Mathematics and the formative use of standardised assessment. For years she has been involved in Mathematics teachers' professional development and she is the author of numerous research contributions on Mathematics education.

The human factor: framing the student

Luigi Umberto Rossetti - Lucia Scotto di Clemente

This paper aims to report the results obtained from the experimentation in some classes of two Campania's second cycle educational institutions in the city of Benevento and Avellino in the area of "non-cognitive skills".

Scope of application. Among the regional objectives assigned to school managers in the Campania region by the Director General, the need to "implement the acquisition of non-cognitive skills through the logic of the integrated social network in formal, informal and non-formal contexts" stands out. The Internal Evaluation Committee is, therefore, committed to reflecting on how to support the manager in the pursuit of this objective, designing appropriate improvement actions consistent with the data returned by INVALSI and with the indicators made available by MIUR in the SNV and SIDI platforms for the updating of the RAV and the PdM and the preparation of the new PTOF for the three-year period 2022/2025.

Experimentation and participants. The main objective of the experiment is to understand how the non-cognitive variable "human factor" affects pupils' INVALSI results. There are two participating schools: 1. Istituto Alberghiero "Ipsar Le Streghe" of Benevento ; 2. Liceo Statale "Paolo Emilio Imbriani" of Avellino. The experimental pathway, which has already begun, will be implemented in the following steps in the 2021/2022 school year and will concern some sample second and fifth classes of the two institutes: - Identification of the classes subject to the experimentation; - Organisation of activities with the educational institutions participating in the experimentation: it must be similar among all the participating schools; - Sampling of classes; - Training on the application of the personality recognition tool in the four reference groups: Dominant, Precise, Sociable and Enthusiastic; - Segmentation of classes by personality; - Implementation of CBT test exercise activities; - Organisation and analysis of results by personality; - Generalisation of the intervention. The contact persons for the three educational institutions identified are: - Prof. Rossetti Luigi Umberto (digital animator Ipsar Le Streghe Benevento); - Prof.ssa Scotto Di Clemente Lucia (Italian teacher and assessment referent Liceo P.E.Imbriani di Avellino). Innovative elements The innovative element of the experiment is inherent in the attempt to verify how the non-cognitive variable of the students' personalities can influence their results, as well as what can be done to improve these results. The starting point is the attempt to categorise students according to their decision-making time (long or fast) and their relationship with others (introverted or extroverted) with the aim of putting them at ease and increasing their probability of success in the tests. The students will be divided into four personality types structured in two groups: introverts and extroverts. This subdivision will be carried out by means of a test available in both paper and digital versions and will serve the students to self-knowledge and the teachers of the educational institution to plan interventions to support the improvement of non-cognitive areas of weakness. This element is also the reason why it was decided to limit the classification of the student to only two variables such as time and relationships. Time management in particular has always been a highly critical factor in the INVALSI tests. Also important is the development of the network action between several educational institutions, which makes it possible to build a composite picture of the good practice, favouring the aspect of generalisation.

Results. The results expected at the end of the experiment are - Class data by school institutions; - Class data by personality segmentation; - Aggregate data; - Comparison report between the second classes of each institute; - Comparison report between the fifth classes of each institute; - Comparison report between the second classes of the two networked institutes; - Comparison report between the fifth classes of the two networked institutes; - Creation of shared digital material database; - Report comparing the sample classes and the results obtained in the INVALSI tests in the two networked institutes.

Luigi Umberto Rossetti, professor of Business Administration in high schools and assistant professor at the University of Sannio. PhD in Management and Local Development. He is a chartered accountant, auditor and expert trainer. Author of several scientific contributions. Digital Animator and member of the territorial training team - Usr Campania.

Lucia Scotto Di Clemente, Italian teacher in high schools, involved in INVALSI projects and actions on school and learning assessment as a member of the NEVs and as a trainer in actions on OECD PISA and INVALSI tests. Component of the NEVs and as a trainer in actions on the OECD PISA and INVALSI tests. She has participated in national plans for language and literary education in a multilingual perspective with INDIRE and USR.

"Which language do you speak at home?" Didactic ideas from INVALSI data for the enhancement of the bilingualism of foreign students

Antonella Mastrogiovanni - Luca Pieroni - Antonella Vendramin - Francesca Resio

Scientific literature (eg. Cummins) has shown that bilingualism is a factor that strengthens the language skills of a student who uses a language different from that spoken at school in his home life. This condition is common to many students in Italian school without Italian citizenship (NCI) and can be analysed in the light of the students results in the INVALSI Italian test. In some cases the natural coexistence between the two languages can degenerate into competition or even into conflict, causing integration problems in the case of the prevalence of the language of origin, cultural estrangement and weakening of family ties in the case of the prevalence of the target language, in our case Italian.

The study starts from the empirical verification of the levels of competence expressed in the text comprehension test of NCI Grade 8 students of the year 2019 (pre-pandemic) crossed with the languages usually spoken at home. The aim is to verify how much this habit affects this competence and if some languages present different performances with respect to specific areas of reading comprehension. If it is true, in fact, that NCI students who declare that they speak Italian at home manage to achieve good results in the test, the comparison between the skills of NCI students speaking foreign languages among the most widespread in Italy (such as Romanian and Chinese), net of socio-economic background variables that could weigh on the outcomes, could allow to highlight the strengths and weaknesses of a specific foreign L1 with respect to the competence of understanding texts in Italian (L2). It was decided to investigate the skills at the end of the first cycle of education because the problem of learning the Italian language as L2 is reduced compared to primary school and it is therefore possible to verify more precisely the elements that characterize the obstacles or resources of L1 for understanding the text in L2 language.

From this it is therefore possible to outline and propose some guidelines useful to the teacher who has to manage one or more bilingual pupils, with respect to which training courses to undertake both to maintain the skills of a bilingual child, and to facilitate the development of linguistic competence. L2 based on the peculiar characteristics of a specific L1. Furthermore, the knowledge of basic notions about the student's language of origin can allow to enhance bilingualism and to avoid social exclusion or abandonment of the culture of origin by foreign students.

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INVALSI data and outcomes of foreign students - Multiculturalism in education: a Tuscan case study

Marta Castagna - Gabriele Orsini

Learning goals are achieved by students with different times and modalities. Our study analysed the school performances of foreign students attending a Technical Institute for Economics and Technology in northern Tuscany, based on their individual characteristics such as gender, nationality and socio-economic-cultural background in both day courses and evening courses for young adults. Also taking into account the INVALSI Formative Tests submitted by some teachers in Italian language, Mathematics and English as well as the results obtained in last-years INVALSI G10 and G13 tests, we have set up a basis for an analysis of the "school effect" on the learning goals of foreign students, with special attention to the improvement of the didactic, educational and training actions.The theme of diversity is already addressed in the composition of class groups (differences between classes and within them), in the prejudice between "Italian" names vs. "foreign" names and in formulating the criteria for the formation of class groups (on the basis of the equiheterogeneity), in a path of conscious integration and valorisation of differences.In particular, the current pandemic situation has highlighted critical issues relating to discrimination and inequalities in access to technological resources: already during the first "lockdown" period (March to May 2021), our school has made up for the lack of digital devices and supported students by providing them with PCs, tablets and phone cards.

In our geographic area there are no prevailing ethnic groups as in other areas of Tuscany or in neighboring Ligurian area. The particularity of the local economy, centered on stone and marble processing, brings workers from all over the world, often with their families, but sometimes only for a few years or even months. The socio-economic-cultural background of our Institute is mostly low or medium-low, but some foreign students have medium-high or high ESC index (these students usually come from the Far East, e. g. sons of marble sculptors, and are used to speak English as a standard communication tool). Another particularity is the case of Italian students who move abroad with their families for work reasons for a certain period of time and sometimes, on their return, need to recover skills in their mother tongue.

G13 2021 INVALSI data show results above the regional and national average for both the 1st- and the 2nd-generation foreign students in English Reading tests: many reach the level B2 (100% for the 1stgeneration and 60% for the 2nd one); in Listening tests all 1st-generation foreign students reach at least the level B1 (66%) and 33% of them reach the level B2 (40% B2 and 40% B1 in the 2nd generation). As for Mathematics,percentages of 1st- and 2nd-generation foreigners with learning levels 4 and 5 are definitely higher than both regional and national averages (level 5 is reached by 33% of the 1stgeneration and level 4 by 40% of the 2nd generation (more than the double of regional and national averages). In Italian language, however, performances are lower than the regional and national averages: all 1st-generation students do not go beyond learning level 3, and the 2nd-generation ones do not go beyond level 4.

The educational channeling correlated to gender and connected to the origins of the students was also analysed. The number of female foreign students enrolled in our school is not high, except in some areas (AFM - Administration, Finance and Marketing; RIM - International Relations and Marketing; Environmental Chemistry and Biotechnologies). We have also investigated students'choices related to the orientation programs carried out in collaboration with first-degree secondary schools of our territory and evaluated the effectiveness of the orientation process.Most foreign students belong to the second generation ("Generation 2.0" students), but we have also taken into consideration "Generation 1.75", "Generation 1.50", "Generation 1.25" and "Generation 1.0". A certain percentage of students are not

registered as foreigners, as they have an Italian father and a non-Italian mother of various ethnic origins.In Latin, two terms are used to indicate the other from oneself: alius alia aliud , when others are many beyond the self, and alter - alter if the opposition is only twofold. We have tried to see our Institute as a river that goes beyond the alter opposition and welcomes its tributaries and contributions from everybody, overcoming the uncritical ethnocentrism.

After analysing INVALSI G10 and G13 data, our school has decided to create a specific teacher committee devoted to managing all aspects related to multiculturalism teaching issues and to assessing the effectiveness of educational interventions such as hosting programs, support to families, Italian L2 courses, ad hoc projects and recruitment of language mediators. A specific teacher-training program hasbeen deliberated. Agreements are also in place with local Adult Learning Centres. The first results are already evident: enhanced attendance for both in-person and remote lessons during the second lockdown period (November 2020 to April 2021); an increase in the enrolment of foreign students in our school; a greater availability of teachers with significant multicultural skills. These actions are still in progress and can help in both enhancing the school effect (with a special focus on G10 and G13 results in Italian language) and increasing the percentage of foreign students attending our Institute. We try to be explorers and "jumpers of walls" and we think that "embracing the other" is a real growth opportunity for the entire educating community.

Marta Castagna, graduated in Classical Literature at the University of Pisa. She has been a school headmaster since 2012. She is a M.i. trainer for PNSD and IO CONTO programs and member of the Tuscany Committee for the Evaluation of School Headmasters. She coordinates the teacher training program for the province of Massa Carrara. She currently directs the Technical Institute "D. Zaccagna - G. Galilei" in Carrara (MS).

Gabriele Orsini, graduated in Materials Science in 2007 and obtained a PhD in Chemical Engineering in 2012 at the University of Pisa. He collaborates with this University as an external lecturer and co-author of scientific publications. Since 2017, he is a tenured chemistry teacher at the Technical Institute "D. Zaccagna - G. Galilei" in Carrara (MS).

The results of the INVALSI Mathematics Tests in the Marche Region a.s. 2020-21: how much has distance learning influenced?

Carmina Laura Giovanna Pinto

The results detected with the standardized INVALSI tests in the school year 2020/21 highlighted the effects of almost two years of distance learning resulting from the pandemic situation related to Covid-19 especially in situations of educational fragility of pupils with special educational needs. The study aims to compare the data collected for the Marche Region in the spring of 2019 in full distance teaching activity and the results of the INVALSI Mathematics tests in the school year 2020/21, to highlight any critical issues and how inclusive teaching has managed to solve them.

Carmina Laura Giovanna Pinto, Professor of Mathematics and Physics, commanded at USR Marche since September 2015, she is currently admitted to the aa. 2020/21 to the third year of the PhD AREA: Science and Technology - Curriculum: Mathematics at the School of Advanced Studies - University of Camerino. He participated with his article in the drafting of the volume "INVALSI data as a tool for innovation and school improvement. IV Seminar" INVALSI data: a tool for research and teaching ", within the OJS platform space by FrancoAngeli dedicated to the series Open Access INVALSI per la ricerca. She deals with didactics of Mathematics and was a trainer for newly hired teachers for teaching evaluation and system evaluation and new digital resources and their impact on teaching. She participated as speaker at the working table "Skills and multimodality in open educational resources" created within the Officina Education and Future 2021, coordinated by the Research Group on Social Studies on Science, Education, Communication of the National Research Council-Institute for Research on Population and Social Policies, in collaboration with the Ministry of Education and the Futures of Education initiative of UNESCO.

Item INVALSI: analysis of errors

Anna Maria Moiso - Roberta Strocchio - Federica Ferrini

Introduction. We are a group of educators who have been attending training courses run by the Turin Casa degli Insegnanti for years. Believing that the achievement of grammar and reading comprehension skills are a citizenship right to be guaranteed to all, we decided this year to propose a study of the processes of understanding and experimentation of innovative teaching methodologies. First of all, the educators asked these questions: how do we achieve our goals? Which processes are important in the task of comprehension? which conceptual schemes do we put in place for acceptable data collection? How do we design an acceptable theory?

Subject of research. The didactic proposal has as its objective the reflection on the mistake as a learning tool. We started from the items of the INVALSI test, and extrapolated those creating greater difficulties. Then we analyzed the mistakes in class – in whole-class discussion—trying to understand what determined them. The whole discussion was recorded by the teacher and then again submitted to students for reflection. At a later time, the same class was presented with a new INVALSI test that included, possibly, the same difficulties, in order to verify whether the group work, previously carried out and guided by the teacher, has allowed to overcome the difficulties in both understanding and grammatical reflection.

Research method. The Exploration involved students in third grades in primary school and third grades in upper secondary school (high school) who had taken the test in the previous year. In addition, the exploration/investigation/report was carried out on two third-grade classes in lower secondary school,

proposing an INVALSI test chosen from those already administered by the Institute, as a preparatory exercise for future 2021-22 tests.

Data. In this case, it was possible to obtain significant data, both with regard to the characteristics of the students (especially gender, socio-economic and cultural situation) and to highlight effective methods to reduce differences and improve inclusion.

Results. The teaching group reflected collectively on the mistakes, and brainstormed the most appropriate pedagogic strategies and exercises to overcome them. This work has allowed the project to discuss the teacher's role, who need to be thought as the "enabler of creative principles" at the basis of every learning process, stimulating discovery, reflection and interaction. keywords: educational research, teaching practices, gender and socio-cultural differences, inclusion.

Anna Maria Moiso, Italian language and literature High school teacher. Supervisor for SIS Piemonte (languages). Trainer. Textbook author. Coordinator of teaching research groups. Autor of INVALSI tests. Supervisor of Stanza di Italiano for Casa degli insegnanti, Torino.

Roberta Strocchio, theacher of Italian language, Latin and History since 1992. PhD in Greek - Latin philology. Member of the work group of professor Italo Lana (Faculty of classics at the University of Turin): Seneca's bibliography of XX century; Seneca and youth. Publications: The meanings of silence inside Tacito's works, The dissimulatio of Tacito's works.

Federica Ferrini, teacher of humanities in the first and second grade secondary school since 2011. Graduated in philology and literature at the University of Turin with a research thesis Il liber Psalmorum tra i Rerum Vulgarium Fragmenta: l'amore umano verso l'eterno. The most recent studies, which take as their starting point the results of INVALSI tests, concentrate on the teaching of Italian by competences, with particular attention to the valenziale grammar didactics method.

Being a comprehensive school and responding to postpandemic educational challenges

Roberta Franchi - Francesco Mammarella - Lorella Romano

Introduction. The omni-comprehensive Institute consists of 15 Primary School classes, 21 First Grade Secondary School classes, 28 High School classes with 5 courses (linguistic, human sciences, socio-economic, applied sciences, scientific/sports), for a total of 1.324 students. In addition, the historic building and the learning environments for the Lyceum are 50% unsafe, neither innovative nor inclusive.

Problem for the whole Institute: absence of adequate learning environments; poverty of multimedia resources; turnover of teachers and consequent need for training; poor integration with the territory and with families.

Priority: to improve learning and citizenship outcomes in the three-year period 2022/2025.

Process objectives: -curriculum, design and evaluation for the conception and activation of alternative educational scenarios: laboratory classes at the Lyceum with the presence of two teachers who plan and work together; publication of the school newspaper to enhance language and digital skills;

- inclusion and enhancement of teachers: peer learning training between curricular teachers and support teachers; - learning environments: widespread school in the spaces of the historic center, outdoor breaks, nature-classrooms, digitized municipal media library and multimedia school library; - integration with the territory and families: activities with the Parents Committee to make everyone aware of the new educational challenges that place students at the center in a vision of community; civic monitoring with Open Cohesion.

Research subject and hypothesis. How to develop the ability of the School and its interlocutors to use data in a reflective and effective way to better satisfy the needs of young people and children in their living area and respond to what has been experienced, achieved and now expected by the various school actors after 2 years of pandemic.

Data used. Strategies to share VISION, to use the tools of intra and interinstitutional dialogue, to disseminate good practices of documentation and modalities for official agreements and pacts.

Method. Analysis of INVALSI data, civic monitoring and modalities of participation of students and families in educational processes.

Results. The School has laid the foundations for the protagonism of students and for an alliance with the Educating Community, with the third sector and with cultural institutions to avoid early school leaving. Within this mission there are: the Parents Committee founded before the first lockdown; the Pact for the Development of the Vestina Area with the Amiotti Foundation of Milan and Coldiretti; the 2021 summer course of the PON Entrepreneurship for high school youth; collaboration with Unicef and the invitation to represent Abruzzo region in Lampedusa, from 29 September to 3 October 2021.

Our Omni-comprehensive Institute has launched a Collaborative Data system through civic monitoring and new media education that passes through the periodical L'Angolino which will soon be set up as a school cooperative.

By responding to this call, we intend to share indicators and data, actions and results, to think together on how to face and overcome the problems related to educational poverty and inequalities, with a specific focus on special educational needs. and also on the involvement of the mothers of our students. In this context, a training course on the inclusion of pupils with disabilities was started in the school year 2021/2022, as required by the Decree number 188 of 21 June 2021, involving special needs teachers and curricular teachers in a research-action process in an inversion of roles in teaching practice, through the "Special needs teachers TEACH" project.

Roberta Franchi, Franchi is a Language and Literature teacher. She has been Vice Principal for 3 years. During her university studies, she worked as a free-lance journalist for Il Messaggero and at the moment she is the Editorial Director of the School Magazine "L'Angolino". She has a large experience in National Operational Programmes on Education.

Francesco Mammarella, is an English teacher. He is currently performing his duties as Vice Principal. During his university studies, he worked as a free-lance journalist for Il Messaggero. He has a large experience in International School Projects.

Lorella Romano, School Principal for three years at Città Sant'Angelo. Before this position, she has worked as a teacher in Kindergartens, Primary and High Schools, focusing in particular on students with special needs.

New teaching scenarios: reflections and hypotheses for a multidisciplinary didactics

Claudia Califano – Giovanna Vadalà

Introduction. To fine-tune this contribution, I started with some reflections that emerged during the period of the Covid19 Pandemic and the result of both my personal experience as a teacher and the continuous discussion with other colleagues who are members of the Innovation team. The sudden transition from one face-to-face teaching to another totally remote led all of us to an immediate and drastic revision of the teaching methodologies mainly adopted, in order to combine them with the use of technology, as the only instrument of learning. The team that I have made and still am a part of is made up of teachers with heterogeneous skills who have been deployed according to the needs that the DDA has brought out in the teachers of the Institute and in the students. The latter, in the INVALSI Surveys, appear to have mediocre or poor levels of competence in the basic disciplines, but very often, during the DDI or DDI of the school year 2020/2021 they became active protagonists of the learning environment represented by the Platform 'Institute, often supporting teachers in daily difficulties. We can say, in fact, that if the pandemic has accentuated old problems, such as that of teachers' skills in the use of technologies or the digital divide in some areas of our country, it has also brought out and enhanced new potential and new perspectives of our country educational system. Reflection on the essential contents of the disciplines, on the skills and competences to be built and the use of a new form of relationship and learning environment, offered by the use of digital, are now a reality. It has become essential, for many teachers but also for many students, to have a good digital competence, which would support and convey the disciplinary contents, making them accessible and immediately usable. The multidisciplinary approach, therefore, was the terrain on which we intervened, in mine as in many other schools, to innovate the learning setting, create new "interconnections" between the disciplines and create the conditions for improving the levels of competence of students even in basic disciplines.

Object and research hypothesis. The idea was to start a careful reflection on the teaching practices, technologies and tools that we had adopted at school level, both during the first period of total closure and subsequently. In other words, I wondered if we were able to do a teaching that would respond to everyone's expectations; the analysis of the objective data and the ways in which they were translated into didactic-organizational choices led me to believe that despite the difficulties, the authentic approach to technologies had represented a quality element of our training offer. Today, after passing, we hope, the most critical phase, returning to face-to-face teaching, we need to think about new teaching perspectives that inevitably involve a paradigm shift with respect to the role of the teacher. We must think of integrating digital technologies and tools in teaching, reinventing learning settings, adopting active and laboratory methodologies associated with a multidisciplinary approach. In this sense, CBL methodologies, flexible, motivating and engaging, through the promotion of the authentic use of technology and, above all, thanks to the multidisciplinary approach, can be the ideal ground for introducing new tools, new teaching formats, such as for example "Hackathon", new teaching practices and new solutions to old problems, such as the unsatisfactory results of students from some areas of the South in the INVALSI Surveys. Furthermore, recent educational research has hypothesized to overcome the difficulties of having to rethink the paradigm of traditional teaching, intervening on the training of teachers, working on the so-called "Intersections" of knowledge domains. Why not think, therefore, of creating multidisciplinary workshops in our schools firmly based on the vertical curriculum of the Institute? Like other active teaching methods, they can be particularly motivating and represent new solutions that allow you to open new perspectives to teaching and contribute to improving results even in curricular learning.

Data used. The data are those relating to the DDA/DDI at the level of the Institute, those relating to the results of the classes in the 2021 Surveys, the INVALSI Reports 2019, 2021, the INDIRE study published by Biondi in 2015 and other European publications in the field of educational research and active teaching methodologies.

Method. The collection and analysis of data at the level of the Institute, those of the results of the pre-post-pandemic Learning Surveys, were compared with elements taken from the 2015 MIUR Report and from the comparison with other experiences in the area. This was followed by an extensive examination of the rich bibliographic documentation on the difficulties and perspectives of teaching and finally the examination of the data and publications of the Digital Agenda and others on the subject of integrated technology.

Results. A school that wants to build the skills referred to in the most recent European Recommendations can only do so, rethinking the learning setting, the teacher's modus operandi and the curriculum, annually declining the digital skills integrated into the teaching practice. The challenge, so to speak, is to raise the levels of basic skills, enhancing all those methodologies that involve a team and multidisciplinary approach so as to be highly motivating for students, as the most recent educational research has highlighted.

Claudia Califano, was born in Parma and lives in Reggio Calabria; she graduated in Classical Literatures at the University of Messina and has a Master in Classical Archaeology at the University of Catania. Since 1992 she has been a teacher of Italian and Latin language and Literature and for four years at the Liceo Nostro-Repaci of Villa San Giovanni. Fond of technologies applied to teaching, for years she has been involved in teacher training both in new technologies and in disciplinary fields occasionally collaborating with INDIRE.

Giovanna Vadalà, lives in Reggio Calabria, she is a teacher of Mathematics in the lower secondary school on the outskirts of the city. She is part of the Executive's Staff, and has always been involved in the Evaluation and Self-Assessment of the Institute. Passionate about new technologies applied to teaching, she is a Digital Animator, she loves researching and experimenting with new strategies and methodologies to be used in the classroom.

"It's the most difficult and expensive thing we've ever done"

Francesca Cimmino - Chiara Cimmino

Teaching practice during the pandemic has generated a series of compelling questions about new models of applied teaching; it has established essential relationships between effective educational research, efficient technologies and long-term academic improvement. It is as if the fear of the loss of content and skills due to long isolation had been mitigated only by the restorative thought of the conscious and unconscious purchase of "broader" skills that we necessarily need to get out of the growth stalemate in which the Country he's been bogged down for too long. Digital teaching must be truly integrated and serve the student's long-term educational path. The 2022 school year could be decisive for the debate on the use of specific software at the service of the student and the teacher who, in the mare magnum of recovery, consolidation and enhancement of knowledge, skills and disciplinary and transversal skills, has a need to implement Digital Scholarship. This, in today's context of intelligent technologies and smart learning, will draw the datification, and from a negative connotation (which scares teachers and managers so much), it would lead towards a transformative direction of digital teaching. Through the participatory validation of intelligent systems and their relative data collection, during the educational process, it could be possible to organize personalized services of orientation for students, through the analysis of data collected during the school career, with impact along their entire career. Furthermore, the longitudinal analysis and the collegial discussion between teachers could lead to the generation of services (automated and non-automated) aimed at preventing drop-out. INVALSI has provided schools with Training Testing to "diagnose" and "promote" actions in this direction, dealing with some methodological and conceptual nodes essential to achieve the basic learning goals and as a teacher I did not miss the opportunity to test the validity and solidity of this "experiment" that I have read, probably distorting its objective, through the lens of the Digital Scholarship and the "predictive approach of algorithms at the service of integrated digital teaching". The

reports of this test will be shown and analyzed in the slides as a starting point for the discussion. Showing the results of my students at the Formative Testing (and of the approach to the platform by colleagues) I would like to share a vision of the future integrated digital teaching with the use of machines defined as "intelligent" without the need to "copy the biological mind". Let's try to talk about the fears that many of us have in using even just the technological tool, when in the world there is a new force that is not intelligent in the classic sense of the term, but in the hands of human beings who must be accompanied by school to live in this context. Discuss the new requests on A.I. to build a "predictive" approach for IDE in order to spread the use of ICT to the maximum, and use algorithms integrated with educational software to monitor the "progress" and "stoppages" of the students' academic career. Design an experimentation on small class groups of DDI models with "ad hoc" characteristics, a sort of "digital innovation observers" for the specific school sector Reflect on the connections between the advancement of research on the "discipline" and the use of data, integrating this perspective in teaching for lifelong learning.

Method of inference and method of correlation: synchronize the characteristic traits of knowledge "if … then" with the characteristic traits of "this is correlated with that", use of context-oriented models (if digital teaching is defined as integrated, it can meaning that these are 2 "different" intelligence models that can coexist, they do not necessarily have to "assimilate"). Developing "predictive" algorithms (genetic perhaps, due to the inhomogeneity of the survey environment) to advance an explanation of how didactics evolve and therefore to activate a narrative that leads to educational success. Using the heterogeneity of the sources.

Changing the process inevitably leads to a loss: metacognition may undergo transformations, but the purely undergone machine learning is more harmful than the acted one. A modest amount of data to reflect on and discuss is better than nothing: from the micro (classroom) to the macro (Education System) ... it's a moment that has lasted for too many years. I dream of software that, at the same time, support us by offering us new cognitive challenges, different learning environments to stimulate all the intelligent of our children, but which at the same time store and process the data collected during the school years, which are available to the whole school community in order to identify critical moments, losses, too dangerous detachments and take action to bring the student, and the teacher, back on the right path.

Francesca Cimmino, teacher of secondary school literature, married and mother of three children. Instrumental Function Evaluation, Innovation and Didactic Research Area, referent for Ed. Civic. Engaged in AE projects, supporter of transformation (scholar of transformational anthropologies), convinced of the need for a "flexible and updatable" school at any cost.

Chiara Cimmino, learning support staff - St. Vincent's catholic primary school - Marylebone London, single and mother of a girl. Graduated in Italy in Forestry Sciences, transferred to the UK with enormous sacrifices, convinced of the need for a "flexible and upgradeable" school at any cost.

Competent or capable?

Gianluca Valle

Introduction. The 21st century school fits into the context of the so-called Fourth Industrial Revolution: the role played in it by the production and management of intangible assets (data, information, images), by the use of digital technologies and communication networks, by research of a sustainable quality of life reveal how necessary it is to cultivate and implement the problem-solving skills. The redefinition of these competences, taking into account on the one hand the New Recommendations on key competences of the Council of Europe (22 May 2018) and on the other hand the most recent studies on multiple intelligences and critical thinking, can no longer be postponed, but rather it constitutes the premise for the creation of new didactic settings and innovative learning strategies.

Research subject and hypothesis. Starting from the New Recommendations on key competences of the Council of Europe (2018), it is a question of verifying whether and how there is a common pedagogical horizon that connects notions that are often too poorly defined and all in all related to different fields of

investigation. What operational definition of intelligence (or rather, of intelligences) is the basis of key competences? Are problem-solving skills a subset of soft skills? Or are these areas of different skills that require balanced integration? Does it still make sense to contrast knowledge with skills, or is it more useful - as well as more grounded - to reconfigure them within a more comprehensive notion, such as that of capability? What is the fundamental pedagogical core that allows you to keep critical thinking, creative thinking and caring thinking together? What contribution can blended training and the didactic methodology of Situated Learning Episodes offer to the development of transversal competences and capabilities?

Data used. Bigliographic research and the study of essays or articles relating to various disciplines (in particular, pedagogy, teaching, psychology, philosophy of mind), also in the international context, for the definition of some key concepts, such as that of competence, intelligence, critical thinking, capabilities, soft skills and problem-solving skills. This preliminary study must serve to generate a multidisciplinary field of reflection, within which it is only possible to promote innovative teaching strategies and proposals (for example, EAS). The data used mostly come from the INVALSI 2021 test report, from the ISTAT 2021 Report on education levels and returns to employment, from the OECD Education at a Glance 2021 Report.

Method. The method followed is that of the historical-critical investigation of the sources, in a first phase. In the second phase, the INVALSI data, crossed with those of ISTAT and OECD, are used to define the levels of competence of students of the Italian upper secondary school, during their schooling and in their transition to the world of work or university. However, it will be a question of understanding whether the levels of competence do not need to be redefined in terms of levels of skills. In other words, does the school have to train competent or capable children?

Results. This investigative work, which has been going on for some years, still requires moments of study and deepening. A first result consists in showing the need - as well as the usefulness - of orienting teaching in our schools. If the skills require specific and varied forms of intelligence, the creation and realization of one's own abilities (in the sense of capabilities) requires a more "homogeneous" attitude to self-orientation and self-regulation, which basically every disciplinary teaching should point. It is not just about learning to solve problems, as if they were puzzles, but also to define and select them, place them in a priority scale, mobilize emotional and empathic energies, invent non-linear solution strategies.

Gianluca Valle, Professor of Philosophy and Human Sciences at the Liceo Gelasio Caetani in Rome. Laurea in Philosophy from the University of Pisa (110 cum laude). PhD in Philosophy at the International School of Advanced Studies of the Collegio San Carlo of Modena (summa cum laude). Translator from French and German of human sciences essays. Author of numerous essays and curatorships in the philosophical and pedagogical area. Theatrical critic for the magazine Persinsala.it. Member of the Clinamen-Psychoanalytic Research Association. He has held the position of coordinator of the Department of Human Sciences numerous times, where he promoted the planning of teaching by skills, preparing reflection documents on the key competences of the Recommendation of the Council of Europe. In the a.s. 2018/19 and 2019/20 he participated in the drafting of the Improvement Plan and the Institute's Self-Assessment Report. In the a.s. 2019/20 he coordinated the Nucleo Interno di Valutazione and he was the drafter of the Social Reporting document on the SNV-MIUR platform. In February 2021, he participated as a speaker at the V Seminar "INVALSI data: a tool for research and teaching", with a speech on the changes in the teaching setting in the post-Covid era.

From "naive thinking" to "critical thinking". First steps in reflexivity

Maria Antonietta Russo - Francesco Piro - Guseppina Rubano - Norma Di Giacomo – Gerardina Ricciardiello - Daniela Caracciuolo - Carmela Sinno

The analysis of the 2018-2019 INVALSI tests and the results achieved by second classes in particular, carried out with the teachers of the kindergarten, led to a rethinking of the methodologies of teaching and training practices. What emerged is the frequent difficulty of pupils to manage problematic situations and to carry out even minimal problem solving experiments. To provide even minimal tools in this field it's

necessary not only to multiply the tests and the type of tests (possibly structuring them in a playful or at least pleasant way), but to guide the student to understand what kind of challenge he is facing, also providing him with a minimum vocabulary age-appropriate thinking. This type of approach, which can be called "training of critical thinking" - if by the term "critical thinking" we mean that type of thinking which, through reflection on its own acts and results, becomes capable of improving its efficiency - it must be done simultaneously in the logical-Mathematical and linguistic-literary fields, considering that the basic skills are similar. In the second case, it is necessary to give linguistic learning a curvature that exalts the ability of communication, invention, expression (as well as the attention and reflection of the child on them) following the spirit of the National Indications and their textual affirmation "We are all teachers of Italian ". In the second case it is a question of enhancing the child's ability to manipulate, construct and reconstruct and the ability to justify and communicate the discoveries made in this way. An internal connection point of the program is the introduction of dialogic practices according to a model that now has different and plural realizations in the school world, but of which the forerunner remains Matthew Lipman's "Philosophy for Children". An agreement was made with the University of Salerno - Department of Human Sciences to coordinate the work already carried out autonomously by the group of kindergarten teachers with the learning of teaching practices specifically dedicated to "critical thinking" (in the sense indicated above). Philosophical and Training - to start a research-action path on the ways of training critical thinking that will gradually involve all the teachers of the school institution. The agreement with the University of Salerno has prof. Paola Aiello, currently director of the DISUFF Department, prof. Full professor of special pedagogy (M-PED / 03) prof. Francesco Piro, full professor of History of Philosophy (M-FIL / 06) scientific director of our research-action path. Basic objectives: • Correlate the improvement of problem solving skills with the personal growth of the student or his appreciation of the school experience Expected results: • Ability on the part of teachers to recognize the ways of thinking used by children in the situation and discuss them with the children themselves • Ability on the part of teachers to manage paths of dialogic practices structured on the circle-time model. • Ability on the part of the pupils to tackle problems with a minimum of complexity by calling on internal resources and trying different solutions Areas •Transversal skills • Didactics and methodologies • Methodologies and laboratory activities • Dialogic practices Action research will continue over time: a.s. 2021/22 monitoring of first classes activities a.s. 2022/23 activity monitoring and data analysis of the second classes INVALSI national test.

Maria Antonietta Russo, school manager since 2009, is serving at the I.C. of Montecorvino R. Macchia (SA). Graduated in Sociology at the University of Salerno, she is qualified in Philosophy, Psychology and Educational Sciences. Internship supervisor from 1999 to 2008 at the Faculty of Primary Education at the University of Salerno. She collaborated with IRRSAE Campania as a student and speaker/group leader in training and refresher courses from 1992 to 1998. She coordinated various research paths in the context of the school/family relationship and evaluation, taking care of the publications.

Francesco Piro, full professor of History of Philosophy at the University of Salerno, is the author of over 100 publications (registered on the University website and on the Cineca website) dedicated to the relationship between philosophy, logic and methodology of science, as well as the contribution given by several philosophers to this theme. For decades he has been intensively involved in teaching critical thinking, founding the Research Group on Education in Critical Thinking https://sites.google.com/unisa.it/educazione-al-pensiero-critico/home.

Giuseppina Rubano, is a primary school teacher. Since the year 1996/97 she has been working at the I.C. Montecorvino R. Macchia (SA). She is a member of the staff, of the data processing group, of the self-assessment unit and responsible of the commission for administration and correction of the INVALSI tests and evaluation tests. Starting from 2009/10 she is instrumental function of three-year plan of the training offer (PTOF) and evaluation of the school system: INVALSI - School quality. She participated at the 3rd seminar "The INVALSI data: a tool for research" - Bari 26-28 October 2018 as author.

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INVALSI Test: a useful resource for teachers

Marco Bardelli - Giuseppe Lucilli - Luca Della Libera - Maria Chiara Duse

Introduction. The INVALSI Mathematics tests are part of surveys planned in a form that allows statistical processing of the data that can be reused by schools to reflect on students' learning outcomes. The questions of the INVALSI tests are linked to specific objectives and targets for Mathematical skills drawn from the national guidelines. Furthermore, each question is associated with a defined learning purpose and identifies a prevalent Mathematical learning process. From this point of view, the questions provide solid information to understand if a student has achieved certain objectives and at what levels. On the other hand, the results of the tests alone, if they are not discussed between students and teachers, cannot by themselves return the richness of the Mathematical reasoning processes that are of capital importance for meaningful learning (Freudenthal, 1995), in particular if they are referred to complex dimensions such as solving problems, arguing and demonstrating (Arzarello, 2015; Boero, 2015). It is therefore important that teachers and students have at their disposal solid tools for surveying and evaluation but at the same time directing the latter to express their considerations and reflections on the reasoning by which they have chosen certain answers, allowing teachers to better understand the students' Mathematical learning processes.

Research subject and hypothesis. The research is presented as a first teaching experience, to be developed later, in which we tried to use the INVALSI questions, appropriately selected and modified in the format, to investigate the pupils' answers. The starting hypothesis is that if the task is made more complex, through a request for reasons for the answers given, the students could worsen their results. In this way, however, the students could be made more protagonists of their own learning process because some aspects of the didactic contract are limited (Brousseau, 2008) gaining from the students a deeper understanding of the contents even if in the face of a greater cognitive effort.

Data. The following INVALSI Math questions were used:
- LEVEL 5 N. 20/2009, N. 9/2009, N. 10/2009, N. 12/2010, N. 7/2011, N. 8/2013, N. 29/2013, N. 12/2014, N. 7/2015, N.18/2016;
- LEVEL 2 N.9/2009, N.16/2009, N.18/2009, N.10/2010, N.11/2010, N.10/2012, N.6/2014, N.10/2014, N. 7/2018, 22/2018.

The choice fell on questions that showed a significant percentage of incorrect answers, greater than the correct ones.

Method. Three versions of the questions which were originally multiple choice were developed. The first version keeps the original text but completely removes the multiple answer thus varying the difficulty of solving the problem, given the absence of the results to refer to, also removing the influence of the wrong answer that was chosen by most of the students. The second version keeps the original text, also keeps the multiple choice, but replaces the wrong answer, chosen by most of the students, with one previously not present. The facilitated version eliminates the major obstacle for the correct resolution of the problem so as not to invoke strong misconceptions allowing to understand better if the correct answer could emerge more. The third version keeps the original text, keeps the multiple choice as in the original test but adds the request to explain the choice of the answer made. This version involves a high level of difficulty, because it increases the complexity of the answer to be provided by leading the student to express his reasoning process. The tests were administered to 105 primary class V pupils and 137 primary class II pupils, for a total of 242 subjects, by two graduating teachers in Primary Education Sciences, in the presence of the class teacher, in two schools in Friuli and Veneto. The data were subsequently collected and processed to calculate the percentages of the different types of responses.

Results. The most interesting and unexpected result that emerged from the research concerned the third version, i.e. the one identical to the original INVALSI version (the text of the question and the multiple choice options are the same) with the request for an explanation of the answer provided: this version it recorded significant increases in the accuracy of the answers in both levels. In level V, compared to the national figure, the average increase in correct answers was 13.2% (15.3% excluding the only question with a negative increase); in level II, compared to the national figure, the average increase of correct answers was 24.9% (28.1% excluding the only question with a negative increase). It seems really interesting that the mere request for an explanation, without prejudice to the possibility of multiple answers, is able to significantly increase the percentage of correct answers. In addition, the third version offers the possibility of accompanying the reading of the outcome data with those directly connected with the learning process contained in the justifications of the answers provided. It almost seems that the request for explanations to students may have acted with a "drag" effect on the answers, increasing the correct ones. The results finally lead to consider how the high percentage of incorrect answers present in certain questions in the original INVALSI tests could be affected by a failure to enhance the students' reasoning processes that are not always requested in the questions present in the tests.

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Giuseppe Lucilli, after the Scientific Maturity and the Conservatory Diploma, he obtained a Degree in Mathematics from the University of Padua, a qualification for teaching in secondary school and a PhD in Multimedia Communication (XXIII cycle) at the University of Udine. He also obtained a MIUR Master in "Training profession in Mathematics teaching" at the University of Bologna. Since 2001 he has been a lecturer in Mathematics and Physics at the scientific high school and since 2015 a contract lecturer in Mathematics Education at the degree course in Primary Education at the University of Udine.

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The importance of how to communicate INVALSI data

Marina Paola Mariano

Introduction. The use of INVALSI data rendered by the SNV to the school begins with the return of them to the stakeholders present in the school itself. The Headmaster, the teachers of the classes involved in the Institute, those of all the classes of the Institute, the pupils and their families, the President of the Institute Council, the parents of the future members, are all interested in seeing what results have been achieved. The results of the tests taken by the students are a useful tool to reflect and intervene on the weaknesses and strengths of learning and use them to implement teaching practices aimed at reinforcing or recovering learning. Every didactic practice implemented benefits from the tests because it makes use of an external point of view, objective and free from the daily life of the class, helping to create as an objective a quality didactic and pedagogical path. Each member of the groups mentioned, however, is the bearer of a different interest: the Manager, the Teachers, the students and the families look at the data rendered by INVALSI from a different angle because the use they will make of it is different. It becomes necessary to provide adequate responses to the expectations of stakeholders. The return of data to the school is the founding

moment of a good practice and becomes the starting point to study what tools, actions, and checks are needed in order to improve the training offer.

Object. Communication is fundamental and the results of the tests carried out in the previous spring, once they arrive at the school, must be disseminated so that each interested party makes the best use of the contributions: see who / what is needed / to do what. The School Director and the Referent for evaluation, are the only figures with free access to all the data and results that INVALSI sends to the school. When the FS prepares the report for the Director, it must immediately give the results that the school has obtained, in general, but also for each individual class, highlighting the path in the years of the class itself so as to allow the complete vision in its historical framework. The teachers of the classes involved in the Primary School and Secondary School have an interest in seeing how their classes coped with the trials. All the other teachers of the College want to see how their school has faced the tests with respect to and in comparison to similar. For this reason, the report to the teaching staff must be general, but also go into the details of the classes,and then, at a later time,deepen in detail. The families of future members when they participate in the presentations of the Educational Offer, are always interested in the Invals i Tests:they want to see how the school that their children will attend ranks against the benchmarks. The presentation in this context must be concise, immediate, supported by a broader explanation ofthe presentation and context of the INVALSI Tests.

Data. Using the tables provided by INVALSI or creating special tables with the data received. •. to ds report tests and parts of them comparison with previous years strengths and weaknesses monitoring over time •. to the teaching staff report tests and parts thereof in detail, indication of the reflections to be made •. to users in the presentation of the training offer general reports compared to benchmarks first and second generation foreigners monitoring over the years secondary classes primary school Report using the data returned in general form and for each class, for Italian-Mathematics, in comparison with the benchmarks and in comparison with the second classes of the last 2 years. The parts of the tests, the comparison between the classes and between the classes, levels of learning, concordance or not between class grade and test result, finally the feedback in citizenship, gender, advances. Fifth classes primary school the same reflections made for the second classes, adding english in its specificities and with a comparison over the years with the other fifth classes. the added value is important, when it is provided in various forms by INVALSI. I have always created a graph with the results of the fifth classes when they were in second, to show the change, the evolution of the classes. third classes secondary first degree as for the primary, the results of Italian language and Mathematics are reported, in comparison with the benchmarks and in comparison with the third classes of previous years. important is the reflection on the distribution of students in learning levels; as well as added value and variability between classes.

Method. Searching for the most useful data for the figure for which the report is intended. The graphs and percentages already provided by INVALSI must be reported emphasizing what is most needed. Comparison tables must be created with data already existing at school or received in previous years.

Results. Targeted restitution puts every figure of the institution in a position to know how to direct their intervention. The Director evaluates the progress of the classes and the school as a whole; he supports and promotes the educational research that the College must undertake in order to recover, or reinforce and disseminate good practices. Teachers can organize the interventions to be implemented in their interclasses and departments. Even colleagues not directly involved in the tests follow good practices and interventions to reflect on critical issues. The College identifies which tools, actions and checks must be put in place to improve the training offer. The parents of the future members follow the presentation and reflect not only on the results and explanations provided, but also on the communication itself and its transparency where, inthe presenceofpush-ups, the school shows which interventions are or have been implemented.

Marina Paola Mariano, teacher of Primary School of Milan and FS Evaluation of institute; she was referent of the QUADIS project and TIMSS referent. She is external observer for INVALSI. Graduated in Pedagogy at the Catholic University and postgraduate specialized in learning and cognitive-behavioral disorders at the same University.

INVALSI Mathematics tests and National Indications as tools of reflection in teachers' professional development program

Francesca Martignone - Federica Ferretti

Introduction. In recent years, there has been a growing international interest in integrating large-scale assessment results, methods, theoretical frameworks and tools - designed and implemented to have a systemic impact - into the local actions of teachers and schools (Looney, 2011). With regard to the Italian standardised assessment tests (INVALSI tests), several published studies have been highlighting how to use data and tools provided by INVALSI also in Mathematics teachers' professional development paths (Ferretti et al., 2020; Martignone, 2017; Santi et al., in press).

Focus of the study. The aim of INVALSI tests is to assess the learning of Italian students, but INVALSI data and tests can also become objects of reflection for pre-service or in-service teachers of both the first and second cycle of education. The INVALSI tests show examples of tasks that are designed according to the objectives explicitly stated in the ministerial curricular indications. This is a peculiarity that characterises the INVALSI tests: the reference framework on which they are based is closely linked to the National Guidelines. Teachers can therefore find in the INVALSI Mathematics tests examples of problems to reflect on, thinking about the targets for the competences' development and the objectives foreseen at ministerial level.

Data. In this contribution we show some examples of selected tasks from the INVALSI Mathematics tests for the first cycle of education. The reflections shared and developed with teachers during teachers' professional development courses can become a first step for the development or modification of teaching practices that follow the indications provided by the ministerial curricula documents. Tasks and data from field topics that are often neglected in the actual implemented curriculum (Mullis and Martin, 2017), such as probability, can be analysed. Another important aspect that is assessed in the INVALSI tests are the argumentative tasks. Also on this point there is a full consistency with the ministerial curricular indications in which the importance of the development of processes and the production of arguments is stressed. The INVALSI tests can therefore influence the implemented curriculum by providing examples of questions that implement the requirements of the National Guidelines and that can also become the subject of analysis and discussion in teachers' professional development courses.

Results. Through specific teachers' professional development activities, a dialogue between teachers and standardised assessments can be opened, whereby some aspects of the curriculum can be discussed. These teachers' professional development activities can modify or enrich teachers' teaching practices (Santi et al., in press). Thus, standardised tests, when closely linked to national standards and curricula as in the case of INVALSI tests, can become a resource for teachers who can use them to reflect on the intended or attained curriculum (Mullis and Martin, 2017). Although the aim of an external evaluation such as the one carried out by INVALSI is to contribute to an evaluation of the system, an analysis of these tests can also become a tool to modify the system itself and, consequently, influence the implementation of the national ministerial indications.

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Developing social skills in preschool: the RAV rubrics for instructional design and evaluation

Alessia Rosa - Sara Mori - Jessica Niewint-Gori

Introduction. Social skills can be defined as the set of skills that are functional in relational interactions with peers and adults, and that contribute to emotional development, self-esteem, and academic achievement (Tomlinson and Hyson, 2009). Preschool represents one of the first social spaces in which children experience group learning (Goodrich et al., 2015). In this context, teachers and the specific organizational proposals developed by them play a key role in supporting social skills (Hollingsworth and Winter, 2013). The cognitive and emotional development of children can in fact be supported by teachers through the proposal of specific educational activities and the design of learning environments characterized by high levels of empathy, able to promote pro-social attitudes and skills such as cooperation, participation in group activities, and conflict resolution (Myck-Wayne, 2010). Children's ability to self-regulate their learning and to organize themselves autonomously in individual and group activities".

Objectives and hypotheses of the contribution. This contribution illustrates the experimentation of a teaching activity conducted by INDIRE researchers together with preschool teachers, aimed at children in the last year, specifically designed for the development of socio-relational skills through the Think, Make, Improve (TMI) approach (Martinez and Stager, 2013) and the support of the 3D printer, according to the principles of maker education. It is believed that this experimentation can contribute to "activating in the majority of children attitudes of curiosity, both in individual and group activities [...] and the ability to express their emotions and know how to manage them, to express opinions and argue them in confrontation with others", as described in level 7 of the rubric on development results in the childhood RAV; it is also thought that this can promote "inclusive, cooperative and solidarity-based friendship relationships. [...] where "Children live routine situations participating with pleasure and autonomy, in a climate of respect for needs, including personal needs", as described in the quality criterion of level 7 of the RAV outcomes rubric in terms of well-being.

Data used/methodology. The workshop proposal was articulated in about twenty meetings mainly aimed at stimulating sharing and collaboration. To this end, all the activities were characterized by a limited number of resources, and the achievement of the objectives necessarily implied interaction and interdependence between peers. The workshop activity was proposed through work in small groups. Each activity began with the reading of an excerpt from a fairy tale that acted as an integrating background and allowed the contextualization of the situation-problem (Trinchero, 2013). - The first activity had the objective of constructing a shared logo representative of all the members of the group. - In the second activity, the children had to pool their reading skills in order to find out which objects/furniture they had to make. - In the third activity the groups were asked to design the vegetables in the fairy tale, represented in pictures on sheets of paper. - In the fourth activity, the children were asked to design the main characters of the fairy tale using geometric shapes. In order to observe how effective the activity was in achieving the expected objectives in line with what is described in the quality criteria of the childhood RAV rubrics, observation grids were developed for the socio-relational competencies built in a joint work between teachers and researchers. The observation of the students during the work sessions allowed the researchers to evaluate the proposed activities with a view to improvement and transferability.

Results. The contribution illustrates the activities carried out in the classroom with children and teachers and the observation tools used to allow the criticalities and strengths of the proposed activity to be made explicit. The aim is to share good practice in terms of both methodology and the technological tools used with this age group. It is thought that it will be possible to discuss with those present at the seminar the limits and possibilities for developing similar proposals.

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The heterogony of ends between integrated digital teaching and standardized tests

Anna Maria Romano - Giovanni Pucciarini - Loredana Paglialunga

Introduction. The closure of schools in March 2020, determined by the emergency health situation, was one of the most serious consequences of the spread of Covid-19. Distance Learning (which later became Integrated Digital Education) represented a fundamental tool for continuing the educational path in a new learning environment supported by technology. Its adoption, however, has brought numerous challenges, both for teachers, who are suddenly called to change their teaching approach and adapt to the new digital environment (Pellegrini and Maltinti, 2020) and for students, digital natives by definition, but of fact not always ready to grasp the introduction of such a pervasive novelty in their dimension of study and personal development. Although numerous studies have identified the factors most involved in a positive use of distance learning (Scherer et al., 2018), the interruption of face-to-face teaching activities has significantly affected school learning.

Research subject and hypothesis. The object of the research was to use the tools offered by digital technology in order to allow, also in DAD, the development of those competences subject to investigation by the INVALSI National Tests. The hypothesis from which we started was to be able to ensure our students the achievement of skills development goals (National Indications 2012) also through the implementation of online enhancement paths carried out in synchronous mode.

Data used. The research required as a starting point the use of INVALSI data relating to the fifth grades of the Primary School and third of the Lower Secondary School, of our Institute for the three-year period 2016-19. The analysis of the data returned by INVALSI over the three years made it possible to identify areas and dimensions in which the students of our school highlight the greatest problems. Particular attention was paid to identifying the type of item that, over the last three years, proved more difficult for our fifth grade students. For the lower secondary school, the data, returned by INVALSI, highlighted a variance between the classes of the same year, not necessarily and univocally attributable to such marked basic differences in the levels of the students, nor detected teaching within, ordinary and intermediate and final assessments of school results. The analysis of the data relating to the results of the INVALSI 2021 tests represented a fundamental moment for verifying and evaluating the effectiveness of the courses carried out and the achievement of training goals by our students.

Method. The recipients of our research were the students of five fifth classes of the Primary School and of four third classes of the Lower Secondary School of the Comprehensive Perugia 6 Institute. The training course saw the direct involvement of 8 Primary School teachers and 3 Secondary School teachers engaged in a remote synchronous activity (DAD) aimed at the preparation of standardized tests, but, indirectly, also of other teachers whose classes have in fact constituted the "control group" in the analysis of the data returned by INVALSI. The activities were carried out in out-of-school hours in streaming using Google Meet, but also in asynchronous mode through the sharing of study material (Google Drive), exercises and tests (Google Modules) made by drawing material from the GESTINV platform. For the Primary School the specific activities, proposed in view of the standardized tests, concerned both Italian language and Mathematics, while for the Secondary School only the English language. The methodologies used were that of problem solving, debate, peer to peer (Italian language and Mathematics) and a more systematic and structured approach to Reading and Listening (English).

Results. The reading and analysis of the results of the INVALSI 2021 tests allowed the start of a reflection on the DAD and on how much it has influenced the teaching-learning process in our Institute. In the face of surprisingly positive results in the INVALSI 2021 tests by students of the lower secondary school, not only in English, but also in Italian language and Mathematics, an unexpected critical situation was found with

regard to those of the fifth classes of the Primary School. The reading and analysis of the data returned by INVALSI has therefore allowed the start of a reflection on the relationship between "intentional actions and unintentional outcomes", of great indicative value and particularly relevant in the current phase of remodeling of the RAV and of the PDM which identify, in the results of the standardized national tests, the focus of the identified priorities.

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INVALSI Formative Testing: a first key to understanding the effects of Covid -19 on school results

Andrea Guarnacci - Ileana Ogliari - Maria Rosaria Orefice

Introduction. Before the learning loss caused by the pandemic was analyzed by the Report of last July dedicated to the national surveys of 2020-21 learning, the Institute's adhesion to the INVALSI Training Testing - although aimed exclusively at students of grades 3 and 6 - proved to be functional in understanding how much and where the students involved showed uncertainties and difficulties (possibly) also exacerbated by the forced use of distance learning. In this perspective, it was not so much a question of using the questions in Italian language, Mathematics and English made available as recovery of the national tests canceled in 2020, but rather of enhancing their diagnostic and training function.
Research objective and hypothesis. The results achieved by the students involved, analyzed by an ad hoc working group that studied them and returned them in the collegial context with an apparatus of graphics, tables, and operational proposals, made it possible to give empirical concreteness to the perception shared by teachers and professionals on the negative impact caused by the closure of schools during lockdown periods, whether national or local.
Data used. The quality of the Formative Testing, with the possibility of making use, in the understanding of the text, of a multistage test at an increasing level of complexity has also made it possible to give greater depth to the reading of the data, anticipating in fact what emerged from the results of the test national grade 8: a minimum percentage of excellences, for which, we wondered how, quality courses capable of enhancing their potential were evidently built.
Methodology. More generally, it was very interesting to note the critical issues that emerged, because they provided a sort of mapping of the shadow areas of the curricular projects on which, in the Department meetings, we reasoned together, by order of school, in order to find the most suitable corrective measures to ensure a better quality of our educational system. To this has been added an aspect that might seem marginal, but which, on the contrary, in an era in which the use of Integrated Digital Didactics nevertheless appears to be an irreversible path, has given further significance to Formative Testing: the difficulty encountered in using the mouse and keyboard for grade 6 learners was so obvious that, as a school, we started a series of exercises right from Primary - for some by setting a response time - in front of the PC. For the teachers it was also, and once more, the opportunity to "think" about the structure of the tests, using the rich information apparatus that accompanied them. In this way, it was possible to read the data in an overall perspective and, at the same time, "break it down" to understand who, among the pupils, had done what and how. The curricular design therefore had a sort of correspondence (full, partial, minimal) with what emerged from the results, with the opportunity to understand in which learning areas the learners had paid

the most duty to distance learning. So far, the reporting part, a fundamental prerequisite of the proactive construction phase, through which, having established the negative weight of the closure of the school, it became central to foresee strategies for recovery/improvement of learning.

Results. With this in mind, and not only for the classes involved in the experimentation, guidelines have also been defined that, hopefully, can already determine the expected results in the short term. Priority, in this sense, seemed to accustom the students to the unity of knowledge, developing interdisciplinary tests in which to emphasize reasoning (anchoring the proposed questions to reality situations), at the same time favoring the use of argumentation supported by an adequate lexicon context of reference. From this point of view, the INVALSI data, with the return to the Institutes of the results of the national tests, will once again constitute an important litmus test to understand if and how close we have come to what, in any operating condition, represents the primary objective of teaching: to ensure learner's educational success by promoting the active and responsible citizenship of each of them.

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Strategy games, didactics for problems not only to activate cognitive processes but also to promote a positive attitude towards Mathematics after the Lockdown

Maria Francesca Ambrogio

In this paper we want to present an exploratory study conducted during the last school year on a 4th grade of primary school.

After the Lockdown due to the Covid-19 pandemic, pupils arrived on September disoriented and with important mathematics difficulties, but they were always able to attend in presence, so a careful observation of their progresses was possible.

Data collected from the activities proposed in the beginning of the last school year, showed that examined pupils presented difficulties in all the thematic cores, especially relating to "Data, Reports and Forecasts". The same students achieved excellent results in the first quarter of the previous year.

The DDA methodological change raised issues regarding the contents of the discipline, the metacognitive processes and had a negative impact on some pupils attitude towards mathematics. The same students who had shown great curiosity towards strategy games proposed in previous years seemed to be unable to grasp even the playful side, while anxiety and fear of making mistakes emerged. Doubts raised in both facing new topics and approaching the text of a problems.

Therefore, a questionnaire consisting of 10 questions was designed and administered to investigate the pupils difficulties regarding each thematic core of the subject.

The questionnaire made it possible to gather information on pupils' relationship with Mathematics, allowing for an in-depth analysis on strategies to be implemented to remove DDA insecurities and promote a positive attitude towards the subject.

The class already participated in an action research project in 2017-2018, whose results were presented in the IV Seminar "INVALSI data: a tool for research and teaching" in a contribution entitled: "Mathematical games as a learning tool of diversified and lasting skills "(Vaccaro and Ambrogio, 2019). The project was

about the use of mathematical games in Mathematics teaching-learning with the aim of developing logical-mathematical skills, stimulating problem-solving and enhancing argumentative competence. For this reason, it was decided to re-propose a strategy games teaching approach.

Problem-based didactics and face-to-face "mathematical doing" have enabled cognitive processes to be implemented: exploring, hypothesizing, arguing, verifying, collaborating and sharing choices.

The positive relational mood established and laboratory teaching have generated a less anxious attitude towards the subject. This allowed them to recover basic mathematical and metacognitive skills.

Three moments of evaluation were realized through the administration of tests during the school year. These tests were composed with both 2nd and 5th grade items chosen from previous years' standard test repertoire.

At the beginning of the school year, a first test was administered in order to measure the level of students preparation immediately after the Lockdown, with respect to the goals of the National Indications. A second test was administered at the end of the first quarter.

The results obtained from these two test sessions revealed information on the pupils learning process and enabled designing didactic actions for the recovery of learning.

According to the Institute's provisions on DDI, the "in presence" activities have been integrated with some remote activities (building of geometric artifacts, web videogames, online team works, …) in order to enable students to autonomously use their devices.

In May, the class was offered the 5th grade math test of the year 2021 with the aim of assessing learning path and attitude of pupils towards the subject in a situation of anxiety.

The analysis of data gathered thorough the study showed positive results, particularly in those pupils who had achieved excellent results in the previous school year but demonstrated criticality in the period following the Lockdown.

Improvement was found particularly in argumentative and metacognitive skills. A change in attitude towards the subject was also observed in students who declared they were afraid of problems in the initial questionnaire.

The data obtained were compared with 5th grades results from the same Institute and some interpretative hypotheses have been formulated for a further qualitative study.

Research results highlighted the effectiveness of the strategies adopted in solving issues showed in the begin of the year.

The choice of conducting this work and proposing verifications built on INVALSI tests was also dictated by the need to support the assessment strategy, changed during the last school year following the issue of the Guidelines in December 2020.

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Competence- Language building at Liceo Scientifico "E.Fermi" Ragusa

Ornella Campo - Giusi Paladino

Introduction. The following work aims to highlight how much the processes of methodological innovation introduced into teaching practice have affected the results achieved by students in standardized tests, with reference to the English language, AT "Liceo Scientifico Fermi" in Ragusa. From the analysis of the INVALSI report, in fact, useful data and relevant information were obtained to ascertain the improvement processes within the school system, despite the criticalities caused by the Covid emergency.

The paper examines the data related to the administration of the INVALSI Tests 2020/2021, in the last year of Secondary School, level 13, in Italian language, Mathematics and English. From a perspective of self-evaluation, the reading and interpretation of the tables and graphs are both a useful diagnostic tool for

improving the educational offer within the school, and a means of identifying areas of excellence and areas of criticality in order to strengthen and improve the teaching action.

Theworkalsoputsemphasisonthepositiveimpactthattheteachingandlearningprocess implemented in the classes of the last year of all courses, during distance teaching, has had on the improvement of the outcomes.

Object. In the 2020/2021 school year, the tests were administered to 100% of the Institute's students, so the reading of the data reflects the situation faithfully.

The analysis of the returned data allows us to highlight, through the comparison with the results reported by other educational institutions, within the Region and in Southern and National areas, that the Institute, regarding Italian language and Mathematics, shows a decrease as in all National Territory, as compared to the previous surveys, as detailed in the INVALSI Report 2021.

As regards English instead, against the trend compared to what happened at National level, where the results are stable with respect to the previous surveys, the Institute has reported a relevant increase of the results, both in Reading and in Listening, as detailed below.

Method. It is clear that the effect of the pandemic and therefore the need for alternative teaching methods have produced different outcomes.

From the data of 2021, in Italian language and Mathematics, most students are in the intermediate levels, 2 to 3, and the percentage of students in level 5 is lower. DAD has facilitated neither laboratory teaching nor the practice of writing and Mathematical exercises, preparatory to the written tests of the State Examination.

Be worth considering instead, the observation of learning levels in English to underline the positive increase in the percentage of students reaching level B2 in both Reading and Listening skills. The placement tests on Reading and Listening and Use of the English, consistent with the criteria established by the Common European Framework of Reference (CEFR), are fully in line with the curricular teaching activities and the Institute educational offer. English Listening and reading assessment tests, with respect to the type of task (method), the focus, the theoretical level of the questions, the length of the text (reading), the number of words per minute and the duration of the audio file (Listening) do not show any discrepancy with the skills and competences acquired by the students in the five-year course.100% of the students shows language competences between B1 (Listening) and B2 (Reading).

The considerable improvement in the results can be explained using a teaching methodology based on the followings:

• a Comprehensive and effective Vertical Syllabus;

• a systematic communicative approach meant to the development of integrated;

competences(related to the four skills, life skills, EU key competences), in line with CEFR;

• systematic use of an integrated teaching and software which have not produced interruptions during the distance teaching;

• implementation of CLIL methodology, also with the support of mother tongue teachers, in the classes of the final year, which can make learning functional to the students' real needs, also enhancing their motivation.

Results. According to the data, the number of students that have reached the target National Indications/Guidelines is higher than the rest of the country and has increased compared to the previous tests.

In the Reading 88.2 % of the students have acquired level B2 with a rise of 4,6% as compared to the previous tests (84.2%).

In the Listening 67,1% of the .tudents have acquired level B2 with a relevant rise of 15.5 compared to the previous tests (51.6%).
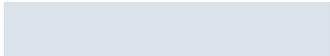
In the light of the results it is advisable to reflect on the correspondence between the INVALSI evaluation and the teachers' evaluation, on the congruence between the results obtained and the expectations, as well as on the impact that the teaching methodology has on the improvement of the outcomes, in the awareness that the standardized tests represent a support to teaching, comparing the data in a perspective of self-evaluation.

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