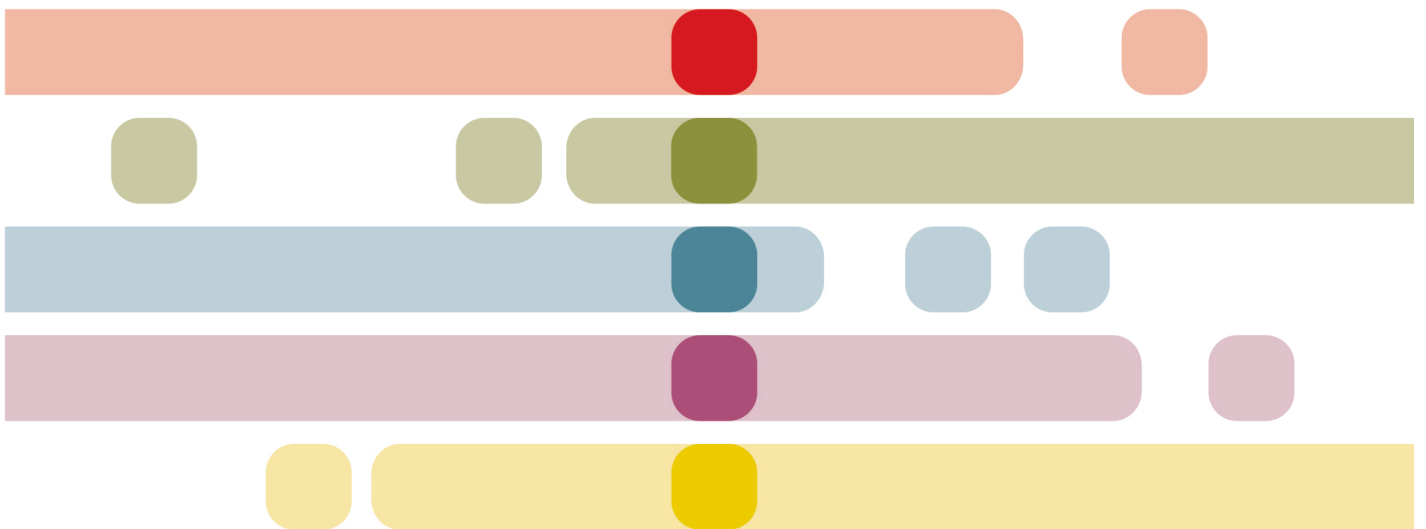




Società Italiana di Ricerca Didattica

Giornale Italiano della Ricerca Educativa
Italian Journal of Educational Research

anno XI
numero 21
Dicembre 2018





Società Italiana di Ricerca Didattica



Giornale Italiano della Ricerca Educativa

Italian Journal of Educational Research

RIVISTA SEMESTRALE

anno XI – numero 21 – Dicembre 2018



Direttore | Editor in chief

PIETRO LUCISANO | Sapienza Università di Roma

Condirettori | Co-editors

LOREDANA PERLA | Università degli Studi di Bari "Aldo Moro"

ACHILLE M. NOTTI | Università degli Studi di Salerno

Comitato Scientifico | Editorial Board

JEAN-MARIE DE KETELE | Université Catholique de Lovanio

VITALY VALDIMIROVIC RUBTZOVA | City University of Moscow

MARIA JOSE MARTINEZ SEGURA | University of Murcia

ETTORE FELISATTI | Università degli Studi di Padova

GIOVANNI MORETTI | Università degli Studi di Roma Tre

ALESSANDRA LA MARCA | Università degli Studi di Palermo

ROBERTO TRINCHERO | Università degli Studi di Torino

LORETTA FABBRI | Università degli Studi di Siena

IRA VANNINI | Università di Bologna

ANTONIO MARZANO | Università degli Studi di Salerno

MARIA LUISA IAVARONE | Università degli Studi di Napoli "Parthenope"

GIOVANNI BONAIUTI | Università degli Studi di Cagliari

MARIA LUCIA GIOVANNINI | Università di Bologna

PATRIZIA MAGNOLER | Università degli Studi di Macerata

ELISABETTA NIGRIS | Università degli Studi Milano-Bicocca

Comitato editoriale | Editorial management

CRISTIANA DE SANTIS | Sapienza Università di Roma

DANIA MALERBA | Sapienza Università di Roma

ROSA VEGLIANTE | Università degli Studi di Salerno

Note per gli Autori | Notes to the Authors

I contributi, in formato MS Word, devono essere inviati all'indirizzo email del Comitato Editoriale: **rivista@sird.it**

Ulteriori informazioni per l'invio dei contributi sono reperibili nel sito **www.sird.it**

Submissions have to be sent, as Ms Word files, to the email address of the Editorial Management: **rivista@sird.it**

Further information about submission can be found at **www.sird.it**

Consultazione numeri rivista

<http://ojs.pensamultimedia.it/index.php/sird>

Codice ISSN 2038-9736 (testo stampato)

Codice ISSN 2038-9744 (testo on line)

Registrazione Tribunale di Bologna n. 8088 del 22 giugno 2010

Finito di stampare: Dicembre 2018

Abbonamenti • Subscription

Italia euro 25,00 • Estero euro 50,00

Le richieste d'abbonamento e ogni altra corrispondenza relativa agli abbonamenti vanno indirizzate a: **abbonamenti@edipressrl.it**

Editing e stampa

Pensa MultiMedia Editore s.r.l. - Via A. Maria Caprioli, 8 - 73100 Lecce - tel. 0832.230435

www.pensamultimedia.it - info@pensamultimedia.it

Progetto grafico copertina

Valentina Sansò

Obiettivi e finalità | Aims and scopes

Il **Giornale Italiano della Ricerca Educativa**, organo ufficiale della **Società Italiana di Ricerca Didattica (SIRD)**, è dedicato alle metodologie della ricerca educativa e alla ricerca valutativa in educazione.

Le aree di ricerca riguardano: lo sviluppo dei curricula, la formazione degli insegnanti, l'istruzione scolastica, universitaria e professionale, l'organizzazione e progettazione didattica, le tecnologie educative e l'e-learning, le didattiche disciplinari, la didattica per l'educazione inclusiva, le metodologie per la formazione continua, la docimologia, la valutazione e la certificazione delle competenze, la valutazione dei processi formativi, la valutazione e qualità dei sistemi formativi.

La rivista è rivolta a ricercatori, educatori, formatori e insegnanti; pubblica lavori di ricerca empirica originali, casi studio ed esperienze, studi critici e sistematici, insieme ad editoriali e brevi report relativi ai recenti sviluppi nei settori. L'obiettivo è diffondere la cultura scientifica e metodologica, incoraggiare il dibattito e stimolare nuova ricerca.

The **Italian Journal of Educational Research**, promoted by the **Italian Society of Educational Research**, is devoted to Methodologies of Educational Research and Evaluation Research in Education.

Research fields refer to: curriculum development, teacher training, school education, higher education and vocational education and training, instructional management and design, educational technology and e-learning, subject teaching, inclusive education, lifelong learning methodologies, competences evaluation and certification, docimology, students assessment, school evaluation, teacher appraisal, system evaluation and quality.

The journal serves the interest of researchers, educators, trainers and teachers, and publishes original empirical research works, case studies, systematic and critical reviews, along with editorials and brief reports, covering recent developments in the field. The journal aims are to share the scientific and methodological culture, to encourage debate and to stimulate new research.

Comitato di referaggio | Referees Committee

Il Comitato di Revisori include studiosi di riconosciuta competenza italiani e stranieri. Responsabili della procedura di referaggio sono il direttore e il condirettore della rivista.

The Referees Committee includes well-respected Italian and foreign researchers. The referral process is under the responsibility of the Journal's Editor in Chief and Co-Editors.

Procedura di referaggio | Referral process

Il Direttore e Condirettore ricevono gli articoli e li forniscono in forma anonima a due revisori, tramite l'uso di un'area riservata nel sito della SIRD (www.sird.it), i quali compilano la scheda di valutazione direttamente via web entro i termini stabiliti. Sono accettati solo gli articoli per i quali entrambi i revisori esprimono un parere positivo. I giudizi dei revisori sono comunicati agli Autori, assieme a indicazioni per l'eventuale revisione, con richiesta di apportare i cambiamenti indicati. Gli articoli non modificati secondo le indicazioni dei revisori non sono pubblicati.

Per consultare il codice etico consultare il link:

<http://ojs.pensamultimedia.it/index.php/sird/about/editorialPolicies#custom-0>

Editor in chief and co-editor collect the papers and make them available anonymously to two referees, using a reserved area on the SIRD website (www.sird.it), who are able to fulfill the evaluation grid on the web before the deadline. Only articles for which both referees express a positive judgment are accepted. The referees evaluations are communicated to the authors, including guidelines for eventual changes with request to adjust their submissions according to the referees suggestions. Articles not modified in accordance with the referees guidelines are not accepted.

INDICE

9 EDITORIALE DI PIETRO LUCISANO

Studi

- 11 **NICOLETTA BALZARETTI, SIMON N. LEONARD, LISA LIM, PAUL UNSWORTH, IRA VANNINI**
Innovating methodology through international collaboration: Expanding the use of video analysis for understanding learning designs
Apporti metodologici innovativi attraverso la collaborazione internazionale: l'uso della video analisi per comprendere la progettazione didattica
- 31 **FEDERICO BATINI, MARCO BARTOLUCCI, CHIARA BELLUCCI, GIULIA TOTI**
Failure and dropouts. An investigation into the relationship between students repeating a grade and dropout rates in Italy
Bocciature ed abbandoni: uno studio sulla relazione fra bocciature ed abbandoni
- 51 **NICOLE BIANQUIN, SERENELLA BESIO, MABEL GIRALDO, FABIO SACCHI**
L'alternanza scuola lavoro per gli studenti con e senza disabilità. Una prima analisi interpretativa comparativa tra lingua e contenuto dei Piani Triennali dell'Offerta Formativa (PTOF)
Work-related learning for students with and without disabilities. A first qualitative data analysis between language and content of the PTOFs
- 73 **PAOLA DAMIANI, FILIPPO GOMEZ PALOMA**
Educational ECS. Un approccio "embodied cognitive" per le scuole
Educational ECS. Embodied cognitive approach for school
- 83 **ANNA D'ALESSIO, ANNAMARIA PETOLICCHIO, ROSANNA TAMMARO**
CLIL, una metodologia vincente nell'ottica del *lifelong learning*
CLIL, a winning methodology from the perspective of lifelong learning
- 101 **MONICA FEDELI, JOELLEN E. CORYELL, DANIELA FRISON, JONATHAN TYNER**
Uno studio qualitativo transnazionale US-Italia sulle prospettive dei docenti che insegnano in corsi internazionali. Le voci dei docenti sullo sviluppo professionale
A cross-national qualitative study on instructor perspectives for teaching internationally diverse students. The teachers' voices on faculty development
- 115 **GIOVANNI MORETTI, ARIANNA GIULIANI, ARIANNA MORINI**
Accrescere la consapevolezza degli studenti come soggetti in formazione: utilizzo e validazione del *Motivated Strategies for Learning Questionnaire* in Italia
Increase students' awareness as trainee subjects: use and validation of the *Motivated Strategies for Learning Questionnaire* in Italy

- 133 SILVANA ZITO, GIUSEPPE MERCURIO, ALESSANDRO PIGONI, SIMONA MERCURIO, ANNAMARIA CURATOLA**
Regolazione emotiva e metacognizione nei bambini e negli adolescenti
Emotional regulation and metacognition in children and adolescents

Ricerche

- 159 GIORGIO ASQUINI, MARGHERITA EMILETTI**
Differenze di genere nel Problem Solving Collaborativo: il caso italiano
Gender differences in Collaborative Problem Solving: the Italian case
- 173 CHIARA BERTOLINI**
Innovare la didattica è possibile: una ricerca-formazione nell'ambito della didattica della comprensione del testo
Improving the school is possible: research and training experiences on the text comprehension
- 189 ROBERTA CARDARELLO, ANDREA PINTUS**
Insegnare la comprensione a scuola. Un percorso didattico sperimentale centrato sui testi e sul confronto "tra pari"
Teaching text comprehension. Content approach and peer interaction in an experimental training
- 205 GIUSI CASTELLANA, ANDREA GIACOMANTONIO**
Buoni e cattivi lettori. Esiti della sperimentazione di un intervento didattico metacognitivo sulle strategie di lettura nella comprensione del testo scritto
Good readers and poor readers. The effects of a metacognitive intervention experiment and the teaching of reading strategies on reading comprehension
- 223 CLIZIA DE NADAI, SARA MORI**
Valutare per migliorare: competenze STEM e abilità trasversali
Assessment for improvement: STEM competences and soft skills
- 241 MARIANNA TRAVERSETTI**
Strategie di insegnamento e metodo di studio: dati di ricerca sugli allievi con DSA
Teaching strategies and study method: research data for students with learning disabilities
- 261 SILVIA ZANAZZI**
I docenti inclusivi tra teoria e pratica
The inclusive teachers between theory and practice

Esperienze

- 275 CHIARA BERTOLINI, ANDREA PAGANO**
Il digital storytelling nell'educazione prescolare: quali suggerimenti didattici vengono dall'analisi delle pratiche a scuola?
Digital storytelling in pre-school education: what teaching suggestions can be drawn from the analysis of practices at school?
- 291 VALERIA BIASI, CONCETTA LA ROCCA**
Processi di auto-valutazione dei Nidi e delle Scuole dell'Infanzia: il ruolo della formazione metodologica di base dei docenti e dei dirigenti
Nursery Schools and Kindergarten Self-evaluation processes: the role of basic methodological training for teachers and managers
- 313 ILARIA BORTOLOTTI**
Quale modello di formazione per docenti all'uso delle tecnologie nella didattica?
Which model of teachers' training for the use of technology in teaching?
- 329 STEFANIA CHIPA, CHIARA GIUNTI, LORENZA ORLANDINI**
L'approccio pedagogico del *Service Learning* per valorizzare l'autonomia e la responsabilità degli studenti in contesti socio-economici disagiati: il caso dell'IC *Amerigo Vespucci* di Vibo Marina (VV)
The pedagogical approach of *Service Learning* in disadvantaged socio-economic contexts to enhance students' autonomy and responsibility: the experience of the IC *Amerigo Vespucci* at Vibo Marina (VV)
- 343 KATIA MONTALBETTI**
Valutare la didattica nella scuola secondaria. Potenzialità, rischi e valore formativo per gli studenti
Evaluating teaching in secondary school. Potential, risks and educational value for students
- 355 MAILA PENTUCCI**
L'elaborazione del curriculum verticale nelle comunità scolastiche: un esempio di Ricerca Collaborativa a partire dalle concezioni degli insegnanti rispetto al curriculum
Developing the vertical curriculum in school communities: an example of Collaborative Research based on teachers' conceptions of the curriculum

Nel *Manifesto per la Ricerca educativa e l'innovazione didattica* della SIRD la prima emergenza educativa considerata è relativa al fatto che “l'educazione richiede fiducia: fiducia nei bambini e nei giovani, fiducia negli operatori e negli insegnanti, fiducia nella ricerca e ancora fiducia nelle istituzioni che governano e nel funzionamento corretto del sistema sociale e economico del paese”. La fiducia, del resto, non è solo uno dei fattori che sono alla base dei rapporti educativi, ma anche uno degli aspetti fondanti di qualsiasi rapporto umano e sociale.

Per questo, l'idea di assumere come base del rapporto con gli insegnanti il controllo (la non fiducia), rappresenta una scelta perdente da qualunque punto di vista la si consideri. Perdente anche quando con il controllo si immagina di evitare o limitare episodi critici.

Quando si difende il controllo con l'adagio latino “l'occhio del padrone ingrassa il cavallo”, si commettono diversi errori. Il primo, di sostanza, è che per ingrassare il cavallo ci vuole buona biada e nessun cavallo ingrassa a guardarlo, il secondo è relativo al contesto in cui l'adagio va collocato: è l'occhio del padrone (che ammira o che deve vendere) a rendere il cavallo più bello e più robusto, dunque un occhio apprezzante o almeno interessato.

È lo sguardo di un occhio apprezzante e interessato che manca alla scuola e il fatto che si torni a parlare di leggi per sostituire questo occhio con telecamere nelle scuole con funzioni di prevenzione e di controllo è segno di un tempo dominato dalla paura. Si torna a parlare di telecamere a seguito della paura suscitata da alcuni episodi di violenza sui bambini con l'idea che queste violenze potrebbero essere evitate se gli insegnanti sapessero di essere controllati e, probabilmente, se poi le pene per gli insegnanti cattivi fossero più severe. Ci vuole più controllo viene suggerito ai nostri legislatori.

Mettiamoci nei panni di un genitore che deve affidare il figlio a una persona che lo Stato ha selezionato se lo Stato stesso lo avverte dicendo “in verità io l'ho scelta in modo un po' approssimativo, del resto dovevo mantenere promesse elettorali, e, ti dirò, anch'io mi fido poco di questi insegnanti, ma ho trovato il sistema di controllarli, stai tranquillo: ci sono telecamere in tutte le aule, e nei corridoi e nei bagni, così se un insegnante farà violenza a tuo figlio potremo punirlo”.

Ancora, i sostenitori delle telecamere dicono che queste registrazioni tutelerebbero anche gli insegnanti da eventuali accuse dei genitori. E di nuovo si prospetta un mondo in cui i genitori sono vissuti come persone di cui non fidarsi, da cui ci si deve tutelare.

La fiducia, tuttavia, non può essere presupposta, va costruita, per questo quando si fanno i concorsi per insegnanti bisognerebbe farli rigorosi e non “non selettivi”, per questo bisogna costruire un percorso di formazione iniziale in grado di



formare le conoscenze disciplinari e didattiche ma anche gli atteggiamenti e lo stile di lavoro degli insegnanti.

Ma ogni volta si sceglie di risparmiare prima, per poi finire a spendere dopo molto di più e anche male. Ogni risparmio formativo presenta poi sia un conto economico sia un conto sociale. Se fossero state investite le risorse necessarie nelle SSIS, e poi nei TFA, e poi nei 24 cfu, se lo Stato si fosse impegnato nel formare e nel reclutare con saggezza gli insegnanti, i coordinatori e i dirigenti scolastici, forse le cose andrebbero meglio. Se i dirigenti e i coordinatori avessero un numero ragionevole di scuole e di studenti da seguire, potrebbero meglio cogliere i segnali di crisi che poi possono sopravvenire, è vero, anche dopo la migliore delle preparazioni e la migliore delle selezioni. Se gli adempimenti di tipo burocratico richiesti ai dirigenti fossero meno gravosi e si tornasse a un ruolo più attento agli aspetti educativi e didattici avremmo anche un controllo intelligente e capace di interventi educativi.

In assenza di tutte queste azioni di fronte ad episodi di crisi lo Stato finisce per prendere le distanze. Lo dice d'Oria su *Orizzonte scuola* rileva che il 90% delle insegnanti inquisite per episodi di violenza ha un'età superiore ai 50 anni e si chiede di conseguenza se la ragione di questi episodi non sia da attribuire all'età o al *burn out*. Lungi dal voler considerare anziane le maestre ultracinquantenni, forse di nuovo è più ragionevole notare che in larga maggioranza le insegnanti meno giovani hanno una preparazione al lavoro che si riduce ai quattro anni di scuola secondaria superiore e, probabilmente, sono meno preparate a gestire la complessità di una scuola sempre più impegnativa. E, tuttavia, è meglio evitare di fare inferenze su una manciata di casi.

Con le telecamere, il personale di pubblica sicurezza addetto ai controlli potrà anche verificare quello che tutti sappiamo e riproporlo a chi cerca di non vedere le condizioni in cui lavoriamo nelle nostre scuole e nelle nostre università: aule non a norma, arredi degradati, assenza di strumenti e materiali didattici. Sono situazioni spesso sotto i limiti della legalità che richiederebbero interventi importanti di edilizia, di manutenzione, di formazione e di sostegno.

La questione educativa è, ma questo lo dicono tutti, non solo una questione strategica, ma anche uno specchio dell'impegno che una società mette nel progettare il futuro. A ogni cambio di governo sta a noi manifestare tutta la disponibilità e tutto il nostro scontento e fare della questione della formazione e della scelta di insegnanti di cui potersi fidare, un terreno di confronto con le altre realtà associative degli insegnanti, con i genitori e con gli studenti e con le istituzioni preposte. Chissà che l'occhio del cavallo (liberato dai tradizionali paraocchi) non migliori un po' anche il padrone?



Innovating methodology through international collaboration: Expanding the use of video analysis for understanding learning designs

Nicoletta Balzaretto • Department of Education Sciences "Giovanni Maria Bertin" -
Alma Mater Studiorum University of Bologna (Italy) - nicoletta.balzaretto@unibo.it

Simon N. Leonard • School of Education - University of South Australia - Simon.Leonard@unisa.edu.au

Lisa Lim • School of Education - University of South Australia Online - Lisa.Lim@unisa.edu.au

Paul Unsworth • School of Education - University of South Australia - Paul.Unsworth@unisa.edu.au

Ira Vannini • Department of Education Sciences "Giovanni Maria Bertin" - Alma Mater Studiorum University of Bologna (Italy) - ira.vannini@unibo.it

Apporti metodologici innovativi attraverso la collaborazione internazionale: l'uso della video analisi per comprendere la progettazione didattica

The purpose of this paper is to propose new directions for research in the use of video analysis to improve teaching and learning design in mathematics. The research directions have been developed through an international collaboration involving researchers from Italy and Australia. The paper includes an outline of these context and the different drivers for research before presenting providing a literature review to support future methodological innovation.

Keywords: video analysis, teachers professionalism, learning design, innovating methodology, internationalization, Mathematics teaching

L'articolo descrive e approfondisce le nuove direzioni di ricerca in ambito educativo attraverso l'uso della videoanalisi per migliorare la progettazione dei processi di insegnamento-apprendimento della matematica. Le direzioni di ricerca sono state sviluppate attraverso una collaborazione internazionale che ha coinvolto ricercatori italiani e australiani. L'articolo illustra una panoramica dei diversi contesti di ricerca e delinea un'ampia trattazione della letteratura di ambito come quadro teorico di riferimento della proposta metodologica innovativa.

Parole chiave: videoanalisi, professionalità degli insegnanti, progettazione didattica, innovazione metodologica e sperimentazione, internazionalizzazione della ricerca, didattica della matematica

11

studi

L'introduzione e i §§ 2, 3 e 5 sono stati scritti da Simon Leonard; il § 2.1 e 4.1 da Nicoletta Balzaretto; il § 2.2 da Paul Unsworth; i §§ 3, 3.1, 3.2 da Ira Vannini; i §§ 3.3, 4, 4.1, 4.2 da Lisa Lim e Paul Unsworth. Tutto l'impianto del contributo e le conclusioni sono frutto di una riflessione comune tra tutti gli Autori.

Innovating methodology through international collaboration: Expanding the use of video analysis for understanding learning designs

1. Introduction

By bringing researchers together to look at similar problems from perspectives shaped by different contexts, international collaborations provide opportunities to innovate in educational research. This paper reports on the first steps in one such innovative collaboration, a partnership between the University of Bologna, Italy (UNIBO) and the University of South Australia, Australia (UNISA). Drawn together by a common interest in the use of video analysis to improve mathematics teaching and learning design, these first steps have engaged the researchers in the partnership in an analysis of the differences and similarities of the Italian and Australian contexts. This analysis, discussed in the first section of this paper, has provided new insights into the work in both countries. In turn this has led to a new literature review, the reporting of which forms the bulk of the present paper. The paper will conclude by outlining innovative directions for new research based on the understandings built by our joint analysis of the literature.



2. Comparisons

With the improvement of mathematics teachers and learning design as a common background, the UNIBO and UNISA research group came together in 2018 with support from the Erasmus+ mobility program of the European Union. The initial intent was to draw on the joint expertise of the group in the use of video analysis to develop new research projects to fully utilise the affordances of the Samsung SMARTSchool (SSS), a purpose-built facility at UNISA designed to support the video analysis of classroom activity. The UNIBO researchers brought to their Australian partners rich experience in using video as a tool to foster in-service mathematics teachers' professional development, gained through participation in the FAMT&L European Project (Ferretti, Michael-Chrysanthou & Vannini, 2018). Early engagement across the new partnership quickly revealed that the exchange would be more extensive than a swapping of technical protocols. Rather, the exchange has led to extensive discussions of the respective contexts, which we outline below.

2.1 *The Italian/European Context: the FAMT&L project*

The FAMT&L (Formative Assessment in Mathematics for Teaching and Learning) project was funded under the European Commission's Lifelong Learning program in 2013 and involved five European countries (Italy, Netherland, France, Switzerland and Cyprus). The processes of learning and teaching mathematics and science are a fundamental component of school activities, preliminary to most of the skills that are significant for life and necessary for citizenship education. However, despite

the commitment of researchers and teachers, the crisis in teaching and learning mathematics in some European countries is becoming widespread (OCSE, 2013). The principal aim was to make a focus on the practices of formative assessment of the mathematics' teachers; to gather information on training and learning needs of teachers; to collect and to analyse data on the formative assessment of the mathematics' teachers in the school contexts of the different partner countries involved. The main goal was to develop objective observational measures of classroom instruction to serve as quantitative indicators of teaching practices in formative assessment. It involved, from a methodological point of view, having the same methodological approach to collect the data, to use the same process to reduce video data, to exploit the data in the same way. That means to provide standardized procedures for using the camera and standardized procedures for analysing videos.

The results of FAMT&L project were related to the realization of a training model (through e-learning) for school math teachers (which can be applied in service and in pre-service training) that has improved teachers' skills: in the field of educational planning and evaluation (both formative and summative assessment, evaluation for learning); and in teaching mathematics in the direction of problem-based learning processes. In this project, video analysis technologies thus serve as a powerful means to activate teachers' professional learning to create awareness, understanding and application of the role that formative assessment plays in mathematics teaching and learning.



2.2 *The Australian context*

As with many OECD countries, Australia's impetus for improving mathematics teaching is informed by declining PISA rankings and relatively static performances in the Trends in Mathematics and Science Study(s) (Thomson, Hillman et al., 2012; Thomson, Wernert et al., 2017) and national testing regimes (Australian Curriculum, Assessment and Reporting Authority, 2018).

Arguably, if there is to be authentic change in mathematics teaching, pre-service teacher education needs to be a significant point for leverage. The main role of pre-service mathematics education is to ensure that graduate teachers know their subject matter knowledge and have an informed perspective of contemporary mathematics pedagogy and practice, and are able to demonstrate this when teaching (Sullivan 2011; Livy, Vale et al., 2016). As Sullivan argues, particular attention needs to be directed at educators gaining richer understandings of the goals and principles that constitute effective teaching and learning of mathematics, in order to develop in learners, not only conceptual understanding and procedural fluency, but also actions of strategic competence and adaptive reasoning. These views have become increasingly pertinent in view of political debates positioning many graduate teachers as under equipped to teach mathematics (House of Representatives Standing Committee on Employment, Education and Training, 2017).

In an attempt to address this, the Australian Government in conjunction with the Australian Council for Educational Research (ACER) recently introduced a Literacy and Numeracy Test for Initial Teacher Education Students (LANTITE), which all graduate teachers must pass to qualify for their degree. According to ACER (2018), the test is designed to assess initial teacher education students' literacy and numeracy skills to ensure they 'are equipped to meet the demands of teaching and assist higher education providers, teacher employers and the general public to have confidence in the skills of graduating teachers'.

However, while the LANTITE may lend statistical weight to pre-service teachers' mathematical proficiency, evidence of improvement in mathematics teaching also requires comprehensive qualitative support. Teaching to Australia's diverse learner contexts requires teachers to draw on much deeper conceptual, socio-cultural and pedagogical knowledge, which includes rehearsal of teaching into practice (Sullivan, 2011; Owen, 2014; Groundwater-Smith, & Ewing et al., 2015). Pre-service educators need to develop deep professional expertise to effectively plan, implement and assess well-designed mathematics teaching and learning programs (Macmillan, 2009; Van de Walle, Karp et al., 2015; Reys, Lindquist et al., 2017).

Pre-service teacher mathematics education programs thus have a responsibility to embed relevant theoretical and evidence-based approaches into mathematics education course design and delivery. In this space, our professional interest as mathematics education teacher-researchers gravitates to exploring how video analysis technologies contribute to pre-service teacher's professional growth and vision. Of particular interest is investigation of the coupling of video analysis technologies within a learning design approach that positions learning theory and pedagogical reasoning alternately rehearsed into practice (Elliot, Sweeney et al., 2009; Lockyer, Heathcote et al., 2013).

The next section will provide a review of literature that captures an overview of video analysis technologies and their application in educational research and teacher professional development. Additionally, the review brings attention to new innovative elements in video analysis including video annotation and video analytic technologies.

3. Literature Review

The discussion of context briefly reported above highlighted to our research group the need to engage in an extensive re-examination of the literature together. Both teacher professional development and learning design are complex endeavours. Video analysis has been used to address very different problem sets, in very different ways, in each of these endeavours and we were keenly aware of the need to develop a stronger joint understanding of previous work. That work is reported in this section of the paper.

Video analysis literature illustrates a large variety of purposes for using video in teacher learning, from lesson analysis (Santagata, 2014) and scaffolding teachers' professional development (Brophy, 2004; Sherin, 2004) to promoting discussion between teachers (Borko, Jacobs et al., 2008) and building a learning community (Sherin, 2004; van Es, 2012). Video analysis can be defined as a systematic observation procedure on videotaped material. It identifies key elements of the behaviour, verbal and non-verbal, of videotaped subjects that are not easily seen through direct observation, and to explore the links between cause and effect in relation to the context in which the observed actions take place. It differs from "video documentary" or "video research", in that it provides for more possibilities for pedagogical research as video is used for data collection and documentation (Galliani & De Rossi, 2014). Video analysis refers to a specific use of video for research (and simultaneously, training) and is often supported by specific video analytics software, such as that originally developed for sports or motion detection. To understand the meaning of video analysis, it is necessary to foreground the concept of "analysis" as a process of focusing, individuation, isolation and recognition of



video information. By distancing the observed from the observer, video information enables the activation of interpretative and reflexive processes on specific behaviours (Tochon, 2008) and the effects on their contexts.

In this sense, through being able to provide observational data on action and the feedback related to it, video analysis affords an opportunity to help teachers think about their teaching practices and to promote professional development. Early use of video analysis is found in the area of *microteaching*, a technique that dates back to the 1960s and '70s in work by Allen and Eve (1968) at Stanford University and Brown (1975). This pioneering work was adapted to multiple applications of video analysis, such as case studies (Calvani, Bonaiuti et al., 2011), video clubs (Sherin & van Es 2009; van Es, Tunney et al., 2014) and lesson studies (Bartolini Bussi & Rapoloud, 2018). In all cases, video analysis is used both for research and training, identified as a tool to understand, promote and support teacher change (Guskey, 1986; Richardson & Placier, 2002) and both pre-service and in-service teacher professionalism. However, it is useful for conceptual purposes to distinguish between video analysis for research, aimed primarily to increase knowledge about teaching practices, and video analysis as a training tool, where it is used as an intervention to promote teacher change.

3.1 Video analysis and educational research

Educational research has always sought to focus on what happens inside the classroom, on teaching practices. In this regard, the means of research are, and have been, indirect – from a questionnaire on the description of classroom practices, through the study of teachers' beliefs and their correlations with practice, to the thinking of teachers (Shavelson & Stern, 1981; Tochon, 1993) toward the study of cognitive models of teacher planning and decision-making.

Indeed, researchers have always been fascinated by the possibility of gaining direct access to teachers' classroom practice, of opening the classroom door and observing directly what is happening inside. Practices not only include gestures, postures, verbal behaviour, but also aims, strategies, values (Beillerot, 1998; Jeanin, 2018). Direct observation has the potential to be the right research tool to open the so-called "black box" that Black and Wiliam (1998) have studied since the 1990s. The observation of teaching practices through video tries to answer this scientific challenge using different observational methodologies informed by the most important educational research paradigms. On one hand, there are classroom studies about teacher behaviours as process variables, either separated or in connection with students' learning products. This research perspective is taken in the recent TIMMS Video Study on teaching practices in mathematics and science (2003 & 2006 in Roth et al., 2006). These methods fit more closely with a quantitative-experimental paradigm, where the observer stands outside the studied context with no direct exchange with the observed teacher and focuses on specific behaviour indicators, which are collected through structured tools such as checklists, rating scales and coding schemes. This observational methodology allows the relationships between fundamental variables to be identified and compared. On the other hand, there are phenomenological-qualitative matrix studies, more related to the idea of situated environment (Rogalski, 2006; Grangeat & Gray, 2008) and an empathic understanding of what happens in a context according to an ecological model (Bronfenbrenner, 1979). In this case, the tools for gathering information are narrative and open. The distance between observer and observed



is restricted but the observer is able to coach the teacher observed.

Video analysis as a research tool has developed in many directions, in the theoretical framework of different paradigms, including mixed models, characterized by the use of triangulating tools, both qualitative and quantitative. Jeannin (2018) identifies four main research directions. The first one characterizes video analysis as a research tool with systematic observations, even on large samples. The researcher guides the construction of initial hypotheses, progressively defining the constructs and behavioural categories to be observed in the video sequences. The aim is to describe and compare multiple and different situations to identify regularities and correlations in video-analyzed teaching practices. The most emblematic example to date is that of TIMMS Video Science (Roth, Druker et al., 2006).

A second research direction is that of qualitative researchers who aim to describe and understand, through video analysis, specific didactic situations. The case study is the typical design, supported by pre- and post-video analysis interviews and questionnaires to the teachers-actors. The goal is to understand in depth what happens in classrooms by crossing different kind of descriptive data with video analysis: narrative and global illustration of the event; categorical analysis (Schubauer, Leutenegger et al., 2007; Sensevy, 2007; Sensevy, Mercier et al., 2007; Marlot, 2008).

A third research direction concerns the use of video analysis informed by grounded theory (Engle, Conant et al. 2007). From this perspective, “data” flows gradually as researchers repeatedly observe the video-taped events, identify significant passages and transcribe meanings to distinguish concepts and constructs and codify actions and situations.

The last research direction identified by Jeannin (2018) is based on collaborative strategies between researchers and observed. In this case the methodological reference is ethnographic research: the video becomes the tool to reconstruct, together with the actor, the context and meanings. The researcher accesses the meanings of videos thanks to what the actor reveals (Christ, Arya et al. 2012).

In such different approaches, the observational procedures and instruments connected to them will also be different. If the collection of field notes is the basic observational tool the first time, then we will have, on one hand, more quantitative approaches where hypotheses and theoretical constructs guide the coding of the narrative data into indicators (and appropriate observation grids and coding schemes), and, on the other hand, more qualitative approaches where the field notes retain their complexity and work more on an intersubjective comparison to interpret the narrative data.

As already mentioned, some researchers combine these methodological approaches, aiming at a deep analysis and interpretation of the video and two main phases within video analysis emerge. Analysis means knowing how to see and notice the detail and to isolate and define it. Interpretation of the particular detail in the video, based on theoretical and/or experiential references, gives it meaning. These two phases form the basis for a video analysis oriented to teachers’ professional development and, when applied to pre-service and in-service teacher training, they highlight the analysis of teaching practice as a fundamental element for teacher change.



3.2 Video analysis and teacher's professional development

Teacher change studies on how and why teachers promote change or resist it and continue to adopt ineffective teaching methods have been well developed over the last 20 years (Vannini, 2012). The main question concerns what kind of teacher training is most effective, in order to change teachers' beliefs and practices toward teaching practices oriented to students' success. There are many factors that contribute to the stability of teacher beliefs (Girardet, 2018), both in pre-service and in-service teachers, which often do not change with training or when exposed to innovative classroom practice. Where there are strong pre-existing beliefs, a lack of self-efficacy and difficult school contexts, teachers in training tend to re-establish cognitive balance by returning to previous beliefs, even when these are pedagogically inadequate (Kagan, 1992).

However, there are also many studies that have highlighted the most facilitating factors for change, which is viewed as a long and dynamic process during which theory and practice, under certain conditions, meet and mutually influence each other in order to build teacher beliefs and innovative teaching habits (Nettle, 1998). The relationship between beliefs and practices is very complex and only by considering them interdependent (Richardson, 1996; Vannini, 2012; Buehl & Beck, 2015; Girardet, 2018) is it possible to imagine effective professional development interventions. In a review of studies about factors influencing in-service and pre-service teachers' change in classroom management, Girardet (2018) found reflection on prior beliefs, studying alternative practices, learning by doing, reflection on practice and a collaborative learning environment to be the most influential.

As can be seen, the focus on own and others' practices and reflection, individual and collective, and beliefs and practices are the key elements for change. In this sense, video analysis – as well as microteaching since its origins – presents an interesting opportunity given its potential for teacher professional development. It turns from a research tool into an effective training tool. Richardson and Kile (1999) even argue that when video analysis is used to promote teacher change, the separation between research and training no longer exists.


Video analysis offers an opportunity to reflect on practice and implement training during which the teacher acts, observes, receives feedback, reflects, plans, and acts again, promoting what Castoldi, Damiano et al. (2007) refers to as reflection-in-action. Videos become a valuable tool to support the teacher's conceptualization of action, using diverse methodological approaches. Through video analysis procedures, teachers can be helped to exercise analytical thinking about their own and others' practice. The focus on detail and performing action in the classroom allows the teacher "in training" to notice the action, re-think it, assign it meaning and then gradually distance themselves from and see it critically. More specifically, the habit of observing what happens inside the classroom is a very important tool for helping a teacher in training to start from practice and re-think and re-design it (Danielson, 2007). Observation focuses on empirical data, the "actions and behaviours" within real life contexts. Teachers can then compare their beliefs with such empirical data and use them to structure and re-structure new beliefs. The data emerging from a valid systematic observation procedure makes it possible for the observed subject to step back from the action performed and view it critically (Lovece & Vannini, 2018).

Internationally, many prominent teacher training associations are moving towards this type of training, for example the OECD (2018) and UNESCO (2018) in Europe, the Bill and Melinda Gates Foundation (2013) in the United States, uni-



versities in Canada (Karsenti & Collin 2011). They align with a substantial body of research that shows the positive impact of studying real-life classroom situations and the exercise of teachers' analytic ability (Sherin & van Es, 2009) to decode and interpret them and reflect and plan in new ways (Beck, King et al., 2002; Bruning, Siwatu et al., 2008; Choi & Lee, 2009; Rich & Hannafin, 2009; Cevik & Andre, 2013) towards the development of a professional vision. There has also been a substantial amount of research in the different ways of using video analysis by English-speaking (Guernsey & Ochshorn, 2011) and French-speaking researchers (Laveault, 2009; Meyer, 2012), and U.S. teaching associations (cf. TNTF, 2018, New America, 2018; Teachstone, 2018), which have found support for reflexivity tools (Bonaiuti, Santagata et al. 2017; Ferretti, Michael-Chrysanthou & Vannini, 2018) lesson study (Bartolini Bussi and Raplout 2018) and video clubs (Sherin & Han, 2004, Sherin, 2007). In all these cases, video becomes an effective tool for decentralizing oneself, removing action from the here and now, slowing the emotional burden and triggering systematic processes of thoughtful thinking.

Accordingly, the teacher may follow these steps:

- 
- exercising analytical thinking on video sequences;
 - noticing and describing slowly with words (conceptualization);
 - looking for cause-effect links;
 - identifying possible alternatives compared to those observed.

This process takes in moments of individual reflection and collaborative discussion with other teachers. Obviously, the effectiveness of these directions in teacher training is linked to the consistent and intentional use of tools to support reflection. In this regard, video self-analysis, in which the presence of a critical friend is essential (Richardson & Fallona, 2001), can be distinguished from video hetero-analysis, which sees individual and group reflection moments integrated with discussion with an expert.

3.3 *Innovations in video analysis for pre-service and in-service teacher's professional learning*

Recent innovations in video analysis technologies, including video annotation and video analytics software, are noted in studies conducted by Calandra, Brantley-Dias et al. (2007), Chatti, Marinov et al. (2016), Colasante (2011), Goeze, Zottmann et al. (2014), Khurana and Chandak (2013), Mirriahi, Jovanovic et al. (2018), Mu (2010), Pardo, Mirriahi et al. (2015) and Rich and Hannafin (2009).

Video annotation tools are used to facilitate a user's interaction with video content. They provide the means by which users can create and respond to comments posted onto the video time line or post as chat within an adjacent dialogue box. Originally used in qualitative research outside education, video annotation has expanded into education over the last decade (see Pardo, Mirriahi et al., 2015). These tools enable teachers to 'review, analyse, and synthesize captured examples of their own teaching in authentic classroom contexts' (Rich & Hannafin, 2009, p.53). With time-stamped annotation features, annotation software enables educators to make comments and reflections which can be shared with peers and educators (Pardo, & Mirriahi et al., 2015). Examples of annotations tools include Coursemapper (Chatti, Marinov et al. 2016), VideoAnnEx (Lin, Tseng et al., 2003), the Video Interaction for Teaching and Learning (Preston, Ginsburg et al., 2005,

Lee, Ginsburg et al., 2009), MuLVAT (Theodosiou, Kounoudes et al. 2009), WaC-Tool (Motti, Faga Jr et al. 2009), the Media Annotation Tool (Colasante, 2011), the Collaborative Annotation Tool (Harvard University, n.d.), and the Collaborative Lecture Annotation tool (CLAS) (Risko et al., 2013).

Video annotation tools have been perceived positively by pre-service teachers (Colasante, 2011; Colasante & Douglas, 2016) and can enhance teacher reflection by providing a platform and structure for analysis (Rich & Hannafin, 2009). Recent research has started to document the positive effects of video annotation on academic performance. Klefodimos and Evangelidis (2016) examined learner sequences of activities within video (i.e., viewing patterns) and found that these were related to exam performance. More advanced video analytics have also been carried out specifically with video annotation tools. Mirriahi, Liaqat et al. (2016) employed 12 variables from clickstream data captured in video annotation software, and analysed these with transition graphs. Using cluster analysis, they identified four profiles of students that were related to academic performance. Chatti, Marinov et al. (2016) presented a new video annotation tool called Coursemapper, which boasts a unique feature whereby heatmaps are created from learner traces to reflect most viewed segments of video, and annotation maps highlight segments that are frequently annotated. Students found this feature useful in terms of helping them quickly identify popular videos thereby reducing cognitive load. In all, these studies show the possibility of employing educational data mining (EDM) approaches to video analytics in ways that inform learning.

However, at least one study has found that there is in fact no difference between having to annotate a video and simply watching it, regarding the outcome of confidence (Fadde & Sullivan, 2013). This suggests that more research needs to be done to inform a better understanding of video pedagogy in pre-service teacher education (Blomberg, Renkl et al., 2013; Chittleborough, Cripps Clark et al., 2015), and how video annotation pedagogy can facilitate better learning outcomes. Research on video annotation tools and users' perceptions of their benefits and limitations are evident, however the actual annotations themselves have, to date, rarely been examined. This is a significant gap, as video annotations are potentially a rich source of information about how students are constructing knowledge about what they are learning.

This research gap is more sharply defined when considering the lack of use of video annotation tools in pre-service mathematics teacher education courses or teacher development programs. In one Australian context (University of South Australia) and, emanating from work conducted by Risko, Foulsham et al. (2013) regarding Collaborative Lecture Annotation System (CLAS), is the deployment of Online Video Annotation for Learning (OVAL) software. OVAL is currently being trialled to explore the affordances – a term used by Arenas (2015) to denote actionable possibilities – of video annotation coupled with learning analytics to study pre-service teacher's modelling of practice in finer-grained detail. OVAL affords course coordinators facility to import OVAL as an external tool into their course allocating viewing privileges to specific groups who are then enabled to collaboratively view, annotate and post responses about the video recording. Leonard and Westwell (in press) have demonstrated that providing structures for teachers to work collaboratively to engage with real problems of practice can promote lasting reform. This pilot aims to analyse pre-service teachers' enacted knowledge, meaning-making and co-construction, and/or specific traits or characteristics of teacher's teaching through role modelling and peer presentation. For discussion of models of analysis akin to annotation practice see also Colvin, Rogers



et al. (2016), Cotrell and Doty (1971), Kourieos (2016), Savas (2012), Gardner and Gardner (1969) and (Young 1968).

Video analytics, which sees video interaction data analysed at scale to understand and improve the effectiveness of video-based pedagogies, is a very recent additional development in video analysis. While research in this area is still in its infancy (Giannakos, Sampson et al. 2016) those devoted to this field contend that an applied use of video analytics in educational research may provide greater understanding about learners' engagement and outputs. Movement in this space is evident from the inaugural Workshop of Smart Environments and Analytics on Video-Based Learning was held as part of the 6th International Learning Analytics Knowledge Conference (2016) to connect research into video-based learning with that on smart environments and analytics to create synergies between these fields. As noted by Giannakos, Sampson et al. (2016, p. 502) 'as a step toward improving learners' experience and engagement with video-based learning systems; students' activity might be converted via analytics into useful information and benefit smart environments efficiency and ultimately learners experience and performance'.

While machine learning (ML) has not sufficiently been able to seamlessly extract and thematically analyse audio tracks that accompany video data, advances in this field have surfaced recently, most notably from Tech-companies; Google, Microsoft (Cognitive Sciences) and Mangold, where software has been designed to read, record and interpret in real time, gestures and facial features sentiment, language and vocabulary, as well as track motion and movement. However, to more fully accomplish the task of extracting and thematically analysing audio tracks that accompany video, machine learning requires more sophisticated, responsive software that automatically assimilates, accommodates and synthesises the complexities and subtleties of human's interactions and language. ML tools capable of recording, reading, and analysing teacher/learner engagement, enactment and feedback may provide significant purchase in the creation of highly responsive learning designs and interventions particularly in mathematics education, where students' disengagement and under-achievement have been characteristically problematic across Westernised schooling systems.

4. New directions in research

In a world increasingly shaped by smart devices and social media, meanings and values transmitted through multi-media modalities, such as video, cannot but reimagine traditional approaches to teaching and learning especially those that continue to position the teacher at the centre and controller of knowledge (Moreno & Mayer, 1999; Siemens, 2005; Anders, 2015; Bingham, Reid et al., 2016). Arguably the role that video and virtualised messaging now plays in the co-construction of knowledge is worthy of critical attention by educators and this point is particularly acute in consideration contemporary teacher-learner contexts regarding in pre-service and in-service teacher education programs, and the means from which to improve course delivery and practice through digitally enhanced learning design (Elliot, Sweeney et al. 2009; Ellis & Goodyear, 2010; Lockyer, Heathcote et al., 2013).

The FAMT&L project (Ferretti, Michael-Chrysanthou & Vannini, 2018) is one powerful example of a recent international initiative that situates video analysis in teacher's professional learning. And, emanating from Australia, studies on video



annotation and learning analytics technology conducted by Gašević, Dawson et al. (2015), Pardo, Mirriahi et al. (2015), Risko, Foulsham et al. (2013) have led to the development of OVAL for use in pre-service teacher education. This additional suite of video analysis technology is thought to provide strong potential to greatly enhance pre-service teachers' meaning-making and professional practice when constructively engineered into course learning design.

Gašević, Dawson et al. (2015) and Lockyer and Dawson (2011) contend that the affordances that video analysis software supply to educators and researchers, as noted above, are predicated on the positioning of these technologies in purposeful learning design. By learning design, these authors point to the intentional engineering and architecture of a course or program that is underpinned by well-theorised pedagogical intent and practice. Similarly, Biggs (1996, 2012) and Elliot, Sweeney et al. (2009) outline development of well-informed constructivist learning sequences which involve learners in exploratory, explanatory and applied learning tasks moving them from noticing, to salience, to synthesis. Learning design thus is used a term to include all intended aspects of teacher's work from planning, implementation and assessment perspectives positioning these practice architectures (Lowrie, Leonard et al., 2018) within strategies and principles deriving from constructivist and connectivist theorising.

Lockyer & Dawson's (2011) proposition is that when learning design is coupled with learning analytics, educators and researchers are provided powerful potential rapid responsive tools from which to analyse teaching and learning, thus making timely interventions to support and or nourish learners. This they contend lends food for thought when considering reforms driven by government and institutions that demand quality, replicable and scalable teaching and learning approaches evaluated through data sources such as learning analytics. The challenge they present is that a learning design approach need be founded on its case-based merit. How that case becomes translatable into scalable practice whilst maintaining its socio-cultural, structural and pedagogical integrity is another key question posed.



4.1 *Improving mathematics teaching*

Identified through our joint exploration of the literature, the main aims of our research collaboration are to explore how:

- Video analysis technologies serve to support pre-service teachers' co-constructions of mathematics education from knowledge and practice standpoints.
- Pre-service teachers better understand how to design and implement effective approaches to teaching and learning mathematics.

From our joint perspective, educational inquiry that utilises video analysis technologies to notice, reflect on, inform and reflexively influence educator's practice, conjoins with similar studies conducted elsewhere (Hiebert, Stigler et al., 2005; Tripp & Rich, 2012; Coffey, 2014; Ludecke, 2014; Santagata, 2014; van Es, Tunney et al., 2014; Gašević, Mirriahi & Dawson cited in Gašević, Dawson et al., 2015; Darling-Hammond, 2016; Mitchell & Reid, 2016; Lowrie, Leonard et al. 2018). The additional elements of surprise we bring to this study are the purposeful inclusions of video annotation and video analytic tools, which are housed within a course learning design (Elliot, Sweeney et al. 2009; Ellis & Goodyear, 2010; Crisp, 2011; Lockyer, Heathcote et al., 2013) and/or practice architecture (Lowrie,

Leonard et al. 2018) that seeks to optimise their affordances (Dawson, Bakharia et al. 2010; Arenas, 2015; Cheng & Leong, 2017).

While research on video analysis is abundant, research on the use of video annotation tools combined with video analytics has rarely been examined. This is a significant gap, as data drawn from these additional tools are potentially rich in information about how students co-construct, engage with, and enact professional knowledge. This research gap is more sharply defined when considering the lack of use of video annotation and video analytics in pre-service mathematics teacher education courses. Thus, the term video analysis technologies in this research encompasses the above additions as a suite of tools.

Using video analysis technologies as tools for teacher learning, the researchers are guided by questions that can be summarised as follows (Santagata, 2014):

- What is the teacher learning purpose of using video?
- What types of video will work for that purpose?
- What viewing modality will best serve that purpose?
- How can we assess that we have achieved our purpose?

Approaching these questions suggests a multi-dimensional research framework:

- a) Measure impact on students' developing pedagogical content knowledge including their developing sophistication in understanding curriculum frameworks, effective teaching approaches and their application of research informed strategies for teaching mathematics effectively.
- b) Measure pre-service teacher' confidence and proficiency towards teaching mathematics.
- c) Ascertain translation into practicum based on prospective assessment (viva and presentation assessments) and retrospective collaborative assessment post practicum.
- d) Gather data from a range of sources including collaborative peer assessment of weekly group presentations, formative assessment from OVAL Annotations and video analytics, and summative assessment techniques (teacher and peer assessed and viva) and other related system-based learning analytics to gauge students' self-reported performances as well as their graded performances.

4.2 Improving learning design

As mentioned previously above the term learning design is suggestive of logics drawn from actions and possibilities relating to the engineering of learning within an architecture of practice (Kemmis, 2014; Lowrie, Leonard et al., 2018). We are also guided in our use of this term by Elliot et al's. (2009) study which grounds learning design deeply within constructivist pedagogy that has an intended learning focus on learners raising cognition through practice-based inquiry also referred to in the context of their study as problem-based learning or authentic learning (*ibidem*). This approach dovetails cleanly with Bigg's (2012) notion of constructive alignment whereby learners move from states of awareness through to mastery and application of assessable knowledge. Essentially this design affords the learner to notice, explore (question), explain (collaborate and share) and apply their knowledge through enactment of assessment (formative and summative).



Pre-service teachers are also required to work in learning teams and this social learning aspect of the learning design is informed from King and Sen (2013) and Michaelsen and Sweet (2008).

Procedural elements of this learning design are as follows:

1. Teams of three students present a total of six presentations, which require them to theorise, explore, explain and model teaching and learning of mathematics. Pre-service teachers are organised into table groups comprising two teams of three students. At each table, one team of three presents to the other team of three (observers), who peer-review the performance. Each presentation is video recorded from dual vantage points.
2. Prior to their presentation, each team has access to a scaffold that outlines the key conceptual and pedagogical points to be covered in their presentation, including a selection of relevant literature for review. During the presentation, observers also provide constructive verbal feedback and produce a marked-up peer review sheet using qualifiers: “sound”, “good”, “very good” or “excellent”. Post presentation, the tutor formally assesses the team’s PowerPoint presentation. On request, groups may view the raw footage and or thumbnails which in can be provided on a portable share drive for review and or editing.
3. The research team then edits the raw clips into smaller 3-5-minute snapshots in which questions and comments are posed in OVAL for response. During the final two weeks of the course, groups access their video clips via OVAL software from the course site in Moodle (the university’s learning management system), from which they can collaboratively annotate and analyse their clips. Subsequently, annotations as text, and analytics as engagement, are then mined for analysis. In this research the video clips are used only as a mode for reflection and comment made available to the individual, team and table group. In future research a higher level of ethical consent will be applied for to dig deeper into these video data.



5. Conclusion: Innovating methodology directions

Emerging from this engagement with the literature we see potential for innovations in research methods such as analysing large volumes of qualitative text sourced from pre-service teachers written responses (video annotations, narratives and assessment artefacts) using both innovative structured tools and common known tools, Coh-matrix, and Language Inquiry & Word Count (LIWC) for example, which provide insight into linguistic structure and other linguistic features including sentiment (emotion, psychological dispositions) as revealed in writing (Graesser et al., 2011; Bell et al., 2012). Therefore, the innovation methodology directions will draw on natural language processing (NLP) tools and/or methods to analyse the video annotation data for insight into students’ construction and co-creation of meaning. Finally, the resultant video analytics – that is, the trace data generated from users’ interactions with the video – could be interrogated to explore how student teachers used the video annotation tool for reflection and learning. Akin to Gašević & Dawson’s (2015) study, both user activity and quality of the learning products will inform the evaluation of this learning analytics project. It is also highly likely that further collaborations with colleagues either based at the University’s Teaching Innovation Unit, or elsewhere, may generate a suitable tool(s) that reads and interprets proximities of coherence and cognition derived

from pre-service teachers' annotated video responses and assessment artefacts. This is especially the case with cross-over and close collaboration already forged between the University of South Australia and the University of Bologna and their cross-border FAMT&L project which relied heavily of video data and thematic analyses techniques.

The affordances of using video analysis technologies in learning design appear highly attractive. Pre-service teachers are imagined connecting professional reading, noting, discussion and presentation in seamless iterative episodes of learning. Collaborative viewing and annotation of their group presentation via video technologies provide a powerful new layer from which to construct and co-create meaning about their teaching and learning of mathematics education. The applied use of video analytics seeks to extrapolate from learning design rich seams data that can analysed using ML tools such as coh-metrix, LIWC or other natural language processing (NLP) tools.

The study hopes to provide a well theorised and evidence-based case study which may in the first instance translate to the production of more capable mathematics teachers and second, trigger capacity for more scalable projects to ensue suited to in-service teacher education programs. The need for improvement in mathematics teaching in Australia, if not elsewhere, has been noted. As with the FAMT&L project, the use of video technology as a multi-media teaching and learning tool provides a solid contribution to educator's supply of contemporary professional resources.

However, the logistics of using video technologies should not be underestimated. Use of video technology is labour intensive. Significant time and effort are required to wade through and edit video and careful consideration must be given to the secure warehousing and management of video data. With advancement in video hardware and software and in this case, utilisation of a smart learning environment, these concerns are somewhat mitigated.

While we as university teachers are within our mandate to seek improvements in teaching and learning, we must always consider the ethical impact that our studies have on its participants. This research study has a clear mandate to work with pre-service teachers and to actively include them in the design of the study. We have learned that not all students are comfortable about the use of video for reflection and analysis purposes, and these students are able to opt out of the project without repercussion. With that in mind, we have promoted the idea that the work of educators is always in the public's view and always public in the way educators communicate and justify their teaching. Educators are always professionally and passionately defending their teaching through their knowledge base and through their practice and this this project aligns with developing professional capacity, efficacy and resilience. However, the greatest benefit we have promoted in this research venture is the benefit gained from the development of professional knowledge, especially regarding more effective teaching and learning of mathematics.

References

- Allen D.W. & Eve A.W. (1968). Microteaching. *Theory Into Practice*, 7(5), pp. 181-185.
- Anders B.A. (2015). Use of Video to Enhance Education. *Design Strategies and Innovations in Multimedia Presentations* (pp. 189-201). S. Hai-Jew. Hershey, Pennsylvania, IGI Global.



- Arenas E. (2015). Affordances of Learning Technologies in Higher Education Multicultural Environments. *Electronic Journal of e-Learning* 13(4), 217-227.
- Australian Council for Educational Research (2018). *Literacy and Numeracy Test for Initial Teacher Education Students*. Retrieved 23 August, 2018, from <<https://teacheredtest.ac-er.edu.au/>>.
- Australian Curriculum, Assessment and Reporting Authority (2018). *National Assessment Program*. Retrieved 13 November, 2018, from <<https://www.nap.edu.au/information/faqs/2018-naplan-results>>.
- Bartolini Bussi M.G. & Raplud A. (Eds.) (2018). *Il lesson study per la formazione degli insegnanti*. Roma: Carocci Faber.
- Beck R.J., King A. & Marshall S.K. (2002). Effects of Videocase Construction on Preservice Teachers' Observations of Teaching. *The Journal of Experimental Education* 70(4), pp. 345-361.
- Beillerot J. (1998). *Saber y relación con el saber*. Buenos Aires, Argentina: Trilce.
- Biggs J. (1996). Enhancing Teaching through Constructive Alignment. *Higher Education* 32(3), pp. 347-364.
- Biggs J. (2012). Constructive alignment in university teaching. *HERDSA Review of Higher Education* 1, pp. 5-22.
- Bill & Melinda Gates Foundation (2013). *Measures of Effective Teaching Project Releases: Final Research Report*. Retrieved 30 August, 2018 from <<https://www.gatesfoundation.org/media-center/press-releases/2013/01/measures-of-effective-teaching-project-releases-final-research-report>>.
- Bingham T., S. Reid & Ivanovic V. (2016). Paint me a picture: translating academic integrity policies and regulations into visual content for an online course. *International Journal for Educational Integrity* 12(1): 2.
- Black P., & Wiliam D. (1998). Assessment and Classroom Learning. *Assessment in Education: Principles, Policy & Practice*, 5(1), pp. 7-74.
- Blomberg G., Renkl A., Sherin M., Borko H., & Seidel T. (2013). Five research-based heuristics for using video in pre-service teacher education. *Journal for Educational Research Online*, 5(1), pp. 90-114.
- Bonaiuti G., Santagata R., & Vivinet G. (2017). How to capture teacher professional vision. A coding scheme. *Italian Journal of Educational Research X*(Special Number), pp. 7-74.
- Borko H., Jacobs J., Eiteljorg E., & Pittman M.E. (2008). Video as a tool for fostering productive discussions in mathematics professional development. *Teaching and Teacher Education* 24(2), pp. 417-436.
- Brofenbrenner U. (1979). *The Ecology of Human Development*. Massachusetts, USA: Harvard University Press.
- Brophy J.E. (2004). *Using video in teacher education*. Amsterdam: Elsevier.
- Brown G. (1975). *Microteaching: a programme of teaching skills*. Philadelphia, USA: Harper & Row.
- Bruning R., Siwatu K.O., Liu X., Pytlikzillig LM., Horn C., Sic S. & Carlson D. (2008). Introducing teaching cases with face-to-face and computer-mediated discussion: Two multi-classroom quasi-experiments. *Contemporary Educational Psychology*, 33(2), pp. 299-326.
- Buehl M.M., & Beck J.S. (2015). The Relationship Between Teachers' Beliefs and Teachers' Practices. *International Handbook of Research on Teachers' Beliefs* (pp. 66-84). H. Fives & M. Gregoire Gill. New York, USA: Routledge.
- Calandra B., Brantley-Dias L., & McNeal K. (2007). An electronic system to support novice teachers' reflective lesson design. *Multicultural Education & Technology Journal*, 1(2): pp. 100-111.
- Calvani A., Bonaiuti G., & Andreocci B. (2011). Il microteaching rinascerà a nuova vita? Video annotazione e sviluppo della riflessività del docente. *Italian Journal of Educational Research*, 6, pp. 29-42.
- Castoldi M., Damiano E., Todeschini P., Pietro G., & Mariani A.M. (eds.) (2007). *Il mentore. Manuale di tirocinio per insegnanti in formazione*. Milano: FrancoAngeli.



- Cevik Y.D. & Andre T. (2013). Examining Preservice Teachers' Decision Behaviors and Individual Differences in Three Online Case-based Approaches. *International Journal of Educational Research*, 58.
- Chatti M., Marinov M., Sabov O., Laksono R., Sofyan Z., Fahmy Yousef A., & Schroeder U. (2016). Video annotation and analytics in CourseMapper. *Smart Learning Environments*, 3(1), pp. 1-21.
- Cheng L., & Leong S. (2017). Educational affordances and learning design in music software development. *Technology, Pedagogy and Education*, 26(4), pp. 395-407.
- Chittleborough G., Cripps Clark J., & Chandler P. (2015). The Pedagogy of Using Video to Develop Reflective Practice in Learning to Teach Science. *Video research in disciplinary literacies*. L. Shanahan, E. Ortlieb, L. E. Shanahan & M. B. McVee. Bingley, England, Emerald.
- Choi I., & Lee K. (2009). Designing and Implementing a Case-Based Learning Environment for Enhancing Ill-Structured Problem Solving: Classroom Management Problems for Prospective Teachers. *Educational Technology Research and Development*, 57(1), pp. 99-129.
- Christ T., Arya P., & Chiu M.M. (2012). Collaborative Peer Video Analysis: Insights About Literacy Assessment and Instruction. *Journal of Literacy Research*, 44(2), pp. 171-199.
- Coffey A. M. (2014). Using Video to Develop Skills in Reflection in Teacher Education Students. *Australian Journal of Teacher Education*, 39(9).
- Colasante M. (2011). *Using a video annotation tool for authentic learning: A case study*. Global Learn Asia Pacific, Melbourne, Victoria, EdITLib.
- Colasante M. (2011). Using Video Annotation to Reflect on and Evaluate Physical Education Pre-Service Teaching Practice. *Australasian Journal of Educational Technology*, 27(1), pp. 66-88.
- Colasante M., & Douglas K. (2016). Prepare-Participate-Connect: Active Learning with Video Annotation. *Australasian Journal of Educational Technology*, 32(4), pp. 68-91.
- Colvin C., Rogers T., Wade A., Dawson S., Gašević D, Buckingham Shum S., Nelson K., Alexander S., Lockyer S., Kennedy G., Corrin L., & Fisher J. (2016). *Student retention and learning analytics: A snapshot of Australian practices and a framework for advancement*. Australian Government Office for Learning and Teaching.
- Commonwealth of Australia (2017). *Inquiry into innovation and creativity: workforce for the new economy*. Canberra, House of Representatives Standing Committee on Employment, Education and Training.
- Cotrell C.J., & Doty C.R. (1971). *Assessment of Micro-Teaching and Video Recording in Vocational and Technical Teacher Education: Phase IV - Classroom Application of Micro-Teaching and Video Recording. Final Report*. Washington, DC, Ohio State University, Centre for Vocational Technical Education.
- Crisp G. (2011). *Teacher's Handbook on e-Assessment: A handbook to support teachers in using e-assessment to improve and evidence student learning and outcomes*. Sydney: Office for Learning and Teaching.
- Danielson C. (2007). *Enhancing Professional Practice: A Framework for Teaching*. Alexandria, Virginia: Association for Supervision and Curriculum Development.
- Darling-Hammond L. (2016). Research on Teaching and Teacher Education and Its Influences on Policy and Practice. *Educational Researcher*, 45(2), pp. 83-91.
- Dawson S.P., Bakharia A., & Heathcote E. (2010). *SNAPP: Realising the affordances of real-time SNA within networked learning environments*. UK, Networked Learning.
- Elliot K.A., Sweeney K., & Irving H.R. (2009). A learning design to teach scientific inquiry. *Handbook of Research on Learning Design and Learning Objects: Issues, Applications and Technologies* (pp. 652-675). L. Lockyer S., Bennett S., Agostinho, & Harper B., Hershey, Pennsylvania: Idea Group.
- Ellis R.A., & Goodyear P. (2010). *Students' experiences of e-learning in higher education the ecology of sustainable innovation*. New York: Routledge.
- Engle R.A., Conant F.R., & Greeno J.G. (2007). *Video Research in the Learning Sciences*. R. Goldman, R. Pea, B. Barron & S. J. Denny. Lawrence Erlbaum Associates, Inc., Publishers, Mahwah, New Jersey (pp. 239-254).

- Fadde P., & Sullivan P. (2013). Using Interactive Video to Develop Preservice Teachers' Classroom Awareness. *Contemporary Issues in Technology and Teacher Education (CITE Journal)*, 13(2), pp. 156-174.
- Ferretti F., Michael- Chrysanthou P., & Vannini I. (Eds.) (2018). *Formative assessment for mathematics teaching and learning: teacher professional development research by video-analysis methodologies*. Milano: FrancoAngeli.
- Galliani L., & De Rossi M. (Eds.) (2014). *Videoricerca e documentazione narrativa nella ricerca pedagogica. Modelli e criteri*. Lecce: Pensa MultiMedia.
- Gardner R. A., & Gardner B.T. (1969). Teaching sign language to a chimpanzee. *Science (New York, N.Y.)* 165(3894): 664.
- Gašević D., Dawson S., & Siemens G. (2015). Let's not forget: learning analytics are about learning. *TechTrends* 59(1), pp. 64-71.
- Giannakos M.N., Sampson D.G., Kidzinski L., & Pardo A. (2016). *Smart environments and analytics on video-based learning*. 6th International Conference on Learning Analytics & Knowledge, Edinburgh, Scotland, ACM.
- Girardet C. (2018). Why do some teachers change and others don't? A review of studies about factors influencing in-service and pre-service teachers' change in classroom management. *Review of Education*, 6(1), pp. 3-36.
- Goeze A., Zottmann J.M., Vogel F., Fischer F., & Schrader J. (2014). Getting immersed in teacher and student perspectives? Facilitating analytical competence using video cases in teacher education. *Instructional Science*, 42(1), pp. 91-114.
- Grangeat M., & Gray P. (2008). Teaching as a Collective Work: Analysis, Current Research and Implications for Teacher Education. *Journal of Education for Teaching: International Research and Pedagogy*, 34(3), pp. 177-189.
- Groundwater-Smith S., Ewing R., & Le Cornu R. (2015). *Teaching: challenges & dilemmas*. South Melbourne, Victoria, Cengage Learning Australia.
- Guernsey L., & Ochshorn S. (2011). *Watching Teachers Work: Using Observation Tools to Promote Effective Teaching in the Early Years and Early Grades*.
- Guskey T.R. (1986). Staff Development and the Process of Teacher Change. *Educational Researcher*, 15(5), pp. 5-12.
- Harvard University (n.d.). *Open Sourcing Harvard University's Collaborative Annotation Tool*. Retrieved 4 September, 2018, from <<http://blogs.harvard.edu/acts/files/2012/06/handout.pdf>>.
- Hiebert J., Stigler J.W., Jacobs J.K., Givvin K.B., Garnier H., Smith M., Hollingsworth H., Manaster A., Wearne D., & Gallimore R. (2005). Mathematics Teaching in the United States Today (and Tomorrow): Results from the TIMSS 1999 Video Study. *Educational Evaluation and Policy Analysis*, 27(2), pp. 111-132.
- Jeannin L. (2018). Theoretical framework of video-analysis methodology. *Formative assessment for mathematics teaching and learning: teacher professional development research by videoanalysis methodologies* (pp. 69-95). F. Ferretti, P. Michael- Chrysanthou & I. Vannini. Milano: FrancoAngeli.
- Kagan D.M. (1992). Professional Growth Among Preservice and Beginning Teachers. *Review of Educational Research*, 62(2), pp. 129-169.
- Karsenti T., Collin S. (2011). The impact of online teaching videos on Canadian pre-service teachers. *Campus-Wide Information Systems*, 28(3), pp. 195-204.
- Kemmis S. (2014). *Changing practices, changing education*. Singapore: Springer.
- Khurana K., & Chandak M.B. (2013). Study of various video annotation techniques. *International Journal of Advanced Research in Computer and Communication Engineering* 2(1), pp. 909-914.
- King G., & Sen M. (2013). The Troubled Future of Colleges and Universities. *PS: Political Science and Politics*, 46(1), pp. 83-89.
- Kleftodimos A., & Evangelidis G. (2016). Using open source technologies and open internet resources for building an interactive video based learning environment that supports learning analytics. *Smart Learning Environments*, 3(1): 9.
- Kourieos S. (2016). Video-Mediated Microteaching – A Stimulus for Reflection and Teacher Growth. *Australian Journal of Teacher Education*, 41(1).





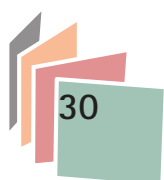
- LAK (2016). The 6th International Learning Analytics & Knowledge Conference. Retrieved 31 August 2018, from <<http://lak16.solaresearch.org/>>.
- Laveault D. (2009). L'évaluation en classe : Des politiques aux pratiques. *Mesure et évaluation en éducation*, 32(3), pp. 1-22.
- Lee J.S., Ginsburg H.P., & Preston M.D. (2009). Video Interactions for Teaching and Learning (VITAL): Analyzing Videos Online to Learn to Teach Early Childhood Mathematics. *Australasian Journal of Early Childhood*, 34(2), pp. 19-23.
- Leonard S.N., & Westwell M. (in press). Translating the science of learning through co-design: working with teachers to prioritise executive functioning skills in mathematics education. *Learning under the Lens – Applying findings from the Science of Learning to the Classroom*. A. Carroll, R. Cunnington and A. Nugent. Oxfordshire, UK, Routledge.
- Lin C.-Y., Tseng B.L., & Smith J.R. (2003). VideoAnnEx: IBM MPEG-7 Annotation Tool for Multimedia Indexing and Concept Learning.
- Livy S.L., Vale C., & Herbert S. (2016). Developing Primary Pre-Service Teachers' Mathematical Content Knowledge during Practicum Teaching. *Australian Journal of Teacher Education*, 41(2).
- Lockyer L., & Dawson S. (2011). Learning Designs and Learning Analytics. *Proceedings of the 1st International Conference on Learning Analytics and Knowledge* (pp. 153-153). Banff, Alberta, ACM.
- Lockyer L., Heathcote E., & Dawson S. (2013). Informing pedagogical action: aligning learning analytics with learning design. *American behavioral scientist*, 57(10), pp. 1439-1459.
- Lovece S., & Vannini i (2018). From beliefs to practices: the video-analysis methodologies to observe the formative assessment in classroom. *Formative assessment for mathematics teaching and learning: teacher professional development research by videoanalysis methodologies* (pp. 96-117). F. Ferretti, P. Michael- Chrysanthou & I. Vannini. Milano: FrancoAngeli
- Lowrie T., Leonard S., & Fitzgerald R. (2018). STEM Practices: A translational framework for large-scale STEM education design. *EDeR - Educational Design Research*, 2(1), pp. 1-20.
- Ludecke M.A. (2014). *Using video to promote pre-service teachers' thinking about their transition to teaching*. Australian Teacher Education Association Conference, Sydney, ATEA.
- Macmillan A. (2009). *Numeracy in early childhood: shared contexts for teaching & learning*. South Melbourne, Vic., Oxford University Press.
- Marlot C. (2008). *Caractérisation des transactions didactiques : deux études de cas en Découverte Du Monde Vivant au cycle II de l'école élémentaire*, Université Rennes 2.
- Meyer F. (2012). Les vidéos d'exemples de pratique pour susciter le changement. *Revue internationale de pédagogie de l'enseignement supérieur*, 28, pp. 1-23.
- Michaelsen L.K., & Sweet M.S. (2008). Fundamental principles and practices of team-based learning. *Team based learning for health professions education: A guide to using small groups for improving learning*. L. K. Michaelsen, D. X. Parmelee, K. K. McMahon & R. E. Levine. Sterling, Virginia, Stylus Publishing.
- Mirriahi N., Jovanovic J., Dawson S., Gašević D., & Pardo A. (2018). Identifying Engagement Patterns with Video Annotation Activities: A Case Study in Professional Development. *Australasian Journal of Educational Technology*, 34(1), pp. 57-72.
- Mirriahi N., Liaqat D., Dawson S., & Gasevic D. (2016). Uncovering student learning profiles with a video annotation tool: reflective learning with and without instructional norms. *Educational technology research and development*, 64(6), pp. 1083-1106.
- Mitchell D., & Reid J.A. (2016). Re-viewing Practice: The Use of Video Recordings in Learning to Teach. *Fusion* 8.
- Moreno R., & Mayer R.E. (1999). Cognitive Principles of Multimedia Learning: The Role of Modality and Contiguity. *Journal of Educational Psychology*, 91(2), pp. 358-368.
- Motti V.G., Faga Jr R., Catellan R.G., da Graca M., Pimentel C., & Teixeira C.A.C. (2009). *Collaborative synchronous video annotation via the watch-and-comment paradigm*. 7th European Conference on Interactive TV and Video, Leuven, Belgium, ACM.
- Mu X. (2010). Towards effective video annotation: An approach to automatically link notes with video content. *Computers & Education*, 55(4), pp. 1752-1763.

- Nettle E.B. (1998). Stability and change in the beliefs of student teachers during practice teaching. *Teaching and Teacher Education*, 14(2), pp. 193-204.
- New America (2018). New America. Retrieved 30 August, 2018, from <<https://www.newamerica.org/>>.
- OCSE (2013). *PISA 2012 Results: Ready to learn. Students' engagement, drive and self-beliefs*. Paris. III.
- OECD (2018). *OECD*. Retrieved 30 August, 2018, from www.oecd.org.
- Owen S. (2014). Teacher Professional Learning Communities: Going beyond Contrived Collegiality toward Challenging Debate and Collegial Learning and Professional Growth. *Australian Journal of Adult Learning*, 54(2), pp. 54-77.
- Pardo A., Mirriahi N., Dawson S., Zhao Y., Zhao A., & Gasevic D. (2015). *Identifying Learning Strategies Associated with Active use of Video Annotation Software*. The 5th International Learning Analytics and Knowledge Conference, Poughkeepsie: NY, ACM.
- Preston M.D., Ginsburg H.P., Jang S., Eisenband J.G., Moretti F., & Sommer P. (2005). Video Interactions for Teaching and Learning (VITAL): A Learning Environment for Courses in Early Childhood Mathematics Education.
- Reys R.E., Lindquist M.M., Lambdin D.V., Smith N.L., Rogers A., Cooke A., Ewing B., Robson K., & Bennett S. (2017). *Helping children learn mathematics*. Milton, Qld: John Wiley & Sons Ltd.
- Rich P.J., & Hannafin M. (2009). Video Annotation Tools: Technologies to Scaffold, Structure, and Transform Teacher Reflection. *Journal of Teacher Education*, 60(1), pp. 52-67.
- Richardson V. (1996). The role of attitudes and beliefs in learning to teach. *Handbook of research on teacher education* (pp. 102-119). J. P. Sikula, T. J. Buttery and E. Guyton. New York: Macmillan.
- Richardson V., & Fallona C. (2001). Classroom management as method and manner. *Journal of Curriculum Studies*, 33(6), pp. 705-728.
- Richardson V. & Kile R.S. (1999). The use of videocases in teacher education. *Who learns from cases and how? The research base for teaching with cases* (pp. 121-136). M. A. Lundberg, B. B. Levin and H. L. Harrington. Mahwah, New Jersey, L. Erlbaum Associates.
- Richardson V., & Placier P. (2002). Teacher Change. *Handbook of Research on Teaching* (pp. 905-947). V. Richardson. Washington DC, American Educational Research Association.
- Risko E.F., Foulsham T., Dawson S., & Kingstone A. (2013). The Collaborative Lecture Annotation System (CLAS): A New TOOL for Distributed Learning. *IEEE Transactions on Learning Technologies*, 6(1), pp. 4-13.
- Rogalski J. (2006). Psychological analysis of complex work environments. *European Perspectives on Learning at Work: The Acquisition of Work Process Knowledge* (pp. 218-236). M. Fischer, N. Boreham & B. Nyhan, European Centre for the Development of Vocational Training.
- Roth K.J., Druker S.L., Garnier H.E., Lemmens M., Chen C., Kawanaka T., Rasmussen D., Trubacova S., Warvi D., Okamoto Y., Gonzales P., Stigler J., & Gallimore R (2006). *Teaching Science in Five Countries: Results From the TIMSS 1999 Video Study: Statistical Analysis Report* (NCES 2006-2011). Washington, DC.
- Santagata R. (2014). Video and teacher learning: key questions, tool and assessment guiding research and practice. *Beitraege zur Lehrerbildung*, 32(2), pp. 196-209.
- Savas P. (2012). Micro-teaching Videos in EFL Teacher Education Methodology Courses: Tools to Enhance English Proficiency and Teaching Skills Among Trainees. *Procedia - Social and Behavioral Sciences*, 55(C), pp. 730-738.
- Schubauer M.L., Leutenegger F., Lizogat F., & Fluckiger A. (2007). Un modèle de l'action conjointe professeur-élèves: les phénomènes didactiques qu'il peut/doit traiter. *Agir ensemble. L'action didactique conjointe du professeur et des élèves* (pp. 51-91). G. Sensevy, A. Mercier, M.-L. Schubauer-Leoni & F. Leutenegger. Rennes, Universitaires de Rennes.
- Sensevy G. (2007). Des catégories pour décrire et comprendre l'action didactique. *Agir ensemble. L'action didactique conjointe du professeur et des élèves*. G. Sensevy, A. Mercier, M.-L. Schubauer-Leoni and F. Leutenegger. Rennes, Universitaires de Rennes: 13.
- Sensevy G., Mercier A., Schubauer-Leoni M.-L., & Leutenegger F., Eds. (2007). *Agir ensem-*



ble. *L'action didactique conjointe du professeur et des élèves*. Rennes, Universitaires de Rennes.

- Shavelson R.J., & Stern P. (1981). Research on Teachers' Pedagogical Thoughts, Judgments, Decisions, and Behavior. *Review of Educational Research*, 51(4), pp. 455-498.
- Sherin M.G. (2004). New perspectives on the role of video in teacher education. *Using video in teacher education*. J. E. Brophy. Amsterdam, Elsevier.
- Sherin M.G. (2007). The Development of Teachers' Professional Vision in Video Clubs. *Video Research in the Learning Sciences* (pp. 742-765). R. Goldman, R. Pea, B. Barron and S. J. Derry. Mahwah, New Jersey, Lawrence Erlbaum.
- Sherin M.G., & Han S.Y. (2004). Teacher Learning in the Context of a Video Club. *Teaching & Teacher Education: An International Journal of Research and Studies*, 20(2), pp. 163-183.
- Sherin M.G., & van Es A. (2009). Effects of Video Club Participation on Teachers' Professional Vision. *Journal of Teacher Education*, 60(1), pp. 20-37.
- Siemens G. (2005). *Connectivism: A Learning Theory for the Digital Age*.
- Sullivan P. (2011). *Teaching mathematics : using research-informed strategies*. Camberwell, Victoria, ACER Press.
- Teachstone (2018). Teachstone. Retrieved 30 August, 2018, <from <https://teachstone.com/>>.
- Theodosiou Z., Kounoudes A., Tsapatoulis N., & Milis M. (2009). *MuLVAT: A Video Annotation Tool Based on XML-Dictionaries and Shot Clustering*. 19th International Conference, Limassol, Cyprus, ICANN.
- Thomson S., Hillman K., & Wernert N. (2012). *Monitoring Australian Year 8 student achievement internationally: TIMSS 2011*. Camberwell, Victoria.
- Thomson N S., Wernert N., O'Grady E.J., & Rodrigues S. (2017). *TIMSS 2015: reporting Australia's results*. Camberwell, Victoria.
- TNTP (2018). *TNTP*. Retrieved 30 August, 2018, from <https://tntp.org/>.
- Tochon F. (1993). Le Fonctionnement "improvisationnel" de l'enseignant expert. *Revue des Sciences de l'Éducation*, 19(3), pp. 437-461.
- Tochon F. (2008). A Brief History of Video Feedback and Its Role in Foreign Language Education. *CALICO Journal*, 25(3), pp. 420-435.
- Tripp T.R., & Rich P.J. (2012). The Influence of Video Analysis on the Process of Teacher Change. *Teaching and Teacher Education: An International Journal of Research and Studies*, 28(5): pp. 728-739.
- UNESCO (2018). *UNESCO*. Retrieved 30 August, 2018, from <https://en.unesco.org/>.
- Van de Walle J.A., Karp K.S., & Bay-Williams J.M. (2015). *Elementary and Middle School Mathematics: Teaching Developmentally, Global Edition*. Essex, England, Pearson Education Limited.
- van Es E.A. (2012). Examining the Development of a Teacher Learning Community: The Case of a Video Club. *Teaching and Teacher Education: An International Journal of Research and Studies*, 28(2), pp. 182-192.
- van Es E.A., Tunney J., Goldsmith L.T., & Seago N. (2014). A Framework for the Facilitation of Teachers' Analysis of Video. *Journal of Teacher Education*, 65(4), pp. 340-356.
- Vannini I. (2012). *Come cambia la cultura degli insegnanti*. Milano: FrancoAngeli.
- Young M.A.C. (1968). Review of research and studies related to health education practice (1961-1966): patient education. *Miscellaneous: Health Education Monographs*, 26, p. 64.



Failure and dropouts

An investigation into the relationship between students repeating a grade and dropout rates in Italy

Federico Batini • Corresponding author - FISSUF department - University of Perugia (Italy) - federico.batini@unipg.it

Marco Bartolucci • FISSUF department - University of Perugia (Italy) - marco.bartolucci@unipg.it

Chiara Bellucci • FISSUF department - University of Perugia (Italy) - chiara.belluccigubbio@gmail.com

Giulia Toti • FISSUF department - University of Perugia (Italy) - giuliatotiunipg@gmail.com

Bocciature ed abbandoni: uno studio sulla relazione fra bocciature ed abbandoni

In this paper we aim to investigate the relationship between school failures and early school leaving. The research objective was to verify, through the analysis of archive data of a sample of two high schools, whether the repetition of a school year somehow influenced early school leaving.

Rather than encouraging students to engage more, repeating a school year has consequences like deterioration in school performance, problems in terms of social adaptation as well as a drop in motivation. What is more it could lead to a reduction in their self-esteem and perceived self-efficacy with respect to the educational path. Results show a statistically significant correlation between number of students who repeated a year and early school leaving, and no correlation between each of them and the number of students enrolled.

Keywords: education, dropout, failures, high school learning

In questo articolo abbiamo voluto investigare la relazione tra fallimento scolastico e abbandono scolastico. L'obiettivo della ricerca era verificare, attraverso l'analisi dei dati di archivio di un campione di due scuole superiori, se la bocciatura, il ripetere un anno scolastico poteva influenzare in qualche modo l'abbandono scolastico.

Piuttosto che incoraggiare gli studenti a impegnarsi di più, ripetere un anno ha conseguenze, come il deterioramento delle prestazioni scolastiche, influisce negativamente sull'adattamento sociale e determina un calo di motivazione, portando perciò ad una riduzione dell'autostima e della percezione di auto-efficacia degli studenti rispetto al percorso educativo. I risultati mostrano una correlazione statisticamente significativa tra il numero di studenti che hanno ripetuto un anno e l'abbandono scolastico precoce, e nessuna correlazione tra abbandono, bocciature e numero di studenti iscritti.

Parole chiave: educazione, abbandoni, fallimento, scuola secondaria di secondo grado

31

studi

Tutto il contributo è frutto di un lavoro comune. I paragrafi possono, tuttavia, essere così attribuiti: Bellucci Chiara §§ 3, 4,9; Giulia Toti § 1; Marco Bartolucci §§ 2 e 5; Federico Batini §§ 6, 7,8.

Failure and dropouts

An investigation into the relationship between students repeating a grade and dropout rates in Italy

Introduction

1. Early school leaving

Early school leaving is a complex phenomenon, which was for years considered a “social emergency”. This term generally refers to the dissipation of intelligence and potentials within school education (recorded, for example, through repetitions), but even the so-called “dropouts” are included in the statistics of early school leaving.

Who are these guys?

The term “drop-out” is of Anglo-Saxon origin and literally means “pushed out”, “dropped out”, “let go”: the dropouts are youngsters who did not complete education or training and therefore did not achieve a formal certification. More specifically, Batini (Batini, 2014), taking Morrow (1986), states that they can be divided into five categories:

- push-out: students not supported by school;
- disaffiliated: students who do not feel attached to school;
- educational mortalities: those who fail to complete their studies;
- the capable drop-out: students with outstanding capabilities, who are nevertheless unable to adapt to the demands of school;
- students who leave school only for a short period (stop-out), and then falling.

Today, the term “drop-out” also relates to the more general phenomenon of the early leaving, which refers to the dispersion of possibilities and potential of subjects who, despite failures, complete education. The Italian word “*dispersion*” is derived from “*dispergere*” (consisting of “dis” and “*spergere*”, to scatter), which brings to mind littering things here and there at random but has acquired the meaning of “*disperdere*” (composed of “dis” and “*perdere*”, to lose), which somehow refers to the meanings of the verbs “to separate”, “to divide”, “to dissipate” and “to squander” (Benvenuto, 2011; Ministry of Education, 2000).

In the process that leads a person to make the decision to drop out of school a whole series of factors can come into play and, combined with each other, too often they have a negative influence. As a result, in Italy, in 2012/2013, the 17.6% of students left school without a qualification in upper secondary education (Eurostat, 2014; Batini, 2014; ISFOL, 2014; Istat, 2014). This is a very alarming figure, which leads us to reflect on the responsibilities that the various “parts competitors” have in determining such a phenomenon. In the European context, the indicator used to estimate the early school leaving is the one relating to the *early leaving from education and training* (ELET): youngsters aged between 18 and 24 years, who do not progress further than the lower secondary education¹. The goal set by the Europe

1 More in detail, the numerator of the indicator refers to people aged between 18 and 24 years who meet the following two conditions: (a) the highest level of education or training

2020 Strategy is to reach the target of 10% of ELET; according to the 2016 Eurostat data, Italy is at the bottom among the EU-28 States (just better than Portugal, Romania, Spain and Malta) with 13.8%, as against an EU-28 average of 10.7 % (Eurostat, 2017). Although the percentage of ELET is generally decreasing (in 2011 the EU-28 average was 13.4% and in Italy 17.8%, whereas in 2007 they were respectively 14.9% and 19.5%), a relatively large number of youngsters aged 18-24 has no educational qualification (higher than the lower secondary education).

Moreover, among the Italian regions there is a strong variability in the ELET rate: for example, the Veneto region has already exceeded the European goal with its 8%, while Sicily and Sardinia are at about 24 % (Eurostat, 2017). Even in the OECD countries, in 2016, there was a general improvement, as an average percentage of 16% of young adults (that means aged between 25 and 34 years) had not progressed further than lower secondary school, while in 2000 the percentage was 25% (OECD, 2017).

2. The causes of the phenomenon

As already mentioned, school dispersion cannot be traced back to a single cause, because it includes different problems; focusing just on the causes of abandonment, we could say that they are divided into four main groups:

- Subjective causes (students' psychological characteristics, as for example the attitudes to fail, resistance to the school context, disengagement etc., mainly related to aspects of personality, such as the need for autonomy, independence, disorientation...). A research conducted by Alivernini and Lucidi in 2011, on a sample of 426 children, showed that those students who had a better perception of their abilities also had higher self-esteem and motivation to study. These perceptions of effectiveness, also resulted in a very positive attitude related to school performance and seemed to decrease the likelihood of abandonment (Alivernini, Lucidi, 2011);
- Socio-cultural causes (cultural poverty of the student's family, which leads them to have very few expectations of school and its educational attainment): a study conducted in 2003 in Norway and the United States on a sample of 1,637 students, found that in Norway youngsters whose parents had a low level of education were more likely to leave school, in a percentage two times higher than those who had graduated parents, while in the US this chance turned out to be more than four times (Lundetrae, 2011). Another research dating back to 2005 by Petrucci on a sample of 1,511 students shows that the socio-cultural factor plays a decisive role: the lower was family education, the less appears to be the motivation to study and the willingness to continue (Petrucci, 2005);

ning that they have completed is 2011 ISCED (International Standard Classification of Education), levels 0, 1 or 2 (1997 ISCED levels 0, 1, 2 or 3C short) and (b) they did not receive any education or training (in other words neither formal nor non-formal ones) in the four weeks before the survey. The denominator is the total population of the same age group, excluding the respondents who did not answer the questions about "the highest level of education or training successfully completed" and the "participation in education and training" (Eurostat, 2017).



- Socio-economic causes (correlation between socio-economic conditions of students' families as well as their academic performance and the overall duration of their course of study): according to a survey carried out in Georgia in 2011, on a sample of 5130 school students, among children who had dropped out of school, the socioeconomic status of the family had a profound influence on their decision (Bradley, Renzulli, 2011). Another study in Ghana and Tanzania in 2010 has further shown that groups of marginalized or economically disadvantaged children are most at risk of dropping out, because of the stronger pressures pushing them to seek work since an early age (Sabates, Akyeampong, Westbrook, Hunt, 2010);
- Educational causes (factors related to school and its functioning: for example the way teaching and learning are organised, interpersonal relationships developed at school, etc.): a deep research carried out in 2012 in Turkey on a small sample of 25 dropouts, found that the main reasons that pushed them to leave their studies were school failure, the dislike of their study subjects (because they were considered not very adherent to their interests nor useful for their future work) and poor relationships with teachers (Bayhan, Dalgic, 2012). Another research that goes in the same direction is the one conducted by Trincherro and Tordini in 2011 on a sample of 2,156 pupils: the students' story often revealed the discomfort of not being understood by teachers thus having negative relationships with them, what can quickly lead to "dispersion" (Trincherro, Tordini, 2011).



3. How Action is needed

In view of this multiplicity of factors that interact with each other, resulting in an increased likelihood of dropping out of school by students who are already considered "at risk", there is a need for an integrated action among all those involved, even by emphasizing the important role of school in the recognition of the internal causes as well as in making sure that these are removed. Consequently, it is undeniable the need for a systematic and integrated approach – into the school system and between schools and territory – through formal, non-formal and informal learning. This means an approach leading to a school system able to recognize and value each person, promoting the development and growth with appropriate interventions within specific contexts, that answer to families' expectations and, above all, to the characteristics of people involved (Benvenuto, 2011).

In order, to fully participate in society and establish themselves as individuals and active citizens, young people need a broad range of knowledge and skills. Education and school are essential tools for the personal development, for a greater integration and social development of the sense of responsibility and initiative. That is why it is necessary to implement measures allowing to cope with the problem of early school leaving, although in the last decade dropout rates have steadily declined.

Policies against early school leaving should focus on prevention, intervention and compensation.

Prevention aims to avoid the occurrence of factors that can lead youngsters to leave school.

As the authors say in the cited research (Batini, 2014; Benvenuto, 2011; Trincherro, Tordini, 2011), in order to reach these goals we should:

- Increase participation in early childhood education, which has been recognized as a good way to reduce the likelihood that they will drop out of school in future;
- Ensure linguistic support to those children and young people from immigrant families, as well as an effective integration policy, also in order to promote acceptance of ethnic and cultural differences in schools thus reducing problems of discomfort and facilitating the learning;
- Provide extra-curricular activities for students facing with specific learning disabilities, in order to allow them to develop the skills which are necessary in life; in fact, it was recognized that these specific difficulties (dyslexia, attention deficit disorder, hyperactivity...), connected to all the other issues, make them more at risk of dropping out;
- Increase the permeability of education pathways, combining generic training to professional one;
- Offer consulting services to the parents, because the family environment has a great influence on the educational and social development of children;
- Provide targeted support to those students who are coming from disadvantaged families, for example through scholarships, the opportunity to have free school meals or textbooks;
- Change the increasing educational levels of learner, even by means of active teaching.



These actions would reduce the impact of social inequality and, at the same time, would counter the risk of “ranking” among students. In the already mentioned research of 2010 (Sabates et al., 2010), made in Ghana and Tanzania, we see that lots of measures have been proposed in these countries to reduce dropout rates among economically disadvantaged students: mainly better learning conditions and flexible school programmes (by eliminating the problem of overcrowded classes, making the quality of teaching more effective, adopting an appropriate instruction language ...). They all adopt the policy of automatic promotion and provide several different incentives (free textbooks, lower or free tuition fees, scholarships, health and nutrition supports, solving the problem of nutritional deficiencies and other diseases...), in order to engage families to make sure that they guarantee the participation of their children in school.

Intervention strategies must be implemented to address the difficulties that emerge at an early stage, thus avoiding the early school leaving:

- Improving the classroom environment experienced by children, thus allowing an approach to the study in a stimulating and inclusive way that promotes learning. Positive relationships among peers and between teachers and students are required to engage young people in the learning process and to keep up their motivation to study;
- Providing adequate support to any uncomfortable situation that can occur, in order to help those students who face difficulties in their path (including, for example, taking drugs or alcohol, physical abuse, trauma...);
- Focusing on the support and mentorship of youngsters, based on personalized approaches to learning: in some cases, students take the decision not to finish their education path because they do not consider studying in general, or the subjects studied at school, as relevant elements to their future life. Moreover, everyone is a special case and not all respond adequately to the same teaching method. Therefore, the inadequacy of the school curriculum to the life needs

and to the interests of children appears to be a frequent cause of school failure: a too rigid and uniform education system makes it difficult to customize school work according to individual needs and the connection between education and the daily needs. Faced with this awareness, there is a need for a flexible and personalized approach: schools should leave the traditional methods of teaching, by renewing and diversifying programmes, expanding the range of educational options offered to students. Active teaching methods (movies, workshops, music...) and extra-curricular activities (sports, theater...) are fundamental to involve, encourage and motivate young people in their learning process and, thus, the so-called “school of skills”, pointing to the transversal nature of knowledge and strengthening those skills required to master the life, should be a primary objective to be pursued;

- Providing effective guidance in the school path: during their training, students need to understand what they are interested in, their expectations and their skills and it is very important that they are continuously supported, through guidance activities, in this process of becoming aware.
- Offset strategies, trying to reconnect those who dropped out of studies and to get them back into the paths of education and training; they represent a second chance. In this perspective, the approaches used in second-chance schools will necessarily have to be very different from those used in traditional schools, by focusing on the problems that led these guys to leave school and offering an appropriate learning environment, able to help them to regain self-confidence. Depending on the expectations and motivations, programmes are very flexible, lasting from a minimum of three months to a maximum of one year. They are based on teaching methods and advice and support alternatives, being much more personalized and modeled on the specific needs of each student (Benvenuto, 2011; European Commission, 2011; Honeyball, 2011).



On the other hand, it has been repeatedly demonstrated how programmes too much based on face to face lectures and with an unconditional allegiance to the content – other than not involving students – are not able to give them that motivation and that interest in the study, that should be the “main strengths” in any training. Moreover, as already explained, a teacher-student perceived as insignificant, a negative school environment and many other factors can be the causes of an increasingly pressing discomfort, leading students to alienate and to drop out of school. Many studies so far have highlighted the importance of experimenting new approaches of teaching and managing the class, especially interventions that uses active learning, authentic tasks, narrative guidance and a part of reading intervention. Results show improvements not only in learning achievement, but also in the empowerment of different cognitive (Batini et al., 2017) and psychological dimensions such as motivation and learning strategies (Batini et al. 2018). Changing the goals and involving students in defining their own learning goals, has been proved to be effective in preventing early school leaving (Batini et al 2017).

4. Failure: a failure for whom?

Along with all these factors, another one shown by the analysis of the correlation coefficients, has a strong influence on students, demotivating and depriving them of their self-esteem and self-confidence and, consequently, increasing the proba-

bility of not completing their education: the rejection.

It is one of the most controversial education policies: some argue that it is beneficial, others, however, state that its consequences are so bad as to be considered harmful to students. In many countries, repeating a school year is seen as a corrective action, which gives students with poor school performance the opportunity to achieve better learning outcomes. In other countries (such as Korea, Norway and Japan), the rejection is not considered a viable policy to tackle the insufficient student achievements. Thanks to the policy of “social promotion”, all students are promoted to the next grade regardless of their academic performance, providing additional learning opportunities to young people most in need (Brophy, 2006).

First, analyzing this policy from a social and economic perspective, we could say that it is a waste of resources for society, since it implies high costs: thanks to a study carried out in 2011 by the OECD, it is seen that costs of failure represent 10 to 12% of total expenditure on primary and secondary education in Belgium, Spain, Netherlands and Portugal and 5-10% in Brazil, Germany and Italy (Ikeda, García, 2013; Ikeda, 2011).

Focusing on a micro-level analysis, a series of research has shown how rejection leads students to have lower academic performance and cause a reduction in self-esteem, self-confidence and motivation to study. In a single expression, the repetition of a school year leads students to be alienated from school and rejected students are much more likely to abandon the educational institution (Ikeda, García, 2013; Brophy, 2006).

This is revealed, for example, by interviews conducted over the past year to 67 drop-out youngsters: almost all of them have made the decision to leave school after rejection (Batini, 2014).

Another study relating to these negative consequences has been conducted by the OECD in 2013 on a sample of 470,000 students. This research showed that, in many of the countries examined, the students who repeated a school grade tended to have a more negative view of school in comparison with youngsters who did not fail (Ikeda, García, 2013; Ikeda, 2011).

It is important to pay attention to the fact that students with disadvantaged socio-economic background or belonging to ethnic minorities are more involved in repetitions of a school year, so that in addition to the negative effects on the individual, involving problems at the level of fairness of system, it strengthens social inequalities. Among OECD countries, data show that disadvantaged students are, on average, 1.5 times more likely to be rejected than advantaged students who have the same educational attainment of the first ones (Avvisati, 2014).

An OECD report, published in September last year and entitled “Are disadvantaged students more likely to repeat grades?”, underlines the effects of failure on the student’s educational path, pointing out that this practice increases the probability of dropping out and how this applies, in particular in case of disadvantaged students, thus perpetuating and increasing social inequality. Data derived from the results of PISA 2012, regarding failure rates in the OECD countries, tell us that the 12% of old students has been rejected at least once in their compulsory school path and that the equivalent figure in Italy is 17.1%; This shows that rejection is still the most widely used practice to tackle underachievement, despite many researches have shown the negative effects it may cause.



5. Materials and methods

The paper presents an empirical research carried out within the territory of Gubbio (with the collaboration of two schools – ITIS “Cassata Gattapone”² and High School “G. Mazzatinti”³), which analyzes the relationship between repeated grades and dropouts in these two upper secondary schools.

The specific objective of the research was to verify, through the analysis of archive data, if the rejection somehow influenced ESL. Through a series of interviews, they have been compared the opinions of teachers, pupils and students with high academic performance relating to the “usefulness” of the rejection and its consequence on the phenomenon of school dropouts.

The initial assumption was that there is a significant relationship between repeating the year and dropping out of school. Rather than encouraging students to engage more, the rejection has consequences as the likely deterioration in school performance, or problems in terms of social adaptation (it has been shown that this practice mostly affects the socio-economically disadvantaged youngsters, or those belonging to ethnic minorities). It also discourages students, by dropping their motivation to study and leading to a reduction in their self-esteem and in the perceived self-efficacy with respect to the educational path.



- 2 The ITIS “Cassata Gattapone” in Gubbio includes three different schools: the Commercial Institute, the Professional Institute and the Technical and Experimental Institute. In this research we used exclusively the archive data related to the Industrial Technical and Experimental Institute, which gives the opportunity to the students to choose from seven fields of study: mechanical, electronic, urban, linguistic, biological, computer and agriculture. Data presented are total and refer to students who have registered, that have been rejected and who have dropped out of school in relation to all fields of study of the Institute. Over a period of ten school years (since 2004/2005 to 2013/2014), the total number of students who are enrolled in the various fields of study is 2405; among them, the guys who have left school are 285, an 11,85% of the enrollments. By analyzing data on specific failures, it was possible to calculate that students who have been rejected are 456, since that corresponds to 18.96% of the total number of enrolled students. Finally, school leaving occurred as a result of one or more repeated grades is 192, so that the failed students who have graduated in the ten years correspond to the 42.11% of all students who experienced to repeat years.
- 3 Liceo “Giuseppe Mazzatinti” in Gubbio offers four fields of study: scientific, humanities, the school of human sciences and the art school. The data presented in this paper are total, therefore relate to students registered, rejected and who have left school without obtaining a diploma related to all the four above mentioned fields of study. In the ten year period, from 2004-2005 to 2013-2014 (the last full year for which data were available), the total number of students who are enrolled in the various fields of study is 2209; among them, always having ten years as reference period, school dropouts (leaving aside, for now, the reflection on the students who have left school after one or more failures) are 181, since it corresponds to the 8,19 % of all the enrolled students. Focusing, then, on the rejection, figures show us that the total number of repeating students, one or more times, in ten years of schooling is 198, a number that corresponds to the 8,96% of all the students enrolled. Now, it seems useful to focus on the percentage of students who left school after repeating, during the ten years, and compare it to the percentage of early leavers in the total of enrolled students. In particular, with the data available it was possible to calculate that the school leaving occurred after one or more failures are 91, corresponding to the 45,96% of the total of students who repeated a grade.

For the first part of the research, made by the analysis of archive data, it was necessary the collaboration of the schools that participated in the research. In particular, they were asked to provide access to quantitative data regarding the last ten school years (since 2004-2005 to 2013-2014). The queried data are the following:

- How many students are enrolled each year in that class;
- How many students, among the ones enrolled, have dropped out of school (also including missed frequencies);
- How many students have been rejected every year, and in that class;
- How many failed students are enrolled back in school / those who did not enroll / those who have kept the registration but then did not attend;
- How many failed students have graduated.

Working on the data obtained, through an analysis of the correlation coefficients, it was possible to determine whether, during the ten years, the rejection has or has not affected school leaving.

The second part of the research consists of a series of semi-structured interviews to students who have already experienced rejection, students with high performances and teachers.

As for the students, the focus has been primarily placed on the difficulties that they faced during their educational path, on the reasons that caused the failure as well as on the effect that this practice has had on them. In the case of the high performance students, interviews focused on the reasons that led them to study and to work as well as on their vision of school, study and rejection in general. Interviews to teachers, however, have focused on their thinking about rejection, its effects and its usefulness or not and on their work experience.

To be more specific, we report here the interviews' generic areas of interest.

- Rejected:

- Personal information;
- Previous and current schooling;
- Reasons that led them to choose the secondary school;
- Reasons for the failure and the effect it has had on them;
- Opinions on the rejection and the traditional school;
- Social and emotional;
- Hobbies and interests;
- Personal future.

- High performance:

- Personal information;
- Previous and current schooling;
- Reasons that led them to choose the secondary school;
- Reasons that led them to study and engage in school and difficulties faced;
- Opinions on the rejection and the traditional school;
- Social and emotional;
- Hobbies and interests;
- Personal future.

- Teachers:

- Personal information;
- Work experience;



- Relationship with students and their families;
- Opinions on the reasons of failure at school;
- Opinions on the rejection;
- Opinions on their work and on traditional school.

For the analysis of the interviews, which aims to highlight the celebrations and the different opinions on the “usefulness” of the rejection, it was useful to rely on the technical construction of response categories and to quantify them.

The 80 interviews were divided into: 20 to the teachers, 30 to high school performance students and 30 to rejected students/rejected students who have dropped. All the research participants came from Gubbio (or neighboring cities, like Gualdo Tadino, Cagli or Umbertide), attending (having attended) school in proximity of Gubbio.

6. Results



In the two schools, longitudinally investigated, the overall figures are shown in the tables below and already allow a first representation of the phenomenon. It is sufficient to check how the dropout rate is multiplied by 4.5 times by considering only those students who have repeated a school grade once or more:

		PERCENTAGE
TOT. ENROLLED STUDENTS GENERAL	2209	8,19%
TOT. GENERAL DROPOUTS	181	
		PERCENTAGE
TOT. ENROLLED STUDENTS GENERAL	2209	8,96%
TOT. FAILED STUDENTS	198	
		PERCENTAGE
TOT. FAILED STUDENTS	198	45,96%
TOT. DROPOUTS AFTER FAILURE	91	

Tab.1: IIS Mazzatinti: percentage of total abandonment of students enrolled in the ten years; percentage of rejected students enrolled in the ten years; percentage of dropouts in ten years.

		PERCENTAGE
TOT. ENROLLED STUDENTS GENERAL	2405	11,85%
TOT. GENERAL DROPOUTS	285	
		PERCENTAGE
TOT. ENROLLED STUDENTS GENERAL	2405	18,96%
TOT. FAILED STUDENTS	456	
		PERCENTAGE
TOT. FAILED STUDENTS	456	42,11%
TOT. DROPOUTS AFTER FAILURE	192	

Tab.2: ITIS Cassata-Gattapone: percentage of total dropout students enrolled in the ten years; percentage of rejected students enrolled in the ten years; percentage of dropouts in ten years.

To test the correlation coefficients between the variables of the tables above, we longitudinally analyzed them in the ten years. The results, in the figures below, show an absence of correlation between the variables related to enrollments vs. and the failures of the total enrollments vs. the total number of dropouts, for both schools analyzed separately, and show a statistically significant correlation (IIS G. Mazzantini: $r=.651$, $p<0.05$; ITIS Cassata Gattapone: $r=.893$, $p<0.001$) for what concerns the variables total rejections vs. dropout of failures.



Total number of students enrolled vs. Number of students who repeated a grade

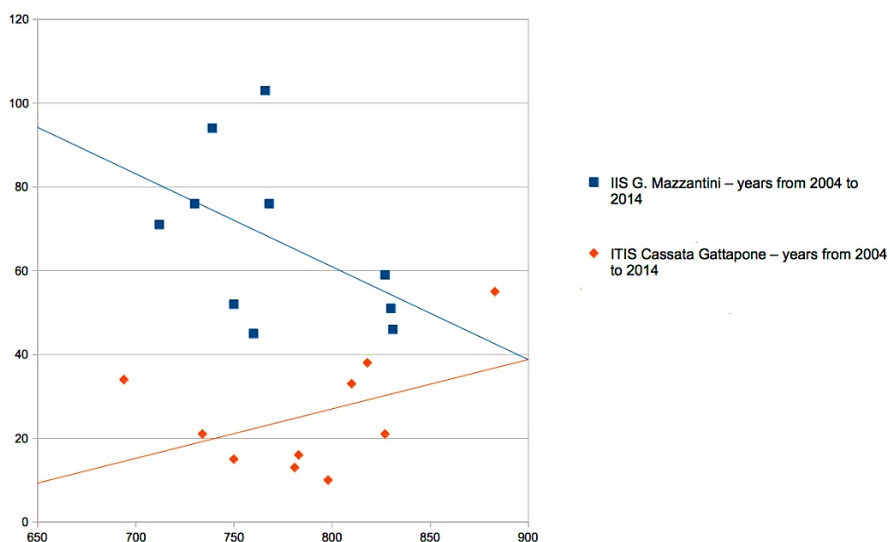


Fig. 1: linear regression of the total number of students enrolled vs. students who repeated a grade from 2004 to 2014

Total number of students enrolled vs. Number of students who left school

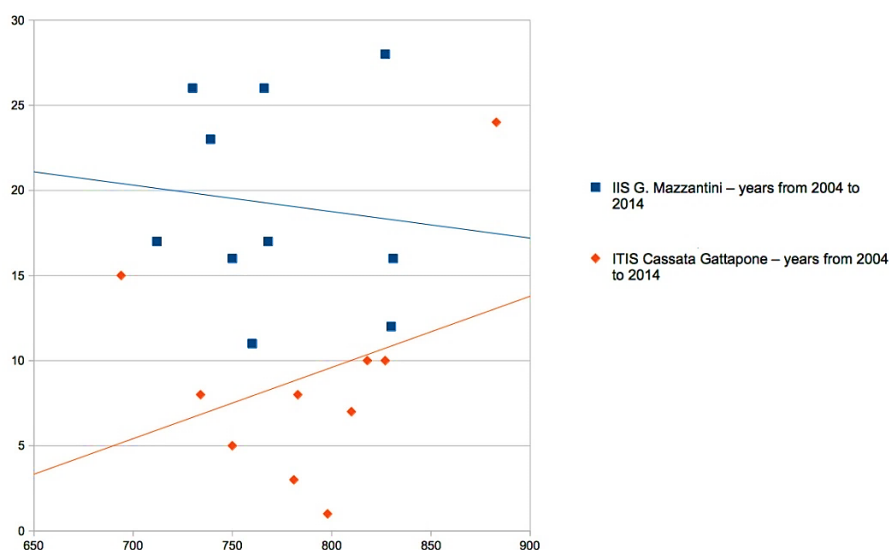


Fig. 2: Linear regression between the total number of students enrolled and the number of students who left school



Number of students who repeated a grade vs. Number of students who left school

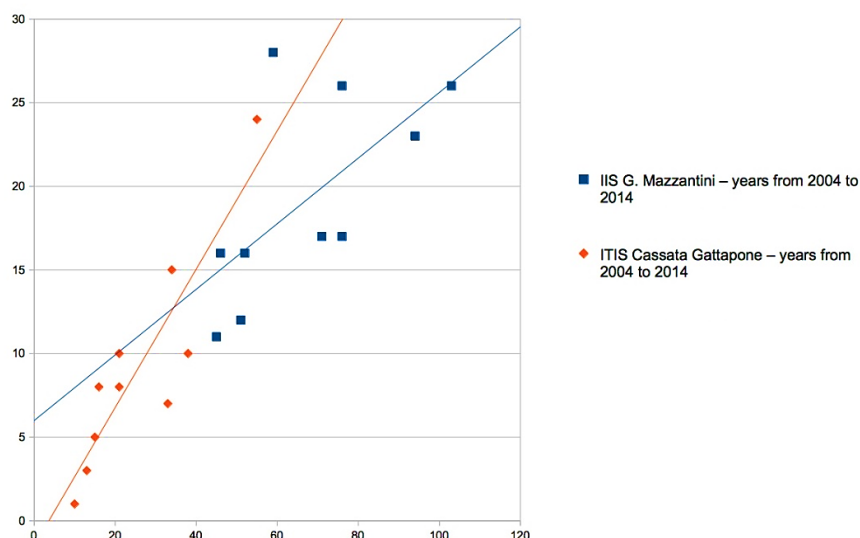


Fig. 3: Linear regression showing significant correlation (IIS G. Mazzantini: $r=.651$, $p<0.05$; ITIS Cassata Gattapone: $r=.893$, $p<0.001$) between the number of students who repeated a grade and the number of students who left school.

Qualitative in-depth analysis.

The qualitative analysis is here represented in a synthetic way, as for quantity, in order to facilitate the understanding of the different opinions of the three categories of subjects interviewed:

	School subjects	Teachers	Didactics	Rejection
HIGH PERFORMANCE STUDENTS	<ul style="list-style-type: none"> - What I study can be useful in my life (15 subjects); - Not everything I study could actually be useful in my life (15 subjects). 	<ul style="list-style-type: none"> - Not all the teachers are helpful (16 subjects); - Teachers are helpful (14 subjects). 	<ul style="list-style-type: none"> - An interactive lecture is more stimulating (23 subjects); - I prefer a face to face lecture (3 subjects); - There would be a need of both interactive and face to face lectures (1 subject). 	<ul style="list-style-type: none"> - Rejection can motivate students to study (13 subjects); - Rejections demotivates students (2 subjects); - Rejection demotivates, motivates, or is irrelevant for students according to their personality (15 subjects).
REJECTED STUDENTS	<ul style="list-style-type: none"> - What I study can be useful in my life (9 subjects); - Not everything I study could actually be useful in my life (14 subjects); - What I study cannot be useful in my life (7 subjects). 	<ul style="list-style-type: none"> - Not all the teachers are helpful (13 subjects); - Teachers are helpful (16 subjects); - I do not like any of my teachers (1 subject). 	<ul style="list-style-type: none"> - An interactive lecture is more stimulating (27 subjects); - I prefer a face to face lecture (1 subject); - There would be a need of both interactive and face to face lectures (2 subjects). 	<ul style="list-style-type: none"> - Rejection motivated me (15 subjects); - Rejection demotivated me (9 subjects); - Rejection demotivated me but then it motivated me (6 subjects).
TEACHERS				<ul style="list-style-type: none"> - Rejection does not motivate students to study more (4 subjects); - Rejection motivates students (10 subjects); - Rejection demotivates, motivates, or is irrelevant for students according to their personality (18 subjects); - I am opposed to rejection except for when it is necessary (8 subjects).



Tab. 3: High performance students, rejected students, teachers: comparison of opinions

From this first table we can see important differences in motivation between high-performance students and youngsters who have already been rejected at least once. The differences can be seen in evaluating the importance of what is studied at school, even if rejected students are those who consider their teachers more helpful. This figure, however, is different with respect to the following table, in which the 77% of rejected students state that they did not receive any support from school. The appreciation for the face to face lecture, which is still nowadays the most used, indicates a remarkable difference and can represent, as for the studies on the learning outcomes, one of the causes of a lower school performance of students who have been rejected at least once. One third of the rejected students says that was demotivated by the rejection, while one fifth consider it as the cause of an initial demotivation which then became a motivating element. Half of all repeaters (probably having internalized what they listened to from adults) attribute a motivating function to rejection, while “only” 37% of those with a high performance agree.



It is very interesting that only the 13% of the high performance students considers rejection as demotivating, while percentage of teachers who consider it useless (unless really needed) is 20%.

Although the percentage of teachers who believe that rejection gives motivation is a minority (25%), it is still widely practiced. On the other hand, a similar percentage (45% and 47%, respectively) of teachers and students with a high performance considers repeating a school grade to be stimulating or demotivating according to the personality of the students.

It is significant that this does not suggest, at least for teachers, something consistent with the consequences. There is a high degree of agreement among all youngsters, although with a much higher percentage for students who have already repeated a school grade, on the need for interactive lessons, in which students can play an effective role as protagonists, make choices, have responsibility, perceive a relationship between their commitment and the achieved results.

	Support by the school	School and study	How to motivate students	Parents
HIGH PERFORMANCE STUDENTS	<ul style="list-style-type: none"> - A support for students in difficulty can be useful (16 subjects); - A support for students in difficulty can be useful only when students themselves understand that studying is important (14 subjects). 	<ul style="list-style-type: none"> - Study and school are useful and important (30 subjects). 	<ul style="list-style-type: none"> - Teachers can motivate students by supporting them and showing their passion for the job (11 subjects); - Teachers can motivate students through a more interactive didactics (16 subjects); - Teachers can not motivate students (3 subjects). 	<ul style="list-style-type: none"> - My parents did not complete their studies (11 subjects); - My parents completed their studies at school / at university (19 subjects).
REJECTED STUDENTS	<ul style="list-style-type: none"> - School did not give me support (23 subjects); - School gave me support (7 subjects). 	<ul style="list-style-type: none"> - Study and school are useful and important (24 subjects); - Study and school are useful but there is something more important (6 subjects). 	<ul style="list-style-type: none"> - Teachers can motivate students by supporting them and giving them confidence (9 subjects); - Teachers can motivate students through a more interactive didactics (20 subjects); - Teachers can not motivate students (1 subject). 	<ul style="list-style-type: none"> - My parents did not complete their studies (20 subjects); - My parents completed their studies at school / at university (10 subjects).
TEACHERS	<ul style="list-style-type: none"> - As a preventive measure, school adopts several strategies (38 subjects); - As a preventive measure, School does not really support students in difficulty, as it should do. (2 subjects). 		<ul style="list-style-type: none"> - In order to motivate students, it is adopted a more interactive didactics (16 subjects); - In order to motivate students, we try to make them understand how much is useful in life what they study (6 subjects); - In order to motivate students, we support relationships and foster their sense of responsibility (12 subjects); - Motivating students is not easy at all (6 subjects). 	

Tab. 4: High performance students, rejected students, teachers: comparison of opinions



The main motivational factor on which teachers can intervene is considered to be the didactic one to a greater extent in comparison with the relational one. The confidence and tranquility conveyed by teachers are important motivational factors for those who have already experienced rejection, perhaps because they have experienced anxieties and lack of confidence in their path. For high-performance students, however, the second motivational factor that teachers can influence is the involvement through the passion for their discipline.

This last factor reveals how for high-performance students the disciplinary approach and the passion for the contents is an important factor, which could perhaps help to explain their success in an eminently disciplinary school and still, despite all the normative changes, anchored to the contents.

According to the teachers (40%) there is already a more interactive teaching which, in their opinion, has not the aim of conveying learning in the correct way (real learning is not conceivable without the involvement of learning subjects) but a purpose of motivation to study. According to 35%, the important factors are the relational dynamics, especially those that empower the areas in which it is possible to intervene, while 15% indicate their powerlessness to intervene in the motivation factors of their students.

High performance pupils think that some kind of support is useful, but for half of them it is true only if pupils involved are aware of the importance of studying. As many as the 95% of the teachers interviewed also believe that school operates sufficiently and with different strategies in a preventive perspective and these data reveal, as a whole, the difference in perception. Repeating students perceive that they have not received support.

There is a certain difference of opinion with respect to the usefulness of schools: 100% of high-performance students consider studying and school as useful and important, compared to 80% of peers who repeated school grades. In 20% of cases, although they consider school as important, they believe that there are more important things.

Finally, as it was to be expected, the percentage of parents with a high level of education is much higher among high-performance students and this is in line with the literature on the subject, with the opinions expressed by the two categories of pupils and with the “recognizability” that is rewarded by the education system. 63% of high performance students children have parents who have completed higher education or have a university degree, compared to 27% of repeaters.

Discussion

At the “G. Mazzatinti” High School, over ten years, the total number of enrolled students is equal to 2209, the corresponding quota for the “Cassata Gattapone” (ITIS) Industrial and Experimental Technical Institute was 2405: in the latter school, the general dropouts were more than those occurred in the High School, with percentages corresponding, respectively, to 11.85% and 8.19% of the total enrolled students.

At ITIS, over ten years, there was a quota of 456 rejected students, corresponding to 18.96% of enrolled students, compared to the number of students rejected in the other school which was 198 (8.96% of the total number of enrolled students), much lower than the one recorded at ITIS. It is obvious to attribute this difference to the pre-selection that occurs with the choice of the upper secondary school where only students with high performance tend to enroll in the High School (according to the old conception of the High Schools).



The percentage of students who dropped out of school after having been rejected once or more was slightly higher at high school, despite a much higher rejection rate at ITIS. In particular, there were 91 boys who attended High School and who, after being rejected, did not complete their education, whereas 192 attended ITIS and took the same decision not to complete their studies. These figures, if compared, respectively, to the number of students rejected in the two schools, give rise to slightly different percentages: at high school, 45.96% of pupils rejected in ten years did not complete their education path, while the corresponding percentage for ITIS is 42.11%.

An explanation for the fact that at ITIS, even though the rejection rate was much higher than at the High School, a lower proportion of pupils who were rejected left school in the course of ten years could perhaps depend on the location of the rejection and on the mentality of the students rejected: a rejection for them could perhaps be considered part of the school curriculum, without however definitely compromising the final outcome. An influence could be constituted by the fact that the students themselves consider the rejections at High School more devaluing and more demotivating, also because they are concentrated in the initial classes, often with an explicit goal of selection. The rejection in the first two classes, at High School, could be interpreted as an indicator of the own inadequacy to the type of course attended.

Nevertheless, reflecting on these data represented in the graphs, it can be seen that over ten school years, about one in two repeating students in both schools has dropped out.

Classes with more than one rejection differ from institution to institution: at the High School more repetitions were recorded in the first and second school years, while at the ITIS this figure is higher in the third classes than in all the others.

Finally, if in recent years the rates of rejection related to high school have decreased, going from a 4.90% of students rejected in the school year 2004/2005, to a 4.07% in the year 2010/2011, and finally between 1% and 2% in the following years, the corresponding figures for the ITIS show a completely different situation: the rejection rates in relation to the total number of students enrolled are relatively high in all the years considered, going from 9.90% of students rejected in 2004/2005, to 13.45% in 2010/2011, and ending up between 5.54% and 10.41% in all the other years considered.

Results relating to the lack of correlation between enrolled students and rejection seem to indicate that a “quota” of repetitions is in some way, even if not explicitly or not consciously, “fixed” in such a way as there are actually no significant reductions as the number of students decreases or significant increases as the number of enrolments increases. The same dynamics occur for the abandonments. In this second case, however, the relative constancy of the abandonments can only be explained through the influence of another variable represented, in fact, by the repetitions.

The initial hypothesis is therefore confirmed by the statistical significance: the repetitions have an extremely strong effect on the increase of the chances of abandonment.

As it can also be seen from the data represented in the graphs above, the two Institutes have different characteristics. The analyses conducted separately, however, reveal the presence of the same trend with regard to the relationship between rejection and abandonment, strengthening the significance of the data.

The discussion of the data, therefore, shows an undoubted correlation between



rejection and abandonment, but how does rejection affect the probability of abandonment?

Since we do not have additional data with respect to the students whose careers have been examined, in the archive, we can not verify, for example, any relationship between their origins (family income, parents' level of education) and the effect of rejection on actual abandonment, even if the reference literature allows us to hypothesize a role in this regard.

The qualitative micro insights, especially if related to previous studies on youngsters who have actually abandoned (Batini, 2014), make us assume the intervention of other variables: one of these is certainly the demotivation, many students indicate the rejection as “decisive” with respect to their school leaving (Batini, 2014; Batini, Bartolucci, 2017). Moreover, the qualitative insights of this survey show an effective relationship between the loss of motivation caused by rejection and the actual choice of leaving school. Interviews conducted with dropouts (Batini, 2014) show significant elements in the relationship with their teachers: “no one has looked for me”, “in my opinion some teachers were happy when I dropped out” and similar phrases are evidence of a difficulty (Batini, 2014), confirmed by the qualitative micro analysis where 12 students out of 30 claim that teachers are not helpful. It would obviously be interesting to investigate this aspect, by collecting a series of data in a longitudinal way, mainly in order to verify the effect of variables on the different initial conditions of students and then following their careers.



Conclusions

The data collected in a specific territory therefore deserve an in-depth study, relating to a wider sample. It is not difficult, however, to conclude how the existence of a strong causal relationship between repetition and abandonment and the very significant presence of children from a situation of socio-cultural disadvantage among the repeaters, determines a situation in which the rejection ends up for them a contribution to the social immobility, confirming the results of international investigations already mentioned.

Despite a lot of research that, as we said, sheds light on the purely negative effects of rejection, still many teachers believe that it can be a good method to make classes more homogeneous (in learning) and to motivate students with poor school performance to apply their potential more, so as to achieve, in this way, better results in school. The cause of the consolidation of these ideas among teachers depends, perhaps, on their personal experience at school: the rejected students will have to attend the same class again, along with the same teacher, who will see the temporary advantages that the rejection has brought in terms of performance, without worrying, however, what happens in subsequent years, when the rejected children are faced with new issues to study and their school performance becomes even lower than it was previously (Brophy, 2006).

It is therefore evident how the rejection becomes a real system of social selection in the educational path. In particular, in the first two years of the upper secondary school, coinciding with the last two years of compulsory school in Italy, the rejection takes on a particular importance because it becomes a motivation to “choose” not to continue their studies. On the other hand, field research has shown, in line with what rejected students in particular have said, how active teaching and specific methods are able to increase students' learning outcomes. It is time,

therefore, to reflect on the function of repetition of school years and on the real meaning of compulsory schooling. When a country defines a compulsory length of education, everyone must be guaranteed the same learning opportunities. The diversity of the upper secondary education pathways and the use of rejection as a tool for “levelling” classes do not seem to go in this direction. In modern education systems, where the need to define learning outcomes and their certification is increasingly stressed, rejection cannot be the system that defines different outcomes. Students who do not achieve certain learning objectives may recover them later or may not receive certification of their learning objectives. The definition of an equal path with respect to any condition, repeating in full one year, cannot be logically integrated with an approach centred on the learnings.

When Don Milani claimed the injustice of the rejection, he warned against rejecting, excluding and humiliating the students: helping them to overcome the difficulties they faced could be a much better way of coping with poor school performance and of preventing the school from becoming, as he himself said, “[...] a hospital that treats the healthy people and repels the sick one” (Scuola di Barbiana, 1967, pp. 20). What has been analyzed in this research leads us, unfortunately, to conclude about the absolute modernity of Don Milani’s metaphor.



Riferimenti bibliografici

- Alivernini F., & Lucidi F. (2011). Relationship between social context, self-efficacy, motivation, academic achievement, and intention to drop out of high school: A longitudinal study. *The Journal of Educational Research*, 104(4), pp. 241-252.
- Avvisati F. (2014). *Are disadvantaged students more likely to repeat grades*, PISA in Focus - OECD 2014.
- Bayhan G., & Dalgiç G. (2012). *School dropout according to the views of high school leavers*. *Studies*, 13(3).
- Batini F., Bartolucci M., & De Carlo E. (2018). I Feel Good at School! Reducing School Discomfort Levels through integrated Interventions. *Athens journal of education*.
- Batini F., Bartolucci M., & De Carlo E. (2017). *Fight Dispersion Through Education: The Results of the First Cycle of the NoOut Project*. *Mind, Brain, and Education*.
- Batini F., & Bartolucci M. (2017). *Dispersione scolastica. Ascoltare i protagonisti per comprenderla e prevenirla*. Milano: FrancoAngeli.
- Batini F. (a cura di, 2015). *OCSE “Skills Outlook 2013. Primi risultati della ricerca sulle competenze degli adulti”*. Torino: Loescher.
- Batini F. (2014). *Drop-out*. Fuori|onda.
- Batini F., Bartolucci M., Paper or Facebook? An experiment on the comprehension of texts with a group of dropouts. *Form@re - Open Journal per la formazione in rete*, [S.l.], v. 15, n. 1, pp. 40-48, apr. 2015. ISSN 1825-7321. Estratto da: <<http://www.fupress.net/index.php/formare/article/view/15433/15117> doi:10.13128/formare-15433>.
- Benvenuto G. (2018). Lesclusione scolastica e la prospettiva di una scuola inclusiva. In V. Biasi, & Fiorucci M. (a cura di). *Forme contemporanee del disagio* (pp.139-166) Roma: Roma TrE-Press. Estratto da: <<http://romatypress.uniroma3.it/ojs/index.php/forme>>.
- Benvenuto G. (2011). *La scuola diseguale. Dispersione ed equità nel sistema di istruzione e formazione*. Roma: Anicia.
- Bradley C.L., & Renzulli L.A. (2011). *The complexity of non-completion: Being pushed or pulled to drop out of high school*. *Social Forces*, 90(2), pp. 521-545.
- Brophy J. (2006). *Grade repetition, International Academy of Education (IAE) and International Institute for Educational Planning (IIEP)*. Education policy series.
- Commissione europea (2011). *La lotta contro l'abbandono scolastico: un contributo decisivo all'agenda Europa 2020, Comunicazione della commissione al Parlamento europeo, al consiglio, al comitato economico e sociale europeo e al comitato delle regioni*. Bruxelles.

- European Commission. Directorate-General for Employment, & Inclusion. Directorate A. (2011). *Employment and Social Developments in Europe*. Publications Office of the European Union.
- Eurostat (2017). *Decrease in 'early school leavers' in the EU continues*.
- Eurostat regional yearbook (2014). Education.
- ISFOL (2014). Audizione dell'ISFOL presso la VII Commissione Cultura, Scienza e Istruzione della Camera dei Deputati in occasione dell'indagine conoscitiva sulle strategie per contrastare la dispersione scolastica, Istituto per lo sviluppo della formazione professionale dei lavoratori.
- Honeyball M. (2011). *Relazione sulla lotta contro l'abbandono scolastico*. Documento di seduta, Parlamento Europeo.
- Ikeda M., García E. (2013). Grade repetition: A comparative study of academic and non-academic consequences, *OECD Journal: Economic Studies*.
- Ikeda M. (2011). When students repeat grades or are transferred out of school: What does it mean for education systems?. *PISA IN FOCUS - OECD 2011*.
- Istat (2014). Noi-Italia 100 statistiche per capire il Paese in cui viviamo 2014, Sistema statistico nazionale.
- Lundetrae K. (2011). Does parental educational level predict drop-out from upper secondary school for 16-to 24-year-olds when basic skills are accounted for? A cross country comparison. *Scandinavian Journal of Educational Research*, 55(6), pp. 625-637.
- Ministero della Pubblica Istruzione (2000). *La dispersione scolastica: una lente sulla scuola*. Roma: MIUR.
- Petrucelli F. (2005). *Psicologia del disagio scolastico*. Milano: FrancoAngeli.
- Sabates R., Akyeampong K., Westbrook J., & Hunt F. (2010). School Drop out: Patterns, Causes, Changes and Policies, *An Education for All Global Monitoring Report*, UNESCO.
- Scuola di Barbiana (1967). *Lettera a una professoressa*. Firenze: Libreria editrice fiorentina.
- Trincherò R., Tordini M.L. (2011). *Responsabilità e disagio. Una ricerca empirica sugli adolescenti piemontesi*. Milano: FrancoAngeli.
- Trincherò R. (2009). "Io non ho paura". "Capire e affrontare il bullismo". Milano: FrancoAngeli.
- Update O.O. (2017). *Organization for Economic Cooperation and Development (OECD)*.

