Active Learning and ICT in Upper Secondary School: A Possible Answer to Early School Leaving

Silvia Panzavolta(✉) and Chiara Laici

INDIRE, Innovation Department,
Via Michelangelo Buonarroti, 10, 50122 Florence, Italy
{s.panzavolta, c.laici}@indire.it

Abstract. The paper outlines the first phase of a three-year research activity on active learning in the core curriculum subject, intended as a possible solution to student disengagement in secondary schools. The paper presents the problem the research intend to attack - school failure, school unsuccess, student disengagement and early school leaving - and describes the context of the research, its originality, and the remedial measures put in place by the research team and policy makers. Among those, Continuing Professional Development (CPD) of teachers and structural measures to involve several stakeholders, including students. Then, the research design is given and the research tools presented, showing what dimensions are investigated. Finally, it provides some preliminary results as for one of the four qualitative case studies being carried out and future research perspectives.

Keywords: Student engagement · Core curriculum subjects · Upper secondary school · Early School Leaving (ESL) · CPD

1 Introduction

As mentioned in the 2013 European Commission Report on Early School Leaving [1], "Early school leaving (ESL) is a multi-faceted and complex problem caused by a cumulative process of disengagement. It is a result of personal, social, economic, education or family-related reasons. Schools play an important role in addressing ESL but they cannot and should not work in isolation. Comprehensive approaches that focus on the root causes of ESL are required to reduce ESL. Reducing ESL can help towards the integration of young people into the labour market, and contribute to breaking the cycle of deprivation that leads to the social exclusion of too many young people". The Europe 2020 strategy [2] sets out a target of reducing school drop-out rates to less than 10%, asking a big effort to all Member States that are afflicted by this problem.

This article has been developed jointly by authors. Silvia Panzavolta wrote the Sects. 1, 2, 4.1 and 4.3. Chiara Laici wrote the Sects. 3, 4.2, 4.3 and 5

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G. Vincenti et al. (Eds.): eLeot 2016, LNICST 180, pp. 19–27, 2017.
DOI: 10.1007/978-3-319-49625-2_3

Given this scenario, the Italian Government issued a Law [3] addressing the problem of ESL, and created the so-called "Technical and Vocational Poles" as a possible solution. In fact, Technical and Vocational Poles, as imagined by the Government and described in the mentioned Law, represent an organizational model potentially capable of reconnecting VET schools – the most afflicted by drop-out rates – to their community and production districts and of fostering a systemic approach to employability, by networking schools, companies, vocational training agencies and universities (as suggested by the European Commission in the mentioned Report, this is a "comprehensive approach"). These Poles could be able to represent a solution to the ESL since they put together different stakeholders (companies, regional VET systems, schools) and can offer specific VET courses and opportunities (apprenticeship, dual system, VET regional courses, alternating training, etc.) answering the different needs of at-risk students.

In Tuscany, drop-out rates are heavy, reaching 16,3% - far away from the threshold set out by the European Commission for 2020. Moreover, the NEET[1] population is growing, making the ELS phenomenon ever more serious. That's why an early and systemic intervention is crucial, so that each student can be offered various VET opportunities, designed according to the specificities of the community and of the labour market where s/he lives and studies. The Tuscan Region started this new organization of the VET system in 2013, setting out a specific Decree [4] so that Poles could be constituted from then onwards[2]. In Tuscany 25 Poles have been created, covering 5 main production sectors (agriculture, tourism, fashion, mechanics, navigation), among which 8 were identified [5] to be the object of an experimentation on 5 main areas (school and vocational guidance; active learning in the core curriculum subjects; additional VET courses; alternating training; dual system), considered as crucial to reduce ESL and school failure. INDIRE has been chosen by the Tuscan Region, together with other Institutions, to support the Poles in their innovation and experimentation processes, in particular on active learning in core curriculum subjects and alternating training.

2 The CPD Project on Active Learning

The CPD project on active learning "La didattica laboratoriale nei Poli Tecnico-Professionali" has been designed by INDIRE according to a specific definition which is in relation to a different model of schooling, where lectures are replaced by student-centred activities, so-called "lab activities".

According to several researchers [6–10], even though ESL is a complex problem where many causes occur, schools play an important role, especially when student engagement is concerned. Active learning means putting in place different strategies

[1] NEET = Not in Education, Employment or Training.

[2] In order for a Pole to be formally created, there must be at least: two Technical or Vocational schools, at least two companies and one institute delivering post-secondary non-tertiary courses (ISCED 4). These institutions must sign a formal agreement where medium-term objectives (for 3 years), a governance organization and committees are identified.

able to: engage students in tasks oriented to projects or product construction; solicit different learning styles and preferences; develop competences and soft skills; include informal and non-formal learning of students, also by strengthening networking with different stakeholders outside the schools; differentiate and customize learning opportunities according to students' profiles and attitudes; adjust time and place of learning according to needs and requests from students; make it possible for teachers to teach with problem-solving and interdisciplinary approaches; use authentic tasks and innovative assessment practices; develop creativity and research-oriented competences.

The coaching model is based on the tutorship between expert schools - so-called "tutor" schools - and trainee schools and it is derived by the "Avanguardie Educative" Movement model [11]. Both face-to-face and virtual classrooms are in place to scaffold the piloting of schools as for the innovative methodologies proposed. The project [12] lifespan is one school year (September 2015–June 2016).

3 The Research Design on Active Learning

In order to answer learning needs of young students that use daily ICT as a communication, learning and creative knowledge construction tool [13], it is important to change the lecture-based model of schooling, with its desks in line, and rethink the school settings to make them more flexible and open, as socio-constructivist theories advocate. According to the social theory of learning [14], a classroom should be intended as a learning community where the teacher guides, engages, and interests his/her students, thus making it possible peer education and peer tutoring to be promoted. In such flexible learning situations, learning by doing, discovery learning, cooperative learning and reflective learning - where the teacher is a coach and not a lecturer - are promoted [15]. ICT should be considered as enablers for transforming learning environments, promote knowledge co-construction, allow personalization of outcomes and strategies and scaffold the acquisition of curriculum cultural and symbolic clues [16–18]. ICTs act on different levels - cognitive, communicative, expressive, creative and socio-relational levels - since they allow the manipulation of objects (i.e. simulation, 3D visualization), student authorship [15], student-student and teacher-student collaboration and active participation.

The present research activity, as highlighted above, considers active learning with ICT as a possible answer to engage at risk students and it is aimed at investigated its efficacy and effectiveness, especially in core curriculum subjects.

The three-year research activities, after a preliminary phase of literature review, will be deployed into two phases: the first one (school year 2015–2016) will insist on a local and regional dimension whilst the second one (school year 2016–2017) will take into account a wider dimension (national and international). During the first phase, 4 schools are taken into account and 4 case studies being carried out, one for each core curriculum subject (*maths, sciences, language education, foreign languages*). Case studies have been selected by using a stratified random sampling method, the strata being the production sectors, four in total in Tuscany, or: mechanics, navigation, tourism-agriculture and fashion. The second phase will take into account inspirational

cases where the "lab-approach" is in place, in order to derive innovative practices that can be exported to other contexts and scaled-up. Research activities investigate specific dimensions that literature correlates [19, 20] with disengagement and ESL such as student motivation, school well-being, teacher performance, classroom climate, school organization. Each dimension is observed before and after INDIRE CPD course on active learning takes place[3]. The tools selected by the research team are the following ones: standardized tests; observations in the classrooms; student Portfolios; video-observations by the teachers, focus groups with the students; interviews with subject teachers and head teachers; content analysis on online environments and teachers' documentation.

4 Preliminary Results: A Case Study on English Language Teaching and Learning

As for this case study, one of the 4 foreseen in the first year, we would like to stress some results as for: standardized tests [21]; observation in classroom; student Portfolio; video-observation. Some information on the composition of the classroom is useful to have a clearer understanding of the educational context. The students attend the second year of a technical navigation school, located in Leghorn, which is a rather historical school of the harbour city. There are 22 students, 18 boys and 4 girls, among whom there are 3 Special Education Needs (SEN) students[4] and 2 failed students. Few technologies are available in the classroom (one IWB, not properly working). Wifi is available only for teachers.

4.1 Standardized Tests

AMOS standardized tests provide teachers, psycho-pedagogists, and school psychologists with tools for the assessment of study skills, cognitive styles and emotional and motivational aspects of learning, thus allowing a deep understanding of student strengths and weaknesses and suggesting remedial activities to be put in place to scaffold them. The specific tests that were administered during the pre-CPD phase in the classroom, in December 2015, are the following ones. *QSS*: questionnaire on study strategies, subdivided into 3 dimensions (a. efficacy - the student beliefs as for the efficacy of possible strategies that an ideal student can use; b. use - relating to the actual use the student does of those strategies; c. coherence - measuring the gap between the strategies considered as ideally useful and those actually employed by him/her). *QC*: questionnaire on the student personal beliefs and confidence as for his/her intelligence and personality, his/her learning goals (mastery versus performance goals) and his/her

[3] From now onwards, in the text we will refer to the 2 moments as pre-CDP and post-CPD.

[4] Definitions of SEN students vary widely across countries as they are specific to each country's legislation. In Italy SEN students are made up of three main group: disabled student, student with learning disorder (i.e. dyslexia), students with socio-cultural disadvantages (Ministry of Education Note NO.8 issued on March 6th 2013).

self-efficacy perception in facing study activities. *QAS*: the questionnaire aims at assessing the student self-regulation skills (identifying three dimensions: a. organization - capacity to plan the quantity of material to be studied in due time; b. personal processing - capacity to process the content in order to understand and remember it; and c. self-evaluation - capacity to predict the results of one's own performances, to realize the degree of achievement and detect possible weak points in one's own study strategies), his/her knowledge of possible strategies and sensibleness in using them according to the situation and to personal characteristics. *QSC*: questionnaire on student cognitive styles. Cognitive style is intended as the student's preference in the use of specific strategies. The test discerns among two styles: global - when the person prefers to have a global picture of a content - and analytic - when the person looks at details and specific topics. *QAR*: questionnaire on anxiety and resilience, measuring both the degree of arousal - physical and psychological - when facing a threat or an obstacle and the ability of the student to face difficulties and unsuccess.

Some results of the standardized tests are rather interesting, some are in line with our expectations. As for the QSS, it turned out that the class is generally poor in identifying effective study strategies, even though they show an adequate use of the strategies they considered as most relevant. As for QC, the majority of the students has a flexible conception of their personality and intelligence and, as we expected, they have more performance goals than mastery goals. As for QAS, surprisingly the class has in general good self-regulation strategies, even though the metacognitive sensibleness is generally low. As for QSC, the majority of the class has a global and visual cognitive style, as turned out to be in the portfolios as well. Finally, as for QAR, the class has in general a good degree of resilience and the peak of arousal is mainly on mastery goals.

4.2 Observation in Classroom

The pre-CPD observation was done in December 2015. Before visiting the classroom, the researchers informed the teacher on the observation protocol. The observation was carried out by two researchers, who stayed in the classroom during one-hour lesson without interacting with the students and the teacher. They used an observation grid presenting several sections: general context information; organization of space and time of the lessons; student work organization (group work, individual work, etc.); classroom climate (social, emotional and relational aspects); teacher role; ICT use (roles, attitudes, etc.). Each researcher noted his/her personal notes and afterwards produced a narrative observation report, referring to the sections above. The two reports were then sent to the teacher for comment integration. In May 2016 the post-CPD observation will take place.

On the observation day, 19 out of 22 students were present, among whom one is a SEN student (his SEN teacher was in class) and two have learning disorders. The setting was traditionally arranged, with the whiteboard, the teacher desk and the student desks set in line. The setting remained unchanged during the lesson; the teacher, instead, went around, presenting herself more as a facilitator than a "knowledge broadcaster". However, the rhythm of the lesson was totally guided by the teacher,

asking students, involving them in the discussion and providing feedback and examples. It was an interactive lesson on grammar and vocabulary, following a flexible storyboard, with some conversation in English. Interactions were always between one single student and the teacher. The classroom seemed to be quiet and well behaving, but only little engaged. Students seemed to be tired, shy, unemotional. They only participated a little bit more when some familiar content was considered (i.e. their smartphones). The role of the teacher, as said above, was that of facilitating and scaffolding students, trying to involve them and to interest them, even by joking of playing with words. An IWB was present but no ICT were used during the lesson. Based on the observation, researchers found a class with low motivation, little engaged, even though good and trustful relationships exist among students and with the teacher.

4.3 Student Portfolio

The student portfolio, divided into four sections, is a tool designed to help students become aware of their learning strategies and study method. It can be used as a mean for sharing one own's progress in one or more areas taken into account [22]. The student portfolio is an online tool to allow students reflect on their competencies, guide them in their decision making process and develop their metacognition, considering its multidimensional meaning: attitudes, skills and behaviours [23]. The style of the portfolio is informal, comprising both open and multiple choice questions - some of them even using visual hints such as comics - and asking students to upload their material (note-taking, pictures, etc.). Students were asked to fill in the four sections during the whole school year, in particular, Sects. 1 and 2 in the pre-CPD phase and Sects. 3 and 4 in the post-CPD phase. Section 1 - filled in by November 2015 - dealt with study habits and preferences, self-esteem and learning needs. Section 2 was to be filled in after a usual - very likely traditional - lesson, in order to gather the student's emotions towards that lesson, his/her thoughts on the teaching process, the lesson weaknesses and strengths and, finally, his/her suggestions to improve it. Section 3 should be filled in after an active lesson has been experienced (it could be from March onwards) according to the same schema as in Sect. 2. Finally, Sect. 4 aims at summing up the whole year experience and metacognition process and bringing to conclusions and perspectives.

Between November 2015 and January 2016, Sects. 1 and 2 were filled in by 19 out of the 22 students of the classroom. This paragraph looks in particular to some of the answers provided by the students to the question "How I learn" and the one asking them to provide a definition of what they mean by "active learning". Students report that *they learn better* if they are actively involved in the learning process (i.e. by repeating, personally processing or making exercises and practical work) and that *they are facilitated* by the mediation of a classmate. They also like getting some feedback by the teacher and they prefer their work being constantly checked. They also report *working better* if the tasks are clear, thus suggesting a crucial point: a well-designed and performed lesson. They say *they remember more* if they write on their notebook what they do during the lesson. When they are asked *to do some exercises*, they prefer to have concrete examples, to read/listen to rules and study them beforehand. As for

their definition of "active learning", they generally relate it with the process of applying knowledge. Some think of "active learning" as something happening in the lab, a physical place that is generally designed for applying knowledge and linked with the workplace.

4.4 Video-Observation

Teachers were also given a specific protocol of video-observation, called EVIDENT (Evidence-based VIDeo Enquiry iN Teaching) [24], implying the video recording of a typical lecture (of at least 45 min), the self-analysis against a specific Self-Assessment Grid, the visual representation of his/her scoring through a Radar and a reflection process through a specific format (Self-analysis and Improvement Report). The protocol is based on the DASI dynamic model [25] and on Hattie's work [26].

The investigated dimensions are presented the following ones. *Organisation and structure of the lecture*: structuring of the lecture in terms of methodological-teaching components, form of message, relations with contents already dealt with, and with phenomena linked to the student's personal life. Description provided by the teacher on the reasons why a certain content is learnt. *Problematization*: behaviour of the teacher aimed at the problematization of contents, posing questions, answering students' doubts and favouring/promoting discussion on a new content. *Examples and application*: opportunities in terms of: modelling (the teacher provides behavioural models, cognitive, emotional and relational strategies that the students can follow and copy); application (the teacher foresees exercises, experiments, etc., ensuring the processing of new contents in an active way, by students). *Time management*: management of the activities, avoiding waste of time by the teacher and organizing the school-time at best, as well as the time for studying at home. *Learning environment*: the class is perceived as a learning environment, profitable in terms of learning and socialization. *Assessment and metacognition*: presence of assessment, self-assessment elements, peer-evaluation and description/sharing of associated criteria. Attention to metacognitive aspects.

The results of the analysis made by the English teacher confirm what was observed by the researchers during the observation visit. The strongest aspects are "Organization and structure of the lecture" (10/10) and "Problematization" (10/10): in fact, the lecture was highly teacher-led, with the teacher asking questions to students and guiding the progress of the work. The teacher makes an extensive use of "Problematization" (10/10). This is coherent with what we observed, since the teacher asked the students to apply grammar, to compose sentences and to propose examples for vocabulary or grammar rules. Another strong dimension is "Assessment and metacognition" (10/10). What we observed showed that the teacher pays attention to provide an immediate feedback to students, even though we could not see in that lecture an innovative use of assessment practices (peer evaluation, rubrics, etc.). It can be that in the lesson she observed, those aspects were covered. The only very weak point is the dimension "Management of time" (4/10) intended as the actions that the teacher puts in place in order to manage the activities, avoid waste of time, and organize the school-time at best, as well as the time for studying at home. The rhythm of the lesson we observed was little bit slow, with some students talking with each other or not paying attention

because the engagement was not stable. Another dimension to be improved is "The classroom as a learning environment" (8/10), in particular for the area of the ICT use and for differentiation, since the lesson was generally delivered as if all students had the same needs, styles and preferences.

5 Conclusions and Research Perspectives

From these first analysis results on the English case study – which has of course some limitations due to the stage of the analysis – we can say that the students consider collaboration and self-paced learning as equally important, even though from the observation we carried out collaborative work should be better developed, since the lesson was mainly based on teacher-led activities and individual work. A strong point in the lesson structure is the constant feedback that the teacher gives to the students - which they appreciate and considered as a crucial point - even though some aspects should be improved, or: an explicit and clear presentation of lesson time, objectives and roles; a constant engagement of students in concrete tasks and activities; personalization strategies in order to meet the different cognitive styles (mainly global and visual type, as emerge from standardized tests and portfolios). Since the class climate and relationships among students and with the teacher are very good, and that the majority of the students has a flexible conception of their personality and intelligence and good self-regulation skills, we hope that the CPD course will empower the learning community. Given the little emotional arousal observed and the low motivation demonstrated, we suppose that, by using more engaging methods and combining them with ICT - which is the core of the CPD offer - students will show more participation and engagement. This will be our research focus in the final part of the first-year case studies (May 2016). The other 3 case studies are being carried out and analyzed and research activities will continue in the school year 2016–2017, focusing on national and international level.

The DigCompOrg international framework [27] for educational organization innovation, will also be considered as a tool for supporting teachers and head teachers in innovating teaching/learning practices, school leadership/governance, and networking.

Acknowledgments. The authors wish to thank Carlo Beni, data analysis responsible, for his precious contribution.

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