

SELF-EFFICACY: A BOOSTER FOR PEDAGOGICAL INNOVATION

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This study is framed within a research doctorate program, whose aim is to investigate: 1. Italian lower secondary teachers' familiarity with ICT, active teaching and peer sharing; 2. teachers' profile and its correlation with difficulties in ICT integration and pedagogical innovation; 3. teachers' self-efficacy perception and its correlation with professional development and training opportunities.

On account of these goals, we have been trying to arrange a few initiatives of informal training in enhanced environment, built upon a cooperative task-based approach. This training model is meant to reskill educational professionals in technological advances, but also to grow teachers' self-efficacy perceptions, which are important variables, affecting behavior and goal orientation, and are proved to predict intentions in ICT adoption.

Possible significant contribution in this model relies on two aspects: providing blended interactive environment for peer training; encouraging technological

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adoption in school by affecting teachers' self-efficacy perception.

According to provisional results, teacher's needs for peer discussion, sharing and counselling have been answered by in-presence and virtual debate, as well as by focus group meetings; ICT perceptions have positively evolved after collaborative training and knowledge building practice. Conclusive findings analysis should also indicate whether the reinforcement of self-perception through dedicated training enhances teachers' intention to implement and share pedagogical innovation within the school.

1 Introduction

International scientific literature on pedagogical innovation and teachers' professional development (OECD PISA 2009; OECD TALIS 2013; OECD 2015) emphasizes the urgent need for school systems to arrange for new paradigms of in-service continuous training, in order to keep educational professionals in step with technological advances.

Actual teachers' educational models tend to provide users with knowledge, skills and attitudes required to integrate contemporary tools and resources into the learning process (UNESCO ICT Competency Framework for teachers), in order to assist effective teaching. Effective teaching corresponds in literature with the ability of: specifying clear lesson objectives, goals and challenges; providing coherent teaching material and resources; making learning as concrete and meaningful as possible; breaking down the task, providing guided practice and step by step prompts; integrating ICT in the classroom (Trincherò, 2013).

Computer Technology Education (CTE) recent trends focus on multiple pedagogical uses of technology, rather than merely on equipment (Mishra & Koehler, 2006), and address the importance of expanding the availability of open resources and applications (OECD, 2015). As for the equipment, HW and SW needs tend to be progressively less crucial, since new systems based on Cloud Computing on demand applications and services are now available. On the basis of the great potential of new learning environments and educational technology, other studies suggest ways for overcoming teachers' resistance in ICT integration in their practice (Domine, 2009; Bax, 2011; Chao, 2015).

School-based training is generally considered as the most effective form of professional development for introducing new teaching practices, as it encourages informal sharing among teachers (OECD, 2015). However, Italian national education plans (PNSD, 2015) hardly meet the scale of actual professional needs and OECD surveys indicate that effective pedagogical strategies often rely more on teacher experience and self-training than on dedicated formal training. Therefore, educational institutions start turning from formal training offers towards more flexibly tailored professional trainings.

In regard to the above literature and to teachers' needs, we have been trying to investigate whether a new peer learning model in a technology enhanced

environment could affect teachers' beliefs and their professional profile. According to scientific research, information about the beliefs and about perceived self-efficacy is helpful to predict teachers' pedagogical attitudes and, in particular, their intentions to integrate ICT in their practice (Ajzen, 1991; Benigno *et al.*, 2014; Geitz *et al.*, 2016). Nevertheless, increasing teachers' perception of their own professional self-efficacy is hardly ever taken into account when designing teachers professional training models and there is scope for further inquiry.

This contribution summarizes: exploratory study, experimental training, data collection and provisional analysis.

Provisional findings assess the relevance of sustaining teachers' career through peer training and sharing, relying on technological resources and pedagogical debate. On the basis of provisional and expected results, the aim of this study is to provide school institutions with hints to arrange for a blended training model, which could foster opportunities for teachers both to develop technological competencies and to discuss and cooperate with peers. This model is meant to positively affect the diffusion of innovation.

2 State of the Art

2.1 Teachers' Professional Development

A significant proportion of teachers participating in OECD Teaching and Learning International Survey (TALIS, 2013) declared that professional development does not meet their needs. According to the survey definition, professional development indicates all the activities that can lead to implement knowledge, competencies, skills and experience of the teacher, including formal and informal learning about the pedagogic use of ICT solutions.

In order to best address teachers unsatisfied demand for professional development, actual Italian national plan for digital school (PNSD, 2015) would provide school principals with guidance in assisting informal learning among peers, supporting pedagogical uses of ICT, facilitating knowledge sharing, creating networks of teachers who can assist colleagues in integrating digital devices into their practice. In consideration of scarce pre-service training, of teachers' average age (oldest in TALIS countries) and of non-homogeneous teachers' desire for innovation (OECD, 2013), it would be crucial to give teachers more chances of overcoming obstacles and feeling comfortable with ICT advances, thus avoiding resistance to classroom technologies integration.

International research and experience, however, show that ICT in itself does not transform teaching and learning but only offers tools that assist the application of innovative pedagogical approaches (Mishra & Koehler,

2006; Domine, 2009; Hattie, 2009; Chao, 2015). In the attempt of optimizing the relationship between technology education and pedagogical quality, professional development programs – based on problem solving processes, cooperation, reflective thinking, knowledge building and sharing – play a fundamental role and teachers are taking an active, mediating part in such activities (UNESCO, 2011).

2.2 Teachers' Self-Efficacy

Among teachers' professional skills – needed to achieve pedagogical quality – involvement in interaction with colleagues and the educational community, as well as their influence in school decision making and in school climate, are also very crucial and are highly associated in socio-cognitive theory to teachers' self-perception of efficacy (Bandura, 2006). In Bandura's theory, self-efficacy is one's belief in one's ability to succeed in specific situations, accomplish a task or performance (Bandura, 1997). Teachers' self-efficacy dimensions include: instructional efficacy, disciplinary efficacy, influence decision making, parental involvement, community involvement and ability to create a positive climate. Issues affecting self-efficacy are: enactive experience, vicarious experience, verbal or social persuasion and physiological factors (Bandura, 2006).

In particular, vicarious (or observational) learning indicates that active observation of another person performing a behavior and being rewarded for it increases the probability that the observer engages in that behavior. In a sense, teachers can learn, or reinforce, a specific behavior without actively performing it, but only observing the behavior and its consequences on a peer. The person being observed, or model, must be a person with whom the observer can easily identify. Whereas in microteaching technique (Hattie, 2009) the trainee reviews a recording of a teaching session, in order to get constructive feedback from peers about his/her performance, in vicarious experience the trainee observes volunteer peers' teaching practices, discovers new educational approaches, confronts with new strategies, thus regulating his/her own beliefs.

Teachers own self-efficacy beliefs and perceived behavioral control are proved to be useful in predicting intentions (Ajzen, 1991); in specific, self-efficacy and outcome expectancies seem to be valuable predictors of the successful adoption of learning technologies in their practice (Benigno *et al.*, 2014). Considering this information in designing professional training might contribute to provide original models for teachers' education.

Self-efficacy evaluation is carried out through self-efficacy perception measuring (Caprara, 2014). Scales of perceived self-efficacy must be tailored to the particular domain of functioning that is the object of interest. Adaptation of different self-efficacy validated questionnaires (Bandura, 2006; Tschannen-

Moran & Woolfolk Hoy, 2001; Biasi *et al.*, 2014) helps in establishing criteria, in order to build up data collection tools for this research.

2.3 Teachers' Technology Education

Current CTE studies investigate both facilitating resources for technological education programs and influence of computer technology use on teachers' belief profiles, practices and perceptions. In particular, a few studies examine teachers' ability to carry out their intentions to integrate ICT into their actual classroom (Bax, 2001; Chao, 2015) and some of them suggest that intention to use technologies would be greater when teachers have control over their use (Ajzen, 1991; Cox *et al.*, 1999; Dabbagh & Kitsantas, 2012).

Among enabling technologies which support teachers' professional development and ICT adoption (Web 2.0 and SN, Mobile Computing), new systems based on Cloud Computing on demand application and services are now available. Moreover, distributed architectures and Cloud Computing seem to be fostering new behavioral paradigms in acquiring and disseminating knowledge and sharing experiences (Caviglione *et al.*, 2011).

New models aimed at educational development should therefore avoid largely theoretical training, based on traditional face-to-face courses or workshop formats (PNSD, 2015), in order to provide proper training to embed ICT in pedagogy (OECD, 2013). Besides, mobile Cloud Computing advances assure trainers and trainees the opportunity of being independent from a given device or network and of accessing educational platform, documents and applications from any mobile workstation, thus facilitating peer learning and helping to integrate formal and informal learning (Dabbagh & Kitsantas, 2012). While peer learning is a powerful source of professional development for teachers learning communities in advanced environment (Almog & Hertz, 1999), ICT and learning design training becomes particularly meaningful when teachers have opportunities to practice what they have learnt in the training.

Technology for education in the Cloud seems to be both the most complex setting for teachers to receive and practice blended technical training, and the most effective and accessible environment where they can get to know how to use services and devices and how to embed their use in subject teaching (PNSD, 2015). Such a compound setting could ultimately create more opportunities for informal learning within the school, fostering learning design approaches and tools, assisting teachers when facing similar challenges, sharing experiences and tips, learning from peer experience (*Ibidem*).

3 Method

Pre-Test Post-test experimental multiple non-equivalent group design.

3.1 Context and Participants

This research population includes low secondary school teachers within Genoa municipality.

Given the strong need expressed by teachers in order to overcome perceived obstacles to integrate ICT and collaborative settings into their practice (OECD TALIS, 2013; Oddone & Firpo, 2015), we have been trying to arrange opportunities for teachers' to join in-service development activities, aimed at encouraging the adoption of innovative pedagogical settings and professional network models.

We identified 4 sample groups of teachers, who were undertaking training (N=74; M5/F69). Participants average age is 47 (AA=47, $SX=9,3$), average length of service is 15 years (AA=15, $SX=10,6$). Participants covered all disciplinary subjects and were distributed across 12 schools of the municipality.

3.2 Procedure

Building on the above principle, we set up a few initiatives (experimental training, peer-sharing, focus groups, vicarious observation), which were meant to: support computer technology education, increase awareness about teachers' competencies and professional efficacy, intensify peer cooperation (Wenger, 2006; Benigno *et al.*, 2014).

In specific, a Cloud Learning Environment has been arranged (Oddone, 2016) – exploiting Google for Education pedagogical platform and other free autonomous tools, educational applications, storage, sharing and discussion services – and hosted participatory pattern workshops. Workshops pattern details are available in a different study.

In order to affect teachers' self-efficacy, enactive experience of digital tools and learning environments has been encouraged, as well as vicarious experience in peers' classrooms. Observation grids have been elaborated during training, filled in during observational experiences and shared during debriefing debate. Other forms of restitution have been arranged along experimental training: individual narration, focus groups, nominal group technique.

In order to report the workshop fruition, to observe the evolution of teachers' opinions in regard to pedagogical ICT use and to register possible training effects – especially on self-efficacy perception – a few research instruments were prepared: entrance survey; training monitoring and focus groups; self-evaluation test; concluding survey.

3.3 Instruments

3.3.1 Case study

A case study has been carried out in April 2014, in order to generate exploratory findings. The study involved low secondary school teachers from the whole province of Genoa (N=110; M23/F87) and investigated the relation between teachers' professional profile and their difficulties in the adoption of ICT, sharing tools and active practices. Findings are coherent with national studies, as for personal data (age, sex, professional experience) and for perceived obstacles to innovation technologies and collaborative settings (Oddone & Firpo, 2015).

3.3.2 Entrance Survey, Self-Evaluation Survey, Concluding Survey

Entrance survey was submitted to the sample population (N=74; M5/F69) before training and was meant to provide information about teachers' attitude towards professional development, teachers' representations about teaching efficacy and inclusion, teacher's opinions about Cloud Learning technology.

Conceptual framework was structured around 5 sections: personal data, professional data, efficacy, inclusion, ICT (opinions and perceptions of respondents). It was arranged as follows: presentation of the research, 35 mandatory checkbox type questions, 18 multiple choice questions, 12 scale type questions. A text box was provided at the end of the survey to enter comments or remarks. The form was created using Google Forms tool and submitted through the Web browser. Responses were collected in a spreadsheet; the tool provides summaries of the collected data with charts and graphs.

Self-evaluation survey was also created using Google Forms tool and is being submitted to the groups, as long as they achieve training process. Data are meant to provide information about teachers' representations on self-competence and self-efficacy, as well as on personal achievement of training goals (Angiolani & Oddone, 2015).

Final survey hasn't been settled yet. It will consist of a questionnaire, which will be sent to low-secondary school teachers population via school administrative offices e-mail. Target population size will be calculated with reference to Genoa district low-secondary school teachers workforce data. Concluding questionnaire will be structured on the entrance survey model and compared with validated tools. The survey will focus on the following dimensions: instructional efficacy, disciplinary efficacy, efficacy in creating a positive school climate.

3.3.3 Qualitative Observation and Group Interviews

Training monitoring was based on regular observation of the interactions on the educational platform and on group discussion services. It also focused on task delivery performances, on feed-back about the activities and on e-mail exchanges between participants and the researcher. Observation was meant to monitor fruition of the training materials, participation into collaborative activities, teachers' mood and attitudes toward task-based peer learning.

Nominal group technique (with paper notes or Padlet App digital notes) was used in initial steps of brainstorming in order to encourage creative thinking, heterogeneous inputs and avoid social conditioning. This method requires participants to write down their ideas silently and independently on a given subject, prior to a group discussion. This technique increased the number of solutions generated by groups (Trincherò, 2002).

Two focus group interviews were conducted from an exploratory perspective (N=11; M2/F9), in June 2014 and February 2016. In-depth group interviews are a qualitative method in which a small sample of respondents discuss one selected topic, an external moderator focuses the discussion onto relevant subjects in a non-directive manner. Focus groups interactions are recorded and filmed and, in addition, non-participant observation registers the behaviour of the research subjects (*Ibidem*). These interviews were meant to figure out teachers' representation about self-efficacy construct and help in building up indicators for the final survey. Non-probability sampling technique, participants, setting and data analysis information, as well as questions outline schema, are available in a different study.

3.4 Data Description and Analysis

Research data come both from questionnaires and qualitative observation.

Descriptive statistical analysis on questionnaires data (arithmetic average, standard deviation, distribution) is useful to outline participants' personal data. Provisional personal data (age, sex, average number of years of teaching experience) tend to be homogeneous within the experimental group, as well as representativeness of taught subjects and geographic distribution across the municipality. Further statistical intra-results analysis (concentration, distribution) will be carried out on participants' opinions and views data coming from conclusive data collection.

In regard to opinions and views, main outcome from entrance survey is respondents' representation of effective teaching. According to the sample, effective teachers (and methods) appear to display certain characteristics (table 1):

Table 1
TEACHERS' REPRESENTATIONS OF EFFECTIVE TEACHING

Year	Learner Type
Build learning on different levels of complexity	68.2%
Apply cooperative and innovating strategies	59.1%
Get in touch with learners	50.0%
Structure learning around key-concepts of a subject	50.0%
Produce visible learning (artifacts)	50.0%
Differentiate learning objectives and outcomes (included evaluation)	45.5%

Most of the above features are coherent with appropriate instructional strategies in literature (Tschannen-Moran & Woolfolk Hoy, 2001; Trinchero, 2013), which are based on: goal setting and sharing of assessment criteria and objectives; communicating with learners, peers, the school board and the community; committing pupils in the learning process and managing classroom; integrating technology and active teaching into the curriculum.

In regard to self-efficacy construct, respondents settle that peer learning and professional development activities are impact factors on self-efficacy perception and job satisfaction, as well as on active teaching methodology (fig. 1).

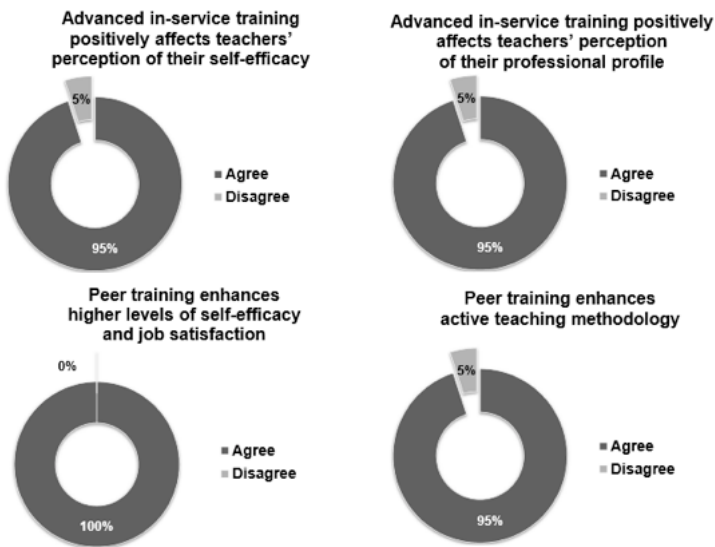


Fig. 1 - Impact factors on self-efficacy and active teaching

From self-evaluation survey, main outcomes are: teachers self-positioning

in the emerging field of technology innovation (68.2% cautious innovator; 31.8% innovator; 0% sceptical); respondents' main concerns in engaging in the experimental training, which lays with prior knowledge and skills (45%); positive contribution of the training to bring awareness to teachers' internal resources and/or limits (95%); experiencing cooperative approaches and interaction in Cloud based environment across training lapse as positive impact factors on innovation (86.4%). 91% of participants were able to describe one experience of successful teaching in which they had been involved during training lapse (narration) and most of them agreed that belonging to a knowledge building community has positive impact factor on perceived self-efficacy (fig. 2).



Fig. 2 - Impact factors on self-efficacy and active teaching

A few items have been arranged in a SWOT analysis planning approach, in order to shed light on key internal and external factors seen as important in building up a sustainable peer development project, focused on collaborative training and increasing teachers' self-efficacy (fig. 3).

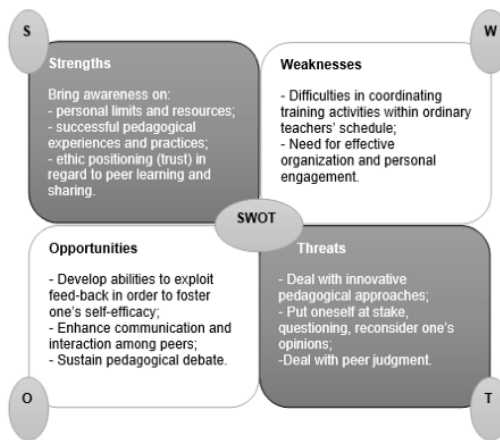


Fig. 3 - SWOT matrix evaluating a self-efficacy training design

From observation, we register regular interactions of participants on Google Classroom and Google Groups, especially in the aim of accessing materials, arranging group work or asking for explanations; regular (individual and group) task delivery on the educational platform. From self-reported feed-back and peer interactions we notice initial resistance to task-based activities and growing openness and confidence within the training progress. Monitoring of vicarious observation (self-reported, assessment of the experience grids) returns teachers' feelings and attitudes about those activities. In specific, curiosity and desire for new practices is sometimes counterbalanced by puzzlement and discomfort in peer observation, which is perceived by a tiny sample as an evaluative judgment on colleagues' job, rather than a form of observational learning (fig. 4).



Fig. 4 - Synthesis of debriefing, based on group grids concerning vicarious observation

From focus group interviews, we have strong assessment of teachers need for peer discussion and interaction, as well as for peer counselling. From focus groups audio-video recording and transcription we also have teachers' opinions and representations on self-efficacy. Textual data have been categorized in semantic areas and recurrent concepts have been brought back to theoretical framework on self-efficacy perception. Analysis focused on the following dimensions: ability to influence learning, manage the classroom and create a positive climate; and on factors which are proved to be, in scientific literature, as sources of self-efficacy: self-esteem and self-concept, vicarious experience, verbal and social persuasion, competencies assessment (Bandura, 1997).

4 Results

Initial results are encouraging. Regular presence at workshops assessed teachers' needs for in-service training and provided opportunities to experiment ICT tools and applications, to practice problem solving and interaction in both physical and virtual environment; participation in focus groups assessed needs

for peer counselling, as well as for active pedagogical debate; participation in vicarious observation assessed needs for mentoring, tutoring and coaching at all levels, age and length of service.

Taking part in professional development initiatives was perceived by most teachers as a booster for active teaching, since familiarity with digital tools, mobile devices and Cloud environment has to be strengthened. As in TALIS population (OECD, 2013), teachers who were involved in networking activities appeared to be more willing to use ICT in their classroom and to develop learning design strategies. New educational cooperative approaches are spreading and use of educational applications improved among participants (self-reported).

Joining professional development activities was also associated, in TALIS conclusions, to higher self-efficacy and job satisfaction levels. This aspect has to be confirmed by concluding findings. However, almost unanimous respondents positioning (fig. 1) already seems to emphasize the relevance of in-service training as a significant impact factor on professional profile, on self-efficacy perceptions and on job satisfaction. Main critical issues are related with coordinating experimental activities within teachers' ordinary schedule and with threats associated to social judgment among peers (fig. 3). Further inquiry into the reasons of these threats would be of great interest.

As for self-efficacy perceptions, provisional analysis of teachers' vocabulary (qualitative data from focus groups) currently conveys relatively mature awareness about self-efficacy construct, even if the concept of transferable skills often relies on simple reorganization of pedagogical practices, rather than on self-efficacy sources, as they are described in literature (competences and experiences analysis, vicarious observation, verbal persuasion, feed-back).

Return on investment and satisfaction about training goals achievement were positively judged by participants, whether with regard to abilities, or to communication and interaction, or to instructional design. In specific, focus group interviews were seen as special occasions for professional discussion and the technique was useful to steer or alleviate frustration, and boost self-esteem. According to the participants, focus group was not only a research tool but also a "survival tool" in teacher's routine. Most participants declared they were willing to volunteer and participate in other focus groups.

Teachers contribution has been fundamental in highlighting technological and pedagogical gaps in their professional profile, indicating the effort they have to engage into in order to: acquire new instructional and digital skills; gain awareness about their self-efficacy in school; perform effective and inclusive teaching.

Concluding findings could validate new patterns to improve teachers' education environment and to disseminate more open and complex pedagogical

design.

Conclusion

Previous research outcomes establish a significant positive relationship both between teachers' beliefs and their actual use of technology, and between teachers' self-efficacy and goal orientation; they also suggest that teachers' intention to introduce innovation is positively related to self-reported use of Web 2.0 applications and services in their classrooms, that is to the ability of translating their intentions into actions.

Correlation between intentions, abilities and self-efficacy perceptions appears to be an interesting and implementable conceptual model, in order to sustain teachers' valorisation and professional development. However, increasing teachers' perception of their own professional self-efficacy represents an original step on the still infrequently travelled path toward informal peer training solutions. Therefore, additional investigation into flexible training models aimed at increasing self-efficacy perceptions and job satisfaction could furtherly support teachers' development and pedagogical innovation.

Most effective contribution in this study relies on two aspects: providing a practical blended interactive enhanced environment for teachers' informal training; encouraging technological innovation in school by affecting self-efficacy perceptions through enactive experience, vicarious observation and peer discussion. This model is meant to provide hints for future professional (formal or informal) educational programs, to enhance peer learning, tutoring and counselling, thus boosting sustainable innovation within Italian low secondary school system.

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