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CLOUD COMPUTING APPLICATIONS AND SERVICES FOSTERING TEACHERS' SELF-EFFICACY

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According to recent surveys on pedagogical innovation and teachers' professional development, Italy lags behind most OECD countries when it comes to equipment and usage of information and communication technology (ICT) in school. Schools need to support professional development and new training models, so that teachers who are less proficient in the use of technology can acquire proper skills and strategies.
This study aims at investigating: lower secondary teachers' familiarity with ICT pedagogical usage and active learning strategies; teachers' difficulties in introducing ICT in school, which might be associated with their professional profile; teachers' self-efficacy perception, which is a significant (and measurable) component of the beliefs that influence ICT adoption. In order to achieve this goal, an informal blended training course supported by Cloud Computing Applications and Services has been organized and monitored. Data collection tools and evaluation questionnaires were arranged and partly

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submitted.
According to the provisional results, teacher's ICT perceptions have positively evolved after professional training. Conclusive findings analysis should also confirm whether the reinforcement of self-perception enhances teachers' intention to adopt new technologies in their practice. This study might finally provide education programs with a practical peer-training model, which affects teachers' self-efficacy perception and leads – in turn – to a larger diffusion of innovating strategies.

1 Introduction

Recent surveys on pedagogical innovation and teachers' professional development (OECD PISA 2009, OECD TALIS 2013, OECD 2015) show that Italy hangs back from most OECD countries when it comes to equipment and usage of ICT in school (Calvani, 2013). In this context, scarcity of digital equipment has to be counterbalanced by initiatives leading to new teaching practices, new tools and services, new models aiming at innovating and supporting quality teaching (PNSD, National Plan for Digital Education, 2015).

UNESCO ICT Competency Framework for teachers emphasizes the urgent need for teachers to gain knowledge, skills and attitudes required to integrate contemporary tools and resources into the learning process. Moreover, 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 digital pedagogic resources (OECD, 2015). As for the equipment, HW and SW needs tend to be progressively less crucial, since new systems based on Software as a Service paradigms are available (Caviglione *et al.*, 2011) and shift towards big data architectures and cognitive computing synthesis opportunities is happening.

Conversely, national education plans hardly meet the scale of actual professional needs. 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 offers towards more flexibly tailored professional development projects. 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). Most studies highlight the great potential of educational technology and suggest ways for overcoming teachers' resistance in ICT integration (Domine, 2009; Bax, 2011; Chao, 2015), as well as for implementing school network.

In regard to the above literature and to teachers' professional needs, we have been trying to investigate how a new professional learning model in a technology enhanced environment could affect teachers' beliefs and influence their professional behaviours and profile. Indeed, not only knowledge and skills, but

information about the beliefs and perceived self-efficacy is helpful to predict teachers' pedagogical attitudes and, in particular, their intentions to integrate ICT in their practice (Albion, 1999; Benigno *et al.*, 2014).

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

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 is designed in order to 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 Professional development and pedagogical innovation

According to OECD Teaching and Learning International Survey definition (TALIS, 2013), 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. The main themes related to this definition are: pre-service training and induction; mentoring; in-service professional training; contents, type of activities and impact on pedagogical practices; teachers' development needs.

Italian national plan for digital school (PNSD, 2015) currently includes professional development provisions, but these provisions do not meet the scale of actual needs. In consideration of scarce pre-service training (OECD, 2013), of teachers' average age (highest in TALIS countries) and of uncertain teachers' desire for innovation, it would be crucial to give teachers more chances of feeling prepared and comfortable with ICT advances, thus avoiding resistance to classroom technologies integration. Providing school principals and teachers with guidance in assisting informal learning among peers; supporting pedagogical uses of ICT to facilitate knowledge sharing beyond the school institution; creating networks of teachers who can support colleagues in integrating ICT in their pedagogy, are some of the main goals of actual Italian educational plan (PNSD, 2015).

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; Calvani, 2013; Chao, 2015). Other studies suggest that teachers should possess both skills in the use and belief in their capacity to integrate ICT into teaching (Albion, 1999).

In the attempt of optimizing the relationship between technological inno-

vation and pedagogical quality, learning about technologies (through problem solving processes, cooperation, reflective thinking, knowledge building and sharing) should go hand in hand with increasing teachers' beliefs in their capacity to work effectively with ICT (Albion, 1999).

2.2 Teachers' beliefs and self-efficacy

A few studies examine teachers' ability to carry out their intentions to integrate ICT into their actual classroom and some of them suggest that it is possible to understand teachers' beliefs (Cox *et al.*, 1999) and motivational factors related to teachers' intentions to use Web 2.0 technologies, thus predicting behaviors (Ajzen, 1991; Pajares, 1992). And notably that intention to use technologies would be greater when teachers have control over their use (Ajzen, 1991; Cox *et al.*, *op. cit.*; Dabbagh & Kitsantas, 2012). Information about beliefs and perceived behavioral control is useful to predict teachers' intentions, underlying their pedagogical practice (Ajzen, 1991), and so might be teachers' perception of their own professional self-efficacy. Self-efficacy and goal orientation are important variables which affect learning behavior (Geitz *et al.*, 2016). Moreover, self-efficacy and outcome expectancies are predictors of the successful adoption of learning technologies (Benigno *et al.*, 2014).

In socio-cognitive theory, self-efficacy is one's belief in one's ability to succeed in specific situations, accomplish a task or performance (Bandura, 1997). Self-efficacy evaluation is carried out through self-efficacy perception measuring. 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) leads to establish criteria, in order to build up data collection tools. In Bandura's theory, teachers' self-perception is highly associated with professional experience, influence in school decision making, interaction with colleagues and the community. Teachers' self-efficacy dimensions are: 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, *op.cit.*). Considering one or more of these factors in designing professional training might contribute to provide original models for teachers' education.

2.3 Enabling technologies and training

TALIS data show that Italian teachers did not have, during the survey lapse, enough training opportunities, or not necessarily the most appropriate training

to embed ICT in pedagogy (OECD, 2013). New models aimed at educational development should avoid largely theoretical professional training, based on traditional face-to-face courses or workshop formats (PNSD, 2015). International research also shows that teachers prefer to be trained by peers, rather than by experts (Wenger, 2006; OECD, 2009) and that the most transformative activity among all professional development activities would be individual and collaborative research (OECD, 2013).

With the aim of supporting collaborative distributed learning among peers, digital technology is currently considered as the most effective enabling know-how and environment for training educators (OECD, 2015; PNSD, 2015; Pozzi *et al.*, 2015), helping to integrate formal and informal, personal and social learning (Dabbagh & Kitsantas, 2012).

Among digital enabling technologies (Web 2.0 and SN, Mobile Computing), distributed architectures and Cloud Computing seem to be fostering new behavioral paradigms in acquiring and disseminating knowledge and sharing experiences (Coccoli *et al.*, 2014). Software platforms that enable effective asynchronous working and resources sharing are also crucial, as well as applications and services enabling teachers to freely use didactic materials.

Cloud applications and services enable ubiquitous, convenient, on-demand network access, software and storage service, thus relieving schools and teachers from spending resources in HW, SW and applications, updates and maintenance (Krumm, 2009; Coccoli & Torre, 2013). Besides, Mobile Cloud Computing (MCC) assures trainers and trainees the opportunity of being independent from a given device or network (Rao et al., 2013) and of accessing documents and applications from any mobile workstation. This is huge potential, especially in the aim of involving disseminate users in peer learning. 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).

In short, one way to improve the extent and relevance of professional development would be to modify training approach by changing the learning environment. Technology enhanced learning environments, which are designed with reference to connectivism learning theory (Engeström, 2001) and social learning theory (Bandura, 1977) – and apply to adult peer interaction – can positively affect self- and co-regulation and, therefore, effective learning (Kaplan, 2014). In addition, a faster equipment process and big data processing appli-

cations could face the challenge of data search, analysis, managing, sharing, storage, and – of course – of mobile computing learning. Such a compound setting could ultimately create more opportunities for informal learning within the school, fostering learning design approaches and tools, given that more teachers will face similar challenges and feel the need to share tips and learning from peer experience (PNSD, 2015).

3 Method

3.1 Design

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

3.2 Context

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 province of Genoa 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).

Given the strong need expressed by teachers in order to integrate ICT into their practice (TALIS OECD, 2013; Oddone & Firpo, *op.cit.*), we have been assuming that increasing teachers' participation into development activities could encourage the adoption of innovative pedagogical practices and professional network models.

On this principle, we set up a few initiatives (training, peer-sharing, focus groups, vicarious observation), which were meant to: support CTE, increase awareness about teachers' competencies and professional efficacy, intensify peer cooperation (Wenger, 2006; Benigno *et al.*, 2014). Teachers joined experimental training across the years 2015/2016.

3.3 Participants

Population includes low secondary school teachers within Genoa municipality. We identified 4 sample groups of teachers, undertaking training (N=74; M5/F69). Participants average age is 47 (AA=47, ^{S}X=9,3), average length of service is 15 years (AA=15, ^{S}X=10,6). Participants covered all disciplinary subjects and were distributed across 12 schools of the municipality.

3.4 Procedure and training

Teachers' ICT pedagogical usage, difficulties in introducing ICT and active learning strategies in school were investigated during the case study and results were associated with teachers' professional profile (Oddone & Firpo, 2015). Teachers' self-efficacy perception is being investigated during experimental training and monitoring.

Experimental training – following entrance survey – consists of 8 hours of presence learning and 16 hours of distance learning. The training includes face-to-face meetings and activities performed on an e-learning environment, built on constructivist instructional design principles. Trainees-teachers are divided in groups of 5, sharing an online virtual classroom. They are supported by experienced peers (one for each group) and by the researcher. Workshops are held in school and structured around the following steps: introduction, conceptual framework, outline of activities, materials and tasks; group cooperative learning (research, analysis, creating knowledge, restitution and peer sharing); metacognition debriefing.

Training contents stem from teachers' needs, which were conveyed during 2014 exploratory study. They focus on: active and inclusive teaching, problem-based teaching, cooperative teaching, digital innovation.

Workshop strategies have been inspired by collaborative learning blended models and peer learning. Interactive methodology and participatory pattern workshops are supposed to put teachers in an operative setting which reflects innovating learning conditions. A sort of enhanced Personal Learning Environment approach has been organized (Dabbagh & Kitsantas, 2012), for both integrating informal learning using social media and supporting teachers self-regulated learning during in-service training. Training groups are meant to manage their learning, both content and process.

In order to implement this approach, training environment is based on free Cloud Computing (CC) Applications and Services (Angiolani & Oddone, 2015). The training activities require participants to interact, develop instructional skills, peer sharing and discussion through cooperative educational models (flipped classroom, jig-saw, situated learning) and Computer-supported collaborative learning (CSCL). They also offer the participants opportunities to experience and increase self-efficacy awareness, through enactive practice of different tools and approaches and through vicarious observation in the classroom.

Course materials and teaching resources are stored into the Google Drive. Most group work starts with aggregation and sharing of materials on an online virtual board (e.g. Padlet application) or within the virtual learning environment. Resources, information and tools are gathered in CC application

software and platform (Google Classroom) and mostly accessed from personal devices, as well as SN and group discussion services (Google Groups). The researcher set up Google Apps for Education accounts.

3.5 Instruments

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 – we prepared a few research tools: entrance survey; training monitoring and focus groups; self-evaluation test; final survey.

Entrance survey conceptual framework was structured around 5 sections: personal data, professional data, efficacy, inclusion, ICT (opinions and perceptions of respondents). It was structured as follows: presentation of the research, 35 mandatory checkbox type, 18 multiple choices, 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 sent to the 4 groups before training activities; they anonymously completed the forms online and submitted it 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 collected in an automatically generated worksheet and 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).

Training monitoring was based on regular observation of the interactions on group discussion services, on task delivery, on self-reported feed-back about the activities and on e-mail exchanges between participants and the researcher.

Two focus groups have been conducted (N=11; M2/F9) in June 2014 and February 2016 and described in a different study. Results of the focus group in-depth interviews data are meant to help in building up indicators for the final survey.

Data analysis is ongoing and final survey hasn't been settled yet. It will consist of a questionnaire, which will be sent to low-secondary school teachers of Genoa municipality, 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.

3.6 Data 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 outcomes from entrance survey are: peer learning and professional development activities as impact factors on self-efficacy perception and job satisfaction (Table 1); peer learning and professional development activities as impact factors on active teaching methodology (95% of sample); reasons for resistance towards in-service training activities (Table 2).

Table 1
IMPACT FACTORS ON SELF-EFFICACY PERCEPTION AND JOB SATISFACTION

Items	Agree	Disagree
Collaborative peer training enhances higher levels of self-efficacy and job satisfaction	100%	0%
Advanced in-service training can positively affect teachers' perception of their professional profile	95%	5%
Advanced in-service training can positively affect teachers' perception of their self-efficacy	95%	5%

Table 2
TEACHERS' RESISTANCE TOWARDS PROFESSIONAL TRAINING

Scientific literature indicates that teachers' attitude towards professional training is characterized by a sort of resistance. Why is this, in your opinion?	
Resistance is related to a principled reason (undervaluation, underpayment...)	45.5%
Resistance is related to objective difficulties (time, place, tools)	31.8%
Resistance is related to the fear of change	22.7%
Resistance is related to ICT	0%

A few items have been arranged in order to shed light on key internal and external factors seen as important to build a Cloud Computing Learning environment, in a SWOT analysis planning approach (Fig. 1).

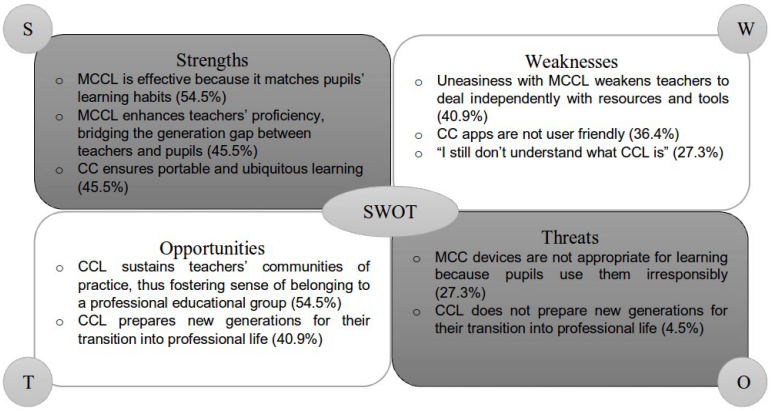

Fig. 1 - SWOT matrix evaluating Cloud Computing Learning strengths, weaknesses, opportunities, and threats

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% skeptical); 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%); belonging to a knowledge building community as positive impact factor on perceived self-efficacy (Table 3).

Table 3
IMPACT FACTORS ON SELF-EFFICACY DURING TRAINING LAPSE

Items	Agree	Disagree
Have you experienced enough professional success during collaborative training lapse?	72.7%	27.3%
Can you describe one experience of successful teaching in which you had been involved during training lapse?	91%	9%
Do you think that belonging to a knowledge building community has positive impact on your self-efficacy perceptions?	77.3%	22.7%

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.

From focus group interviews and e-mail exchanges between the participants and the researcher, 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.

Triangulation of all the above information (quantitative statistical analysis on case study, entrance and self-evaluation data; categorization of textual data; qualitative analysis on focus groups data) would lead to elaborate proper indicators for the final questionnaire on self-efficacy, which will be submitted in the course of 2016.

Conclusive analysis will concentrate on the description of variations in self-efficacy perceptions, for both teachers who joined the experimental training and teachers who participated in other professional training over the last 2 years (in-service face-to-face, individual training plans, webinar, MOOC). Data will be compared with perceptions of teachers who affirm to have attended no training or professional development activity over the last 2 years. Correlation analysis will assess the relationship between the concepts of professional CTE in enhanced Cloud environment and self-efficacy perception; between self-efficacy perception and perceived intention of integrating innovation in the pedagogical practice.

4 Results and expected outcomes

The use of the Cloud environment has solved many problems, eliminating obstacles in managing big amount of data and software, providing educational platform and pedagogical resources, hosting social and professional networking, hence producing new skills and peer interaction flows. CC properly supported instructional methods designed to encourage teachers to work together on learning tasks. In contrast to the linear delivery of content from the instructor's material, CSCL takes advantage of wikis, social networks and Cloud-based document portals. Technological Web 2.0 and CC advances provided trainers a new augmented customized environment, which suitably stimulated sharing information and active knowledge creation. They also offered trainees ground for resourceful and engaging educational endeavors, peer discussion, tutoring and learning.

Google Classroom provided the opportunity for users to receive direct instruction from an instructor, or peer, in an interactive and social environment. Users have access to instant feedback and direction. The virtual classroom

also provides a structured schedule of classes, which users can access asynchronously. In addition, each class (and material) is recorded and stored on a server, which allows for instant playback over the course of the training, or longer. This can be extremely useful for users to retrieve missed material or review concepts, just exactly as their pupils can do, when/if teachers introduce the learning platform tool in their teaching practice.

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 in both physical and virtual environment and to build up active pedagogical debate. 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. 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, enactive experience in an enhanced learning environment has proved to affect the participants' efficacy awareness, together with peer discussion and vicarious observation.

New educational cooperative approaches are spreading and use of educational applications boosted among participants (self-reported). Satisfaction about training goals achievement and return on investment have been positively judged by most respondents.

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.

On the base of concluding findings, 2016 outcomes could indicate new patterns to improve teachers' education environment and to disseminate more open and complex pedagogical design.

Conclusion

Results of previous studies 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.

Cloud Computing Applications and Services offer both a supportive enabling technology and a pedagogical approach. They are effective in putting

individual learners at the center, thus connecting them to information and teachers' community. CC technology is also meant to address teachers' motivation and collaboration, to allow personal control of Cloud space and training time, and, most important, knowledge sharing and creation. Cloud environment can help integrate formal and informal, personal and social learning and thereby achieve group and individual learning goals.

For all these reasons, in regard to actual needs – which were expressed both by international instance and the teachers – we have been trying to investigate how a new professional learning model and environment could affect teachers' perceptions, behaviors and professional profile. Most original contribution in this model relies on two aspects: providing blended interactive Cloud environment for teachers' informal training and – at the same time – encouraging technological innovation in school by affecting teachers' self-efficacy perception through training instructional design.

Fostering the diffusion of training models based on big data, customized environments and cognitive computing principles, could enhance collaboration among people and adoption of innovative pedagogical strategies, sustaining new educational trends and more effective teaching. We expect this training model to provide hints for future professional (formal or informal) training opportunities and to contribute in moving in the direction of exploiting big open data educational paradigm.

REFERENCES

Ajzen, I. (1991), *The theory of planned behavior*, Organizational Behavior and Human Decision Processes, 50(2), 179–211.

Albion, P. (1999), *Self-Efficacy Beliefs as an Indicator of Teachers' Preparedness for Teaching with Technology*, Proc. of 10th Int. Conf. of the Society for Information Technology & Teacher Education, AACE, 1602-1608.

Almog, T. & Hertz, R. (1999), *Teachers as peer learner: Professional development in an advanced computer learning environment*, in O'Donnell, A.M. & King, A. (Eds.), Cognitive perspectives on peer learning, 285-311, Mahwah, NJ, Lawrence Erlbaum.

Angiolani, M. & Oddone, F. (2015), *Un laboratorio di formazione tra pari nella scuola secondaria di primo grado*, Proc. of DIDAMATICA 2015 Conf., 11-18, Genoa, Apr. 15-17.

Bandura, A. (1977), *Social Learning Theory*, Englewood Cliffs, NJ, Prentice Hall.

Bandura, A. (1997), *Self-Efficacy in Changing Societies*, Cambridge, UK, Cambridge University Press.

Bandura, A. (2006), *Guide for constructing self-efficacy scales*, in Pajares, F. & Urdan, T. (Eds.), Self-efficacy beliefs of adolescents, 307-337, Greenwich, CT, Information

Age Publishing.
Bax, S. (2011), *Normalisation Revisited: The Effective Use of Technology in Language Education*, IJCALLT, 1(2).
Benigno, V., Chifari, A. & Chiorri, C. (2014), *Adottare le tecnologie a scuola: una scala per rilevare gli atteggiamenti e le credenze degli insegnanti*, TD 22(1), 59-62.
Biasi, V., Domenici, G., Capobianco, R. & Patrizi, N. (2014), *Teacher Self-Efficacy Scale: adattamento e validazione in Italia*, Retrieved from http://www.ledonline.it/index.php/ECPS-Journal/article/viewFile/771/636.
Calvani, A. (2013), *I nuovi media nella scuola*, Roma, IT, Carocci.
Caprara, G.V. (2014), *La valutazione dell'autoefficacia*, Trento, IT, Erickson.
Caviglione, L., Coccoli, M. & Gianuzzi, V. (2011), *Opportunities, Integration and Issues of Applying new Technologies over e-Learning Platforms*, Proc. of the 3rd Int. Conf. on NGNS, 12-17, Hammamet, TUN, Dec. 18-20.
Chao, C. (2015), *Rethinking Transfer: Learning from CALL Teacher Education as consequential transition*, Language Learning and Technology, 19(1).
Coccoli, M., Guercio, A., Maresca. P. & Stanganelli, L. (2014), *Smarter Universities: a Vision for the Fast Changing Digital Era*, Journal of Visual Languages and Computing, 25(6), 1003-1011.
Coccoli, M., & Torre, I. (2013), *A review of mobile-learning in mobile cloud computing environment*, ICERI2013 Proc., 3499-3505.
Cox, M.J., Preston, C. & Cox, K. (1999), *What Factors Support or Prevent Teachers from Using ICT in their Classrooms*, in BERA Conf. 1999, Brighton, UK, Sept. 2-5.
Dabbagh, N. & Kitsantas, A. (2012), *Personal Learning Environments, social media, and self-regulated learning: A natural formula for connecting formal and informal learning*, Internet and Higher Education 15(1), 3-8.
Domine, V.E. (2009), *Rethinking Technology in Schools*, New York, NY, Peter Lang.
Donadio, S., & Cipolli, C. (2014), *Dati e percezioni sullo sviluppo di una comunità di pratica online di docenti: il caso della scuola "Don Milani"*, TD, 22(1), 39-47.
Engeström, Y. (2001), *Expansive Learning at Work: Toward an activity theoretical reconceptualization*, Journal of Education and Work, 14(1), 133-156.
Geitz, G., Brinke, D. & Kirschner, P. (2016), *Changing learning behaviour: Self-efficacy and goal orientation in PBL groups in higher education*, International Journal of Educational Research, 75, 146-158.
Hattie, J. (2009), *Visible Learning: A Synthesis of Over 800 Meta-Analyses Relating to Achievement*, London, UK, Routledge.
Kaplan, J. (2014), *Co-regulation in Technology Enhanced Learning Environment*, Proc. of Third Int. Workshop MOOC and Big Data, LTEC 2014, Santiago, Chile, Sept. 2-5.
Krumm, J. (2009), *Ubiquitous Computing Fundamentals*, Redmond, Washington, USA, CRC Press.
Mishra, P. & Koehler, M. (2006), *Technological Pedagogical Content Knowledge: A Framework for Teacher Knowledge*, Teachers College Record, 108(6), 1017-1054.
Oddone, F. & Firpo, E. (2015), *Gli ostacoli all'innovazione didattica e l'attuale profilo*

professionale docente, TD, 23(2), 112-120.
Pajares, F. (1992), *Teachers' Beliefs and Educational Research: Cleaning up a messy Construct*, Review of Educational Research, 62(3), 307-332.
Pozzi, F., Persico, D. & Sarti, L. (2015), *Evaluating the acceptance of an Innovative Learning Design Environment within Communities of Practitioners*, in Proc. WCES 2014, Procedia - Social and Behavioral Sciences, 1019–1023.
Rao, N.M., Sasidhar, C. & Kumar, S.V. (2010), *Cloud Computing through mobile Learning*, IJACSA, 1(6), 42-47.
Tschannen-Moran, M. & Woolfolk Hoy, A. (2001), *Teacher efficacy: Capturing an elusive construct*, Teaching and Teacher Education, 17, 783-805.
Wenger, E. (2006), *Comunità di pratica. Apprendimento, significato e identità*, Milano, IT, Raffaello Cortina.