Smart Learning Extended Environment: Connecting Anywhere People And Organizations

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***Abstract*— The paper presents a case study aimed to realize a Smart Learning Environment, using an integration of technologies (digital environment, videoconference, new generation of interactive whiteboard) to sustain a Smart School. Data were collected with quantitative and qualitative method. Teachers and students are realizing a digital course for data base library school content.**

Keywords-smart school; whiteboard device; personal learning devices; videoconference.

I. INTRODUCTION. SMART LEARNING AND PROFESSIONAL DEVELOPMENT

The outcomes of international research on student learning [1][2] and teachers' practices and beliefs [3]-[5], have supported the debate on the need to raise the quality of schools. Nations policies have introduced reforms to better prepare students for the changed conditions of the 21st century [6].

The outcomes on the use of technologies show how the fundamental variable to increase the potential of learning is strictly related to transfer the student control over the learning process. Consequently, "how" people use technologies in learning contexts, becomes much more important than the technologies themselves. As Hattie demonstrated [3][7][8], the processes based on peer tutoring, the use of technologies to construct complex artifacts, or even the interaction organized by teaching methods, are those which better produce evidence learning.

Research on students' learning processes has led to highlight how:

- the principle that learning is not effectively a pure solitary activity, but it is a social action distributed in the context [7]; that the individual construction of knowledge takes place through processes of interaction, negotiation of meanings and cooperation with others [9]-[14]. Consequently, this perspective requires coherent methods of organizing and conducting the class [7];
- the principle of cognitive modification [15][16] is the result of a process of continuous interaction with artifacts, people and problems placed in the context, where the imitative processes [17][18] and "embodied" simulation [19][20] make evident new frontiers for more effective procedural and developmental learning (both cognitive and emotional) [21];
- the principle of inference of the environment/ context on learning allows to form "classes" competencies [10] such as creativity and innovation, problem solving and learning to learn [22]-[24]. The new media (and perhaps more significantly the web-based "social media") have a huge impact on the worldviews of individuals and groups; they also constitute forms of social belonging independent of geographic proximity [25].

Learning contexts are defined as inclusive of digital technologies [26]-[28] and are composed of a physical/spatial and digital dimension in which students realize their activities, even their tools, documents and other artifacts. In this sense technology can support deep learning in many ways, developing extensive learning contexts in which technologies are part of the process development. In particular it is shown how the interactive use of video is one of the forms that most involve deep learning. TALIS-OECD [3][4] contrarily shows a moderate percentage of teachers who orientate their practices in coherence with the research, through paths of exchange and cooperation with colleagues and the world of pedagogical reflection.

One aspect is therefore that teachers are involved in skills training: organizing learning and skills development, leading classes with more effective and innovative methodologies [10][29] in increasingly active learning environments; and engaging is therefore a perspective that requires the extension and dissemination of good practices widely spread.

The continuous training of teachers should therefore become a dynamic and transformative process of professional action, also modifying both the organization of schools - understood as a set of interdependent systems - and the forms of participation in the improvement of institutions, capable of modifying the adaptation matured, with a new update culture.

Scaffolding systems for continuous training thought as transformation and progress highlighted and sustained by research [30]-[34] can be an effective reference for innovation and quality of schools. It is therefore necessary to change the convictions rooted in teachers, expanding their repertoire of thought, perspectives, teaching methodologies; on the other hand to constantly develop and update a

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professional knowledge base on teaching and learning, starting from the research evidence, on the provisions of the adult mind, on the "in-action" connected research [29].

Hattie meta-analysis [7] also highlights some features of today's professional learning communities, increasingly considered an essential tool for establishing collaborative relationships and building capacity for change within the educational institution [35]-[38]. At the same time, professional learning communities become a way for schools to reduce isolation and learn together how to create sustainable change, while also measuring the achievement of improvement goals [35][37][39][40]. A professional learning community can be therefore defined as the set consisting of teachers, managers, administrative staff, staff, facilitators, researchers who share work to improve and progressively develop student learning [41]-[43]. It creates innovative, effective and powerful learning environments for the training of everyone's operations, to train empowerment and agency, to pursue personal, social and community goals.

The structure of the paper is following: in section 2 is described the concept of Smart School and the technology as devices. In section 3 we present the hypothesis, the research design and the people involved. In section 4 the activities designed and realized using devices to evaluate the case study. In section 5 we present some, and work-in progress, conclusions.

II. SMART LEARNING AND SCHOOLS

In order to ensure that learners are provided a relevant and engaging learning experience, it is becoming increasingly vital for such Smart Learning Environments (SLE) to be implemented in secondary and tertiary learning institutions. A SLE is one that features the use of innovative technologies and elements that allow greater flexibility, adaptation, engagement, and feedback for the learner [44]. All in all, these technological advancements are potentially revolutionary for the way teachers and learners interact, paving the way for more learner-centered learning environments. The Smart School is a school that is designed for providing a standard virtual teaching learning environment and as well as improving school management system [45]. The Smart School opens out opportunities and helps all pupils to develop digital skills, creativity and learning to learn. The Smart Schools principles are based on the two guiding beliefs:

- learning is a consequence of thinking, and good thinking is learnable by all students;
- learning should include deep understanding, which involves the flexible, active use of knowledge.

These principles provide a structure for schools with a vision of a learning community that is steeped in thinking and deep understanding, that engenders respect for all its members, and that produces students ready to face the world as responsible, thinking members of a diverse society.

Jen [46] declared five main goals as (1) to provide all-round development of the individual, (2) to provide opportunities to enhance individual strengths and abilities, (3) to produce a thinking and technology-literate workforce, (4) to democratize education, and (5) to increase participation of stakeholders. An appropriate mix of learning strategies is allowed for students to achieve basic competencies and to promote a holistic development. Thus, student-centered learning turns out to be the basis for designing learning activities. High-technology media, such as computer-based teaching-learning materials, the internet, and the World Wide Web, are integrated into conventional media. In order to guarantee the success of the conceptual model of teaching and learning, the Smart Schools require effective and efficient management of the resources and processes to support teaching and learning.

III. HYPOTHESIS AND RESEARCH DESIGN

The case study was investigated in an Italian Middle School (IC3) placed in the City of Modena, composed of 4 different sites distant from each other up to 10 miles (from the central site). Through the Sharp Anywhere· Sharp Anywhere integrates video conferencing with the flexibility of video calling, eliminates the need for meeting rooms and dedicated audio video equipment. It works with a cloud technology.

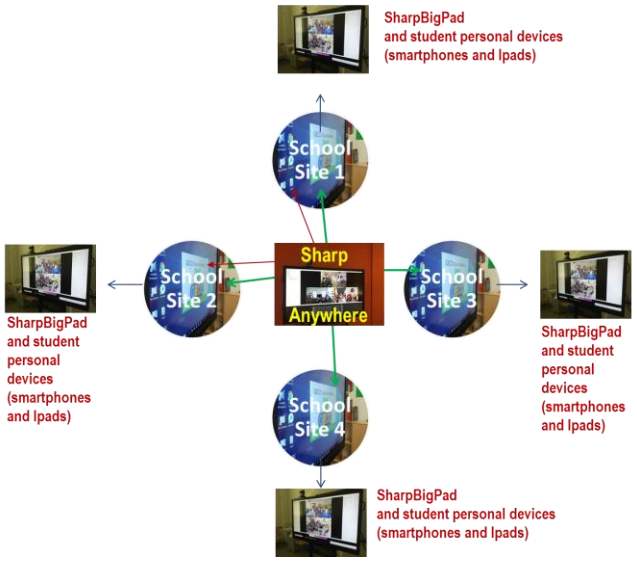

Figure 1. System design: Schools connections and devices.

Sharp has provided 5 BigPad. Sharp BigPad enables the following interactive functions and mobile devices connected via wireless LAN: - sharing of onscreen content; - transfer of files; - interactive onscreen writing and drawing; - remote control from mobile devices.

placed in the classes of different school sites. Mobile BigPad are used in multiple classes Figure 1).

Curricular teachers (n=12) were involved in the disciplinary areas of L1 (Italian Language), Science and Mathematics, Technology and Art. The wireless technology of the BigPad allowed the connection of student devices (smartphone and IPad) with simultaneous sending of photos and digital artifacts of the student's group work.

The Smart School system based on the integration of the tools of GoogleSuite, Sharp Anywhere and Sharp Bigpad was investigated to verify:

- the development of curriculum in soft skills (creativity, teamwork, sense of initiative);
- the methods of conducting the learning environment;
- the development of the idea of professional community and new organizational models of School.

TABLE I. RESEARCH AND METHODOLOGY DESIGN.

People	**Age**	**Meth.**	**Area**	**Quant. Tools**		**Quali. Tools**
				Pre	***Post***	***Post***
Stud.	9-12	Exp. n. 96	Creativity Teamwork Self-Direction	Questionnaire (before/after lessons with Sharp BigPad and Sharp Anywhere)		Focus Group
Stud.	9 -12	Trad. n. 85	Creativity Teamwork Self-Direction	Questionnaire (before/after traditional lessons)		-
Teach.	26-58	Exp. n.12	Science Mathematic Italian language Art and Technology	Questionnaire (before/after lessons with Sharp BigPad and design with Sharp Anywhere)		Focus Group
Res. Team		n. 3	Pedagogy Statistic			

The classes involved were five in the experimentation method, and five in control. Mixed method instruments by teachers and students were used: quantitative data were collected through the initial and final questionnaire at the experimental phase (pre-post test) (Table I). For teachers, based on Talis survey, for students, based on European Entrepreneurship Competence Framework (creativity, teamwork, self-direction). Qualitative data were collected through focus groups and in-depth interviews with teachers and students. A research blog for teachers is used as well.

IV. ACTIVITIES

The activities carried out are divided into sex phases:

- phase I: teacher training on Sharp Anywhere and Sharp BigPad (September / October 2017),
- phase II: planning of teaching activities to be carried out in class and planning of teacher support activities (November 2017 / January 2018),
- phase III: initial data collection in the involved classes (experimental and control) and teachers (February 2018),
- phase IV: implementation of teaching activities in classes with Sharp Anywhere and Sharp BigPad and the start of supervision activities for teachers (February / May 2018),
- phase V: final data collection in the involved classes (experimental and control) and teachers (June 2018), phase
- phase VI: dissemination of good practice outcomes, blueprints for the policies, generalization hypothesis (Table II; Table III).

TABLE II. PHASES OF ACTIVITIES.

Phase N.	**Sept. 2017**	**Oct. 2017**	**Nov. 2017**	**Dec. 2017**	**Gen. 2018**	**Feb. - May 2018**
1	Teacher training					
2			Planning teacher activities Planning teacher supervision			
3						Pre test
4						Experimental activities with classes Sharp Bigpad + Anywhere

TABLE III. PHASES OF ACTIVITIES.

Phase N.	**Feb. – May 2018**	**June 2018**	**July 2018**	**Aug. 2018**
4	Teacher supervision Sharp Anywhere			
5		Post test		
6			Dissemination	

In Phase II and IV, Sharp Anywhere and Sharp BigPad have been used for:

A. *Teachers*

- Connection between different sites to didactic design;
- Connection between teachers and experts outside the school;
- Connection for focus groups and supervision of experimental activities.

Focus Group (FG) is a quality research methodology. The FG is a group interview (with max 10-12 students or teachers) which the researcher asks questions to verify a hypothesis studied with quantitative methods (questionnaires. Usually the FG is played in face-to-face. The Sharp Anywhwere technology has allowed to experiment the FG effectiveness in digital setting.

- Registration and repository the video conferencing in Sharp Anywhere cloud;
- Creation of videoproducts for the continuous training of school teachers and the development of professional communities.

B. *Students*

- Connection between different classes of sites to present learning products;
- Connection between different classes of sites for peer tutoring;
- Connection with classes from other schools for peer tutoring;
- Registration and repository video conferencing of Sharp Anywhere cloud.

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Students – as result of cooperative learning work – realized videos to present a topic of lesson at peer students in other site schools (involved into the experimentation). The presentation by BigPad was the opportunity to save the videos into the Anywhere cloud. In this way every school – students and teachers – can "re-use" the videos for learning any time and any where.

- Realization of videoproducts of subjects studied for school database;
- Evaluation of skills based on authentic products.

C. *Schools organization*

- Connection between different sites for organizational meetings;
- Connection for formal and informal training and information groups;
- Connection for widespread laboratories;
- Connection for parallel classes;
- Connection for staff meetings, team;
- Connection with experts for training and consulting;
- Connection with schools in the training district;
  Connection for academic lessons.

Some interesting activities were realized with integration of devices. The students working in small groups to produce some artifacts – conceptual maps, new words, concept definition, problem solution – to demonstrate their understanding. With their personal devices, students send the artifacts via wireless on the BigPad and teacher can simultaneously compare the works, debate with classroom, improving deep understanding. The BigPad connected with Sharp Anywhere, saves the students works into "Anywhere cloud" and, in this way, teachers (and schools) build a data base of artifacts (categorized by topic or area of learning). Comparing understanding "just-in-time" and simultaneously – using personal and school devices – improve student's competencies, motivation and engagement (this is teacher observation and consideration during the focus group).

V. CONCLUSION

Through the Sharp Anywhere connection monitoring system, a first partial data shows that the Smart School used 60 hours of teacher-time involved in organizational and training activities. Considering that the time for each teacher dedicated from the work contract to the didactic planning is 30 hours, a first result in the Smart School shows how there has been an extension of the planning time with a reduction of the movement time from site to site (Figure 2).

As a consequence, the School technological devices increases the availability of teachers, an optimization of work-time and a possible higher quality of school time.

A second consideration shows how on-demand supervision activities were possible - anywhere and anytime with personal devices (smartphones and IPads) - strengthening the idea of the professional learning community, and outlining the figure of the in-service educational supervisor. This aspect answers the questions emerging in modern teacher education related at the quality of teaching and learning [47][48].

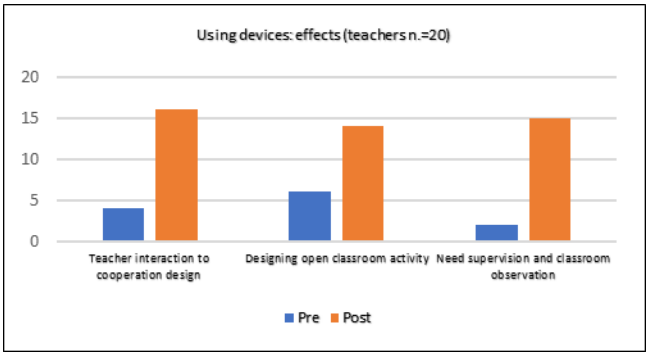

Figure 2. Using devices: effects on teacher into experimental design.

A third consideration concerns the extension of the possibilities for the qualitative research methodology: it is now possible in the Smart School the realization of quality focus groups through the integration of tools, such as Sharp Anywhere and Sharp BigPad, with digital environments for research and continuing education.

A fourth consideration is emerging from focus groups (Table IV): teachers refer the engagement in new didactic methodology and peer collaboration to sustain a professional learning community. The education video production during video supervision – with Sharp Anywhere and Sharp BigPad – is a "cloud resource" to enhance competencies and lifelong learner profile. Cooperative Learning method is used to engage students into project work and to delivery with wireless line, by smartphones, products and learning objects into BigPad.

TABLE IV. RESULTS OF TEACHER FOCUS GROUP.

Strengths	**Weaknesses**
To use personal devices for learning Student motivation Student engagement Student cooperation Student deep understanding Student creativity Teacher support (supervision) Improving quality of pedagogy Improving school climate and quality of teacher work	Short time of experience Few colleagues involved
Opportunities	**Threats**
To realize video for learning To realize school cloud for learning To realize opportunity to share knowledge To build Smart School	No continuity of experience Opposition to change school organization Opposition to culture of innovation

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