Network and mobile technologies in education: a call for e-teachers

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Abstract

At present an ever-widening gap exists between how students and how schools use network and mobile technologies (NMTs).

In fact, there are still various barriers hindering widespread use of NMTs at school. We are obviously not referring so much here to the diffusion of technology in itself as to diffusion of the new pedagogical approaches required to best exploit that technology for the reinforcement and improvement of learning processes (Thorpe, 2012).

Take for example so-called "e-pedagogy" (Elliot, 2008), which relies greatly on learning-by-doing, connectivity and the strong integration of formal (school) education with the informal learning processes (Cook, 2012) which are typical of peer-learning, experiential learning, etc.

Considering that today personal availability of technology to students is (almost) no longer the main obstacle to educational use of the new technologies, there remain essentially two conditions which favour wide propagation of e-pedagogy: (a) an organisational development of the school institution to foster didactic innovation in which NMT use is the normal condition, just as use of the traditional blackboard, paper and pen used for a long time to be the normal condition; (b) a process of continual professional development of teachers which is no longer (or not only) based on formal training so much as on informal learning processes specifically centred on NMT use.

They are two absolutely necessary, strongly interdependent conditions. Organisational development aimed at pedagogical innovation cannot work without adequate corresponding professional development of teachers. Viceversa, professional

development of teachers without any guarantee of the institutional conditions for putting a real pedagogical renewal into practice would end up by blocking any large-scale diffusion of such a renewal (Trentin, 2010).

In order to act on both these conditions we must be aware of the rapid changes in the context and consequently of how the figure of the "e-teacher" should be "modelled" to produce someone who is able to use NMTs both for their students' learning and for their own continuous professional development.

These are the themes which will be dealt with in the present chapter.

***Keywords*:** e-teacher, 2.0 teaching,

1. Introduction

There is an ever-widening gap between how students and how schools use NMTs, even if their diffusion is bringing about marked changes in the way individuals interrelate . And since the teaching/learning process is based above all on communication and social interaction, people involved with education cannot ignore these changes, indeed must consequently adjust to them (Kearsley and Blomeyer, 2004).

It is thus evident that the school system must adopt a strategic role both in guiding the new generations to an ethically correct and discerning use of communication technology, and in proposing it as a tool for enhancing individual learning processes, extending them outside the physical and institutional confines of school (Faberman, 2005; Barnes et al., 2007; Rocha, 2007; Silva, 2007).

Since teachers are the driving force behind teaching and learning activities developed at school, it is inevitably up to them to initiate a process of change in pedagogy. This change must take into account the multiplicity of information and interaction channels which the students have daily at their disposal. We are talking about an extraordinarily important task from the educational point of view, one which requires a change both in the teacher's role and in didactic organization. Such a change has been defined as "epoch-making" (Fullan, 1997; Goodson, 2003), and it requires teachers to "learn to teach" in a different way from the one by which they themselves were educated, as

regards both the specific subject area and the teacher's role (Hargreaves et al., 2001; Gaston, 2006; Thompson, 2007).

It is for this reason that, if we wish to promulgate the knowledge, skills and culture related to the educational use of NMTs, we must use teacher training tools and approaches based on the same resources and methods by which they can then be proposed to students (Trentin and Repetto, 2012).

Hence no longer (or at least not only) formal training (i.e. participation in classroom or distance-learning courses), but interventions focused above all on informal learning processes (Cross, 2005), which exploit the potential of the NMTs for accessing and sharing information, knowledge and good practices, by means of direct consultation of the online sources and social interaction in networked communities of practices (Wenger, 1998; Trentin, 2005).

It is certainly not an easy process but it can succeed, especially if teachers are willing to invest time in a type of professional development aimed at tuning them into the communication channels of their direct users (the students) in order to exploit them for teaching and study support processes. This cannot of course happen if they do not familiarise themselves with NMTs. And the first step in this direction is generally to try and understand not so much how NMTs can be applied didactically (this will be acquired at a subsequent stage) but rather how to use them for one's own professional growth (access to knowledge, participation in online communities or training activities in which the same technological tools are used, etc.).

In this chapter we will focus on some of these aspects, contextualising the problems and trying to understand how the teacher's role changes when new methods of didactic communication and knowledge flow (Trentin, 2011) are introduced with NMTs.

In other words, what conditions are required to make a transition from traditional teaching to "2.0 teaching" feasible? And how should the figure of the "e-teacher" consequently be "modelled" to produce someone who is able to use NMTs for both students' learning and their own continuous professional development?

2. The Key issues

Some time ago, the Danish educational psychologist Steen Larsen argued that:

"Information can be transmitted but knowledge must be induced" (Larsen, 1986)

In support of his theory he listed the three key stages which in his opinion bring about the flow of knowledge from a source (the teacher) to a receiver (the learner):

- *transformation of personal knowledge into public information*. Teachers transform and organize their knowledge in order to transmit it to their students.
- *information transfer*. Teachers transmit their knowledge, transformed into public information.
- *transformation by the students of the public information received into personal knowledge.* Pupils transform the information provided by the teacher into personal knowledge.

Larsen uses a very effective metaphor for describing this inductive process: the electrical transformer. In this, although there is no physical contact between two circuits (the primary and the secondary circuits), a current produced by magnetic induction nonetheless passes between the two.

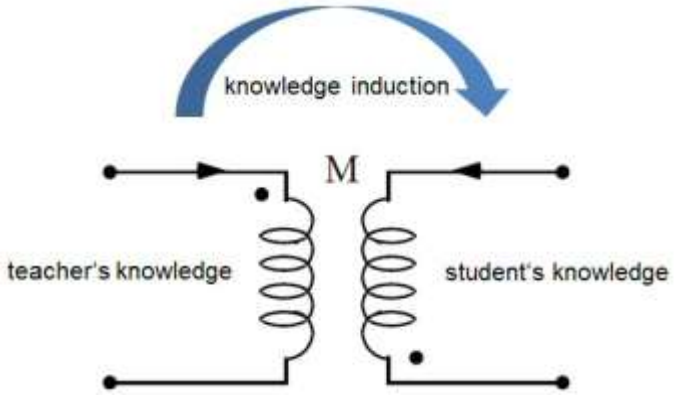

Figure 6.1 – The electrical transformer metaphor

In the metaphor, the primary circuit of course corresponds to the teacher's repertoire of knowledge, and the secondary circuit to the learner's previous knowledge which we are trying to develop further through induction.

The idea of induction also perfectly reflects our awareness that the mechanisms for the acquisition of new knowledge must not resemble the decanting of a liquid from one container (the teacher's head) to another (the student's head), but rather a process of absorption and integration of the information received by the student into his/her own pre-existing cognitive structures, which are the result of personal experience, earlier knowledge, etc.

Thus, one of the teacher's key roles is to create the conditions for stimulating and favouring this process of absorption and systematisation, by proposing both individual and collaborative learning activities, problem-solving and artefact development, etc. (Trentin, 2010).

2.1 School as one of the sources of knowledge, but not the only one

Until some time ago (certainly when the present teachers were students) the sources of information which could influence the development of learner's new knowledge, were limited to the teacher and subject-specific textbooks, in addition to media information channels such as radio and TV: in any case all classifiable as so-called "guaranteed" sources for their correctness and reliability.

The arrival of Web 2.0 (O'Reilly, 2006; Anderson, 2007) revolutionised this scheme, and for the student today there are many more channels for acquiring direct or indirect information in the various subject areas (e.g. Wikipedia). However, without adult control and support, transformation of this information into personal knowledge almost always involves a "do-it-yourself" process wholly lacking in method.

The worrying aspect is that most teachers are unable to support this process (i.e. the favouring of what Larsen indicates as "knowledge induction"), because they are still culturally anchored or induced by the school context to the use of conventional teaching/learning schemes centred on the teacher and the textbook (Coppola et al., 2002; Cochran-Smith, 2005).

There should be a parallel rethinking of the programming/organisation of teaching activities so that the use of technology is not so much an occasional event as normal practice. Evidently individual teachers can do very little in this sense, and the margins of manoeuvre for each single institute are also very limited. As can easily be imagined this is a fight which has to be fought at other levels, such as the ministries and policy-making bodies. It should not however be forgotten that if we wish to win the battle we cannot ignore some fundamental tenets of organisation:

> *"... if a foreign body is getting implemented in a system, either it adapts and will not be regarded as alien or it will continuously be identified as a foreign body and be eventually rejected from the system" (Euler e Wilbers, 2002)*

It is clear that "foreign body" here stands for "NMTs".

This is a key aspect which actually involves not only institutions but also each individual citizen, especially if we consider the need for Life-Long-Learning also after complete formal education.

It is thus necessary to intervene on teachers' professional development, accustoming them to the informality of the learning processes offered by 2.0 resources[1]. This is a key aspect which indeed concerns not only the teaching process but also the single teacher's continuous training (Teras et al., 2010).

Regarding professional development, we should in fact remember that growth both in the specific subject area and in teaching methodology will increasingly involve individual autonomy and the teacher's ability to master the communication technologies in daily use for his/her own continuous education (Hammond and Collins, 1991). This applies to the teacher today and will apply even more to the student in the future.

2.2 NMTs as a bridge between formal and informal learning

As said so far, the school has a pressing need to metabolise approaches to the educational use of NMTs. Firstly for the teachers, both as first-person users and as proposers of these approaches to their students. Secondly for the students themselves, for whom school may be the first context where they learn how to methodically exploit NMTs potential and resources in the study of the various school subjects.

It is the reason why the teaching quality will increasingly evaluated in terms of the education of the learner both in the individual use of network technology/services and in the capacity to become autonomous in providing for the personal own continuous education in the specific contents domain, once the "formal" learning process has been completed (Trentin, 2008).

In this sense, school can play a strategic role, not only educating but also "meta-educating", i.e. equipping students to face the lifelong process of professional development (Hargreaves et al., 2001). In other words, using the "formal" educational process as a bridge, creating the necessary skills for subsequent autonomous management of "informal" learning processes based on searching for and filtering

1. By the term "2.0 resources" we mean here both Web 2.0 technology and also what we have access to through that technology (information, factual materials, social networks, experts, etc.)

information, accessing explicit (codified) knowledge sources, and navigating the ocean of social contacts trapped within the myriad of online social networks (for example the networked communities of professionals).

Although these considerations are nowadays widely accepted, some basic critical questions remain; firstly the poor knowledge of most teachers about the 2.0 resources and consequently the poor educational use of them.

2.3 The ever-widening gap

Speaking about the integration of communication technology into teaching practices we cannot ignore the wide and indeed ever-widening gap that divides the students' personal/daily use of NMTs and the way the teachers propose them for educational activities:

- on the one hand, there are the students (digital natives) (Prensky, 2001; 2004) with their innate capacity for mastering technologies, using them for both social and learning purposes, albeit with little or no method;
- on the other hand, there are the teachers (digital migrants) who, while making admirable attempts to innovate their teaching, tend to propose an educational use of NMTs based on conventional methods and practices of study, anchored to old teaching schemes. It would instead be necessary to conceive and introduce new methodologies inspired by e-pedagogy (Elliot, 2008), which are able to fully exploit the potential of c NMTs both for social interaction and for accessing information.

The widening of the gap is also exacerbated by the way institutions conceive of the physical spaces where the teaching/learning processes for integrating technology in education are supposed to take place.

2.4 The physical spaces of technology-supported education

If we look back in the recent history of educational technology, we can identify at least three stages in the long, slow process of introducing Information and Communication Technologies (ICTs) into school teaching (Trentin and Repetto, 2012).

Stage 1 – *The ICT are installed and used inside a classroom* which has been organised for this specific purpose (the computer room), where students go now and then

specifically to learn to use the computer and sometimes to use it in the study of other school subjects.

Stage 2 – *With ICTs, particularly communication technologies, the classroom walls (of the computer room) are knocked down.* The computer is no longer seen as a tool to be programmed or for running educational software, but also as a powerful means both for accessing information, digital repertoires, and for coming into contact with other realities: distant classes, other students, etc. For most students and teachers, the school online connection remains however the only means to access Internet.

Stage 3 – *The classroom is extended into virtual space, fostering so-called extended/expanded learning* (Faberman, 2005; Rocha, 2007; Silva, 2007). With the diffusion of Internet, both at home and in mobile forms (WiFi technology, netbooks, tablets, smartphones, etc.), the computer room becomes obsolete, since the learning activities supported by the network can be developed anywhere: at school (not necessarily in a computer room), at home, on a park bench.

Now, although Stage 3 has already been in force for some years, schools and teachers are still trying to come to terms with Stage 2 (at least in Italy). In the meantime, students are increasing their use of social networks to interact with classmates, mostly for:

- activating somewhat unorthodox mechanisms for sharing and passing on solutions to exercises and tests;
- accessing information sources for study often using willy-nilly cutting-and-pasting from unreliable sites.

In other words: without any method.

The paradox is that someone else (the teachers) might teach them the method were it not for their lack of the minimum technological skills required to create the right mixture between technology and learning approach, enriched by the huge amount of resources to be found online.

2.5 The need for an osmosis of reciprocal skills

Thus what is needed is a kind of albeit partial osmosis of the reciprocal skills, so as to rebalance them for an effective, efficient use of online resources in the learning of school subjects (Zimmerman, 2007). How can this be achieved? Here the teacher must

inevitably play a fundamental role, not only in his/her guise of subject area expert, but also in that of researcher (teaching implies a process of constant research) and even more in that of educator. This is possible only if the teachers are willing to:

- enter the communicative dimension of the new generations, using the students' own virtual spaces (i.e. "going to visit" the students where they normally interact among themselves);
- indicate study methods which exploit the above dimension;
- educate students to use the potential of NMTs which are at their daily disposal in a discerning, intelligent way;
- educate students to digital citizenship.

In all this, we cannot ignore the urgent need for a systematic initial training programme for educators, and their continuous updating. They must be made aware of the need for change, and this can only begin from within and from the conviction that this is the only way to achieve a partial alignment between the ways of communicating at school and in everyday environments (Zimmerman, 2007).

We say "partial alignment" because the educational mission of school should be to understand how the new generations interact through NMTs, how they access web resources and interrelate socially; but it should also be to intervene where necessary to correct young people's wrong attitudes to the technological potential and their wrong methods of exploiting it. In other words, they should educate them to be digital citizens. But in order to do this, teachers must themselves be good digital citizens, and here a vicious circle is often created.

At this point the question is: why should teachers (digital migrants, always assuming they are willing to migrate) force themselves to enter into the mentality of a digital native and change their way of teaching, when school organisation itself is so alien to the demands of a 2.0 teaching method? In other words, if the teacher is mainly asked to respect the curricula indicated by the Ministry of Education, why bother to make extra work (which in any case is usually not even acknowledged)?

The answer, as we said before, can only be found within each individual. Each teacher must decide whether to merely act as a "content mediator", passing on knowledge of a specific school subject to his/her students (no small feat in itself), or whether to help

them to become citizens of the future who are able not only to read, write and do arithmetic, but also to master methods and strategies for the effective and efficient use of communication technologies (Trentin and Repetto, 2012).

In order to equip themselves for this kind of educational mission, teachers must embark on a path which has some compulsory initial steps, such as:

- entering into the logic of the new communicative dimensions and practices induced by NMTs;
- understanding them fully by putting them into practice;
- mastering the 2.0 resources for their own professional development so as then to be able to educate students to use them efficiently and discerningly in formal and informal learning processes.

What we are looking at is a path which enhances teachers' awareness of the potential of NMTs, starting from their first-person use before they are seen as teaching tools. Hence, a path attracting teachers to NMTs, by presenting them as a means to:

- access information, document archives, educational materials, digital repositories;
- contact and collaborate with colleagues and expert;
- take an active part in communities of practices;
- participate in online or blended teacher training events ("formal" education);
- practise continuous self-direct learning ("informal" learning).

After this first fundamental step, the following one must regard the way in which NMTs can be integrated into individual teaching practices. For example, how to integrate 2.0 resources used daily by the students to improve their approach to both individual and networked collaborative learning? (Trentin, 2010).

This is an very delicate step, requiring teachers' strong awareness of how their role have to change in a "2.0 classroom", i.e. a classroom which widens its range of action, extending it into virtual space, when learning takes place either in an actual physical classroom or outside the school building (Rocha, 2007; Silva, 2007).

Without a clear understanding of the required change in the teacher's role to accommodate the potential of the new communication channels and students' new ways of interacting, it will be impossible either to create suitable teacher training schemes

(which are better applied early on), or to change school organisation so as to favour true didactic innovation based on the considerations expounded above.

Thus, the second part of this chapter will try to outline the profile of what might be defined as the "e-teacher".

3. From teacher to e-teacher

In e-pedagogy, the figure of the teacher continues to be central, although their function changes as compared to exclusively classroom teaching. From teachers delivering a lesson they become facilitators in the process of learning content which they are expert in, contributing to the preparation of the teaching materials and/or supervising their students' interactive activities, both online and face-to-face. How far their function is modified obviously depends on the type of approach adopted each time, for example whether it is more centred on the teacher or on collaborative study.

The knowledge and skills for carrying out this function efficiently are not yet however very widespread among teachers (Robinson and Latchem, 2003). One element of e-pedagogy sustainability is thus closely linked to teacher professional development (Hudson, 2012), which should be concentrated not so much on the instrumental use of NMTs (training in the technologies), as on the various didactic/educational approaches for applying them to education.

3.1 The teacher's changing role

A 2.0 class requires both teachers and learners to take on different roles and responsibilities from a traditional class (Coppola et al., 2002) (Crichton and Kinsel, 2003). Elliot et al. (2008) have in fact for some time now been calling for the development of an e-pedagogy based on reconceptualisation of traditional teaching practices.

Teachers who intend to adopt NMTs in their practice therefore need fully to understand the philosophy underlying the concept of the 2.0 class and the paradigm shift it involves. Traditional teaching/learning practices are focused on the teacher, whose objective is to transfer a given body of knowledge directly to learners. By contrast, e-teaching concentrates on the relationship among learners, and that between learners and

the knowledge to be acquired. Students are helped to be more autonomous, proactive and responsible towards their own learning processes.

Table 3.1 summarises and compares the main characteristics of traditional teaching (which may also make use of technology) and those related to the e-teaching paradigm.

	traditional teaching	***e-teaching***
teacher	possesses and transmits knowledge	guides study
student	passively receive contents	interacts with contents and the tutor/teacher, learns autonomously and in groups
class	place where knowledge is transmitted	place where knowledge is built and shared
knowledge and experiences	transmitted vertically from teacher to learners	shared horizontally among members of the learning group, which includes the teacher
learning processes	strongly directed	active and collaborative
curricular contents	predefined and standardised	flexible and open-structured so as to permit multiple learning paths
NMTs	mainly used to support classroom lessons	the means for constructing an integrated, learner-centred learning environment
teacher's perceptions of Educational Technology (ET)	teacher considers ET as a surrogate for their own role	technology is considered a means for stimulating learners, for improving and amplifying the learning environment

Table 6.1 – Comparison of traditional teaching and e-teaching

To recap then, systematic uptake of e-pedagogy is conditional on teachers having access to suitable professional development so that they become capable of making autonomous and informed decisions about what e-teaching strategies will prove most effective for meeting the needs at hand.

Moreover, given the particular features of online environments, which are certainly different from the physical environments where face-to-face lessons normally take place, the teacher must be trained to choose the most adequate strategies of interaction /didactic communication to fit the medium they are to be used in.

This is a particularly critical competency for teachers; acquiring it should help dispel any impression they may have that the educational use of NMTs simply means transferring the contents and teaching approaches that have proved effective in the classroom onto the net. In short, the special characteristics of a given medium mean that it is never neutral in terms of communication dynamics and strategies (Trentin, 2010). For example, video, audio and multimedia each have their own characteristic pace and timing; also text communication, which is typical of electronic messaging systems (e-mail, forums, social networks etc.) where the expressivity (tone of voice, interlocutor's expression etc.) filtered by the medium often needs to be substituted with artifices such as the so-called *emoticons*.

Before outlining the professional development path to be taken by a teacher who intends to adopt NMTs in his/her, we first need to define the abilities, knowledge and competencies required for effective implementation of e-pedagogy.

3.2 Enabling conditions for 2.0 teaching

There may be many advantages in NMT-based teaching, as we said earlier. There is just one key to adopting it efficiently, however: you have to believe in it!

As well as a firm belief in the potential benefits to learning, other factors indicated by Kearsley and Blomeyer (2004) are:

- the desire to innovate one's teaching approaches;
- the convenience of teaching where and when one wishes;
- the chance to establish a more personal rapport with individual learners;
- the host of materials available on the web;

- the possibility to teach in a more stress-free environment.

Obviously other factors can be influential, especially those regarding the teacher's status, e.g. the chance to earn extra and to capitalise on e-teaching for professional growth and career advancement.

3.3 Willingness to engage in e-teaching

Once the teacher has sufficient conviction about the validity of online approaches, the next matter is the willingness and chance to modify teaching methods. In other words, what boundary conditions are to be considered for supporting e-teaching? Fuller et al. (2000) lists the following demands made of the e-teacher:

- be willing to sit at the computer for at least 2-3 hours a day;
- feel comfortable with one-to-one interaction and debate;
- be flexible in teaching and interested in innovation;
- be willing to use multiple online services in teaching/learning processes.

While these may not appear to be particularly stringent conditions, many excellent classroom teachers are unable to meet them. The reasons for this include difficulty in getting used to regular online interaction with learners, in adjusting to the demands of CMC (Computer-Mediated Communication), and in feeling comfortable with technology.

3.4 Preconditions for e-teaching

From the above, we can derive some preconditions for becoming an effective e-teacher. In this regard, Kearsley and Blomeyer (2004) point to the need to:

- have ready access to the network;
- feel comfortable with tools and systems for teaching and learning online, such as social networks, wikis, e-learning platforms, authoring systems, etc;
- have prior firsthand experience of learning online. This is essential for understanding the potential advantages and pitfalls of NMT-based learning from the learner's viewpoint.

Online training is the best means of ensuring that the prospective e-teacher satisfies the last two preconditions. In this way, trainees will have gained learning experience using

the same tools and methods that they will later adopt themselves in their own e-teaching activities (Trentin, 2010).

3.5 Cornerstones of e-pedagogy

One of the main conditions for effective e-teaching is full awareness of the cornerstones of e-pedagogy. These include:

- learner-centred activities;
- active, problem-based learning;
- problem-based learning related to daily experience;
- activities of information problem-solving, i.e. based on effective and efficient strategies for searching for information online;
- collaborative learning;
- teacher-role flexibility (facilitating individual learners and moderating learning groups);
- peer-based evaluation.

For many teachers this is unfamiliar ground, so these approaches will need to be learnt from scratch and integrated into their practice. Others may already have integrated them into their repertoire of classroom practice, but will nevertheless find it a challenge to implement them online.

Of the above strategies, the one that probably most characterises e-teaching is facilitation of individual and group learning (Collison et al., 2000) (Salmon, 2002; 2004).

4. e-Teacher education and professional development

In most European countries, Initial Teacher Education (ITE) is conducted in a traditional manner, with limited attention dedicated to both the educational use of NMTs (Attwell, 2005) and teachers' capacity to innovate their teaching at the pedagogical and methodological levels.

The result is that after an initial phase of awareness-raising/training, the actual innovation process is left entirely up to individual teachers, who all too often find

themselves on their own when it comes to introducing new solutions into teaching processes. To reduce this sense of isolation, conferences and seminars are sometimes held for disseminating news and good practices about educational NMT use. While useful, these represent only a partial solution to the problem. What is really needed is a new professional profile for teachers, and thus a reference framework for their continuing professional development (Attwell, 2005).

In other words, sustainable adoption of NMTs in support of teaching and learning processes should not be seen as an occasional, sporadic event but rather as part of a general change in teachers' status and in their continuing professional development.

4.1 What competencies does an e-teacher need?

As well as acknowledging the importance of the aforementioned points, we also need to recognise another key factor: definition of e-teachers' competencies as a guide to their professional development. There are still no generally-recognised standards for defining the competencies of the online teacher. However, some international bodies have made proposals in this direction. One of these is the International Society for Technology in Education2, which states that the e-teacher should:

- use social software competently;
- understand the characteristics of the "e-learner";
- understand approaches and strategies for effective e-teaching;
- be fully aware of the pros and cons of CMC;
- understand the dynamics of online group interaction and how to manage them;
- be capable of evaluating online activities (e-tivities);
- understand the legal (copyright) and ethical implications of online education;
- be aware of accessibility issues affecting disabled participants in online learning;
- understand strategies for effective integration of online activities into classroom learning.

This list is not exhaustive but it does cover the most important issues.

2. ISTE – http://www.iste.org/

Besides defining the general guidelines for what the e-teacher's skills should be, we should consider another key aspect, i.e. their continuous professional development. Although this is a concern which is common to all professional categories, it is undoubtedly particularly important for those professions based on intense knowledge flows (Trentin, 2011), experimentation and intensive use of technologies.

4.2 Need for continuous professional development

Teachers can be seen as "artisans" who work mostly alone, with a variety of (human) materials, organised in a highly personalised manner. They develop a repertoire of abilities and strategies that form an integrated set of different mental schemes which gains complexity over time. This repertoire is largely constructed through trial-and-error; indeed teaching in the holistic sense also means experimentation. So teachers are involved first-hand in constructing new knowledge and developing good professional practices.

In the last few years their professional growth has in fact become increasingly linked to school development processes. This is a strong stimulus for:

- concretely defining the work that a teacher must carry out with his/her students;
- potentiating research, reflection and experimentation in a work based on problem-solving;
- attentive examination of important research and experience regarding the best teaching practices;
- analysis of the effects which new communication technologies have on students' learning styles;
- collaboration among teachers, preferably based on the activation of fully-fledged inter/intra-institutional communities of practice which exploit NMTs to amplify communication among their members and give it continuity.

In this way solid foundations can be laid for the development of new approaches to managing and profiting from the immense heritage of tacit knowledge within the school, connecting research to professional development through the identification of good practices and the activation of inter/intra- teacher and school networks.

The teacher's professional growth thus comes to depend more and more on their belonging to communities of practice whose main strategy is collaborative learning.

This ongoing process of professional development requires reflectivity, dynamism and foresight on the teacher's part.

Such qualities can only be fostered within a true culture of professional development, a culture that attributes importance to practice, experience and research, ideally conducted with peers and other professionals operating in the same context.

In this sense teaching is a typical example of a profession with two-way interdependence between practice and research. In other words, teachers draw on research but at the same time they can also be the source of new knowledge generated by their individual professional practice (Engestrom, 1995).

We can say then that the capacity to plan and conduct individual or group research into professional practice is part and parcel of teachers' professional development. Having those abilities also allows the individual teacher to evaluate research conducted by others, and to decide whether to apply it.

In this way professional know-how becomes the result of combined knowledge gained from the workplace and the experience accumulated therein. In other words, professional knowledge is developed through a process of situated learning and is further elaborated by way of personal critical reflection (Hammond and Collins, 1991).

4.3 Implications for continuous professional development

So professional development appears to be based on a complex series of factors. The most obvious of these is the individual's direct involvement in their own professional development. However, there are numerous others, including (Attwell, 2005):

- exploration of, reflection upon and improvement of professional practice;
- development of the skills, knowledge and understanding necessary to evaluate and review professional practice;
- understanding of the processes of change (as practice increasingly takes place in complex and dynamic contexts);
- the ability to create new knowledge;

- development of theoretical knowledge to underpin and complement reflection upon practice;
- study of the interplay between theory and practice;
- the ablility to transfer skills, knowledge and understanding from one context to another;
- the generation of expertise through research;
- the ability to handle complexity and inter-connectedness of issues (including through the formulation of mental models, schemas or networks);
- development of contextualised understanding;
- translation of understanding into action, as appropriate;
- further development of communication skills;
- the attempt to create a wider community of practice that embraces research as a guide to both policy and action;
- the ability to design and carry out authoritative research into aspects of professional practice;
- the ability to analyse, interpret, evaluate and, if appropriate, apply the research findings of others.

These conditions should provide the teacher with abilities and knowledge not just for using NMTs as a support tool, but for integrating NMTs into new pedagogical approaches.

We believe that all this is crucial to 2.0 teaching sustainability, and training projects such as Aladin 2.0 described in Chapter 7 of this book have in fact moved in this very direction.

5. Some conclusive reflections on e-teacher status

In order to integrate the use of NMT's into their teaching practices, teachers must change their attitude to teaching, shifting from a vertical model of knowledge transmission to a more horizontal one which is based on collaborative processes as well as on individual study. The teacher's role continues to be a central one, even if it is now rather as facilitator of the process than as mere dispenser of knowledge.

With this point of view, the nature of the teaching/learning process inevitably undergoes radical changes, as does the student/teacher relationship. The teacher becomes a less authoritarian figure, closer to the role of class intellectual resource, as well as facilitator of student activities. This situation tends to attenuate the authority dynamics which have traditionally existed in the classroom, and constitutes an undoubted opportunity for enriching the teacher/student relationship. To obtain these results it is however necessary to act on two strongly interrelated levels: professional development of teachers and formal recognition of e-teacher status.

Effective take-up of NMT-based learning is heavily reliant on the acquisition and spread of key competencies among teachers. The crux lies in understanding whether a rewards system might provide them with sufficient incentive to invest in development of those competencies, which are essential for e-pedagogy sustainability.

Another consideration concerns e-teacher status or rather how e-pedagogy competencies are regarded and certified. People qualified to teach are issued with a formal certificate documenting their subject-area expertise and their possession of the required academic qualifications. Certificates documenting NMT-based teaching competencies are rarely awarded similar recognition. These skills represent added value gained from experience and ongoing professional development at both methodological and technological levels. The absence of a proper recognition system offers ~~a~~ carte-blanche to anyone wishing to try their hand at e-teaching, whether or not they have undergone adequate training. But what is worse, it generates an impression of e-teaching as a mere adjunct to classroom teaching, a fashionable accessory if you will.

This all points to two major conditions for supporting the sustainability of e-pedagogy, and hence of e-teaching:

- the need for general cultural growth regarding the attitude towards e-pedagogy (from the operators to the policy-makers) and particularly towards its key figures, first and foremost the teachers;
- renegotiation of teacher/tutor status in their new role as e-teacher.

As we have seen, the former condition demands training courses designed specifically for developing the competencies needed to introduce NMTs into teaching/learning processes. The latter condition, on the other hand, requires in-depth reflection about how teachers' status varies when they adopt NMT-based methods.

As we have said, they are methods which imply interaction with students and which are not limited to classroom time but extend outside it. It is an activity which must be adequately recognized, formally redistributing online and onsite teaching hours. At the present moment however, since there is no official regulation of e-pedagogy, its adoption simply amounts to extra, unacknowledged, work for the teacher.

It may thus be concluded that for a true changeover to 2.0 forms of teaching to take place, a combined action is required: on the one hand an organisational development of schools so as to include and make habitual new NMT-centred teaching/learning practices; on the other hand, formal recognition of the emergence of new professional figures without whom the sustainability of these practices could not be guaranteed. In the words of Euler and Wilber, if this does not occur, these practices

> *"... will continuously be identified as a foreign body and be eventually rejected from the system."*

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