

Teacher's Competence and Confidence regarding the use of ICT

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ABSTRACT:

The aim of this paper is to present a qualitative multiple case study research on primary school teachers' competence and confidence level regarding the use of ICT in the teaching and learning practice carried out in five different European countries (Greece, Italy, Portugal, Spain and The Netherlands). Focus group interview was the central data collection technique used in this study. As a result of the data analysis some important issues emerged which gave rise to four main dimensions - individual factors, contextual factors (at macro and micro levels) and factors related with teacher training and education. These factors may function as anchor-points (main categories) for the elaboration of the instruments for further research.

PALAVRAS-CHAVE:

ICT, Innovation, Teachers, Competence, Confidence.

RATIONALE

Research carried out recently in European education projects suggest that the levels of resistance in introducing ICT based innovation in the primary school sector in the Southern regions of Europe is higher than those of the North (Barajas, 2002; Barajas *et al.*, 2002; Costa *et al.*, 1999; Eurydice, 2001;). That's an implication of a variety of factors that range from the curricular structures and the organization of education to the availability of equipment and from teacher's understanding of the potential (and/or limitations) of ICT for didactic issues. Research also revealed that teachers' competence and confidence are decisive factors in undertaking innovation in the educational practices (Becker & Riel, 2000; Williams, 1993). "Space" allowed in the curricular structures in conjunction with the teachers levels of confidence and competence appears to define the scope and magnitude of ICT innovation in educational settings (Barajas *et al.*, 2002).

Our study investigated innovation in primary education precisely from that perspective and the study's central concern is with teachers' skills, knowledge and attitudes towards ICT and innovation. Such identification will, on the one hand, facilitate effectiveness in teacher professional development schemes and, on the other, will serve as a motivational factor for teachers to undertake, or at least consider involvement in innovative practices.

As the basis for a common rationale to serve as a guiding framework, we agreed, as a starting point,

on some working definitions of the key concepts we were going to work with, that is, the concepts of competence and confidence. We use the concept of competence emphasising its complexity and context-dependency, both in the line of Rychen and Salganik (2003, p. 44) - "Possessing a competence means that one not only possesses the component resources, but is also able to mobilize such resources properly and to orchestrate them, at an appropriate time, in a complex situation" - and in the DeSeCo (2006) project as a whole, as well as based on the input of such experts as Le Boterf (1997, 2000), Perrenoud (2000, 2001). Competence, according to Eraut (1994), is a "wide concept which embodies the ability to transfer skills and knowledge to new situations within the occupational area. It encompasses organisation and planning of work, innovation and coping with non-routine activities. It includes those qualities of personal effectiveness that are required in the workplace to deal with co-workers, managers and customers" (p. 160).

In order to define the concept of confidence we based on Bandura's concept of self-efficacy (1977, 1997). Thus teachers' confidence refers both to the teachers' perceived likelihood of success on using ICT for educational purposes and on how far the teacher perceives success as being under his or her control. According to Keller (1987), also based on Bandura, confidence has different components: interest (refers to the attention factors in the environment; relevance (refers to goal-oriented activities); expectancy (refers to one's own expectation for

being successful) and outcomes (refers to the reinforcement value of instruction, here, of the use of technology in learning).

Furthermore, in order that our study could make sense both on a theoretical level and on a pragmatic one, we had to decide on a temporary frame of reference, so that the indicators we selected to anchor the research questions don't lack any validity at all. Some of the principles we set out, and upon which all the partners seemed to agree, may be summarized as follows: a) constructivism as the learning theory we pedagogically and ideologically opt for; b) a teaching theory which emphasizes teacher professionalism and autonomy, appointing the teacher as curriculum designer (open curricular designs with a humanist focus, learner-centred and process-oriented; teacher education based on observation, action and reflection, etc.); c) a theory of "technology based innovation" (legitimacy in view of the formal and the enacted curriculum; confidence level; power of decision; ICT competency in classroom practice; teacher's and learner's autonomy; isomorphism in the training of teachers to work with ICT in the classroom).

OVERALL RESEARCH DESIGN

The study we now present is part of a larger European project - IPETCCO: Investigation in Primary Education Teachers' Confidence and Competence Supporting Innovation¹. Within the IPETCCO project, the first phase of the investigation into the current situation regarding the application of ICT in the learning/teaching practice is carried out in a case study perspective. The line of approaching the proposed task is based on exploratory work, following a qualitative approach, supported by a set of focus group interviews and qualitative data analysis. The second phase is a quantitative study based on material organised and collected by means of a questionnaire based on the results of the case study research.

The objectives of the main project included: a) review into the curricular structures of four Southern European countries with the aim of identifying the "curricular space" for innovation; b) in depth investigation into the current situation regarding

the application of ICT in the learning and teaching practice (case study perspective); and c) investigation into the competence and confidence levels of young potential teachers (of less than 25 year old graduates or nearly graduates) and in investigation into the competence and confidence levels of a sample group of primary school teachers (quantitative approach) analyses, clustering and dissemination of project outputs by means of a questionnaire. In order to make the process understandable, we present the design of the whole study in a schematic way in Figure 1.

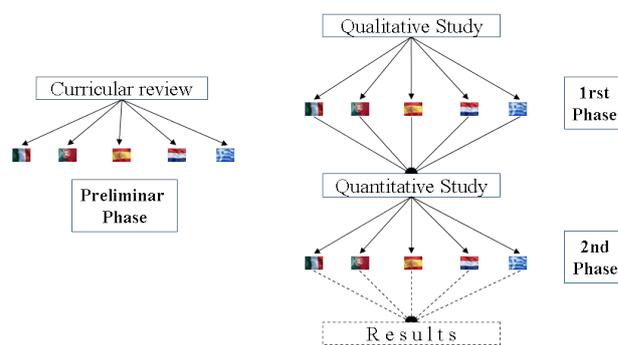


Figure 1: Overall Research Design

THE QUALITATIVE STUDY

We will now go on to present the qualitative study, which corresponds to the first phase of the research project, referring only to the four Southern European case studies. As a starting point we emphasised some emerging from common practice, in form of three assumptions: 1) generally, teachers don't use ICT in their educational practices; 2) even when they do, they are not pedagogically very consistent with either constructivist learning principles suggested by the European experts or by the state of the art in learning and teaching environments, or even by the examples of good and relevant learning practices; 3) teachers' use of ICT is, according to the state of the art and the examples of good practice, a stimulating factor for curriculum innovation.

RESEARCH QUESTIONS

These assumptions gave rise to the following research questions: a) Are there any meaningful differences between the various groups of teachers concerning their usage and integration of ICT in their edu-

cational practices? b) Are these differences mainly determined by individual factors (personal context), by structural and organizational factors at school level (local context), or by structural and organizational factors, of a macro nature, at the level of educational politics and curricular structure of each one of the countries where the study takes place (regional/national level)? c) To what extent do pre-service and in-service teachers' training systems in each country involved, influence teachers competence and confidence degree concerning the integration of ICT in their educational practices? d) To what extent are differences in ICT integration in educational practices among participating teachers influenced by their competence and degree of confidence in using ICT? e) How far is teachers' confidence degree influenced by the effective ICT mastery (ICT competence degree)?

AIMS OF THE STUDY

Based on these research issues we defined two research aims. The first is to make a comparative analysis of the teachers' competence and confidence in ICT use in their teaching practices. The second is to identify and select the most important factors to be included in a questionnaire to map out teachers' skills, knowledge and attitudes towards ICT based innovation.

METHODOLOGY

Methodological approach: The line of approaching the proposed task is based on exploratory work, following a qualitative approach, supported by a set of focus group interviews (Carey, 1994; Krueger, 1997; Morgan, 1997; Powney, 1987) and qualitative data analysis (Anderson, 1994; Denzin & Lincoln, 1994; Rubin & Rubin, 1995). The reason why we choose this kind of methodological support has to do with the need for gathering information from a significant number of teachers in different situations and with possible different perspectives towards the use of ICT in educational settings.

Population and sample: This research, in each country, engaged 20 teachers organized in four groups of five teachers each one (4x5): 2 groups of 5 practicing primary teachers (Group I and II) and of 5 prospective teachers (Groups III and IV) in each of the five participating countries: Group I:

Five teachers randomly selected among the teachers of one "innovatory school"; Group II: Five teachers randomly selected among those from one mainstream school; Group III: Five prospective teachers randomly selected among the students of the final year of the School of Higher Education to which they belong; and Group IV: Five teachers in their first year of teaching (due to the minimal probability of finding teachers in this situation in one and the same school, it is possible to use different criteria, for instance, to bring together teachers from different schools in one interview group).

Data collection and analysis: We privileged the focus group interview as a technique for data collection. It is a technique where an interviewer/moderator asks questions, in this case in semi-structured format, to be answered interactively by people who, beyond their particular characteristics, share places, experiences and ideas about their practice, so that the researcher can get the fullest possible coverage of the topic within the target group. This was one of the reasons we opted for the focus group interview for data gathering, the other was the fact that it is less time consuming than other possible techniques. The content of the transcribed interviews was analysed by means of a system of categories and subcategories, partly identified *a priori*, from the main questions in the interview guide, and partly emergent from the text (the transcribed interview).

NATIONAL CASE STUDIES: COMPARATIVE SYNTHESIS

The main interview topics for questioning were: teachers' relationship with ICT; ICT use at school; relationship of ICT with the curriculum; and ICT teacher training. They were taken as the guidelines which made us split the more meaningful results into five main topics: i) main differences and/or similarities between groups; ii) sources of these differences (individual factors, structural and organizational factors at different levels and contexts); iii) influence of education and training on teachers' competence and confidence degree concerning the integration of ICT in their educational practices; iv) impact of teachers' competence and degree of confidence on ICT inte-

gration in their educational practices; and v) dependence of teachers' confidence level in using ICT from their effective ICT domain (competence degree).

DIFFERENCES AND/OR SIMILARITIES BETWEEN GROUPS:

As a matter of fact, there are more similarities than differences between the primary teachers in the four target countries and even between the different categories of teachers, when identification is possible, in the explicit (what is said) as well as in the implicit text (what can be inferred from what is not mentioned).

As a whole, the primary teachers in the four countries show a positive attitude towards ICT and are aware of the potential of ICT to respond to social and educational demands, both now and in the future, but at the same time of their limitations, either on an institutional level as well as at personal one. Only the traditional teachers in Italy seem to manifest a denial attitude regarding new technologies. Another difference concerns student teachers: while in Italy they declared they have no knowledge about the existence of ICT, in Spain they seem quite familiar with them "the younger and more inexperienced the teachers are, the more they seem to be aware of ICT potential for special needs education and, in more general terms, for an individualisation of learning activities ...".

It is a general opinion that ICT assume a supplementary role in the primary teachers' practice, being used as a complement to other materials. With one or two exceptions ("Click" in Spain and some "home made" programs in Portugal) the teachers in the four countries are acquainted with the same tools and programs.

There are not many concrete examples of lasting and meaningful learning activities supported by ICT, except for the reference to projects in Greece and Portugal. However they do not clarify the role and importance of ICT in their development nor the advantages of using the new technologies over any other means. Furthermore learning gains resulting from the use of ICT are not identified.

No references are made to the value of ICT as a factor of innovation, except in Greece, where "everybody link innovation with ICT availability and use in schools". The other countries agree with our colleague from Spain who writes: "the word "inno-

vation" in connection to ICT was not mentioned at all by the teachers".

SOURCES OF THE DIFFERENCES:

As we said before the differences are not so flagrant and significant that they are worth being mentioned as such. So we had better focus on the sources of the common obstacles to the implementation of ICT in educational innovation. If we highlight the most important issues reported in the four countries as sources of difficulty, we have to point out: a) Time as one of the biggest challenges reported by all groups of teachers (time they haven't had in their training courses, time pressure to carry out the program, time they need to learn new skills, time to get acquainted with new software, time to "follow the program", etc.); b) Equipment is another set of difficulties, although differently perceived by the various groups of teachers – for instance, the innovatory schools tend to dispose of more and more up-to-date equipment than the other schools – as well as technical support.

Sometimes the problem lies in the school organisation itself – large number of pupils per class, number of computers available for the pupils to use, lack of support (either technical or pedagogical), the individualism of most teachers' tasks among others (collaborative teaching is still an utopia and cooperation is an occasional exception). Only Greece and Italy report that ICT promotes collaborative work within the innovatory group. Another constraint to innovation with ICT is the local education authorities who don't show great interest in ICT.

The curriculum (formal or real) in the different partner countries doesn't take "teaching effectively with ICT" as a priority amidst the other demands of the curriculum. The teachers are themselves one of the main causes of difficulty to introduce innovation in education. Many are not concerned about the learning approach they follow. Despite the official rhetoric, explicit in many curricular texts, teachers are neither seldom aware of a learner centred approaches to curriculum, individualised and differentiation practices nor are they concerned with constructivist approaches to learning, which use ICT to emphasize open methodologies, project work, research and autonomous procedures, that is, a privileged setting to explore the potentialities

of ICT. Many don't feel confident either to use the computer with their pupils or to learn how to work with it.

INFLUENCE OF EDUCATION AND TRAINING ON TEACHERS' COMPETENCE AND CONFIDENCE DEGREE CONCERNING THE INTEGRATION OF ICT IN THEIR EDUCATIONAL PRACTICES:

The majority of experienced teachers (traditional and innovative) in the four countries inform that ICT has never been object of their pre-service training. Some of them acquired their computer literacy in in-service courses or informally at home. Even beginning and student teachers admit that they were not properly prepared, even if, in Portugal and in Spain, they have had some credits in "new technologies".

In spite of the lack of ICT training or of an unsatisfactory one, the majority of the teachers give great importance to training as a way of developing their ICT confidence and of developing a positive attitude towards ICT. Only the Greek teachers don't share this opinion; they relate this issue more with personal factors, such as self-interest and need for professional excellence and with external ones rather than with training.

RELATION OF TEACHERS' COMPETENCE AND DEGREE OF CONFIDENCE WITH ICT INTEGRATION IN THEIR EDUCATIONAL PRACTICES:

All groups seem to be aware of the plurality of the necessary competence to use ICT for educational purposes. Italian teachers give great importance to the technical competence, although they believe the single technical competence is not enough, a pedagogical and a didactic one are also needed if effective and efficient educational interventions are likely to be implemented.

Unlike the Italians, the Greek teachers emphasise the pedagogical and the didactic competences as well as the teachers' personal characteristics, although all groups also referred to the importance of the technical competence.

In Portugal, teachers share a different point of view about the most important competences for teaching with ICT: experienced and beginning teachers emphasise the technical skills and attitude, the innovative teachers the curricular and didactic competences and the student teachers find techni-

cal competence and pedagogical efficiency equally important to use ICT in educational contexts and stress the need for experience. In general we could say that teachers with more experience with computers have greater confidence in their ability to use them effectively.

In Spain, experienced teachers emphasise the technical competence as a support for confidence. According to our final report a critical factor for the development of confidence is previous experience with ICT, teacher exposure to the real potential of ICT in education.

Besides these more general considerations, it is worth referring to some perceptions of the different teachers about the effect of ICT on learning activities and their relation with curriculum. The majority of the teachers relate ICT with improvement in the teaching and learning process and in the learners' attainment. In general, teachers consider that ICT favours pupils' motivation to learn. In Portugal a decrease in disciplinary problems and the increase in teaching efficiency are mentioned as positive effects of ICT, as well as the development of pupils' autonomy.

In Greece, the innovative teachers relate ICT based teaching and learning with an adopted pedagogy, which is constructivist in nature. On the other hand, the traditional teachers consider the curriculum as a constraint factor for learning.

For the innovative teachers in Italy ICT play the role of "a cognitive resource in learning allowing the development of more complex and richer thoughts" and the beginning teachers sustain they enhance the pupils' self-esteem. The Portuguese student teachers share the same opinion, adding that computers favour pupils' motivation to learn. The innovative teachers consider that ICT contribute both to the improvement of learning and to the teaching process, while helping pupils develop critical thinking, responsibility and autonomy strategies. Traditional teachers, on the contrary, express the opinion that the computer diminishes children's cognitive and communicative abilities and the interaction with the machine makes them passive by not stimulating them to think autonomously and creatively, although they think ICT helps solve disciplinary problems.

In Greece all groups believe in the positive effects of ICT in a wide range of learning types. The traditional teachers tend to maintain their teaching

routines in spite of ICT. But as Bransford says “The process of using technology to improve learning is never solely a technical matter, concerned only with properties of educational hardware and software” (Bransford *et al.*, 1999, p. 218).

All countries acknowledged that the formal curriculum opens doors to ICT integration, even Greece where the curriculum is not open at all. The fact is that, under the same curricular guidelines, the innovatory schools report their regular use of new technologies while the others don't. The problem lies more on the will of teachers and the conditions of the schools, because, as the Spanish report says: “However, this openness is hardly considered an advantage because taking benefit from it would mean to invest much more time than is available, given the actual teaching conditions”.

The majority of the teachers show a passive and obedient attitude towards curriculum. They conform their practice to the implicit rules of the formal curriculum, although most of them (Spain, Portugal and Italy) adopt a flexible view allowing teachers to redesign it when planning their lessons. Only the Greek curriculum has, according to all groups, no compatibility at all with the use of ICT. That explains why only innovatory teachers seem to believe in the positive effect of ICT on curricular innovation.

As far as lesson planning is concerned, in Greece the student teachers integrate ICT in their plans, but “regular” teachers only do so occasionally. In Italy only innovatory and beginning teachers introduce ICT partially in their planning and in Portugal only the innovative teachers admit doing. However we have to admit that successful integration of ICT into the curriculum depends mainly on teachers being convinced of the relevance of ICT as a means of providing access to a richer range of resources for themselves and their pupils rather than on political decisions. As to the curricular areas more open to new technologies nothing seems to be excluded, although Maths, Sciences and Languages have almost total preference.

DEPENDENCE OF TEACHERS' CONFIDENCE LEVEL IN USING ICT FROM THEIR EFFECTIVE ICT DOMAIN (COMPETENCE DEGREE):

The national reports suggest that confidence in using ICT is still a challenging issue for primary teachers. The Italian teachers privilege the technical

competence as a factor to improve higher confidence towards ICT, as well as the didactic one. In Greece, experienced teachers (innovatory and traditional), and only these, stress pedagogical and personal factors as those which mostly contribute to their ICT confidence. Beginning teachers put the emphasis on the development of pedagogical and didactic competences as a way of gaining confidence, and the student teachers request for more ICT experience.

In Portugal, the innovatory teachers associate the concept of confidence with the loss of fear of damaging the material or of making mistakes when using ICT and, at the same time, with a sense of power over the machine. They point out the following conditions as being favourable towards gaining such confidence: plenty of available time (confidence is slowly gained by working and practicing a lot with the computer), the support of more experienced colleagues and training. The traditional teachers refer mainly to organisational factors, at school levels, as a factor facilitating confidence. The beginning teachers, although recognizing the value of the technical and the pedagogical components, state that confidence in using ICT depends, above all, on personal factors.

According to the Spanish report “the competence degree is recognised in all teachers' groups as the most critical factor for creating a feeling of personal confidence in ICT. A minimum degree seems to be necessary for showing such personal confidence. However, on the other hand, neither competence nor confidence are enough to instil in teachers the need for promoting ICT-based educational innovations”.

MAIN CONCLUSIONS AND IMPLICATIONS FOR FURTHER RESEARCH

If this were not an exploratory study with a limited pre-determined goal, it would now be time to drop some conclusions and make appropriate suggestions. However what we have to do is to try to extract from these results the identification of the main dimensions to organise the final questionnaire and, eventually, suggest some topics to include in it.

Nevertheless, as to the use of ICT in the four Southern European countries, we assume that the

following main issues that emerged from the analysis may function as anchor-points for further research:

- Technology is not an integrated resource within teaching activities;
- Teachers use ICT without a full understanding of learning principles;
- They know how to use computers but not in the classroom with their pupils;
- ICT did not significantly change attitudes, roles and ways of teaching and learning;

In short, there is the general idea that there are not many competent teachers in using ICT for instruction. It is necessary to re-educate the existing teachers. Even the teachers now beginning their work have not been adequately prepared to use new technology. So, enabling teachers to use technology lies in the teacher education schools where new teachers are prepared.

From the analysis it is possible to infer that the work with ICT for pedagogical aims needs to address issues within three main dimensions: the first one has to do with teachers' background knowledge and skills, that is, with what they have previously learned and how; the second and crucial one refers to individual characteristics, both of an affective and cognitive nature; the third one has to do with contextual factors, both an organisational and even of a macro structural order. So, in our opinion, the items to be included in the questionnaire should emerge from the indicators which are to be drawn out of the following three dimensions:

1. Individual factors: mainly affective, related, in general, with teachers' perception of ICT, and, in particular, with its utility and effectiveness for learning: 1.1) General attitude to ICT; 1.2) Expectations regarding its use in educational contexts; 1.3) Value attributed to the ICT while facilitators of learning; 1.4) Satisfaction with the results; 1.5) Feeling well prepared. Mainly, cognitive factors related with the effective mastering of a set of skills and knowledge

considered necessary for the pedagogical use and exploitation of ICT; 1.6) Knowledge of different technological solutions (programs, applications...); 1.7) Technical mastery of these technological solutions; 1.8) Knowledge of modes of scanning of the ICT for educational purposes; 1.9) Experience using of ICT in educational settings; 1.10) Relation to professional development; 1.11) Capacity to work collaboratively and to take the initiative; 1.12) Awareness of the learning theory, the teaching philosophy and the didactical model underlying the pedagogical use of ICT in each context.

2. Contextual factors: The school while facilitator of the teachers work in terms of pedagogical use of ICT: 2.1) Equipment and technological infrastructures; 2.2) Human resources for technical and pedagogical support; 2.3) Software tools (common software, pedagogical applications, etc.); 2.4) ICT integration in the curriculum; 2.5) Use of ICT in curricular projects; 2.6) Teachers' level of initiative; 2.7) Leadership of the school board, but also national and regional policies for promoting and supporting ICT pedagogical use; 2.8) Network infrastructures; 2.9) Technical support; 2.10) Incentives to the development of projects; 2.11) Industry partnerships; 2.12) System of continuous education and professional development of teachers; 2.13) Amount and quality of pedagogical contents and support; 2.14) Observatory of innovatory practices; 2.15) Vision of ICT in the national or regional curriculum.

3. Factors related with teacher training and education: 3.1) Uses of ICT in teaching teachers; 3.2) Integration factor (developing the ability to integrate ICT in the teaching process); 3.3) Use of ICT by prospective teachers during their school activities (technology uses during field experience); 3.4) Supervisors advice on ICT uses; 3.5) Trainers' and prospective teachers' involvement in research projects concerning the use of ICT in real teaching and learning situations.

ENDNOTES

1. Information about the project available at <http://www.isoc.siu.no/isocii.nsf/projectlist/87714>

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