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Why teachers make use of ICT in education

Catarina Player-Koro

Abstract

This study investigates teachers in the Swedish ten-year compulsory school who use ICT (Information and communication technology) in their classroom practice. It poses and gives answers to questions about what is contributing most to explain why they choose to use computers and information technology in their work with students/pupils and uses multiple regression analysis in order to investigate the best pattern of predictive variables. A significant model emerged suggesting that teachers using ICT with students were interested in changing their classroom practice. They also felt self-efficacious in using computers in education and they have positive attitudes toward using ICT in education. The present investigation differs from other studies in that it examines teachers who already are using technology in their classroom practice and it could be seen as a building block in the development of knowledge about how teachers can become more competent and confident in using ICT in their pedagogical work in classroom practice.

Introduction

The development of information and communication technology (ICT) has led to computers becoming part of daily life in western society and has pushed ICT and computers into the classrooms at all educational levels during the last three decades. The motives and argument for implementation have come from many directions, both from advocates inside the schools, but more often from outside, from developers of software

and hardware, and from administrations and governments (Cuban, 2002; Kozma, 2003; Pelgrum, 2001).

The field of education has in many western countries been selected by political powers as the bridging gap for introducing new technology into society. According to The European Commission report on *Key data on education in Europe* (2000) all European countries have official documents aiming to integrate ICT in schools, such as those funded from the National Board of Education in Sweden since 1970s that have successively introduced computer and information technology in Swedish education. During these years the focus for the use of ICT has changed several times. Today the intention behind the integration in many countries including Sweden is that ICT can play a role in both improving education and in changing schools (European Commission, 2000; Jedeskog, 2005; Kiridis, Drossos & Tsakiridou, 2006; Kozma, 2003; Pelgrum, 1993; Pelgrum, 2001; Riis, 2000). Yet many studies show that even if teachers use technology for their own purposes most of them still don't use ICT in their work with students in classroom practice (Cuban, 1986, 2001; Kiridis, Drossos & Tsakiridou, 2006; Steketee, 2005). There are teachers who use ICT as a teaching and learning tool and the question is: What makes them do so?

Evidence from previous research

Integration of ICT in education is a complex process where many agents on different contextual levels play a role. Actors and factors are situated at a micro level, in the classroom, at a meso level in the school or local community and at a macro level, consisting of national and state policies and international trends. Although teachers are important change agents, they are influential in facilitating or impeding changes that are

beyond the direct control of forces on meso and macro levels (Jedeskog, 2005; Kozma, 2003; Pelgrum, 2001).

Nevertheless research has shown that teacher's beliefs and values play an important role in shaping their relation to ICT in the instructional context and that is important for how ICT becomes part of student learning. In studies concerning the amount of teacher's use of ICT in classrooms it appears that technology poses an enormous challenge because it demands significant changes in teacher conceptions of teaching and learning processes and of their own roles within it. Teachers who are open and positive professionals seek out new opportunities with technology (Delcourt & Kinzie, 1993; Honey & Moeller, 1990; Kiridis, Drossos & Tsakiridou, 2006; Steketee, 2005). Their attitudes toward technology and their feeling of being self-efficacious in using it are important factors (Albirini, 2006; Centrum för marknadsanalys, 2006; Cox, Preston & Cox, 1999; Delcourt & Kinzie, 1993; Kozma, 2003; Pelgrum, 1993; Sparks, 1988). Studies dealing with the spread and integration of technology into schools show that attitudes are central in models aimed at explaining how new practises come to be accepted in organisations (Knezek & Christensen, 2001; Rogers, 1995; Russel, 1995).

Beliefs and values: social psychological approaches

In order to understand and explain how teacher behaviour can be predicted by their belief systems two theoretical aspects of social psychological research seem to be relevant.

With respect to belief systems, behaviour according to Albert Bandura's theory about self-efficacy, is described as how the judgement of an individual about his or her ability to handle a specific situation affect behaviour (Bandura 1989, 1997, 2002). Theories about how attitudes seem to predict behaviour are another point of departure. These have

for many decades been in focus for research for social psychologists (Doll & Ajzen, 1992; Fazio & Williams, 1986; Glasman & Albarracín, 2006).

Self-efficacy

According to Albert Bandura, people regulate their behaviour on the basis of belief systems, particularly beliefs of personal efficacy, defined as the power to produce desired outcomes and forestall undesired ones. Self-efficacy is the belief in one's ability to execute a certain course of behaviour successfully, and is considered to be situation or task specific (Bandura 1989, 1997; 2002).

Bandura's claim about the importance of self-efficacy beliefs have been supported by research in the area of teacher's use of technology and has found to be an important factor in decisions about using them (Albion, 1999; Cox, Preston & Cox 1999; Honey & Moeller, 1990). Self efficacy theory suggests that real experience is effective for increasing self-efficacy and according to Albion, (1999), this means that expectations of integrating ICT into teachers daily practices must be supported by developing teachers feelings of self-efficacy in their professional practice. Findings from Cox, et al. (1999) show that perceived ability to use ICT in classrooms is one factor that correlates positively with ICT use in education.

Importance of self-efficacy beliefs has also been supported by research according to teachers' abilities to handle other situations in the classroom (Ashton, 1984; Sparks, 1988;). Ashton (1984) found positive relations between teacher self-efficacy and student achievements. Teachers with strong self-efficacy seem to be more positive toward changing in their teaching and with experimenting with their practices (Delcourt & Kinzie, 1993).

Attitude-behaviour relation

Even if people do not always behave in accordance with their attitudes, as there seems to be variability in the degree to which attitudes predict behaviour, there are many studies that show that attitudes still seem to guide behaviours and researchers have specified conditions and processes where attitudes seem able to predict behaviour successfully.

Attitudes can be conceptualized as having three components, an affective component of emotional responses toward some objects or persons, a cognitive component of beliefs or factual knowledge of objects or persons, and a behavioural component that involves overt behaviours toward objects or persons (Zimbardo, Ebbesen, & Mashlach, 1977).

Attitude accessibility and stability represent two lines of understanding in respect of attitude-behaviour relations and what makes attitude predict behaviour. One line, attitude accessibility, suggests that attitudes influence behaviour when actors activate them from memory, attitudes are more likely to guide behaviour when they are easy to retrieve from memory. The other line of research assumes that attitudes influence behaviour when actors can reconstruct them “on fly”; in this case the most stable attitude seems to be the best predictor for behaviour. Conditions that strengthen attitude-behaviour relation are in both approaches, direct experience, motivation to think about an object or issue, relevant and one-sided information, believing that one’s attitudes are correct, and easily recollected attitudes. Attitude accessibility and stability can capture partially different processes and are connected to one another (Doll & Ajzen, 1992; Fazio & Williams, 1986; Glasman & Albarracín, 2006).

Research in the field of teacher’s use of ICT in education addresses both strong self-efficacy and positive attitudes as important factors encouraging teachers to use ICT in classrooms (Delcour & Kinzie. 1993; Cox, Preston & Cox, 1999). Results from Pelgrums

(1993) study gave a clear answer to the question if teachers with positive attitudes behave differently in terms of how they use computers than colleagues who are less positive: teachers with positive attitudes on educational impact of computers tend to use computers more intensively for teaching.

Similar conclusions were presented by Christensen (1997); here results suggested that technology integration in education appears to be strongly related to teachers' attitudes toward computers. Kiridis, et al. (2006) pointed to the importance in teacher education of focusing on teacher's professional needs and providing them with suitable experiences and paradigms to make them understand the usefulness of ICT in teaching and learning as a precursor of the construction of positive attitudes and perceptions.

Technology integration: a sociological approach

If the main focus of psychological studies is on how people's internal processes predict actions, then sociological approaches focus more on the ways people interact as members of organizations and groups. But even sociological approaches point to the importance of members' attitudes when describing the process of technology integration. One example is Rogers (1995) theory of Diffusion of Innovations, considering that people who adopt and choose to use new innovations such as technology are those who have positive attitudes toward them. According to this model, people's attitudes toward innovations are key element in diffusion among members of a social system.

An innovation defines an idea, practice or object that is perceived as new by those who are targeted as adopters of the innovation. Diffusion is the name of the process by which the innovation is communicated, through different kinds of communication channels, between participants in an organization.

The time it takes for an innovation to be adopted by the members depends on what has been identified and named as the individual's innovation-decision process. Innovation-decision processes occur over five stages, passing from first knowledge of an innovation, to forming an attitude toward the innovation, and then decisions to adopt or reject the innovation. If the innovation is accepted the new idea is implemented and the decision is confirmed (Rogers, 1995). The diffusion model has been applied in a variety of disciplines, including education, for explaining if and how an innovation is diffused to members of a social system. If ICT is viewed as a work place innovation, then the diffusion of the innovation framework seems to be relevant for explaining the process that makes teachers accept and use ICT in education.

Research question

This study aims to investigate teachers who are using ICT in their pedagogical practice. It asks why teachers are using ICT in their work with students and has an interest for which factors contribute most to explaining why teachers use computers and information technology in education. The main objective is to find an explanatory model of the influence of independent variables on the dependent variable, "teacher use of ICT in education".

The main question is: Why are teachers using ICT in education?

Method

Participants

The target population in this study was the Swedish ten-year compulsory school delimited to one of twenty-one provinces in Sweden located in the south west of Sweden, Västra Götalands län. This is the fifth greatest province in Sweden.

The selection of teachers was conducted using cluster sampling. A list from the SCB¹ (Statistics Sweden) register of Swedish schools (December 2002), was used to identify the population. From the list a random sample of 14 schools was selected. Teachers working at the selected 14 schools were the participants in the investigation. Headmasters of the selected schools were contacted in order to get a list of all teachers working on the schools, but this was not possible because of teachers right to protect their privacy. The headmasters provided me with the approximate number of teachers working at each school. Based on that information the number of teachers was estimated to 360. The return rate was 210 questionnaires, so the results from the study are based on 210 teachers (n=210), (169 women and 41 men).

Design

A survey research study was used. Data were collected through self-administrated questionnaires. Aware of the limitations with self-administrated questionnaires, such as for example a low return rate, and the risk for the respondent to misunderstand the questions, a contact person was selected at each school, to help with distribution and motivation and to explain the intention with the questions if needed. Personal contacts were established with the contact persons before the questionnaires were sent to the schools and remained until the questionnaires were sent back.

In total were 360 questionnaires distributed to selected schools and 210 were returned. Some loss in return rate can be explained by the fact that the number of teachers were based on an estimation done by the headmasters at each school. Contact persons reported

¹ Statistiska Centralbyrån

reasons like burden of work and too many papers to fill in as explanations for not answering the questionnaire. Other explanations could be that some teachers were on the sick list, part-time workers or on parental leave. Even though there was a loss in return rates questionnaires were received from every school in the sample.

Questionnaire

The questionnaire contained 27 questions in three sections. The formats of the questions were both fixed alternative, and open-ended questions. In the first section some questions of demographic character, such as age, gender, educational level and access to ICT at home and at school were formulated. The second section contained of fixed alternative questions about teachers' private uses of ICT, their self-efficacy in using ICT for private purposes and if, how and how often ICT is used for private purposes. In the last section fixed-alternative questions about teachers' uses of ICT in classroom practice were formulated as were questions about their self-efficacy in using ICT in classroom practice and how and how often they make use of ICT in classroom. Finally, questions about teacher's attitudes toward the use of ICT in education were asked. These questions were fixed interval items where the respondents were asked to agree or disagree with a series of statements. The respondents also had the opportunity to add responses in their own words in a number of open-ended questions after each of the sequences in the questionnaire. The questionnaire was pretested before the study.

Data analysis

The objective of the investigation was to find an exploratory model of influences on the dependent variable. The statistical package for the social sciences (SPSS) was used for analyzing data collected from the respondents and stepwise multiple regression analysis was used as a way of finding the best predictors in a set of predictors of a dependent variable. In stepwise regression analysis poor predictors are eliminated on a stepwise basis and best predictors are selected on the basis of statistical criteria. The criterion variable was identified from a fixed alternative question consisting of 20 different activities where the respondents were requested to mark which activities they are performing with their students. They also had the option to add activities if they lack some in the list. Pearson's correlation coefficient was calculated for each of the selected predictor variables in order to confirm that they independently correlated with the criterion variable.

In order to compare if there were differences between men and women in their use of ICT in education a matched sample was selected on a one-to-one basis in order to reach the same compound of ages for 40 men and 40 women, and a computation of a one-way unrelated ANOVA was executed. One-way unrelated ANOVA was also conducted in order to analyse if there was any difference in use of ICT between teachers according to how old the pupils they taught were.

Results

Stepwise multiple regression analysis was carried out to investigate the best pattern of variables for predicting teacher use of ICT in education. Using the stepwise method, a

significant model emerged: $F(3, 184) = 27,18, p < 0,001$ that explained 31% of the variance. Adjusted R^2 , which takes into account the number of predictor variables in the model, and the number of participants that the model is based on, was calculated, $R^2 = .299$.

The predictor variable with the largest correlation with the criterion variable was “experience of change in pedagogical practice”. This variable explained 19% ($p < 0,001$) of the variance. The second variable, selected based on the highest partial correlation, was “self-efficacy in using computers in educational practice”. Together with “experience of change in pedagogical practice”, those two variables explained a further 7% (26%) ($p < 0,01$), of the variance. A third variable “teacher’s attitudes toward using ICT in education” was entered and together with “experience of change in pedagogical practice” and “self-efficacy in using computers in educational practice” explained a further 5% (31%) ($p < 0,01$) of the variance.

Teachers who use ICT with their students were thus in this investigation associated with a perceived educational change, self-efficacy in using computers in education and positive attitudes toward using ICT in education. The absolute values of the standardized estimate (b) of these factors, when all are included, are from largest to smallest: “Self-efficacy in using computers in educational” practice $b = 0,26, p < 0,01$, “attitudes toward using ICT in education” $b = 0,24, p < 0,01$, and “experience of change in pedagogical practice” $b = 0,23, p < 0,01$. Variables that did not pass the entry requirement and therefore were excluded from the equation were “teacher’s use of ICT for private purpose”, “self-efficacy in using computers for private purpose,” “age” and “formal education in ICT”. Table 1 gives information for the predictor variables that are included in the model.

Tabell 1

The unstandardized and standardized regression coefficients for the variables included in the model

Variable	B	SE B	β
Experience of change in pedagogical practice	0.81	0.25	0.23*
Self-efficacy in using computers in educational practice	0.74	0.19	0.26*
Attitudes toward using ICT in education	0.92	0.26	0.24*

* $p < 0,01$

Pearson's correlation was performed in order to confirm if variables in the model were independently correlated. The variables that individually correlated with the variable, "teachers use of ICT in education", were: "attitude according to if education practice has changed" $r = 0,47, p < 0.01$, "self-efficacy in using computers in educational practice" $r = 0,45, p < 0.01$, and "teacher's attitudes toward using ICT in education" $r = 0,46, p < 0.01$. Correlation coefficients are presented in Tables 2, 3 and 4.

Table 2

Correlation between "teachers use of ICT in education" and "attitude according to if education practice has changed"

	Teachers use of ICT in education	Attitude according to if education practice has changed
Teachers use of ICT in education	-	0,47*
Attitude according to if education practice has changed		-

* $p < 0,01$

Table 3

Correlations between “teachers use of ICT in education” and “self-efficacy in using computers in educational practice”

	Teachers use of ICT in education	Selfefficacy in using computers in educational practice
Teachers use of ICT in education	-	0,45*
Selfefficacy in using computers in educational practice		-

*p<0,01

Table 4

Correlations between “teachers use of ICT in education” and “teacher’s attitudes toward using ICT in education”

	Teachers use of ICT in education	Teacher’s attitude toward using ICT in education
Teachers use of ICT in education	-	0,46*
Teachers attitude toward using ICT in education		-

*p<0,01

Pearson’s correlation yielded no significant relationship between “teacher use of ICT in education” and “age”, “teacher use of ICT for private purpose”, “self-efficacy in using computers for private purpose”, “formal education in ICT”, and “type of teacher education”.

One-way unrelated ANOVA was performed for a matched group of 40 men and 40 women teachers according to age. Analysis of variance showed no significant difference between men and women in their use of ICT in education.

One more one-way unrelated ANOVA was conducted in order to analyse if there were any differences between teachers according to how old the pupils they taught were. This test showed a significant overall difference $F(2, 176) = 5.19, p < 0.01$ and significant effects were also found through pair wise comparison, one between teachers of children aged 6-9 years compared to those who educated children aged 10-12 years, and one between age 6-9 years and those who educated children aged 13-15 years $p < 0.05$. The analysis showed no significant difference between teachers educating children aged 10-12 years and children aged 13-15 years. From these results it seems that teachers who educate children age 6-9 years use ICT less than those who educate older children. Table 5 gives information about the variance analysis, and table 6 and 7 about the pair wise comparison between age groups of pupils.

Tabell 5

The results of one-way variance analysis of teacher's use of ICT in education according to how old the pupils they taught are

Group	<i>N</i>	\bar{X}	SD	Mean Square	$F_{(2,176)}$
6-9	87	3,62	3,18	44,85	5,19*
10-12	36	5,03	2,32		
13-15	54	5,06	2,88		

* $p < 0,01$

Tabell 6

Pair wised comparison between age 6-9 years and age 10-12 years

Group	Mean Difference
6-9 10-12	-1,41*

*p<0,05

Tabell 7

Pair wised comparison between age 6-9 years and age 13-15 years

Group	Mean Difference
6-9 13-15	-1,43*

*p<0,05

Discussion

Decisions made by teachers about the use of ICT in their work with students/pupils in classrooms are likely to be influenced by multiple conditions. The intention with this investigation was to find an explanatory model to describe teachers who use ICT in their classroom practice. Stepwise multiple regression analysis, which is a data analysis technique used to describe the distribution of a criterion variable as combinations of the values of a number of other variables called predictor variables, was used in order to find the explanatory model. Poor predictors were eliminated during the analysis.

The results from this investigation suggests an exploratory model where teachers who use ICT with students can be associated with a perceived educational change, self-efficacy in

using computers in education and positive attitudes toward using ICT in education.

Worthy of note are also predictors that were eliminated during the computation, such as teacher's use of ICT for private purpose, self-efficacy in using computers for private purposes, age and formal education in ICT.

Teachers who embrace ICT in their work with student/pupils had positive attitudes about using ICT in education and felt self-efficacious in using ICT. Both self-efficacy and attitudes have been widely reported in research as symbiotically related toward ICT and its use in classrooms (Albion, 1999; Albrini, 2006; Centrum för marknadsanalys, 2006; Cox, Preston & Cox, 1999; Delcourt & Kinzie, 1993; Kersaint, G & Horton, B & Stohl, H & Garofalo, J, 2003; Knezek & Christensen, 2001; Kozma, 2003; Miyashita & Ropp, 2000; Pelgrum, 1993; Rogers, 1995; Russel, 1995; Sparks, 1988). Theories about attitudes and self-efficacy seem to have two factors in common; both direct experience and beliefs seem to be strong predictors of behaviours (Bandura 1989, 1997; 2002; Doll & Ajzen, 1992; Fazio & Williams, 1986; Glasman & Albarracín, 2006). Moreover beliefs are also central in the innovation-decision process explaining if and how an innovation diffuses to members of a social system. Teachers who are using ICT in their classroom practice play according to the diffusion of innovation model an important role for diffusion of ICT in schools which is the intention in many European countries (Rogers, 1995; European Commission, 2000).

Teachers in this investigation who were using ICT in their classroom practice appeared to have direct-experience of using technology for teaching. They also felt they could manage the situation and were convinced of the positive outcome of their use. Taking into account predictors that were eliminated this study not only suggests that the

conditions in the model are central it also suggests that it is the association with the pedagogical work in classroom practice that is important. In the case of using technology in education many studies have suggested that increase of teachers ICT competence in general also leads to more positive attitudes toward using ICT in classrooms (Kersaint, G & Horton, B & Stohl, H & Garofalo, J, 2003). This study shows no relation between ICT use and self-efficacy in using ICT in general outside classrooms as a personal tool and ICT use in classroom. It seems according to these results that it is not enough to have competence, positive attitudes and high self-efficacy in using ICT as a personal tool outside the classroom. Even other studies reached the same conclusions. These studies have also pointed to the importance of experience about using technology for teaching (Kiridis, Drossos & Tsakiridou, 2006; Steketee, 2005).

The present investigation differs from other studies in that it examines teachers who already are using technology in their classroom practice. It is obvious that they have positive attitudes and feel self-efficacious, but the variable with largest correlation to the predictor variable is “experience of change in pedagogical practice”. This suggests that teachers who are using ICT in their education are also willing to change their pedagogical practice and their way of teaching.

Further analysis could be done in order to explore data in this study. Using factor analysis the questions that aims to measure teachers’ attitudes and teachers use of ICT in classroom practice could be reduced in order to investigate the underlying nature of the pattern of responses from teachers. Based on results from the factor analysis a model could be formulated and tested using structural equation modelling (SEM). Among the strengths with SEM is the ability to model constructs as latent variables, variables that are

not measured directly, but are estimated in the model from measured variables. This technique could be used to study the variance that is not explained with the questionnaire used in this investigation.

This investigation could be seen as a building block in the development of knowledge about how teachers will become competent and confident in using ICT in their pedagogical work in classroom practice. The results point in the same directions as a lot of other research does, that suitable training (especially of pedagogical aspects of ICT) is necessary and that direct experience of how to handle technology in classrooms are needed (Kiridis, Drossos & Tsakiridou, 2006; Steketee, 2005). Further investigations in this area are important in order to make teachers competent in planning and managing of the use of ICT in the classroom.

References

- Albion, P.R. (1999). *Self-efficacy Beliefs as an Indicator of Teachers' Preparedness for Teaching with Technology*. Retrieved December 19, 2006, from University of Southern Queensland, Department of education:
<http://www.usq.edu.au/users/albion/papers/site99/1345.html>.
- Albirini, A. (2006). Teachers's attitudes toward information and communication technologies: the case of Syrian EFL teachers. *Computers and education, 47*, 373-398.
- Ashton, P (1984). Teachers Efficacy: A Motivational Paradigm for Effective Teacher Education. *Journal of teacher education, 35(5)* 28-32.
- Bandura, A. (1989). Regulation of Cognitive Processes Through Perceived Self-Efficacy. *Development psychology, 25 (5)*, 729-735.
- Bandura, A. (1997). Exercise of personal and collective efficacy in changing societies. In Bandura, A (Ed.), *Self-efficacy in Changing Societies* (pp. 1-45) Cambridge: University Press.
- Bandura, A. (2002). Growing Primacy of Human Agency in Adaption and Change in electronic Era *European Psychologist, 7(1)* 2-16.
- Centrum för marknadsanalys AB (2006, october) IT I skolan 2006. Attityder, tillgång och användning. Sammanfattning KK-stiftelsen.
- Christensen, R. (1997). *Effect of technology integration education on the attitudes of teachers and their students*. Doctoral Dissertation, University of North Texas:
<http://courseweb.tac.unt.edu/rhontac>.

- Christensen R., & Knezek, G. (1999) Stages of adoption for technology in education. *Computers I New Zealand Schools, 11(3), 25-29.*
- Cox, M., Preston, C., & Cox, K. (1999) *What Factors Support or Prevents Teachers from Using ICT in their Classrooms?* Paper presented at the British Educational Research Association Annual Conference on University of Sussex, Brighton.
- Cuban, L (1986). *Teachers and Machines: The use of classroom technology* New York: Teachers Collage Press.
- Cuban, L. (2001). Why are Teachers Infrequent and Restrained Users of Computers in their Classrooms? In Woodward, J. & Cuban, L. (Eds.), *Technology, curriculum and professional development. Adapting schools to meet the needs of students with disabilities* (pp. 121-137) California: Corwin Press Inc.
- Cuban, L (2002) *Oversold and underused – Computers in the classroom USA*: Harvard university press.
- Delcourt, M., & Kinzie, M. (1993). Computer technologies in teacher education: The measurement of attitudes and self-efficacy. *Journal of research and Development in Education 27(1), 35-41.*
- Doll, J., & Ajzen, I. (1992). Accessibility and Stability of Predictors in the Theory of Planned Behavior. *Journal of Personality and Social Psychology 63(5), 754-765*
- European Commission. (2000, February). *Information and Communication Technology in the Education Systems in Europe: National Educational Policies, Curricula, Teacher Training*. Brussel: Office for Official Publications of the European Communities.

- Fazio, R.H., Williams C.J. (1986) Attitude Accessibility as a Moderator of the Attitude-Perception and Attitude-Behaviour Relations: An Investigation of the 1984 Presidential Election. *Journal of Personality and Social Psychology* 51(3), 505-514.
- Glasman, R., & Albarracín, D. (2006). Forming Attitudes That Predict Future Behavior: A Meta-Analysis of the Attitude-Behaviour Relation. *Psychological Bulletin* 132(5), 778-822.
- Honey, M., & Moeller, B. (1990) *Teacher's Beliefs and Technology Integration: Different Values, Different Understandings*. USA, Bank Street College of Education, Center for Technology.
- Jedekog, G. (2005) *Ch@nging school Implementation of ICT in Swedish School, Campaigns and Experiences 1984 – 2004 Sweden*: Uppsala Universitet Universitetstryckeriet
- Kiridis, A., Drossos, Y., & Tsakiridou, H. (2006) Teachers Facing Information and Communication Technology (ICT): The Case of Greece. *Technology and Teacher Education* 14(1), 75-96
- Knezek, G., & Christensen, R. (2001)? Impact of New Information Technologies on Teachers and Students. Retrieved December 12, 2006, from <http://www.iittl.unt.edu/IITTL/wcce/wcce01/impact.htm>
- Kozma, R. (Edit.). (2003) *Technology, Innovation, and Educational Change. A global Perspective* (A report of the second information technology in education study: Module 2). International Association for the Evaluation of Educational Achievement (IEA).
- Pelgrum, W.J., (1993). Indicators of computer integration in education. *Computers Education* 21(1), 141-149.
- Pelgrum, W.J, (1993). Attitudes of school principals and teachers toward computers: Does it matter what they think? *Studies in Educational Evaluation* 19, 199-212.

- Pelgrum, W.J. (2001). Obstacles to the integration of ICT in education: results from a worldwide educational assessment. *Computers & Education* 37, 163-178
- Riis, U. (Edit). (2000) *IT I skolan mellan vision och praktik – en forskningsöversikt* Stockholm: National Board of education
- Rogers, E. M. (1995). *Diffusion of Innovation* (4:th ed.) New York: Free Press.
- Russel, A.L. (1995). Stages in learning new technology: naive adult email users. *Computers Education* 25(4), 173-178
- Sparks, G.M. (1988). Teacher's Attitudes Toward Change and Subsequent Improvements in Classroom Teaching. *Journal of educational psychology*, 80(1), 111-117.
- Steketee, C (2005). Integrating ICT as an integral teaching and learning tool into pre-service teacher training courses *Issues In Educational Research*, 15
- Zimbardo, P.G., Ebbesen, E., & Mashlach, C. (1977) *Influencing attitudes and changing behaviour* USA: Addison-Wesley Publishing Company.