

## ICT INTEGRATION IN THE CLASSROOM: CHALLENGING THE POTENTIAL OF A SCHOOL POLICY

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### **Abstract**

Despite the assumption that the integration of ICT influences the entire school system, research focusing on ICT in schools is generally limited to the study of variables at class level. In contrast to these studies, the present research explores ICT integration from a school improvement approach. More particularly, it examines the local school policy with respect to ICT integration from both the principal's perspective and perceptions of teachers. Furthermore, it studies the relationship between school policies and the actual use of ICT in the classroom. To answer the research questions, a representative sample of 53 primary school principals was interviewed. In addition, the interview data were supplemented with survey data of 574 teachers from the same 53 schools. What emerged from the analyses was that school-related policies, such as an ICT plan, ICT support and ICT training have a significant effect on class use of ICT. In addition, the findings from the interviews indicate that school policies are often underdeveloped and underutilised. The discussion section focuses on challenges to improve the potential of an ICT school policy.

*Keywords:* Media in education; Improving classroom practice; Primary education; Country-specific developments

## **1. Introduction**

In the literature, the question is repeatedly put forward as to what variables determine the integration of information and communication technology (ICT) in education. In this respect, many studies have focused on measuring the impact of variables at class level (micro level), such as computer attitudes (Albirini, 2004; Dementrias, Barbas, Molohides, Palaigeorgiou, Psillos, Vlahavas, et al., 2003; van Braak, Tondeur, & Valcke, 2004), computer experience (Becker, 2001; Williams, Coles, Wilson, Richardson, & Tuson, 2000), and gender differences (Shapka & Ferrari, 2003; Volman, van Eck, Heemskerk, & Kuiper, 2005). The focus on these individual factors has oriented research focusing on ICT integration towards 'individual blame' rather than 'system blame' (Tang & Ang, 2002). Previous research largely ignores the complex systemic nature of ICT integration, including the role of national policies (macro level) and local school policies (meso level). The latter requires more sophisticated statistical techniques (i.e. a multilevel approach) to examine the effects of different factors, measured on different levels, reported by different actors on the dependent ICT integration variable.

Results from an earlier study (Tondeur, van Braak, & Valcke, 2006) indicate a gap between the proposed ICT curriculum at the macro level and the actual use of ICT in the classroom. The study more specifically demonstrated that the aspirations of national educational authorities to foster ICT integration in schools do not easily result in concrete changes in instructional practices at class level. In this respect, Visscher and Coe (2003) point at the variability between schools, suggesting that general, central policies and reforms do not automatically lead to educational change in schools. Schools are considered to differ with respect to performance level, innovation capacity, and contextual characteristics. This implies that educational improvement or innovation efforts should consider to a larger extent the 'power of site or place'. Fullan (2001) concludes that large-scale change could be effective, but requires a degree of top-down initiative at the beginning, followed by larger attention paid to local conditions.

It can be argued that local policies do reflect to a larger extent what happens in the classroom. If teachers share the values expressed within a school-related policy and understand the implications, this policy is able to influence practice (Kennewell, Parkinson, & Tanner, 2000). Therefore, it is important to study the role of local ICT policies on actual ICT integration in education. Recent studies reveal that ICT works in some schools and hardly in other schools because of school factors (Baylor & Ritchie, 2002; Tang & Ang, 2002). The present study is in line with research focusing on the latter school factors. It centres on the hypothesis that school-related policy factors might affect the integration of ICT in the classroom. In addition, teachers' perceptions about the ICT school policy are examined in order to investigate whether these perceptions are vital for successful implementation. Finally, a number of factors at teacher level, which were found to be effective in a previous study (van Braak et al., 2004), were added to the model in order to consider and compare their impact on school policies when explaining ICT integration in the classroom.

## **2. Background**

### *2.1 School policies from a school improvement perspective*

The role of local school policies with respect to ICT integration can be discussed from a school improvement perspective. In brief, the school improvement movement is a practice-

and policy-oriented approach to strengthen schools' capacity for change management (Creemers, 2002). In contrast to 'school effectiveness', 'school improvement' tries to find out *how* schools can change in order to improve, whereas school effectiveness is strongly focused on *what* is to be changed in schools in order to become more effective (Hulpia & Valcke, 2004). School improvement is mainly concerned about the quality of changes with less attention being paid to the consequences at the level of pupil outcomes.

Reynolds, Teddlie, Hopkins, and Stringfield (2000) argue that a school improvement approach to educational change embodies the long-term goal of establishing a self-renewing school. They stress the central role of the school level in mediating change. A sufficient level of school autonomy, the development of school policies and a collaborative school team seem to be positively related to school improvement. In this respect, Stoll (1999) highlights the importance of clear goals and systematic strategies to direct educational change. Subsequently, team development and professionalism of principals and teachers are necessary conditions (Stoll, 1999). Moreover, Gray (1997) stresses the value of strong leadership to guide change efforts. Other important aspects of the school improvement process are continuous quality control, i.e. assessment and reflection (MacBeath, 1999) and schools being part of a network working towards comparable reform goals (Hopkins & Reynolds, 2001). These key factors entail the development of a local school policy in order to guarantee the establishment of the necessary conditions supporting the continuous change processes. ICT integration is considered as an instantiation of such change processes. As a consequence, in the present study, it is hypothesised that local school policies play a significant role in promoting ICT integration in the classroom.

## *2.2 The impact of ICT school policies*

Previous studies focusing on ICT integration demonstrate that a substantial proportion of the variation in educational ICT use is due to school improvement related aspects (e.g. Dawson & Rakes, 2003; Otto & Albion, 2002). Table 1 distinguishes five key factors from the school improvement approach and links these concretely to school policies fostering ICT integration in the classroom. Despite the existence of differences in school improvement approaches, there seems to be a general agreement on this basic set of factors. Yet, this list of school factors cannot depict the complexity of school improvement.

<Insert table 1 about here>

In this respect, a first important factor is the development of a shared vision concerning how ICT is to be used for teaching and learning (Hughes & Zachariah, 2001; Otto & Albion, 2002). It appears that teachers belonging to schools engaged in ICT planning are more likely to apply ICT in an innovative way (Kozma, 2001). Dexter, Anderson, and Becker (1999) also conclude that successful ICT implementation depends upon goals shared by different actors and at different organisational levels. As a consequence, the development of an ICT school plan aiming at setting clear goals and defining the means to realise these goals, is a crucial step towards actual ICT integration (Bryderup & Kowalski, 2002). In addition, Kennewell et al. (2000) suggest that a good ICT plan should also comprise an assessment and evaluation approach to obtain a clear picture of current ICT use. This fosters an iterative approach in planning and monitoring ICT integration.

Analysis of the available research also reveals the importance of leadership in managing ICT integration. School principals are in a position to create the conditions to develop a shared

ICT policy. Several studies (e.g. Anderson & Dexter, 2000; Dawson & Rakes, 2003) support the claim that leadership promoting change is a key factor when it comes to merging ICT and instruction. Baylor and Ritchie (2002, p. 412) also describe leadership as a critical predictor of ICT integration, since it focuses on promoting the use of ICT at a strategic and action level: 'school principals who wish to nurture a technology culture need to join in rather than sitting by the side'.

Other ICT-related school factors that can be connected to school improvement approaches are the degree of ICT training (e.g. Galanouli, Murphy & Gardner, 2004), ICT-related support (e.g., Lai & Pratt, 2004), and cooperation between schools (e.g. Triggs & John, 2004). Baylor and Ritchie (2002) conclude that ICT training has an important influence on how well ICT is embraced in the classroom. According to Cohen and Hill (2001), the most effective teacher training experiences are school subject specific practices, immediately relevant for classroom instruction and connected to school policy. While ICT training is clearly useful, continuous support is an issue that concerns many teachers to a larger extent. Williams et al. (2000) argue that mechanisms need to be put in place to ensure that teachers have adequate access to support. In this respect, Lawson and Comber (1999) stress the provision of ongoing support usually supported by the ICT coordinator. From the study of Lai and Pratt (2004) it is clear that the ICT-coordination is in a good position to guide and successfully integrate ICT in schools. Also cooperation between schools is seen as an important key factor for the integration of ICT. The central features that underpin this process are contact with colleagues who share similar interests, interaction that involves knowledge exchange, and encouragement to take risks, combined with support in analysing why things go wrong and how they can be improved (Triggs & John, 2004).

### *2.3 Purpose of the study*

The literature suggests that the success of ICT integration depends partly on factors at school level. In this respect, a first purpose of the present study is to describe the state of the art regarding ICT school policies in Flemish primary schools with respect to five areas emerging from the school improvement approach as discussed above: the presence of an ICT policy plan, leadership supporting the process of ICT integration, school internal support, evaluation of ICT use, and between-school cooperation.

The second aim of the study explores the extent to which the use of ICT in the classroom practice can be associated with these school factors. Furthermore, the impact of teachers' perceptions of ICT school policies on ICT integration in the class was studied. Finally - taking into account previous research (van Braak et al. 2004) - additional relevant teacher variables were included in the analyses in order to examine their relative impact on ICT practice as compared to the impact of school policy-related variables.

## **3. Research method**

### *3.1 Participants*

The data collection was restricted to actors involved in primary schools in Flanders, the Dutch speaking region of Belgium. A stratified sample of 60 schools was involved in the study. Stratification variables were related to the type of educational network and the degree of urbanisation (rural/urban). At least one teacher at each grade level was asked to participate, resulting in data from at least six teachers per school. The sample comprises 574 teachers, of which 430 were female. Teacher age varied from 22 to 61 years, with an average age of 38 ( $SD = 10.3$ ).

Fifty three principals of the same 60 schools were willing to participate in the study, reflecting a high response rate at school level. School principals were 49 years old on average ( $SD = 6.2$ ). 18 principals were female.

### *3.2 Procedure and instruments*

In view of the first objective of the study, a structured interview with the principals was organised. To direct the structured interviews, an instrument was developed reflecting variables at meso level. Table 2 gives an overview of all meso and micro variables in the present study. Open-ended questions were formulated for each variable, and a number of pre-defined response categories were prepared for each question. The coding categories to structure the answers of the respondents were derived through a review of the literature and reviewed by teachers, ICT coordinators and researchers. Elements of answers that could not be related to the available coding categories were written down literally. This resulted in the need for additional coding. All interviews were audiotaped after obtaining informed consent from the participants.

<Insert table 2 about here>

In view of the second research objective, data from the school principals were linked to the data from the teacher survey. A questionnaire was developed in order to gather information from teachers about the central dependent variable 'class use of computers' and about the determinants of class use of computers, presented in Table 2. The 'Class Use of Computer Scale' (van Braak et al., 2004) was developed for measuring how often teachers use computers in their classroom (Table 3).

<Insert table 3 about here>

Results in table 3 illustrate that the computer is mainly used for training skills, such as drill and practice (53%) and differentiation activities (46%). The eight class use items showed high internal consistency of  $\alpha=.79$ . Scale mean for the total sample was  $M = 34.2$  ( $SD = 18.6$ ), varying between a 0-100 range.

### *3.3 Data analysis*

With regard to the first research aim, all responses to the questions in the principal interview were analysed as quantitative variables. Considering the exploratory nature of the first research objective, descriptive statistics were initially applied to analyse the interview data. When reporting descriptive statistics, only the most important percentages have been reported.

In view of the second research objective, multilevel analysis was performed to determine the impact of school policies on ICT integration in the classroom. Taking into account the hierarchical structure of teachers nested within schools, we opted for multilevel modelling to analyse the impact of teacher and school level variables on the classroom use of ICT, since these models are specifically geared to the statistical analysis of data with a clustered structure (Goldstein, 1995). More specifically, two levels were distinguished: teachers (level 1) are clustered within schools (level 2). The multilevel model was built up from a null model to a model including relevant explanatory variables. The first step in the analysis was to examine the results of an unconditional two-level null model, with only an intercept term included. This model permits partitioning the total variance into within-school and between-school components. It serves as a baseline with which to compare subsequent more complex models

and is unconditional because the variance components are not predicted by any variables. The second step in the construction of the models concerned the inclusion of explanatory variables at both teacher and school level. Initially, all variables were included in the model as fixed effects, assuming that their impact does not vary from teacher to teacher or from school to school. Afterwards, the assumption of a fixed linear trend was verified for each explanatory variable by allowing the parameter coefficients to vary randomly across schools and across teachers within schools. Since parsimonious models are preferred, only significant predictors improving the model were retained. The parameters of the multilevel model were estimated using the iterative generalized least squares (IGLS) estimation procedure made available in the MlwiN software (Rasbash, Browne, Goldstein, Yang, Plewis, & Healy, et al., 1999).

#### **4. Results**

In this section we first present the results with respect to five areas of ICT policies, based on the interviews with the school principals. Subsequently, we focus on the analyses regarding the impact of school policies on the integration of ICT in the classroom.

##### *4.1 ICT school policy*

###### **4.1.1 ICT policy plan**

As to the presence of an ICT plan at school, only 12 of the 53 principals reported the availability of a comprehensive ICT plan including clear goals and determining the means to realise these goals. 21 principals referred to a limited ICT plan, only consisting of goals but incorporating no information about strategies to pursue these goals. The same number of principals indicated the school had no ICT plan whatsoever. Half of these schools, however, planned to develop an ICT plan during the following school year. In schools with an ICT plan present, the plan particularly reflects policies related to the ‘use of computers in the forthcoming school years’ (in 59.3% of the cases), as well as ‘agreements concerning ICT infrastructure and software’ (in 22.2% of the cases). More detailed analysis of the ICT plan reveals that the focus is primarily on developing pupils’ technical skills. Less information is included about the integrated use of ICT in learning and instructional processes. Nevertheless, a number of principals argue that, even if policies are articulated, the implementation is often lagging behind.

*“Despite the effort of the ICT coordination to set up a strategic plan, teachers are not aware of the specifics of the plan.” [Principal/School 17]*

One of the problems explicitly mentioned in this respect has to do with poor communication between the school management and the teachers. Lack of time was singled out as one of the main causes for the absence of developing a shared vision on the applications of ICT in the class. The development of a vision about ICT integration was in most of the cases limited to a top-down strategy, initiated by the school principal or the ICT coordinator.

###### **4.1.2 Leadership**

Principals see their role mainly as a catalyst and facilitator of ICT integration in the classroom. In Flanders, the use of ICT in education is not yet part of the formal curriculum. But teachers are encouraged by the educational authorities and policy developers to adopt computers in their classroom, but this is yet not a compulsory instructional activity. During the interviews, the non-compulsory nature was stressed as the main reason why only a few principals (7.7%) instruct the teachers to use ICT. In this respect, it can be assumed that ICT integration in Flemish primary schools will strongly depend on individual teachers.

*“I cannot push teachers to implement ICT in their teaching.”*

*The current situation of informal (national) policies builds on the willingness of the individual teacher. In this school, a number of teachers respond as creative and productive users of ICT, some are experimenting, and others are inexperienced for effective uses of ICT in learning.* [Principal/School 62]

When principals report their personal impact on the degree of ICT integration, in half of the cases this impact is perceived as limited. Most of the principals mention a lack of time for managing this process in their schools.

*"You cannot be the architect, the engineer, and the builder at the same time"* [Principal/School 53]

#### 4.1.3 Support

Principals were questioned about the barriers and needs they perceive with regard to integrating ICT in the classroom. The first barrier and mentioned most frequently (50%), was the lack of access to resources.

*"In 2002, the Flemish government reached the aim of one PC for every 10 pupils, but they forget that these computers need an update."* [Principal/School 27]

Schools from our sample were reported to have on average one computer for every 6 student ( $SD = 6.6$ ). Generally, each regular classroom was assigned 2.0 computers ( $SD = 1.8$ ). The second most reported barrier (29.6%) refers focuses to the on the lack of adequate skilled staff personnel to coordinate and support the adoption of ICT. As principals mainly perceive their role as a facilitator, they especially expect ICT coordinators to support direct the integration process. Interestingly, many principals reported that it would be advisable to establish appoint a teacher as a 'change agent' in order to maintain sustain the innovation when direction if the ICT coordination is no longer available.

*"Last year, our school had an excellent ICT coordinator; now that he's gone, ICT integration doesn't receive a lot of attention anymore."* [Principal/School 37]

A majority of principals reported that ICT coordinators mainly perform as technical experts. Due to a lack of time, their impact on educational or policy-related issues remains restricted.

*"Within three hours a week, our ICT coordinator has sufficient time to repair our computers but not enough to deal with pedagogical issues"* [Principal/School 4]

The third ICT-related barrier was the limited ICT skills level of the teachers (27.8%). Considering the needs, put forward by the principals, the list comprises more and better infrastructure, more ICT coordination, and more professional development of teachers regarding their ICT skills. Principals emphasise the responsibility of national authorities to tackle meet these needs. Few principals stress the importance of a local ICT-related policy.

#### 4.1.4 Evaluation

From the interviews it became clear that the implementation of ICT in schools is hardly ever submitted to any kind of evaluation: 17 of the 53 principals claimed that the ICT policy has been evaluated occasionally and only 9 principals reported a systematic evaluation. Again, it appears that the evaluation emphasis is mostly related on the infrastructure (hardware and software). In a small number of schools, the evaluation also centres on the actual use of ICT for learning and instruction.

*"Evaluation of ICT use for learning activities has a powerful impact on the practice in my school. Our assessment tools oblige teachers to reflect about the specific ICT competencies they intend to reach each time they plan to use ICT in their lessons. This detailed view how teachers use the potential of ICT in their teaching is also the starting point for reflection and policy planning."* [Principal/School 3]

Comments of a number of principals reflect the central need for a regular evaluation in order to understand ‘where they are’ and identify ‘where they wish to be’ after a period of time. This suggests that in some cases ICT policies are not seen as static, but as an instrument that needs to be reviewed on a regular base.

#### 4.1.5 Cooperation

It is worth noting that schools in Flanders need to set up cooperation with other schools in order to receive funds for ICT coordination. This encouraged most of the schools (75%) to develop partnerships. Beside the opportunity to share an ICT coordinator, the cooperation often also led to shared initiatives related to hardware and software (25.9%) solutions.

*‘Schools should work together for a wide range of technical issues. It is clear that all our partner schools benefit from the experiences of the ICT coordination. But in terms of motivating our staff as well as supporting them in integrating ICT into teaching, this person risks missing the culture of our school’* [Principal/School34]

A common theme in the interviews was – as a result of the requirement to cooperate with other schools – that principals and ICT coordinators felt stimulated to discuss the complex issue of ICT integration. Some principals also stress the importance of involving teachers in this collaboration process; but in only one school did this result in the actual partaking of the teachers.

*‘Last year, my teachers were invited to observe examples of good practice in another primary school. In my opinion, observation of each others practice can be a good incentive.’* [Principal/School61]

#### 4.2 Impact of school policies and teacher characteristics on ICT integration in class

Table 4 presents the results of the multilevel analyses concerning teachers’ use of ICT in the class. More specifically, the impact of school policy factors, teachers’ perceptions regarding ICT school policies, and teacher variables, such as teachers’ computer attitudes, computer experience, and technological innovativeness, was studied.

As can be seen in Table 4, the random part of the null model provides justification for applying multilevel models, for the variances at both the school and teacher-level are significantly different from zero (resp.  $\chi^2=6.153$ ,  $df=1$ ,  $p=0.013$ ;  $\chi^2=242.847$ ,  $df=1$ ,  $p<0.000$ ). This model serves as a baseline to compare subsequent more complex models with and it partitions the total variance of ICT class use ( $347.8 = 31.878 + 315.922$ ) into between-schools (31.878) and between-teachers within-schools variance (315.922). Respectively 9.16% of the total variance in teachers’ use of ICT in the classroom is related to differences between schools, while the remaining part of 90.83% of the variance can be attributed to differences between teachers within schools.

As the fixed parameters in the final model in Table 4 reveal, variables at both the school and teacher level significantly influence teachers’ use of ICT in their class. The results highlight the significant positive effect of teachers’ ‘attitudes towards computers in education’ ( $\chi^2=8.410$ ,  $df=1$ ,  $p=0.003$ ), ‘technological innovativeness’ ( $\chi^2=4.453$ ,  $df=1$ ,  $p=0.030$ ), ‘intensity of computer use’ ( $\chi^2=10.552$ ,  $df=1$ ,  $p=0.001$ ), ‘number of in-service training sessions about ICT’ ( $\chi^2=10.186$ ,  $df=1$ ,  $p<0.000$ ), ‘perceptions regarding the contents of the school ICT plan’ ( $\chi^2=17.435$ ,  $df=1$ ,  $p<0.000$ ), and ‘perceptions regarding school internal ICT support’ ( $\chi^2=22.401$ ,  $df=1$ ,  $p<0.000$ ). In addition, a positive effect of the ‘percentage male teachers at school’ was identified ( $\chi^2=7.324$ ,  $df=1$ ,  $p=0.007$ ). A significantly negative effect was observed for the ‘pupil/PC-ratio in the classroom’ ( $\chi^2=19.375$ ,  $df=1$ ,  $p<0.000$ ), indicating

that the availability of a higher number of computers invoke a higher level of ICT integration in the classroom.

<Insert table 4 about here>

The results point at the fact that ICT integration in daily class practice is significantly associated with teachers' perceptions of policy related factors. No significant effect on teachers' ICT use was found for the principals' perspective. Teachers' perceptions about the ICT school policy seem to be more important for ICT integration in the classroom than a teachers' ICT profile.

### **Discussion**

The findings of the present study highlight the potential impact of policy-related factors on the actual integration of ICT in daily classroom instruction. First, the study confirmed that teachers in schools with an explicit ICT school policy that stresses shared goals are using ICT more regularly in their classroom. This corroborates previous research findings, suggesting that successful ICT integration depends upon the development of a shared vision (Hughes & Zachariah, 2001; Otto & Albion, 2002). It should be stressed, however, that in the present study only 'teachers' perceptions regarding the content of the ICT school plan' and not the actual content of the ICT plan has a significant impact on class use of ICT. As a consequence, an ICT policy plan seems to be an important incentive to foster the integration of ICT use in classroom, but only when teachers are aware of its content. In other words, successful ICT integration becomes much more likely when teachers share the values expressed within the school policy and understand their implications (Kennewell et al., 2000).

Nevertheless, as could be derived from the interviews, teachers in the present study were often overlooked during the development of the school's ICT policy. The results point at a lack of communication between principals and teachers. This reinforces the fact that policy decisions and change models currently do not acknowledge the pivotal role of the teacher in effecting change (Olson, 2000). Olson (2000) suggests that a dialogue should be established based on parity between principals, teachers, and other stakeholders. Engaging teachers in the development of an ICT plan gives them the opportunity to reflect on their particular educational use of ICT (Tondeur et al., 2006). It determines the subjective meaning of how and why individual teachers will respond to ICT. In addition, Tang and Ang (2002) highlight the impact of communication on ICT integration. They suggest that teachers should not be considered as 'recalcitrant recipients' but as 'structurally constrained participants'.

Next to the importance of a shared vision about ICT, three other significant determinants of ICT class use are subject to the influence of school policies, namely the number of teachers' attended in-service trainings, the availability of school-internal ICT support, and the pupil/PC-ratio at school. It is interesting to note that, parallel with the result about the ICT plan, only the perceptions of the teachers and not the principals with regard to school-based ICT support were statistically significant. It appears that teachers reporting a high degree of ICT-related support, incorporate more often these technologies in their practice. This confirms previous research findings pointing at the teachers need for considerable support in view of ICT integration (e.g. Lai and Pratt, 2004). Building on the interviews with the principals it is clear that most support is supplied by ICT coordinators. ICT coordinators, however, primarily provide schools with technical expertise, while their impact on educational or policy-related issues seems to remain limited. As Somekh (1996) noted, needs for technical support tend to take precedence over curriculum support. The government in Flanders is aware of this

problem and has therefore redefined the role and position of ICT coordinators. According to Lai and Pratt (2004), the main responsibility of the ICT coordination is especially to guide ICT integration in teaching and learning (curriculum support). Principals in our study indicate the lack of time as an important obstacle for receiving such curriculum related support. It seems therefore to be recommended to distinguish between technicians providing schools and teachers with technical support, next to ICT coordinators that focus primarily in educational support in view of ICT integration into the curriculum.

Building on the positive effect of the 'number of in-service ICT training sessions' on higher levels of ICT class use, professional development should stay at the centre of an ICT policy. Another finding with policy implications is the impact of the pupil/pc-ratio on ICT class use. But it has to be stressed that this impact is only valid when the computers are located in the classroom. An explanation for this specific impact might be that the in-classroom provision of computers maximises usage-potential, in contrast to computer labs where computer use depends on time-allocation mechanisms. Also, in this context authors state that computer labs are less effective because the separation between computer and classroom reduces ICT integration in learning activities (Salomon, 1990).

The findings about the impact of teacher characteristics on ICT use confirms results reported earlier (van Braak et al., 2004) concerning 'innovativeness', 'attitudes regarding computers', 'intensity of ICT use', and 'gender'. Compared to teacher characteristics, the present study stresses that policy-related factors are important for successful ICT integration. Nevertheless, findings from the interviews indicate that school policies are often underutilised, and it is clear that ICT integration is not yet achieved in a systemic or systematic way in most of the schools. Very few schools can be labelled as 'learning organisations' with a shared commitment to ICT integration. Only 22% reported to have developed an extensive ICT plan, and only 17% of those plans included information about the educational use of ICT.

As ICT continues to drive changes in society and in education, school policies need to define their organisational vision and actions more clearly in view of planned change (Senge, 2000). The literature about school improvement stresses the importance of leadership in developing a commitment to change (Fullan, 2001). Building on the notion that school principals play a central role in this context, the international society for Technology and Education has established Technology Standards for school leaders (Knezek, Rogers, & Bosco, 2001). These "final attainment levels" require primary school principals to implement ICT in a successful way. Their capacity to develop and articulate, in close collaboration with other actors from the school community, a shared vision about ICT use and integration is considered as a critical building block in this process. Therefore, training of principals should be a priority. The study from Dawson and Rakes (2003) underpins the former: the more training principals receive, the more ICT integration at school level is being observed. Their findings suggest that without well-trained, ICT-capable principals, the integration of ICT into school curricula will remain deficient.

In the present study, principals report that their personal impact on the current level of ICT integration is rather limited. They refer in this context to the fact that ICT is not yet included in the formal curriculum. To respond to this problem the Flemish government has recently put forward ICT standards that determine what should be attained by the majority of the pupils at the end of primary education. Considering this decision, it will be interesting to study the impact of these standards on school policies in the near future. This would also help to clarify whether class use of ICT changes significantly when the school policy is more established.

In addition, interpretative research, e.g. case studies can be set up to identify in more detail why other school-related variables affect the (non) adoption of ICT in certain schools. For instance, it is suggested that 'school culture' is an important consideration in terms of ICT integration (e.g., Lim, 2002; Tearle, 2003). School culture can be defined as "the basic assumptions, norms and values, and cultural artefacts that are shared by school members" (Maslowski, 2001, p. 8-9). These meanings and perceptions indirectly affect attitudes and behavior in the organisation of schools (Devos, Bouckenhooghe, Engels, Hotton, & Aelterman, 2007). According to Tearle (2003), they can be linked in how "ready" the school is to adopt the planned change. Future research should investigate on how these 'informal policies' could affect formal policies and, in turn, ICT integration.

## Conclusion

The present research studied class use of ICT from a broader perspective, namely from an ICT school policy point of view. The findings suggest that successful ICT integration is clearly related to actions taken at the school level, such as the development of an ICT plan, ICT support, and ICT training. The results also suggest that principals have to develop a more collaborative approach when defining this policy. The study underpins the importance of a shared and school-wide vision about ICT integration that reflects the opinions and beliefs of the principal, the ICT coordinator, and the teachers.

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Table 1. Five areas of local ICT policies from a school improvement approach.

School improvement	Local ICT policies
Clear goals and systematic strategies for educational change (Reynolds et al., 2000)	Development of an ICT plan facilitating comprehensive ICT integration and fostering an environment towards the realisation of the vision in the ICT plan (Otto & Albion, 2002)
Strong leadership to guide change efforts (Gray, 1997)	Leadership to effectively direct the process of ICT integration (Dawson & Rakes, 2003)
Profession development and support for the implementation of reforms (Stoll, 1999)	Support and training to ensure ICT integration (Lai & Pratt, 2004)
(Self) evaluation systems for monitoring change processes (MacBeath, 1999)	Evaluation to monitor the integration of ICT and guide ICT planning (Kennewell, Parkinson, & Tanner, 2000)
Networking and exchange of good practice with other schools working on the same reform (Hopkins & Reynolds, 2001)	Cooperation to create between-school communities for the dissemination of ICT-related knowledge (Triggs & John, 2004)

Table 2. School and teacher variables involved in the teacher survey and/or interviews with principals.

<i>Variable</i>	<i>Short description</i>	<i>Teachers' Survey</i>	<i>Principals' Interviews</i>
<b>Meso level</b>			
<i>ICT policies</i>			
ICT policy plan	Content ICT plan	✓	✓
Leadership	Leadership style (stimulate, delegate, ...)		✓
Support	Actors supporting ICT integration		✓
	Extent and type of internal ICT support	✓	
	In-service-training (extent and effectiveness)	✓	
Evaluation	Extent and type of evaluation ICT use		✓
ICT-related cooperation (internal and external)	Extent and type of cooperation with colleagues from the same school	✓	
	Extent and type of cooperation with colleagues from other schools		✓
<i>ICT infrastructure</i>			
	Number and place of computers		✓
	Number of computers with Internet connection	✓	✓
	Pupil/pc-ratio (in the classroom)	✓	✓
<i>School characteristics</i>			
School size	Number of pupils		✓
Gender	% male/female teachers at school level		✓
<b>Micro level</b>			
<i>Teachers' ICT profile</i>			
Attitudes towards computers in education	Teachers' Attitudes towards Computers in Education Scale (van Braak, 2001)	✓	
General computer attitudes	Teacher's General Attitudes towards Computer Scale (van Braak & Goeman, 2003)	✓	
Technological innovativeness	Teachers Attitudes about the Need and Willingness to Introduce Computers in the Classroom (van Braak, 2001)	✓	
Computer experience	Years of computer experience	✓	
Intensity of computer use	Degree of computer use (hours a week)	✓	
<i>Demographics</i>			
Age	Date of birth	✓	
Gender	Male/female	✓	

Table 3. Overview of the Class Use of Computer Scale items and % of teachers using specific applications at least once a week.

	%
Encouraging pupils to train skills	53
Using the computer for differentiation	46
Encouraging collaborative learning	33
Asking pupils to do assignments on the computer	33
Encouraging pupils to search for information on the Internet	16
Using the computer as a tool for demonstration	13
Using the computer as a tool for instruction	12
Teaching about the possibilities of computers	8

Table 4. Model Estimates for the Two-level Analysis of Teachers' Use of ICT in the Classroom.

Parameter	Null model	Final Model	Effect size
<i>Fixed</i>			
Intercept	34.531 (1.124) ***	-1.771 (5.191)	
Perception internal ICT support		0.199 (0.042)***	0.22 <i>SD</i>
Pupil/PC-ratio		-0.532 (0.121)***	0.19 <i>SD</i>
Perception content of ICT plan		0.106 (0.025)***	0.18 <i>SD</i>
Number of in-service trainings		1.891 (0.592)**	0.15 <i>SD</i>
% male teachers		0.158 (0.058)**	0.13 <i>SD</i>
Attitudes towards computers in education		0.218 (0.075)**	0.15 <i>SD</i>
Technological innovativeness		0.138 (0.066)*	0.11 <i>SD</i>
Intensity of computer use		0.467 (0.144)**	0.15 <i>SD</i>
<i>Random</i>			
Level 2			
$\sigma^2_{\mu 0}$	31.878 (12.850)*	14.936 (8.524)	
Level 1			
$\sigma^2_{\varepsilon 0}$	315.922 (20.273)***	197.718 (15.310)***	

Note. Per cell: regression coefficient and standard error

\* $p < .05$  \*\* $p < .01$  \*\*\* $p < .001$