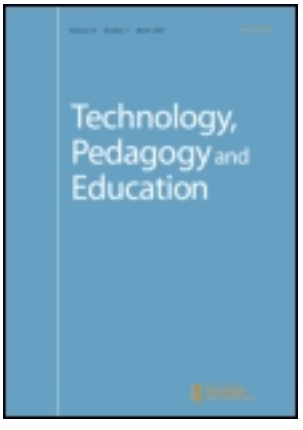
Adopting the Integrative Model of Behaviour Prediction to explain teachers' willingness to use ICT:



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Adopting the Integrative Model of Behaviour Prediction to explain teachers' willingness to use ICT: a perspective for research on teachers' ICT usage in pedagogical practices

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Information and communication technology (ICT) can enable, support, and reinforce the introduction of new pedagogical practices that comply with the educational demands of the twenty-first-century knowledge society. However, despite this potential and despite the delivering of skills-based professional development and the increase in the level of ICT infrastructure, teachers are more often reluctant rather than willing to use ICT. This article reviews existing literature to 1) select a theoretical model that is suited to explain this, and 2) uncover important variables at various levels, including the individual and school organisation that should be included in the model. As a result, it adopts Fishbein's Integrative Model of Behaviour Prediction (IMBP). This model forces the explicit consideration of dispositional variables including attitude, self-efficacy and subjective norm that are the direct and indirect antecedents of intentional ICT usage and real ICT use. Rather than concentrating on general ICT usage, IMBP is concerned with the use of specific ICT tools, such as digital learning materials. The authors believe that IMBP as a diagnostic tool will shed more light upon the issues surrounding teachers' ICT usage.

Keywords: ICT use; ICT willingness in education; teacher professionalisation; Integrative Model of Behaviour Prediction; Technology Acceptance Model

Introduction

Learner-centred approaches emphasise active learning, critical thinking, collaborative inquiry, problem-solving skills, communication skills, information handling skills, self-directed learning, and connectedness with others, all of which are necessary for stimulating the development of life-long learning competencies (Hargreaves, 2003; Venezky & Davis, 2002; Voogt & Pelgrum, 2005). These characteristics are usually referred to as 'twenty-first-century skills' because they are considered necessary to meet the educational demands of the twenty-first century imposed by the knowledge society (Somekh, 2007).

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Information and communication technology (ICT) is often seen as a means for enabling, supporting, and reinforcing educational reform that advocates using those pedagogical practices (Organisation for Economic Co-operation and Development, 2010; Ward, 2005). Kozma (2003) stated that 'ICT enables [educational] innovations by supporting teacher and student activities and by connecting students and teachers to each other and to a vast array of human and informational resources around the world' (p. 5). Pelgrum and Voogt (2009) provided evidence that countries reporting high frequent ICT use – defined as 'at least once a week' – in their pedagogies also reported frequent application of a learner-centred approach (Chile, Canada-Ontario and Canada-Alberta) as opposed to countries with low frequent ICT use (Chinese-Taipei, Japan and Slovenia). The body of evidence that using ICT can positively affect learning outcomes is growing (Higgins, 2003; Meijer, van Eck, & Felix, 2008). Yet, despite this potential, Kozma (2003) noticed that teachers are more often reluctant rather than willing to integrate ICT in their pedagogical practices. We here use the term 'reluctant' to represent a series of states that vary between being hesitant and being opposed to use ICT. Ward (2005), in addition, reported that teachers either do not use ICT at all or primarily use it for administrative purposes (see also Drent & Meelissen, 2008). Also, Yang and Huang (2008) found that 'despite pressure on schools to increase the application of technology, the adoption of teaching and learning practices using new technologies has been limited in terms of teachers' [concerns about ICT adoption], their teaching behaviour as well as their use of technology' (p. 1085). Furthermore, Becta (2008) found that although the number of teachers using technology to support learners to be creative and working together has increased, the proportion of practitioners reporting that they 'rarely or never' do this is still high. Finally, even in those countries reporting frequent use of ICT (i.e. Chile, Canada-Ontario and Canada-Alberta), maximally 40% of teachers report using ICT (Pelgrum & Voogt, 2009). Even to the current day, a 100% coverage of teachers using ICT is still a high ambition as several statistics show a rather limited use (e.g. Kennisnet, 2011).

In order to stimulate ICT use among teachers, several programmes and interventions have been developed, usually by concentrating on delivering skills-based professional development and increasing the level of ICT infrastructure. These interventions, however, appear to be ineffective; teachers' use of ICT does not increase spectacularly and only gradual results are reported (Kennisnet, 2011; Pelgrum & Voogt, 2009). Therefore, the question arises: What are the causes that explain teachers' willingness versus reluctance towards the use of ICT for pedagogical purposes? To answer this question, we first need a theoretical model that considers individual psychological processes as we believe that teachers' dispositions, such as attitude towards ICT use, ultimately determine their decision to use versus not to use ICT in their pedagogical practices. Second, we need to uncover those important variables at various levels, including the individual and school organisation level, that should be included in the model. In order to find such theoretical model and important variables, we examined a number of national and international studies that have been conducted to determine whether any antecedent factors and processes other than incomplete ICT infrastructure and lack of ICT competences underlie teachers' behaviour regarding the integration of ICT in pedagogical practice. Two such studies are the Dutch national study conducted by Kennisnet (*Four-in-Balance Monitor*; Kennisnet, 2010, 2011) and the series of three large-scale international studies of the Secondary Information Technology in Education

Studies (SITES; see Law, Pelgrum, & Plomp, 2008; Pelgrum & Voogt, 2009) under the auspices of the International Association for the Evaluation of Educational Achievement. When looking at the Kennisnet and SITES studies, it can be observed that these studies have been conducted from an array of conceptual models exploring general relationships. These conceptual models usually consider school organisational factors and teacher characteristics and, in some cases, local, regional, and national organisational factors as well. The conceptual models are constructed with the explicit purpose of providing policy makers with information about how to design intervention programmes to engage teachers in using ICT. However, our main interest, as mentioned before, lies in theoretical models that also consider individual psychological processes and dispositions rather than in conceptual models intended for policy makers. Therefore, we further examined other existing models in the literature on their suitability to explain teachers' behaviour towards ICT use. One often-used theoretical model is the Technology Acceptance Model (TAM; Davis, 1989; Davis, Bagozzi, & Warshaw, 1989). But as TAM is technology oriented and not user oriented, it does not take into account the individual psychological processes. The one model which does so is the Integrative Model of Behaviour Prediction (IMBP; Fishbein, 2000; Fishbein & Yzer, 2003). This model was developed in the domain of health care and health promotion and tested for groups with health-related problems (e.g. smoking), who need to change their behaviour (e.g. to quit smoking). Though IMBP has not generally been applied for advancing integrating ICT in teachers' pedagogical practices its behavioural basis is promising. In order to uncover important variables we have examined the literature and found a number of variables at all levels, that is, at the individual and the school organisation, and at the level of local, regional and national organisations.

In this article, we first start with a section discussing TAM, because TAM is well known and very often used in relation to ICT use. We discuss the model from the perspective of adequately explaining individual teacher behaviour towards ICT. We continue by a discussion of the Theory of Reasoned Action (TRA; Ajzen & Fishbein, 1980) as TRA forms the basis of both TAM and IMBP. Then the characteristics of IMBP will be discussed. This discussion leads to the conclusion of how IMBP can be adopted as a theoretical framework for research into individual processes concerning teachers' pedagogical ICT usage. IMBP will also be discussed in the light of integrating most of the important variables on several levels which together explain teachers' behaviour. The article ends with a Conclusion and a Future Research section.

The Technology Acceptance Model (TAM)

The Technology Acceptance Model (TAM; Davis, 1989; Davis et al., 1989) is a theoretical model for understanding which factors affect the use of information systems (IS). TAM posits that two key belief-constructs, perceived usefulness and perceived ease of use, predict the user's attitude towards using a particular IS. This attitude affects the user's intention to use the IS which, in turn, affects actual usage. Davis (1989) defined perceived usefulness as 'the degree to which a person believes that using a particular system would enhance his or her job performance' (p. 320) and perceived ease of use as 'the degree to which a person believes that using a particular system would be free of effort' (p. 320). Perceived ease of use is hypothesised to significantly impact perceived usefulness but not vice versa.

Recently, educational researchers have begun using TAM to study teachers' and students' behaviour towards using ICT. Applying TAM, Aditiwarman and Hussein (2007) found, for example, that computer self-efficacy, technological factors, instructional design, and instructor characteristics are all variables that affect student elearning acceptance.

Although TAM is widely used by IS researchers, it has a number of confounding issues. First, it posits that the effects of external variables are mediated by the TAM belief-constructs. According to Davis (1993), 'TAM motivational variables: attitude toward using ICT, perceived usefulness and perceived ease of use, fully mediated the effect of system design features on usage' (p. 482). Hubona and Kennick (1996), however, found that distal variables such as age, educational level, and employment category directly influence usage behaviour. Second, TAM has been criticised for being too parsimonious, that is, the predictive power of the constructs perceived usefulness and perceived ease of use is low (Legris, Ingham, & Collerette, 2003). Because of this, several IS researchers have extended it by introducing new constructs. Malhotra and Galletta (1999) extended TAM with the construct social norms (i.e. subjective norms) to study the effects of the social environment on IS acceptance. Lucas and Spitler (1999) extended TAM to include social norms and job requirements and found that they 'are more important in predicting use than workers' perceptions of use and usefulness' (p. 291). Taylor and Todd (1995) modified TAM to include subjective norms and perceived behaviour control to adequately predict use by both experienced and inexperienced users. All of these modifications have led the designers of TAM to refine it. Venkatesh and Davis (2000) refined TAM to include aspects of social influence (e.g. subjective norm) and cognitive instrumental factors (e.g. job relevance, output quality), renaming it TAM2. In TAM3 – a second refinement (Vekantesh & Bala, 2008) – factors were added that influence perceived ease of use, such as computer self-efficacy and computer anxiety. According to the authors, TAM3 has become 'a complete nomological network of the determinants of individuals' IT adoption and use' (p. 279). Despite all of these refinements, TAM's main drawback remains. Because of its origins in IS research, TAM was developed to understand IS system acceptance by emphasising system characteristics that determine perceived usefulness and perceived ease of use that, in turn, influence behaviour (e.g. reluctance to use ICT). Therefore, TAM remains a technology-oriented model (see Malhotra & Galletta, 1999). Moreover, TAM cannot distinguish between the various levels in which different human and environmental variables play a role. Tondeur (2007) stated that 'research studies in ICT need to shift their attention toward the whole configuration of events, activities, contents and interpersonal processes taking place in the context in which ICT is used' (p. 14). He assumed an 'integral, multidimensional relationship between computer use and a set of personal, pedagogical and organizational factors' (p. 14). In other words there is need for a model that distinguishes the various levels that play a role in using ICT. In the next section we discuss a model that incorporates those different levels (i.e. the individual, the school organisation, and the level of local, regional and national organisations).

Theory of Reasoned Action

IMBP is grounded on the Theory of Reasoned Action (TRA; Ajzen & Fishbein, 1980; Fishbein & Ajzen, 1975), which is based on the assumption that people are

able to reason about behaviour; that is, they can argue why they will or will not perform a certain behaviour. A second assumption is that behaviour is completely volitional; meaning behaviour is self-controlled and intentional. The theory posits that people will perform a particular behaviour only if they intend to perform that behaviour. For example, teachers will use digital learning materials (DLMs) only if they have formed the intention to do so. Therefore, in TRA, intention is seen as a proxy for behaviour.

In TRA, intention is a function of two variables: attitude and subjective norm. Attitude is the person's overall feeling of how favourable or unfavourable the consequences or outcomes of performing a particular behaviour are. Attitudes are determined by outcome beliefs and their evaluations. Outcome beliefs represent teachers' perceptions of what will happen if they perform the behaviour. They are formulated in terms of expectancies (i.e. probabilities) that particular behaviour has certain consequences or outcomes, which can either be positive (i.e. advantageous) or negative (i.e. disadvantageous). For example, a positive outcome may be that DLMs allow for more variation during classes and a negative outcome may be that DLMs require more preparation These outcome beliefs are evaluated in terms of how good (i.e. welcome, desirable, acceptable, important) or bad (i.e. unwelcome, undesirable, unacceptable, unimportant) they are. These evaluations are used to weigh corresponding expectancies. For example, more variation during classes is highly desirable for a teacher and more class preparation is acceptable to her/him.

Fishbein and Ajzen (1975) defined subjective norm as one's perception that people who are important to a person think that (s)he should perform or not perform the particular behaviour. For example, a teacher's perception that parents and school staff think that (s)he should use DLMs creates social pressure affecting the intention to carry out a reluctant behaviour. The teacher feels forced to use DLMs though (s)he may have formed negative attitudes toward it. Normative beliefs determine the subjective norm and are formulated in terms of expectancies that significant reference groups (i.e. authorities, peers) hold certain stances relating to a particular behaviour. Normative beliefs are weighted by the person's motivation to comply with these expectancies. For example, a teacher thinks that both school administrators and students are insisting on the use of DLMs; however, his/her motivation to comply with these expectancies may be higher for school administrators than for students.

TRA has been further developed by Ajzen (1991, 2005) into the Theory of Planned Behaviour (TPB), which extends TRA by introducing the perceived behavioural control to account for the fact that complete volitional control is not always possible. Perceived behavioural control is the perceived ease or difficulty of carrying out a particular behaviour and is the aggregated form of control-beliefs about the presence or absence of factors that either facilitate or hinder performance (Ajzen, 2002). Perceived behavioural control was derived from Bandura's (1986) Social Cognitive Theory and is strongly related to the concept of self-efficacy (Bandura, 1986; see also Ajzen, 2002), which is explained in the next section.

Integrative Model of Behaviour Prediction

We adopt the Integrative Model of Behaviour Prediction (IMBP; Fishbein, 2000; Fishbein & Yzer, 2003) to account for teachers' behaviour for the advancement of the integration of ICT in their pedagogical practices. IMBP extends TRA by

including the construct of self-efficacy (Bandura, 1986) rather than perceived behaviour control as is the case in TPB. Self-efficacy, defined by Bandura (1997), is the belief 'in one's capabilities to organize and execute the courses of action required to produce given attainments' (p. 3), thus, a person's feeling or conviction that (s)he can carry out a particular behaviour and that (s)he can overcome the impediments that may hinder carrying out that behaviour. For example, a teacher is convinced that (s)he can use DLMs even if technical issues have to be resolved. As self-efficacy is based on a person's beliefs, it is not dependent upon whether a person actually possesses the necessary competences.

In addition, IMBP has been extended by postulating that actual knowledge and skills and current environmental affordances and constraints moderate the intention–behaviour relationship. Thus, if the teacher does not possess the necessary instrumental and pedagogical competences to use DLMs, then at the very moment (s)he is converting intentional DLM usage into real DLM usage (s)he will become aware of this lack of competence, resulting in non-use of the DLM. For example, a teacher wishes to use a DLM containing a movie fragment in a special format but fails to do so because (s)he lacks the knowledge to install the appropriate player software for it. Environmental affordances and constraints work in the same way. For example, if there is a lack of appropriate DLMs to treat a subject in class, then the teacher will have no choice but to use other non-DLMs. The general Integrative Model of Behaviour Prediction (IMBP) is depicted in Figure 1; it can be seen that Theory of Reasoned Action (TRA) is embedded within IMBP (the grey areas).

In Figure 1, variables are grouped into proximal and distal variables. Proximal variables are those variables that are internal to the model influencing behavioural intention and real behaviour directly and indirectly (Ajzen & Fishbein, 1980); proximal variables are sometimes referred to as (behavioural) dispositional variables. Distal variables are those variables whose influences on behaviour intention or real behaviour are mediated by the dispositional variables. The distal variables depicted in Figure 1 include personality traits, stereotypical attitudes, and demographic variables (e.g. gender, age, educational level). These variables – except for intervention/media exposure – form the individual characteristics; hence, together they can be identified as the individual level. The present literature suggests, however, that we may extend this set with other variables, for example with the variables computer experience (Doyle, Stamouli, & Huggard, 2005), educational

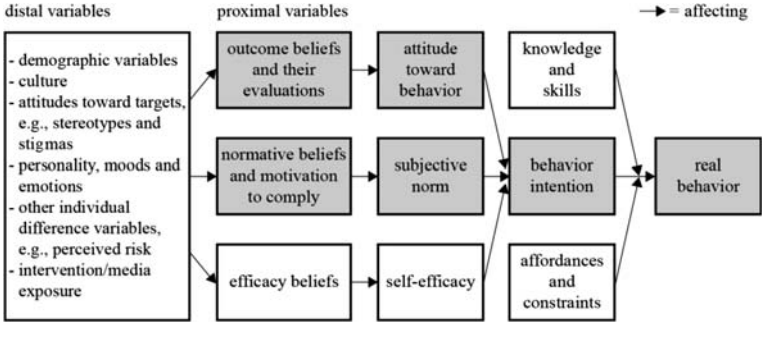

Figure 1. The general Integrative Model of Behaviour Prediction (IMBP; adapted from Yzer et al., 2004); Theory of Reasoned Action (TRA) = grey areas.

philosophy and/or pedagogical orientation (Hermans, Tondeur, van Braak, & Valcke, 2008) and personal entrepreneurship (Drent, 2005).

In our review of the literature on the advancement of ICT integration in teachers' pedagogical practices, this literature seems to indicate that there is a need to distinguish between the various levels at which variables may be operating. In the current literature, we found variables such as ICT policy and vision (Kennisnet, 2011; Tondeur, 2007) as well as work pressure and autonomy (Karasek & Theorell, 1990) suggesting the existence of respectively a school and a task level along with the previously discussed individual level. More precisely, there is a need to distinguish between the individual, the environmental, and the task level. The environmental level, in turn, encompasses the team or section level, the school level, and the system level (i.e. the level of local, regional and governmental organisation). Some researchers prefer to designate these levels as the micro, meso, and macro levels (Valcke, 2005). Other researchers argue that variables at the individual, task, and micro environmental levels are distal whereas variables at the meso and macro environmental levels are ultimate. To reduce complexity at all levels, we define the micro environmental level as including the individual and task levels, the meso environmental level as the school organisation level and the macro environmental level as the system level, which is the level of local, regional and national organisations.

Three principles

As argued before, we need to distinguish between several levels at which variables might influence teachers' behavioural dispositions (i.e. their beliefs, attitudes, self-efficacy, subjective norm, and intention) and, thus, their behaviour. Regarding these behavioural dispositions, Ajzen (1991) saw general behavioural dispositions as poor predictors of behaviour in specific situations. To remedy this, he advised not formulating a target behaviour in general terms but, rather, in specific terms. This is the first principle. Therefore, according to this principle, a teacher's desired target behaviour should not be formulated as 'using ICT in class', because this is too general, but as 'using DLMs in class' or as 'using a digital learner portfolio in class'.

Ajzen also advised specifying target behaviour according to the TACT principle; that is in terms of target, action, context, and timing (Yzer et al., 2004). According to this second principle, specifying the target behaviour as 'using DLMs in class' is insufficient because it does not specify timing. A proper specification would be: 'using DLMs every day in class'. In this specification, the DLMs are the target; the context is defined by the class; action is the usage of the DLMs; and the specification of every day defines the timing.

Finally, proximal variables that form dispositions should reflect the behaviour specification. Ajzen (2006) called this the principle of compatibility, which is the third principle. Thus, if the target behaviour is 'using DLMs every day in class', then dispositions such as attitude should be formulated as 'for me to use DLMs every day in class is fun' and intention as 'I plan to use DLMs every day in class.'

In contrast with these three principles formulated by Ajzen, many studies on teachers' use of ICT treat behaviour in a more general way (e.g. Imhof, Vollmeyer, & Beierlein, 2007). As a consequence of this, these studies cannot discern between situations where teachers feel that electronic learner portfolios will severely increase

their workload (and, thus, where they do not intend to use electronic learner portfolios) and situations where they are positively inclined towards using an electronic learning environment because they believe it helps them to create a powerful constructivist learning situation. These teachers have positive intentions towards using electronic learning environments but negative ones towards portfolios.

In summary, focusing on behaviour in specific situations may more clearly show that one and the same teacher population displays reluctant behaviour towards certain uses of ICT while being enthusiastic towards others. According to Ajzen (1991), the predictive value of dispositions will increase if the three principles are followed. While for practical reasons we use the general term 'ICT' – rather than specifying which ICT is meant – in the remainder of the text, it should be noted that in empirical research the behaviour under study should be more specific.

Properties of IMBP

Before treating the three principles research on determinants of behaviour should adhere to, we have presented the general IMBP. In the next section of our article, we would like to address specific properties of the model which may form an added value over previously used theoretical and conceptual frameworks. An important characteristic of IMBP according to Fishbein (2000) and Fishbein and Yzer (2003) is that the effects of distal variables on behavioural intention are mediated by the dispositional variables attitude towards behaviour, subjective norm, and self-efficacy. This implies that IMBP permits discrimination between specific populations. Because the effects of the distal variables are mediated by the dispositional variables, the relative importance of each dispositional variable is fully determined by the variation of the population reflected in the distal variables (Yzer et al., 2004). Thus, it is quite possible that one population may perform in a way that is primarily driven by attitudinal considerations while another may be driven by feelings of self-efficacy. For example, science teachers may differ from language teachers in their usage of ICT (cf. van Braak, 2001). More specifically, foreign language teachers may initially intend to use video communication channels to allow students to contact foreign students as they believe that authentic communication can be achieved in this way (see Brown, Collins, & Duguid, 1989). However, these same teachers may be hindered in their intention if the equipment that they need to use is in a separate room which is not always available because other teachers use the room as well (i.e. availability), because the room may be in a location requiring a five-minute walk (i.e. accessibility) or because the foreign students live in different time zones and have different school hours (i.e. opportunity). In sum, language teachers must expend a great deal of effort to organise this contact, which can undermine their self-efficacy and ultimately their intent. In contrast, mathematics teachers may not see any pedagogical value in using video communication channels and, thus, never plan to use them. This intent is not determined by perceptions of availability, accessibility or opportunity, but rather by beliefs about the added value of video communication in mathematics teaching. In a second example, teachers who embrace pedagogical reform may differ from teachers who do not. Hermans et al. (2008) found that teachers who adhere to the constructivist paradigm also use ICT more often in their classrooms than those who adhere to more traditional approaches. Similar findings were reported by Voogt and Pelgrum (2005), Pelgrum and Voogt (2009), and Ward (2005). So, in sum,

different populations may have different beliefs and attitudes about using the same ICT regardless of the same intentions.

Adoption of the IMBP in the domain of pedagogical ICT usage

Support for the applicability of IMBP will be sought by showing empirical relationships with the different proximal and distal variables in the model for integration of ICT in teachers' pedagogical practices.

The role of distal and ultimate variables in explaining teachers' ICT reluctance

As argued, three levels must be discerned in which distal and ultimate variables can be categorised (i.e. individual, environmental and task). Variables at all three levels have been shown to have an impact on actual or intentional ICT usage.

Several individual variables have been shown to predict ICT usage such as prior computer use or experience, computer anxiety or ease, computer knowledge and skills, self-efficacy toward using computers, computer confidence, beliefs about computers, attitudes towards computers, individual differences, gender differences, and incentives to change (e.g. Beckers, Wichert, & Schmidt, 2007; Mumtaz, 2000; Nickell & Pinto, 1986; Potosky & Bobko, 1998; Tondeur, van Braak, & Valcke, 2007b; van Braak, 2001).

On the micro level, characteristics of the team, direct colleagues, and immediate supervisor all influence the intention and behaviour of the teacher through social support. On the meso level, school and school organisation have been shown to be associated with actual ICT usage. These meso-level variables include computer infrastructure, computer access, ICT support, ICT school policies, computer training, educational leadership, and participation in school networks (Gülbahar, 2007; Robertson, Fluck, & Webb, 2007). Macro-level variables for which empirical relationships with ICT usage have been found include government financial support and national as well as international ICT curricula and programmes (Tondeur, van Braak, & Valcke, 2007a).

Task characteristics may play an important role in teacher reluctance to use ICT. According to the job demands, control and resources model (Karasek & Theorell, 1990) teachers' expectancies of an additional workload as a result of using ICT may keep them from adopting it in their teaching practices. Moreover, high workload and related outcomes, such as burnout symptoms, may have a similar effect (Hogan & McKnight, 2007). The relationship between actual workload and/or workload expectancies and ICT usage has to our knowledge not been tested empirically, though teachers often mention that they are too busy (Kwakman, 2001).

Reflections regarding previous research on teachers' ICT usage

When comparing studies, there are often disagreements about both the definitions and the operationalisations of the various constructs as well as confounding relationships between them. For example, computer experience is sometimes defined as the extent to which someone possesses computer skills (Geissler & Horridge, 1993), sometimes as the degree of knowledge one possesses about computers (Levine & Donitsa-Schmidt, 1998), and sometimes as subjective 'experience' (Smith, Caputti, Crittenden, Jayasuriya, & Rawstone, 1999). Computer use is

sometimes defined as duration of use (i.e. the number of years that a computer is used), sometimes as frequency of use (i.e. the number of hours of computer usage per week; Bozionelos, 2003), and sometimes as the average frequency of using typical applications such as MS-Word® (Tondeur et al., 2007b). Also, some researchers do not differentiate between use and experience and attribute some or all of these characteristics to computer experience (Jones & Clark, 1995). Not surprisingly, researchers tend to equate computer experience with computer use.

A similar confusion can be observed with constructs such as computer attitude, computer anxiety and computer self-efficacy. With respect to these variables, Doyle et al. (2005) investigated the mutual relationships between computer experience, computer anxiety, and self-efficacy. They concluded that as computer experience increases, self-efficacy increases as well, while anxiety is reduced. Moreover these relationships are strong; a result confirmed by Bozionelos (2001). Wilfong (2006) studied the relationships between the same variables and computer anger and found – in contrast – that there is a weak relationship between computer experience and computer anxiety. In another study, Garland and Noyes (2004) found computer experience to be a poor predictor of computer attitude, while Yaghmaie, Jayasuriya, and Rawstorne (1998) found that positive computer experience had a significant effect on computer attitude. Given the radically different definitions of the constructs, any attempt at comparing the outcomes of studies is virtually impossible.

The second issue is related to the operationalisation of the constructs. Most of the investigated variables cannot be categorised as proximal and, thus, must be distal with the exception of computer attitude and computer self-efficacy. Unfortunately, the measurement of these two variables does not comply with the three principles (i.e. general versus specific, TACT, and compatibility). Very often what is meant by ICT or computers should be read as office applications (e.g. text processor, spreadsheet, database, etc.). This focus is probably due to the fact that early research efforts about teachers' reluctance to use ICT in their instruction stem from the 1980s and 90s where mini-computers were dominant and desktop computers with monochrome screens were rising stars. Operating systems were text oriented (UNIX, DOS) and computer applications were limited to scientific computation and simple office applications. Today, thanks to graphical user interfaces and the Internet, this primarily computational role has become an information and communication role. Computers are now integral to everyday life and are used by (almost) everyone in one form or another. One would expect that measures of computer attitude, self-efficacy, use and anxiety would reflect this change. However, this is not always the case. The Loyd and Gressard (1984) Computer Attitude Scale (CAS), for example, is still one of the most often-used scales to measure computer attitude (e.g. Shapka & Ferrari, 2003) or is used as the basis for new computer attitude scales (e.g. Palaigeorgiou, Siozos, Konstantakis, & Tsoukalas, 2005). Example items from CAS are: 'Learning about computers is a waste of time' and 'I would like working with computers.' Other very frequently used scales, according to Garland and Noyes (2008), are the Computer Attitude Survey (CAS; Nickell & Pinto, 1986: sample item: 'Computers make me uncomfortable because I do not understand them'), the Computer Attitude and Confidence Questionnaire (CACQ; Levine & Donitsa-Schmidt, 1998: sample item: 'The computer is an effective learning tool'), and the Computer Understanding and Experience (CUE; Potosky & Bobko, 1998: sample item: 'I know how to write computer programs').

The same is true for computer self-efficacy. In a recent study by Paraskeva, Bouta, and Papagianni (2008), the Computer Self-Efficacy Scale (Murphy, Coover, & Owen, 1989) was used. This scale has items such as: 'I feel confident handling a floppy disk correctly.' In brief, although it is necessary to examine existing instruments, they should be adapted before using them within the IMBP context, and reflect application of the three principles.

The IMBP adopted for educational ICT usage

IMBP seems to be an appropriate model for explaining the use of specific ICT instruments in pedagogical practice. However IMBP's validity has not been broadly tested and, when tested, it has mostly been in the domain of health care and health promotion. Yzer et al. (2004), for example, studied the effects of adolescents' risk of using marijuana on their intention to use marijuana in order to examine the role of distal variables in behaviour change and found that the distal factors were fully mediated by IMBP's proximal factors. As already mentioned in the Introduction section, IMBP has not yet been tested in the domain of teachers' intention to pedagogically use an ICT object.

Figure 2 shows IMBP applied in the domain for the advancement of the integration of ICT in teachers' pedagogical practices. To accentuate that IMBP should be directed to a particular ICT, the term 'ICT object' is used which can be hardware, an application, a facility, or a service. The distal and ultimate variables chosen are merely examples, based on what has been discussed earlier.

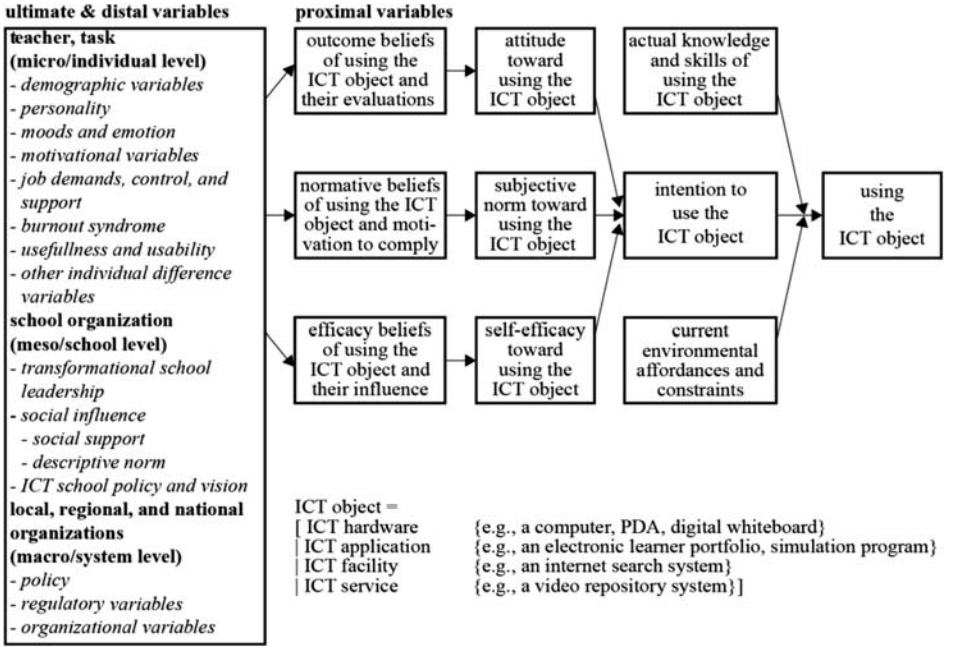

Figure 2. IMBP for the domain for the advancement of the integration of ICT in teachers' pedagogical practices.

In Figure 2 the distal and ultimate variables are represented in a condensed form. As stated before, we have defined the micro environmental level to include the individual and the task levels, the meso environmental level represents the school level, and the macro environmental level represents the system level including local, regional and national organisations. However, to be complete we also present in Figure 3 the uncondensed form of the various levels on which the variables exist.

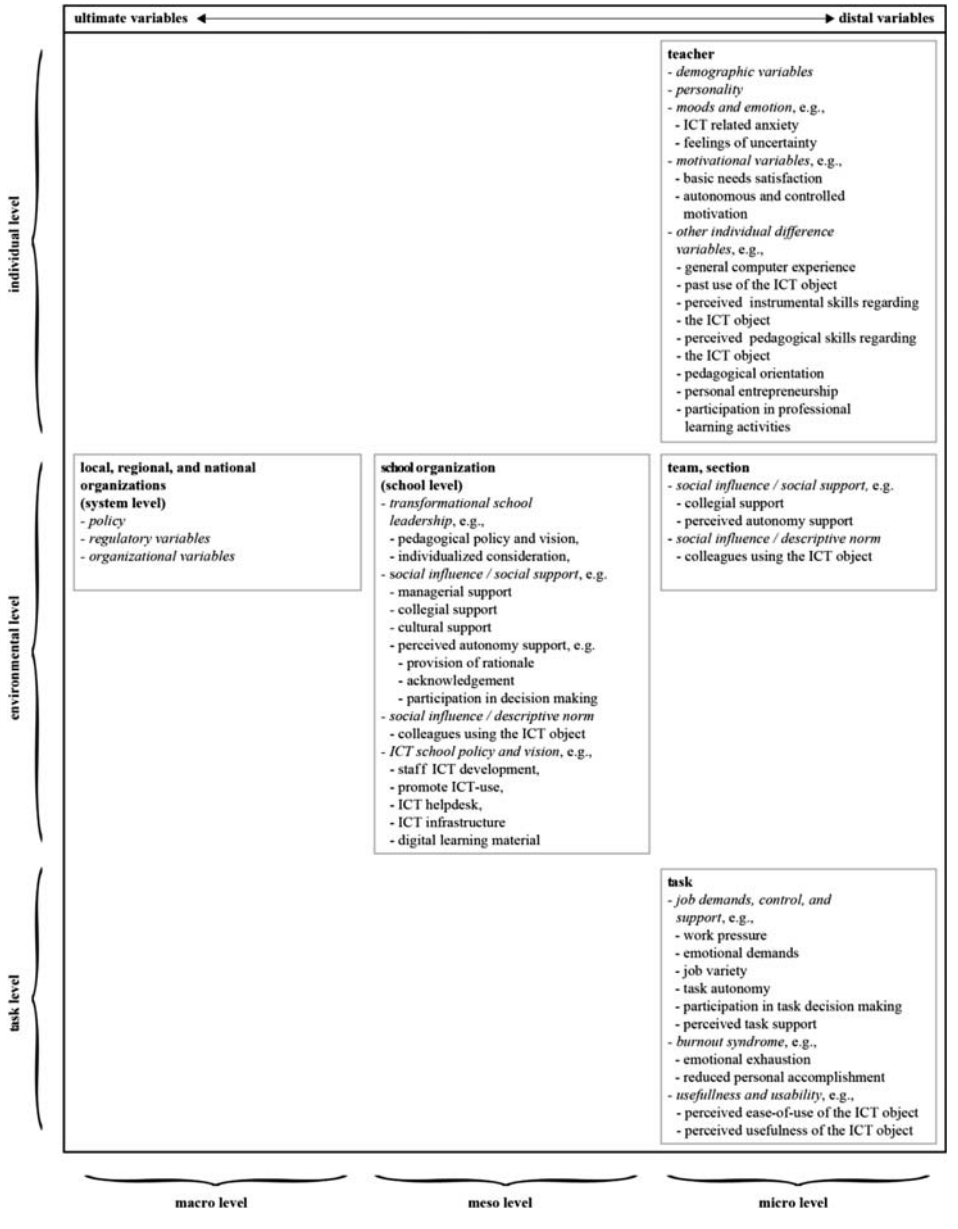

Figure 3. The distal and ultimate variables at the individual, environmental, and the task level.

Conclusion

Using ICT is seen as a way to enable, support, educational reform. Therefore, one would expect teachers to use ICT pedagogically. However, teachers are reluctant to use ICT. The Technology Acceptance Model (TAM) and its successors TAM2 and TAM3 are often used to gain insight in the factors influencing acceptance of a particular technology. TAM's central factors are perceived usefulness and perceived ease of use. TAM is predominantly a technology-oriented model which ignores many variables that may explain why teachers are reluctant to use ICT. In this article we propose using Fishbein's (2000) Integrative Model of Behaviour Prediction (IMBP) as an alternative.

In IMBP the factors attitude, subjective norm, and self-efficacy toward using an ICT object determine a teacher's intention to use an ICT object pedagogically. Intention determines the behaviour which may be either desired (i.e. willingness) or undesired (i.e. reluctance).

IMBP's value lies in its use of a limited number of variables (i.e. proximal variables) determining a particular behaviour. Because distal and ultimate variables affect proximal variables, they may provide clues to the specifics of how an intervention should be designed in order to increase specific ICT use by teachers. For example, if mathematics teachers refuse to use ICT in their classes, then this may be due to negative attitudes toward the ICT object (dispositional variable). An intervention should be directed at changing these attitudes. A closer look may reveal that the negative attitudes are caused by the belief that the traditional approach to teaching math is 'the proper way'. These teachers' educational philosophy (distal variable at the individual level) underlies these beliefs. Changing this philosophy should be the purpose of the intervention. If, on the other hand, teachers perceive a lack of skills and knowledge, then this would imply that self-efficacy and its antecedents are the most important concerns for intervening.

Future research

IMBP has not yet been tested in the domain of teachers' intention to pedagogically use an ICT object. For this reason, the first step in our future research will be the testing of IMBP in this particular domain. Based upon our reflections, using IMBP also means looking carefully at existing instruments and where necessary designing new ones, based on the three principles. This implies defining the ICT behaviour as specifically as possible; for example using digital learning materials or using a digital student portfolio. It also means implementing the TACT principle, thus being specific about when, where, how often and in which context the target behaviour takes place. Finally, including the principle of compatibility holds that our operationalisation of the behaviour dispositions should match the specification of the target behaviour. Designing these new instruments is another step in our future research.

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