MONITOR FOR ICT INTEGRATION IN FLEMISH EDUCATION (MICTIVO): THE THEORETICAL AND METHODOLOGICAL FRAMEWORK

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ABSTRACT

Parallel to ICT investments in schools, monitoring programs have been set up to gain insight into the "return on investment", to assess their effects on educational practices and to map trends. This paper presents the theoretical and methodological framework of a region-wide ICT monitoring study (MICTIVO) conducted in Dutch-speaking schools in Belgium. In line with the MICTIVO model, ICT integration is conceived as a unity consisting of ICT infrastructure, ICT policy and ICT use at the micro-level, in which three actors are involved: principals, teachers and pupils. First, this article focusses on the two European monitoring studies that have inspired MICTIVO: Four in Balance Monitor and Eurydice. Second, this article discusses each of the MICTIVO components in detail. Thirdly, two elements of the field study are highlighted: the sample design and the data collection. The scales were empirically validated in three large-scale MICTIVO studies and show strong psychometric properties. Due to its theoretically-grounded approach and its methodological strengths we believe MICTIVO allows researchers and practitioners to study ICT integration in a comprehensive, representative way.

KEYWORDS

ICT Monitor, Schools, MICTIVO, ICT Integration

1. INTRODUCTION

In Belgium, two regional governments are responsible for educational policy. With regard to the Dutch-speaking schools in Belgium, the Flemish government has been investing in the diffusion of information and communication technology (ICT) for over 20 years (Evers, Sinnaeve, Clarebout, van Braak, & Elen, 2009). The types of investments are diverse: equipment and applications, project funding, professional development programs and coordinating activities and expert staff. In 2007, cross-curricular objectives concerning the integration of ICT were introduced in Flemish education in the form of attainment targets (Vandenbroucke, 2007). Ever since, schools subsidized by the government are expected to integrate ICT in education. Schools autonomously decide how these objectives will be reached, and how ICT are employed to support and enhance teaching and learning. Over the years several important questions regarding the effectiveness of such government policy have come to the forefront. These are related to one particular point of interest: "To what extent do schools implement and integrate ICT in their education?". To answer this question, a monitor for ICT integration in Flemish education (MICTIVO) was developed.

The goal of MICTIVO is to take a representative snapshot of ICT integration in Flemish education. The main research objectives are:

1. Ongoing development and validation of a monitoring instrument based on important evolutions in ICT and education, and based on a number of (new) policy priorities;
2. A large-scale and representative measurement of ICT integration in primary, secondary and basic education on the basis of a web survey, and the reporting of results at the system level;
3. Comparative analyses based on 5-year results gathered since its first round in 2007-2008.

The starting point for MICTIVO is a research-based model of factors that relate to ICT integration (Evers, Sinnaeve, Clarebout, van Braak, & Elen, 2009). This model includes four components: infrastructure and policy, perceptions, competences and usage at the micro level. These components relate to three actors: principals, teachers and pupils with all of these actors having their particular background, ICT competences and perceptions on ICT (see Figure 1). The core components of the original model from 2007 are maintained to facilitate a comparison at different measurement points in time. Evenly important to note is that MICTIVO was conceived as a recurrent monitor with room to add indicators that measure latest ICT-related innovations (e.g. social media usage, BYOD). This paper focuses on the methodological strength of MICTIVO, in comparison with other monitors.
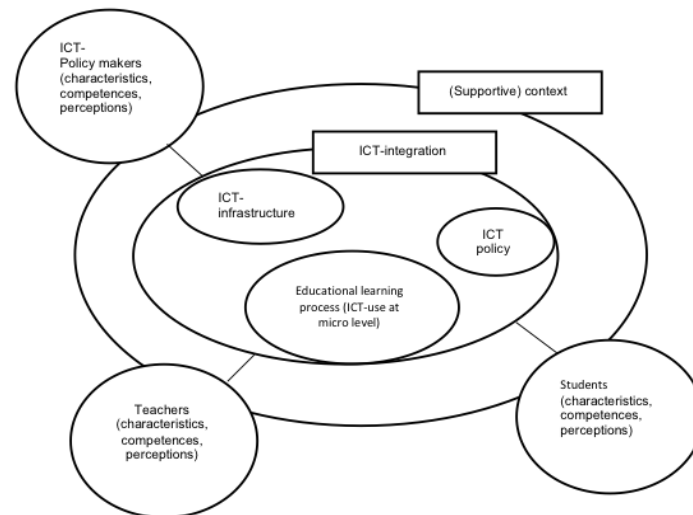

Figure 1. MICTIVO model (Evers, Sinnaeve, Clarebout, van Braak, & Elen, 2009)

2. RESEARCH FRAMEWORK

2.1 ICT Integration Monitoring in Europe

In 2017, a report on Digital Education Policies in Europe and Beyond (Conrads, Rasmussen, Winters, Geniet, Langer, & 2017) was published stating that the integration and innovative use of digital technologies in education has become a policy priority across Europe. The report further emphasizes that careful monitoring and evaluation are crucial for supporting innovation.

In- and outside the European Union, a couple of monitoring instruments are employed for mapping the adoption and diffusion of technology for teaching and learning purposes. The European Schoolnet and the University of Liège (2013), for example, carried out a study on ICT in education in 27 European countries, including Belgium. Data was collected from school leaders, teachers and pupils about elements such as ICT infrastructure, ICT use, ICT competences and attitudes (e.g. Fraillon, Ainley, Schulz, Friedman, & Gebhardt, 2014; European Commission, 2017; Wagner et al., 2005; Collie, Lewis, & Méro, 2011). These efforts provide opportunities for policy preparation, evaluation, quality improvement and benchmarking (Goeman, Elen, Pynoo, & van Braak, 2013).

MICTIVO was developed in 2007 to assess the impact of ICT at all levels of formal education in the Dutch part of Belgium. In 2012-2013 a follow-up study took place (MICTIVO2), while in September 2017 the third and present study has started (MICTIVO3). MICTIVO is originally inspired by two European monitoring studies, namely The four in Balance monitor and Eurydice. The Four in Balance Monitor (Stichting Kennisnet ICT op school, 2006; Kennisnet, 2017) is published annually by Kennisnet and pertains to the use and benefits of ICT in schools in the Netherlands. This model stipulates that introducing ICT for

educational purposes has a greater chance of success if the following elements are in balance: *vision, expertise, digital learning materials, and ICT infrastructure.* To balance these elements, collaboration and leadership is required. The balance that will be obtained, provides opportunities of support for using ICT in teaching and learning. Eurydice is a network that provides reports on European education systems and policies and thereby provides insights into ICT-related developments in different countries. The report 'Key Data on Learning and Innovation through ICT at School in Europe 2011' (Ranguelov, Horvath, Dalferth, & Noorani, 2011) builds on the previous Eurydice publications on ICT in schools in Europe. It provides an overview of how ICT infrastructure has evolved, how ICT is used in educational processes and how ICT is included in European curricula. Data was gathered in primary and secondary education of 31 European countries.

2.2 The Components of MICTIVO3

One of the main purposes of MICTIVO is to get a comprehensive view on ICT integration in education. In MICTIVO1 an extensive literature study was conducted to create a model with four different components and three different actors (Evers, Sinnaeve, Clarebout, van Braak, & Elen, 2009).

Each of the components consists of different indicators that were validated in MICTIVO1 (2007-2008) using exploratory and confirmatory factor analysis. After each field study reliability measures were calculated in order to assess the internal consistency of the scales. In MICTIVO2 (2012-2013) new indicators were added: media literacy (defined in accordance to Lieten & Smet, 2012), the use of social media and digital games for educational purposes and professional development (adapted from Vanderlinde & van Braak, 2010). Logically, additional factor analyses were conducted for the new scales. In the latest MICTIVO study no new indicators were added nor were existing scales adjusted. Hence, new factor analyses were not needed.

In the table below (Table 1) all components and their related indicators are given, as well as the actors that were questioned for that indicator. For the component on ICT policy and infrastructure, the indicators of available hardware (e.g. number of devices, origin, age), software (e.g. website, electronic learning environment) and policy (e.g. origin of policy, support for teachers, security) were measured. The second component, ICT integration, assesses the use of ICT by teachers and pupils in- and outside of the classroom context (e.g. to prepare classes, to support classroom activities, for homework purposes). The ICT competences component consists of the indicators concerning pedagogical-didactical competences of teachers (e.g. class management, evaluation), competences of pupils (e.g. ability of making a presentation, finding relevant information on the internet) and computer experience (e.g. years of computer experience, amount of time spent on an ICT device for leisure). The fourth component, ICT perceptions, consists of the following indicators: perceptions on the importance of ICT use in and for education (e.g. importance from an educational and economical rational), digital literacy (e.g. attitudes and knowledge on responsible use of ICT), use of social media (e.g. using social media for communication with pupils), use of educational games (e.g. supporting pupils with a disability through educational games) and professional development (e.g. amount of trainings on ICT use in education).

Table 1. Components and indicators of MICTVO3 for the different actors

Component *indicators*	Principal	Teacher	Pupils
ICT policy and infrastructure *availability of hardware* *availability of software* *ICT policy* *professionalization*	 x x x x	 . . x x	 . . . .
ICT integration *ICT use by teachers* *ICT use by pupils*	 x .	 x x	 . x

ICT competences			
pedagogical-didactical competences		x	.
competences of pupils	x	x	x
computer experience	.	x	x
media literacy	x	x	x
	.		
ICT perceptions regarding			
importance of ICT for education	x	x	.
infrastructure	x	x	.
professional development	x	x	.

2.3 Sample Design and Participants

In order to achieve the research objectives, the sample design is focused on getting a representative sample of schools participating to the field study. Since its first round in 2007, MICTIVO includes one fifth of all Flemish schools using a proportionally stratified sample at multiple levels. First, a subdivision is made on the basis of the three levels of formal education: (1) primary education with pupils between 5 and 12 years old, (2) secondary education (12-18 years old) and (3) basic education (formal education for adults). Secondly, in primary and secondary education, a subdivision is made between general and special needs education. The total number of schools per group is examined and one-fifth of that number is chosen as the intended sample. The next stratum is based on (1) school size (small, medium, large), (2) educational network (three types) and province (five throughout Flanders and Brussels Capital Region).

For the field study a final distinction is made between the three main actors in schools: pupils, teachers and principals. Since MICTIVO focuses on schools as a whole, it is important to include these different actors in the research. One fifth of the population is a considerably large sample and compliance of schools to take part in the monitor study is a challenge for researchers. In order to obtain the widest possible participation from the sampled schools, they are considered as subset units. In other words, MICTIVO tries to include a representative number of schools, represented by one or more of the three different actors. A school participates in the research if teachers and/or the principal and/or the pupils of that school participates. Given the time and resources, a funnel model was used to accommodate as many schools as possible (Goeman, Elen, Pynoo, van Braak, 2013). The funnel model consists of three sub studies. The first sub study contains 80% of all sampled schools for which only the principal is asked to participate. Sub study two consists of 10% of the schools where the principal and all the teachers are asked to participate. The last sub study also consists of 10% of the schools in the sample and in these schools the principal, the teachers and a number of classes of pupils were asked to participate. In primary education only the pupils of the fifth and sixth year (10-12 years old) were asked to participate. In secondary education a number of classes, dependent on the size of the school and the number of specializations of that school were asked to participate. As many different disciplines and grades were included to guarantee maximum representativity.

3. DISCUSSION AND CONCLUSION

The integration of ICT in education has been both a challenge and an interesting subject of study for governments, scholars and educational systems throughout the world. Countries are stimulating and monitoring ICT integration in various ways. The Flemish department of Education and Training wishes to have insight into the 'return on investment', the effects of ICT on educational practices and emerging trends regarding ICT in education. As a consequence, the MICTIVO model and related measurement instruments were developed and empirically tested.

The MICTIVO model has strong psychometric properties because of the repeated validation of the scales, the representative sample design, the large scale of the study and the validated comparison over time. This allows us to gather trustworthy information about different components of ICT integration using indicators that stand the test of time. The validated scales and the sampling design allows us to make reliable and representative claims about ICT integration in education. The size and breadth of the monitor ensures data on

which solid, independent advice to policy makers can be based. Furthermore, as the monitor consists of the same basic components throughout the different field studies since 2007-2008, one can have a closer look at emerging trends. These strong psychometric properties distinguish MICTIVO with the other monitors for ICT integration in Europe mentioned above on both representativity and the possibility for measuring changes throughout the years.

Nevertheless, we wish to conclude this paper with a critical reflection. Setting up this particular research project and reviewing thoroughly other ICT monitoring projects made us consider seriously new questions. Is taking a snapshot of how and to what extent ICT is integrated in education still a priority when digitization seems to be deeply anchored in education? Should we not shift our focus towards potential undesirable effects and negative impacts of digitization on teaching and learning? And, evenly important: how is ICT going to be used in the future of education?

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