
Teachers as Key Actors in Implementing Information and Communications Technology (ICT) in Teaching and Learning - Findings from ICILS 2018

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Teachers as Key Actors in Implementing Information and Communications Technology (ICT) in Teaching and Learning - Findings from ICILS 2018

Abstract

In spring 2018, Luxembourg participated for the first time in the International Computer and Information Literacy Study (ICILS) run by the International Association for the Evaluation of Educational Achievement (IEA). In the present chapter, we focus on the key ICILS 2018 results for Luxembourg teachers. Concretely, we show the degree of Information and Communications Technology (ICT) use in their teaching and learning, based on an international comparison. Moreover, we present differences in the use of ICT related with teachers' characteristics, such as their view on the role of ICT in practice, their perceived expertise and self-efficacy with ICT, initial and continuous training opportunities with ICT, and use of digital tools and software in class. We also investigate the role of schools' ICT resources and a collaborative environment for ICT, as well as school principals' focus on an explicit ICT policy plan and vision. After analyzing the Luxembourg teacher data, we identify four main factors that are significantly related to the reported use of ICT in teaching and learning: (1) teachers' positive views about ICT use and its role in practice; (2) teachers' expertise in terms of experience with ICT and a higher level of perceived ICT self-efficacy; (3) teachers frequent use of digital learning tools and software in their class; and 4) teachers working in a school where ICT is considered as a priority in teaching. The level of ICT resources in a school also proves important, although the majority of teachers indicate this is already high. In short: Luxembourg's first participation in the ICILS brings relevant insights into what can support teachers' pedagogical use of ICT, so that in turn they can facilitate its use by students in class, and foster their Computer and Information Literacy (CIL) and Computational Thinking (CT) competences.

1. The International Computer and Information Literacy Study (ICILS)

In spring 2018, Luxembourg participated for the first time in the International Computer and Information Literacy Study (Fraillon et al., 2019).

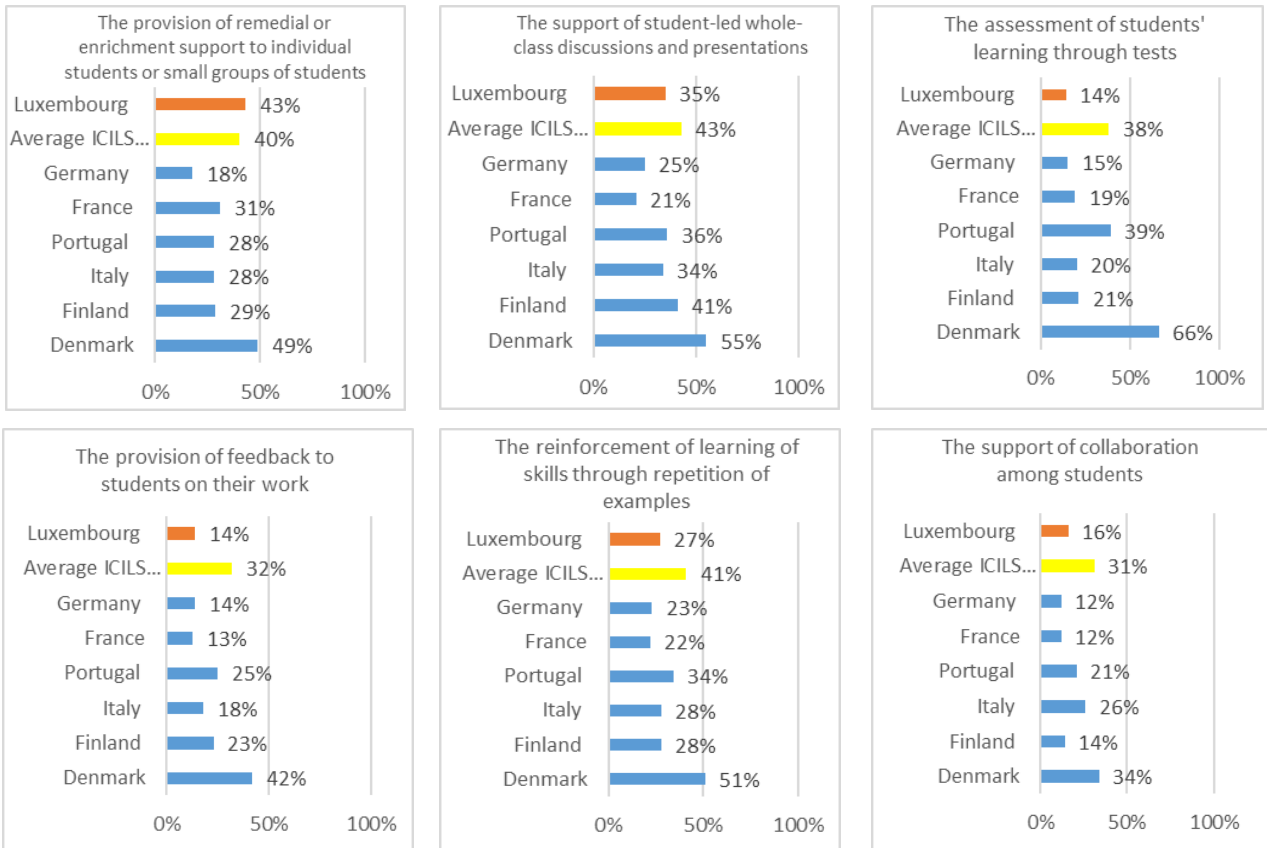
The present chapter focuses on the key ICILS 2018 results for Luxembourg teachers. Concretely, we take an international perspective of teachers' reported use of ICT in practice, and identify national differences related with teacher and school characteristics, as perceived by the teachers. The responses from 494 teachers in 28 schools in Luxembourg were analyzed for this chapter, to complement the findings concerning students (Boualam, Lomos, & Fischbach, 2021). Taking into account the rate of teacher nonresponse and the relevance of the sampling demographic characteristics to the outcomes of interest, teacher and school weights were re-estimated for the analysis in this chapter, to work with a more precise population estimate for the teacher population in Luxembourg.

It is important to mention that an improvement in students' CIL and CT competences and performance could come about through an increase in teachers' use of ICT in their classroom practices (Erstad, Eickelmann, & Eichhorn, 2015; Kennisnet, 2011). Accordingly, we next present the teacher and school characteristics that have the potential to facilitate teachers' use of ICT in their classroom practices, following the results of multiple linear regression analysis. The methodology of this analysis and other details can be found in Lomos, Luyten, and Tieck (2021).

2. Luxembourg Teachers' Use of ICT in the Classroom in Rapport with These Practices in the Other Participating Countries

We make use of information from teachers regarding the extent to which they use ICT in specific practices in their class. This offers a first glance at the level of ICT implementation and use in secondary schools in Luxembourg, in international perspective (See Figure 1).

Figure 1. National percentages of teachers who reported the use ICT in most lessons for teaching practices



Notes: We present the average ICILS 2018 scores for all participating countries and the scores for the European countries of relevance. No significant differences are indicated, considering that most countries did not meet the teacher sample requirements. Percentage estimations are based on the International Report ICILS 2018 (other information on standard errors and the number of participating teachers in each country can be found in the report).

We see that the majority of teachers in Luxembourg stated they use ICT mostly for knowledge transmission in classes (for example, for remedial or enrichment activities with small groups of students and for student-led whole-class discussions and presentations). Fewer indicated using it for knowledge construction in most of their lessons (such as using ICT to support collaboration between students or to provide feedback on their work). We could thus suggest that teachers in Luxembourg have a pedagogical mindset of seeing ICT as a tool to enhance their practice, but not yet to transform their practice.

3. Teachers' Use of ICT in Classroom Practices: Differences related with Teacher Characteristics

3.1. *Teachers' positive views of the possible outcomes of using ICT*

The way in which teachers perceive and understand the possible positive or negative outcomes of the pedagogical use of ICT matters significantly with regard to their reported use of it in class. Those who agree with the possible positive outcomes of using ICT in classroom practices—for example, “develops greater student interest in learning” (79 percent of teachers) and “helps students develop problem-solving skills” (54 percent)—also indicate a greater use of ICT in practice. On the other hand, a relatively high percentage of teachers also agree with the idea of negative outcomes from using ICT—for example “results in poorer written expression among students” (62 percent) and “results in poorer calculation and estimation skills among students” (48 percent).

Collaboration between teachers within schools could support them in discovering the potential positive outcomes of ICT use in teaching and learning, as well as countering the possible negative outcomes. Teachers who report more collaboration with colleagues who use ICT in school also report greater use of ICT in their own classroom practices, thus indicating one possible support mechanism.

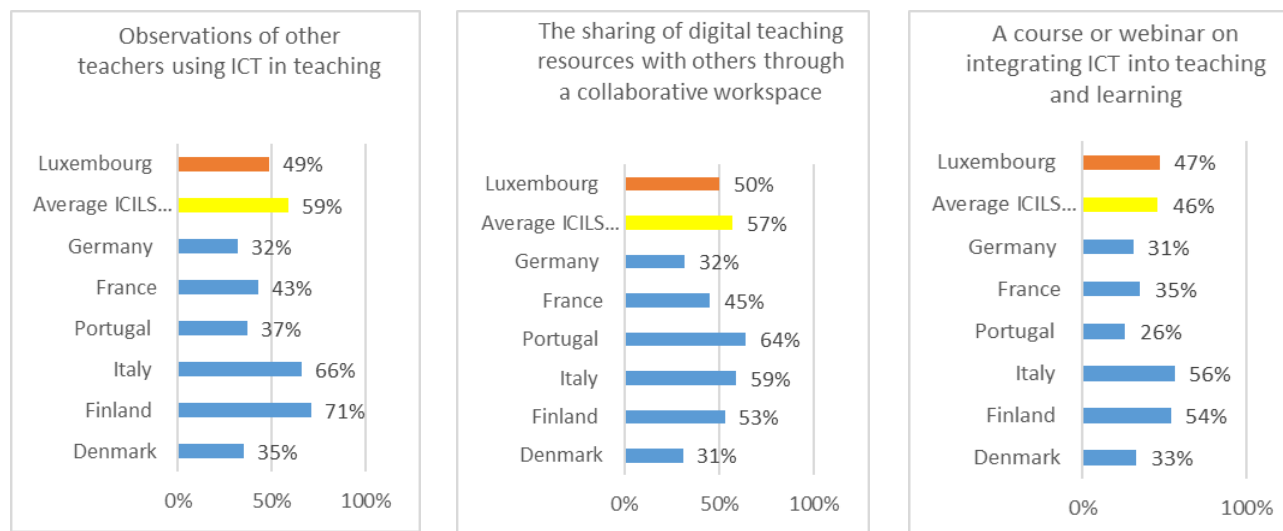
3.2. *Teachers' ICT expertise and how to acquire it*

Teachers with more than 5 years' experience of using ICT in lessons report more use of it in their ongoing teaching practices compared with those who have no equivalent experience. Moreover, teachers with a higher level of perceived self-efficacy in using ICT also report greater use of it in practice. Using any type of ICT tools in class, whether digital learning tools (digital learning games, e-portfolios, etc.) or general utility software (Word, wikis, etc.) can enhance the continued pedagogical use of ICT.

Teachers' experience and self-efficacy in using ICT in class could support future use. This leaves the question of how such characteristics can be enhanced. The teacher data guides us toward the role of initial and continuous professional training in the use of ICT in teaching. We find that those who report having initial teacher training in ICT and/or in its use in teaching (37 percent), also report higher use in teaching practices compared with those who had no such initial training (63 percent). Continuous professional development (PD) in ICT also proves to be an efficient way to support the greater use of ICT by teachers in practice. More specifically, teachers who indicated

that during the two years before the survey they had participated in structured PD learning, and especially in reciprocal PD learning (for example, observing other teachers or using a collaborative workspace to jointly evaluate student work) reported greater use of ICT in teaching practices. It is encouraging to note that a high percentage of teachers in Luxembourg report the opportunity to participate (and have done so) in different types of continuous professional development training for ICT use in teaching (See Figure 2). In this regard, up to 50 percent of teachers in the study report having participated in reciprocal and/or structural PD training in Luxembourg in the last two years. Reciprocal collaborative PD has the potential to shift the present pedagogical mindset of ICT from a simple technical enhancement to pedagogical integration in practice, supported through the exchange of learning between teachers.

Figure 2. National percentages of teachers who report having participated in reciprocal and/or structural professional development learning related to ICT use in the last two years



Notes: We present the average ICILS 2018 scores for all participating countries and the scores for the European countries of relevance. No significant differences are indicated, considering that most countries did not meet the teacher sample requirements. Percentage estimations are based on the International Report ICILS 2018 (other information on standard errors and the number of participating teachers in each country can be found in the report).

3.3. Teachers' use of digital learning tools and utility software

In terms of digital learning material, we expected that using utility software or digital learning tools would be a precursor for the pedagogical use of ICT for remedial support, provision of feedback, inquiry learning, and more. The use of digital learning tools (for example, “digital learning games” or “interactive digital learning resources”) and of utility software (such as

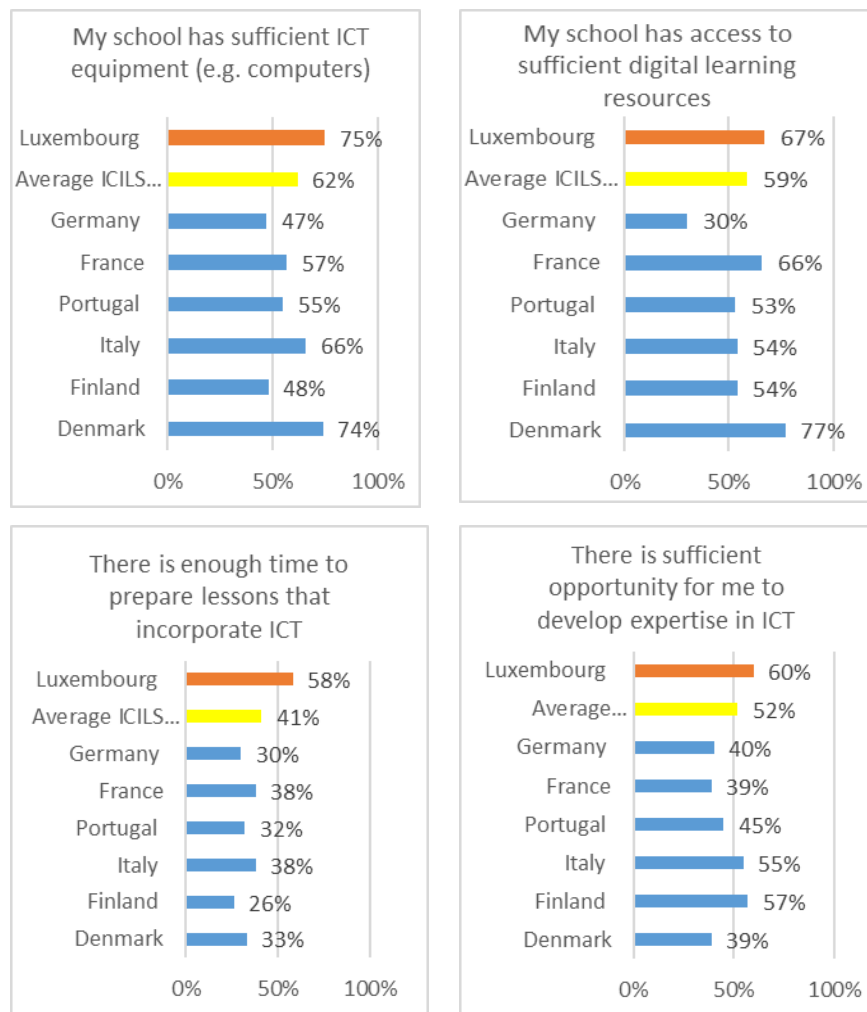
“presentation software” or “spreadsheets”) did prove to be important positive determinants of teachers’ ICT use in practice.

4. Teachers’ Use of ICT in Classroom Practices: Differences related with School Characteristics

4.1. ICT resources and a common ICT vision for teaching in schools

The availability of ICT resources in schools, as perceived by the teachers, is an important facilitating factor in implementing and using ICT (Drossel et al., 2017).

Figure 3. National percentages of teachers agreeing with statements about the availability of ICT resources at school

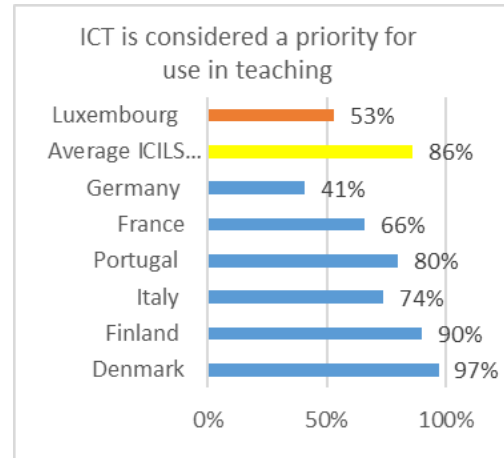


It is positive to note from Figure 3 that the majority of teachers participating in the study in Luxembourg report a very substantial presence of ICT resources in their schools, this being a necessary precondition for successful ICT use (Drossel et al., 2017). A further interesting finding is the large proportion of teachers who also report a high level of resources in terms of the time and opportunity to use ICT in practice (See Figure 3).

Notes: We present the average ICILS 2018 scores for all participating countries and the scores for the European countries of relevance. No significant differences are indicated, considering that most countries did not meet the teacher sample requirements. Percentage estimations are based on the International Report ICILS 2018 (other information on standard errors and the number of participating teachers in each country can be found in the report).

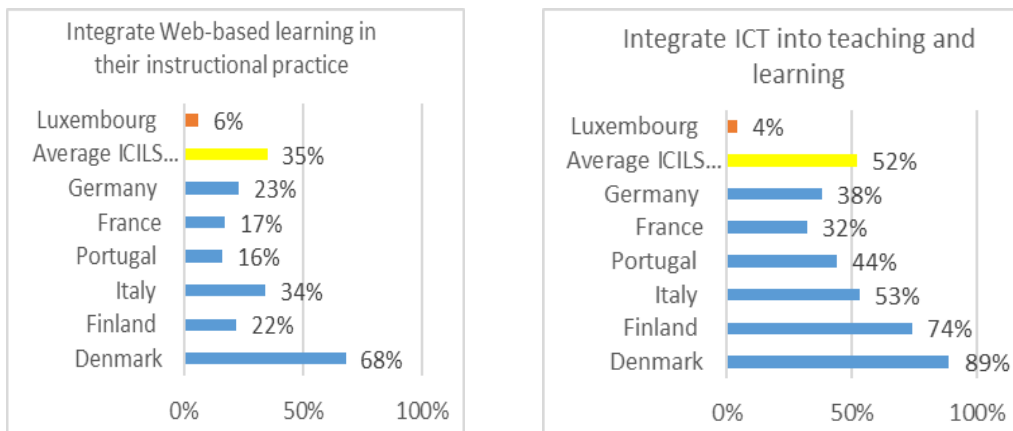
What also appears important in terms of ICT resources is a common vision for its use in school. In Luxembourg, 53 percent of the participating teachers agreed or strongly agreed with ICT being considered as a priority for teaching in their school, while 47 percent disagreed; including 6 percent who strongly disagreed (See Figure 4). Agreeing that ICT is considered as a priority in a school is nevertheless positively associated with teachers’ use of ICT in practice, based on our findings.

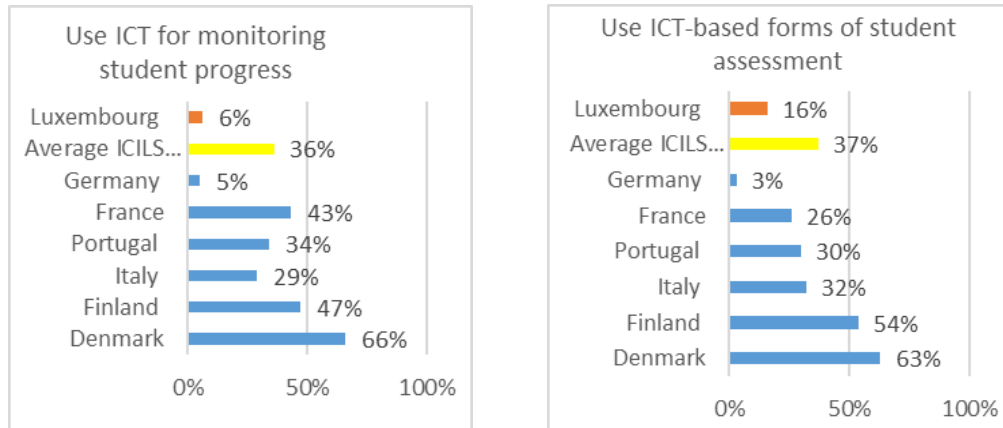
Figure 4. ICT Resources in the school



Considering that emphasizing goals and expectations concerning ICT in teaching in a school are relevant for the teachers, we turned our attention to the school directors and their expectations for ICT in teaching. In this regard, it is relevant to understand how ICT is perceived by school principals in schools, in terms of their expectations of teachers’ knowledge acquisition and use of ICT (See Figure 5). Therefore, we examined the answers of the 26 school principals in the ICILS 2018 study, treating them as attributes of the schools and the participating students’ in the school.

Figure 5. National percentages of students at schools where principals reported “expected and required” teacher knowledge regarding ICT-based activities





Notes: We present the average ICILS 2018 scores for all participating countries and the scores for the European countries of relevance. No significant differences are indicated, considering that most countries did not meet the teacher sample requirements. Percentage estimations are based on the International Report ICILS 2018 (other information on standard errors and the number of participating teachers in each country can be found in the report). “Required” here is understood as “necessary, it must be done.”

These variables were measured using three categories: 1) Expected and required; 2) Expected but not required; and 3) Not expected. A first notable point is the low percentages of students at schools in Luxembourg where principals “expected and required” teachers to reach such ICT goals for knowledge acquisition (See Figure 5). However, the situation is different when we look at the percentages where these knowledge acquisition goals were “expected but not required”: 88 percent “integrating web-based learning in their instructional practices”; 93 percent “integrating ICT into teaching and learning”; 70 percent “using ICT for monitoring student progress”; and 58 percent “using ICT-based forms of student assessment.”

Reporting these teacher ICT knowledge goals as “expected but not required” in school policy is understandable. Obviously, ICT use and teachers’ knowledge of it is expected in Luxembourg schools, but not explicitly required—at least, this was the case in 2018. The schools where such competences were “expected and required” could be those in which ICT pilot projects were implemented (Reuter, 2020) or those with an explicit focus on digitalization. This is in light of the fact that in 2018, Luxembourg reported only an implicit emphasis in the national curriculum on teaching aspects related to computer and information literacy, and no explicit emphasis on teaching aspects related to computational thinking in secondary education (Fraillon et al., 2019).

5. Next Steps: Going From a National to a School-Based Strategy and Implementation

From a teacher perspective, the main conclusions from Luxembourg's first participation in IEA's ICILS are fourfold, showing the teacher characteristics that have the potential to support the use of ICT in teaching and learning. First, teachers' positive views toward ICT's role in practice. Second, teachers' experience with ICT and its use in teaching, accompanied by greater ICT self-efficacy. Third, teachers' frequent use of digital learning tools and software in their class. Lastly, teachers working in schools where ICT is considered as a priority in teaching.

In light of the results presented here, we recognize that the recent national strategy for ICT is in line with the supporting relationships we have identified. These will now need to be suitably implemented in schools. The wide availability of ICT resources in schools has been a priority, as initially defined in the Digital (4) Education strategy (GOUV, 2019; MENJE, 2015). Initial teacher training in ICT for classrooms will be facilitated by overall training in how to manage digitalization in schools and in education (for example, "Educational Technologies"). More flexible continuous development training is planned through the IFEN (l'Institut de formation de l'Education nationale), as well as through the newly established Luxembourg Institute for Digital Training.

The national strategy has been transposed into education and detailed for 2019–2020 (MENJE, 2019) by creating the status of teaching staff specialized in digital competences and assigned to assist primary schools (Instituteurs spécialisés en Compétences Numériques, I-CN). Subsequently, the *Guide de référence pour l'éducation aux/et par les médias* (SCRIPT, 2020) was published in 2020, guiding schools and teachers by outlining in general terms the applicable digital competences. The *Guide de référence* is the starting point for the work of integrating this content in the national curriculum for primary and secondary education, with the aim of guiding teacher expertise and the transfer of ICT in pedagogical practice. Computational Thinking will be also integrated in the national curriculum and national programs for primary and secondary education (MENJE, 2019), with some components to be assessed at the end of primary schooling.

It seems up to the schools to set up the best-fitting strategy to effectively implement and use ICT in educational practice. Moreover, teachers need to be supported to an even greater extent to collaborate with their school colleagues around ICT and to continue participating in collaborative professional development training, with the aim of increasing the pedagogical use of ICT. As is already the case in some schools, school principals, together with their colleagues, could

define explicit expectations and policy plans to guide the work around ICT through their school development plan (MENJE, 2020). In addition, providing principals with a diverse range of tools and professional development opportunities will support their work in terms of emphasizing the desired common vision for ICT in schools. As indicated in the 2012 OECD report (Shewbridge et al., 2020), the pedagogical and instructional leadership role of school principals is of great importance. The scenario of teachers agreeing with the positive outcomes of ICT use in practice will only take place if such outcomes are visible, and with feedback and support from colleagues and leaders in schools.

References

- Drossel, K., Eickelmann, B. & Gerick, J. (2017). Predictors of teachers' use of ICT in school – the relevance of school characteristics, teachers' attitudes and teacher collaboration. *Education and Information Technologies*, 22, 551-573.
- Erstad, O., Eickelmann, B. & Eichhorn, K. (2015). Preparing teachers for schooling in the digital age: a meta-perspective on existing strategies and future challenges. *Education and Information Technologies*, 20, 641-654.
- Fraillon, J., Ainley, J., Schulz, W., Friedman, T., & Duckworth, D. (2019). *Preparing for Life in a Digital World. IEA International Computer and Information Literacy Study 2018*. International Report. IEA.
- Kennisnet, (2011). *Four in Balance Monitor 2011*. Netherlands.
https://www.kennisnet.nl/app/uploads/kennisnet/corporate/algemeen/Four_in_balance_monitor_2015.pdf. Retrieved 15.04.2020.
- [GOUV, 2019]. Government, (2019). *Accord de coalition 2018-2023*. Luxembourg, GOV:
<https://sante.public.lu/fr/publications/p/programme-gouvernemental-2018-2023/programme-gouvernemental-2018-2023.pdf>. Retrieved 07.06.2020.
- [MENJE, 2015]. Ministry of Education, Children and Youth, (2015). *Digital (4) Education – Dossier de presse*. Luxembourg: MENJE. www.digital4education.lu. Retrieved 03.01.2019.
- Lomos, C., Luyten, H., & Tieck, S. (2021). *Implementing ICT in classroom practice: what else matters after the ICT infrastructure?* Manuscript submitted for publication.

- [MENJE, 2019]. Ministry of Education, Children and Youth, (2019). *Zesumme Wuessen. Chancë schafen, Kanner stäerken. Rentrée 2019-2020. Dossier de presse*. Luxembourg: MENJE. <https://men.public.lu/fr/actualites/publications/themes-transversaux/dossiers-presse/2019-2020/190913-rentree.html>. Retrieved 02.02.2020.
- [MENJE, 2020]. Ministry of Education, Children and Youth, (2020). *The Luxembourg education system 2020*. Luxembourg: MENJE. <https://men.public.lu/de/publications/divers/informations-generales-offre-scolaire/systeme-educatif-luxembourgeois.html>. Retrieved 07.06.2020.
- Reuter, C. (2020). *Computational Thinking in der Grundschule*. Master thesis. Donau Universität Krems, Austria.
- SCRIPT, (2020) (Eds.). Service de Coordination de la Recherche et de l'Innovation pédagogiques et technologiques. Luxembourg: SCRIPT. *Guide de référence pour l'éducation aux et par les médias. Enseigner et apprendre pour renforcer la compétence médiatique*. https://edumedia.lu/wp-content/uploads/2020/03/Medienkompass_2020_FR.pdf. Retrieved 04.05.2020
- Shewbridge, C. et al. (2012). *OECD Reviews of evaluation and assessment in education – Luxembourg*. OECD Publishing.