Journal of Infrastructure, Policy and Development 2024, 8(4), 3359.
https://doi.org/10.24294/jipd.v8i4.3359

Article

Enhancing digital competencies in schools: The role of ICT coordinators

Antonin Jancarik*, Vlastimil Hubert

Faculty of Education, Charles University, M. Rettigove 4, 11639 Prague, Czechia
*** Corresponding author:** Antonin Jancarik, antonin.jancarik@pedf.cuni.cz

CITATION

Jancarik A, Hubert V. (2024). Enhancing digital competencies in schools: The role of ICT coordinators. Journal of Infrastructure, Policy and Development. 8(4): 3359. https://doi.org/10.24294/jipd.v8i4.3359

ARTICLE INFO

Received: 19 November 2023
Accepted: 29 December 2023
Available online: 27 February 2024

Abstract: This article discusses the growing importance of digital competencies in education, specifically focusing on the role of technical infrastructure in schools and staff support strategies. The discussion aims at the introduction of the ICT coordinator role in Czech Republic schools. Analysis indicates that schools with an ICT coordinator exhibit improved technology access for students and teachers, not solely determined by computer quantity per pupil. Noteworthy differences lie in the flexibility and availability of technology, with ICT coordinator-aided schools having more mobile computers, mobile labs, and more vital facilitation of BYOD methods. In conclusion, while recognizing the partial nature of school technology equipment data, the article concludes that training teachers and implementing the ICT coordinator role positively impact ICT technology use in schools. Recommendations based on Czech Republic research include establishing the ICT coordinator position, providing financial incentives, and reducing direct teaching loads. Future research should track changes in ICT equipment during ICT coordinators' tenures and explore technology deployment dynamics, emphasizing collaboration between ICT coordinators, school management, and individual teachers.

Keywords: ICT coordinators; BYOD; school ICT equipment; school infrastructure; mobile computers labs

1. Introduction

Digital competencies (Pettersson, 2018) play an increasingly important role today and are important to understanding the current world (OECD, 2010). Much attention is paid to their promotion and development. In line with Harris et al. (2009), we note that models of digital technology implementation are often technocentric. They focus too much on technology skills and ignore the complexity of learning using technology. Technological equipment is one of many prerequisites for developing digital skills. How digital competencies are used is crucial for the effective development of digital competencies. It is necessary to change the system and teaching methods (Benvenuti et al., 2011). The main change factor is teachers' digital competencies, focusing on whether teachers perceive digital technologies as adding value to their teaching and students' learning. Five years ago, less than 40 percent of teachers were ready to use digital technology in their classes (TALIS, 2019). This issue has been captured at the European level in a specific competency framework called the European Framework of Digital Competences for Teachers (Redecker, 2017) and in the Digital Education Action Plan (2021–2027).

It is very important to provide teachers with methodological support in implementing modern technologies and digital competencies (Strudler and Hearingthon, 2008). One possible way is to create ICT coordinator positions. These positions were already established in schools in the 1980s (León-Jariego et al., 2020).

A number of countries have taken this step (McGarr and McDonagh, 2013; Lai and Pratt, 2004; Umar and Hussin, 2014). ICT coordinators in schools can have different roles (Who, 2023; Devolver et al, 2010). In most countries, there is a gradual change in their role from initial technology administrators to a formal position role that supports teachers in implementing ICTs (Woo and Law, 2020).

In this article, we want to focus on the technical equipment of schools or how it can be supported in the field of personnel (Chavez et al., 2023). Most studies that have focused on ICT coordinators have taken the form of qualitative studies (e.g. Woo, 2023; Skues and Cunningham, 2013) or questionnaire surveys (e.g. Blau et al., 2020; León-Jariego et al., 2020). Our aim in this paper is to analyze the influence of ICT coordinators using panel data on school technology in the Czech Republic.

2. Materials and methods

Data from the complete surveys of schools in the Czech Republic for 2021 were used to analyze the technical equipment of schools. The data were collected on all primary schools in the Czech Republic (n = 4235) and contained several dozens of data, both technical and personnel. For this study, only the following selected data were considered:

- Number of computers per pupil
- Number of mobile PCs per pupil
- Number of new computers per pupil (age up to 2 years)
- Number of new mobile PCs per pupil (age up to 2 years)
- School equipped with a mobile computer lab (MCL)
- Possibility of using BYOD
- School internet upload speed
- Download the speed of the school's internet connection

In Czech primary schools 2021, 979,603 pupils registered with 83,610 desktop computers (30,396 under two years old) and 75,342 mobile computers (65,797 under two years old). A quarter of the schools had a portable computer room (n = 1186, 28.0%). Using own devices in the classroom (BYOD) was allowed in just under a quarter of the schools (n = 1008, 23.8%). Four out of five schools declared that all classrooms were covered by Wi-Fi networks (n = 3352, 79.1%). Three out of five schools (n = 2573, 60.8%) had an internet connection of at least 1000 Mbps for upload and download.

The School Facilities Index was also used for this analysis, which combines all the above parameters and allows for a direct comparison of school ICT facilities using a single parameter. In this parameter, each of the first four parameters (desktops, laptops, new desktops, new laptops) weighs 20 percent, and each of the other four (MCL, BYOD, upload, download) weighs 5 percent. For the calculation, we did not use the number of computers per pupil but the percentile rank among schools in the country.

Theoretically, the values of the Equipment Index can range from 0 to 100, but the values achieved range from 2.00 to 76.64. **Figure 1** shows the distribution of values between schools.

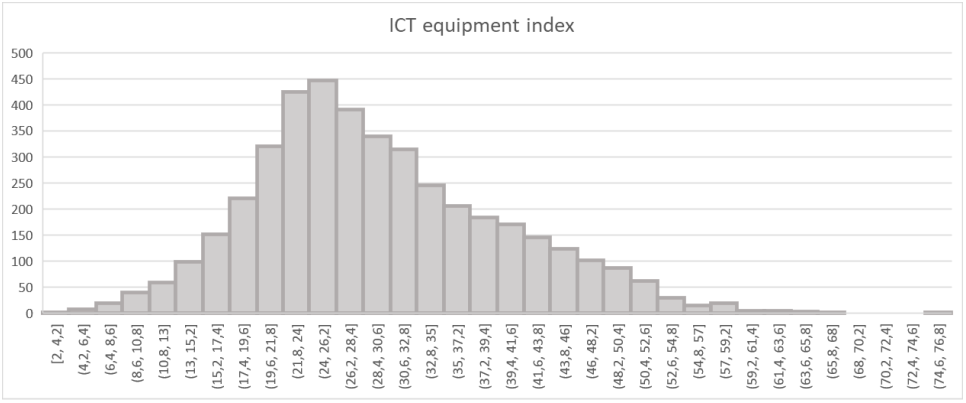

Figure 1. Histogram of values for the ICT equipment index.

Looking at the average equipment of schools according to the ICT Equipment Index in individual regions of the Czech Republic, we see significant differences (see **Figure 2**). The best-equipped schools are in the areas with the lowest socio-economic status of pupils—Karlovy Vary, Moravskoslezský, and Ústí nad Labem. This is mainly due to the systematic support of schools in these regions (Hooper et al., 2018).

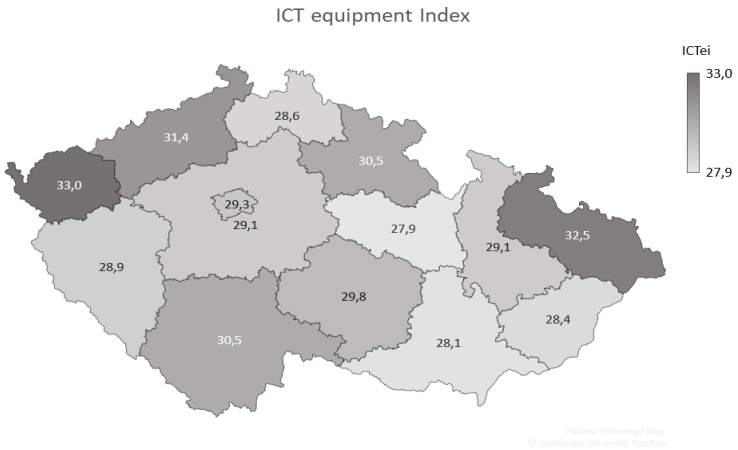

Figure 2. Comparison of regions in the Czech Republic.

However, there are also significant differences within individual districts in individual regions. **Figure 3** shows a comparison of districts within the Karlovy Vary Region.

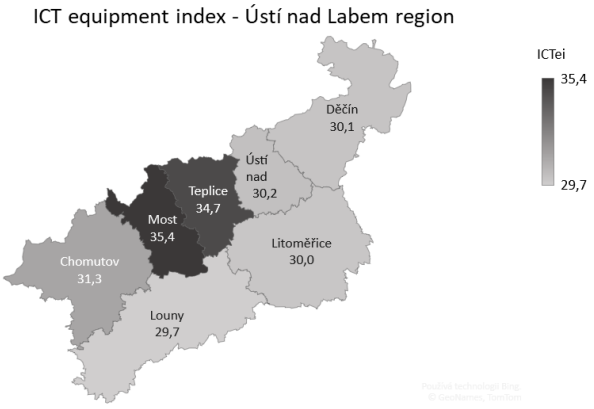

Figure 3. Karlovy vary region.

2.1. ICT school coordinators

An ICT coordinator has been established in Czech schools to support digital technologies (Javorcik and Havlaskova, 2022). An ICT coordinator could be a teacher or principal of the school. The prerequisite for ICT coordinators is fulfilling qualification requirements, including specialized studies (Neumajer, 2020). Performing the function of the ICT coordinator is associated with financial remuneration and a reduction in the number of hours of direct teaching, which depends on the size of the school (see **Table 1**). This paper aims to evaluate the impact of filling this position on the technical equipment of schools.

Table 1. Reduction of teaching load depending on school size.

Number of pupils	Teaching reduction
0–50	1
51–150	2
151–300	3
301–500	4
501 and more	5

In the period under review, the position was filled in 2,302 schools (54.4%). **Table 2** shows how many schools had the coordinator position filled depending on school size and region.

Table 2. Number of ICT coordinators in each region by school size.

	0–50	51–150	151–300	301–500	501 and more
Capital City Prague	19%	35%	50%	55%	75%
Jihočeský region	21%	54%	71%	81%	86%
Jihomoravský region	13%	43%	77%	85%	86%
Karlovarský region	17%	58%	63%	82%	91%
Region Vysočina	11%	48%	76%	88%	91%
Královéhradecký region	12%	41%	66%	58%	70%
Liberecký region	10%	35%	74%	78%	83%
Moravskoslezský region	46%	61%	84%	88%	96%
Olomoucký region	32%	51%	62%	84%	87%
Pardubický region	10%	48%	83%	79%	86%
Plzeňský region	29%	49%	55%	87%	86%
Středočeský region	22%	33%	57%	68%	71%
Ústecký region	20%	61%	72%	77%	82%
Zlínský region	31%	56%	70%	87%	91%
Total	**21%**	**47%**	**69%**	**78%**	**82%**

It is clear from the table that the position of ICT coordinator is filled more often in larger schools, which results from the greater need to manage more computer equipment and a more significant number of teachers. As the number of teachers increases, the need to coordinate their ICT activities increases.

2.2. Research questions

The research aims to answer the question of how the position of ICT coordinator is related to the ICT facilities in schools. To this end, five questions were set out, which were then sought to be answered.

1) Are schools with an ICT coordinator position better equipped than schools that do not have an ICT coordinator position?
2) Are there statistically more computers per pupil in schools where the position of ICT coordinator is filled?
3) Do pupils in schools where the ICT coordinator position is filled have newer computers than pupils in schools where the position still needs to be supplied?
4) Is using mobile computer labs more common in schools where the ICT coordinator position is filled?
5) Is using Bring Your Own Device (BYOD) more common in schools where the ICT coordinator position is filled than in schools where the position still needs to be supplied?

A t-test was used to test the hypotheses; upon establishing the statistical significance of the difference between the groups, we proceeded to evaluate the impact of the coordinator using Cohen's d test.

3. Results

3.1. School equipment

The ICT equipment index was used to compare school equipment. It was hypothesized H0 that school equipment is independent of whether the position of ICT coordinator was filled in the school. When comparing primary schools within the country, it was found that schools with the ICT coordinator role were supplied with an average ICT equipment index score 28.12. In contrast, schools where the position of ICT coordinator is filled have an average score of 30.99.

Using the t-test for independent samples, we found a significant difference between schools with ICT coordinator positions and schools where this position is not filled ($t = -9.183$, df = 4233, $p < 0.01$). The Cohen's d value = 0.28, the provision of ICT coordinator thus has a modest effect.

Let us compare the ICT equipment index for schools in each region (**Table 3**). We find that in all areas, except for the capital city of Prague, schools where the position of ICT coordinator is filled are always, on average, better equipped. This fact can be explained by the fact that Prague is classified in a different category in terms of the use of EU subsidies, and most of the resources for ICT are not available for schools in Prague.

Table 3. Comparison by region.

	ICT Coordinator	
Region	**0 (No)**	**1 (Yes)**
Capital City Praha	30.64	28.38
Jihočeský region	27.91	32.30

Table 3. (*Continued*).

	ICT Coordinator	
Region	**0 (No)**	**1 (Yes)**
Jihomoravský region	25.96	29.71
Karlovarský region	32.49	33.30
Region Vysočina	27.81	31.89
Královéhradecký region	29.04	32.40
Liberecký region	26.65	30.75
Moravskoslezský region	31.07	32.88
Olomoucký region	27.98	29.88
Pardubický region	25.97	29.92
Plzeňský region	27.51	29.91
Středočeský region	27.69	30.63
Ústecký region	30.27	31.98
Zlínský region	25.91	30.00

If we calculated values only for regions outside Prague capital, Cohen's $d = 31.46$. This still only has a modest effect.

The effect of the ICT coordinator on school facilities was found to be significant only for the counties outside the capital city of Prague, so the hypotheses were tested for the counties outside the capital city. This is because schools in these areas have comparable conditions.

3.2. Equipment of schools with computers and laptops

Let us look at the number of computers available to individual pupils (number of computers per pupil). We are surprised to find that in schools without an ICT coordinator, pupils have more and newer computers (acquired in the last two years). Using the t-test for independent samples, we found a significant difference between schools that have an ICT coordinator and schools that do not for the number of computers per pupil ($t = 3.552$, df = 3407, $p < 0.01$) and for the number of new computers ($t = 10{,}120$, df = 2920,441, $p < 0.01$) respectively.

For computer equipment, Cohen's $d = 0.11$, so even though the difference is statistically significant to the disadvantage of schools with a full-time ICT coordinator, this factor has a weak effect. For new computers, Cohen's $d = 0.34$, so this is a modest effect, and we will return to this finding later in the discussion.

We now turn our attention to what computers are used in schools. First, we perform the statistics for desktop computers.

Using the t-test for independent samples, we found a significant difference between schools with ICT coordinator positions and schools where this position is not filled ($t = 18.769$, df = 2616, $p < 0.01$) for the number of desktop computers per pupil. It shows that the number of desktop computers per pupil is statistically higher in schools where the position of ICT coordinator is not filled. Cohen's $d = 0.16$, so this is only a weak effect.

The opposite situation is true for mobile computers. Here, the facilities are better in schools where the position of ICT coordinator is filled. Using the t-test for

independent samples, we found a significant difference between schools with ICT coordinator positions and schools where this position is not served ($t = -9.664$, df = 3947, $p < 0.01$) for the number of mobile computers per pupil. A Cohen's $d = 0.31$ shows that there is a modest effect in this case.

3.3. Mobile computer labs

The increased number of laptops is also related to how they are used. One crucial aspect is whether these laptops are used as desktop computers in the same classroom or are available as part of mobile computer labs and can, therefore, be used flexibly in teaching different subjects.

Data analysis shows that the number of schools where MPLs are available is significantly higher in schools where the position of ICT coordinator is filled. This difference is so significant that it cannot be justified by a higher number of laptops per pupil. A statistical significance was found (chi square = 144.334, df = 1, $p = 0.000$). According to Phi = 0.191, filling the position of ICT coordinator can be described as a modest effect.

3.4. BYOD

The previous result indicates the effect of ICT coordinators on the number of mobile computer labs in schools. However, mobile computer labs are one of many means of making flexible use of computer technology in the classroom. Bring your own device (BYOD) methods are another. Information on whether BYOD methods are allowed in schools is also available within the data monitored. The possibility of using your own device in teaching has yet to be widespread in Czech primary schools. Less than a quarter of schools use it. This method is much more often used in schools where an ICT coordinator is present. A statistical significance was found (chi square = 24.302, df = 1, $p = 0.000$).

According to Phi = 0.78, the influence of the position of ICT coordinator on the use of BYOD in schools can be described as strong to very strong.

4. Discussion

The position of ICT coordinator, which has been introduced in schools in the Czech Republic, is a teacher who is not primarily responsible for managing ICT technologies but for supporting their use. In most schools in the Czech Republic, computers are mainly equipped in specialized classrooms and cannot be used in all subjects (Javorcik and Havlaskova, 2022). Our data analysis shows that in schools where the ICT position is filled, students and teachers generally have better access to technology in the classroom. This difference does not lie in the number of computers per pupil, where the situation is surprisingly better in schools with no ICT coordinator. The main difference lies in the flexibility and availability of technology. Schools with an ICT coordinator have more mobile computers than other schools and are likelier to have mobile computer labs (Watkins et al., 2019). However, the main difference is the possibility of using own equipment in teaching (BYOD). In this area, the influence of the coordinator can be characterized as strong to very strong.

The influence of ICT coordinators is very significant in influencing the use of ICT across subjects, contributing to the use of mobile technologies and influencing the work of other teachers in developing digital competences. This finding is in line with other studies looking at BYOD use both in the Czech Republic (Černochová and Novotná, 2020; Zounek et al., 2022) and abroad (Preston and Younie, 2015; Kay and Schellenberg, 2019; Adhikari et al., 2021; Mawere et al., 2022; etc.).

5. Conclusion

We recognize that analyzing data on school technology equipment can only provide a partial picture of the use of technology in education. Nevertheless, it can be concluded that training some of the teachers and filling the position of ICT coordinator positively impacts the way ICT technology is used in the school. Schools that have filled this position are likelier to use flexible computing technologies—mobile computing, mobile computer labs, and BYOD methods. The creation of an ICT coordinator position, financial remuneration, and a reduction in direct teaching load can be recommended based on research conducted in the Czech Republic.

Further research should focus on monitoring the changes in ICT equipment in schools during the ICT coordinator's tenure and on further research on the deployment of technologies in schools and the cooperation between the ICT coordinator, school management, and individual teachers.

Author contributions: Conceptualization, AJ and VH; methodology, AJ; validation, VH; formal analysis, AJ and VH; investigation, VH; writing—original draft preparation, AJ and VH; writing—review and editing, AJ; visualization, AJ; supervision, AJ. All authors have read and agreed to the published version of the manuscript.

Acknowledgment: The EDUBO project supported the research.

Conflict of interest: The authors declare no conflict of interest.

References

Adhikari, J., Mathrani, A., Scogings, C. (2021). Analysis of technology-mediated pedagogies: Experiences from a BYOD initiative in New Zealand. 2021 IEEE Asia-Pacific Conference on Computer Science and Data Engineering (CSDE). https://doi.org/10.1109/csde53843.2021.9718393

Benvenuti, L., Van Der Vet, P., Van Der Veer, G. (2011). Sciences, computing, informatics: Who is the keeper of the real faith? In: Proceeding of Computer Science Education Research Conference. Open Universiteit, Heerlen, 73–78.

Blau, I., Shamir-Inbal, T., & Hadad, S. (2020). Digital collaborative learning in elementary and middle schools as a function of individualistic and collectivistic culture: The role of ICT coordinators' leadership experience, students' collaboration skills, and sustainability. Journal of Computer Assisted Learning, 36(5), 672–687. Portico. https://doi.org/10.1111/jcal.12436

Chavez, J. V., Libre, J. M., Gregorio, M. W., & Cabral, N. P. (2023). Human resource profiling for post-pandemic curriculum reconfiguration in higher education. Journal of Infrastructure, Policy and Development, 7(2), 1975. https://doi.org/10.24294/jipd.v7i2.1975

Černochová, M., Novotná, J. (2020). Report on ICT in education in the Czech Republic. In: Comparative analysis of ICT in education between China and central and Eastern European Countries. Springer, pp. 107–131.

Devolder, A., Vanderlinde, R., van Braak, J., & Tondeur, J. (2010). Identifying multiple roles of ICT coordinators. Computers & Education, 55(4), 1651–1655. https://doi.org/10.1016/j.compedu.2010.07.007

Harris, J., Mishra, P., & Koehler, M. (2009). Teachers' Technological Pedagogical Content Knowledge and Learning Activity

Types. Journal of Research on Technology in Education, 41(4), 393–416. https://doi.org/10.1080/15391523.2009.10782536

Hooper, E., Peters, S., & Pintus, P. (2018). To what extent can long-term investments in infrastructure reduce inequality? Journal of Infrastructure, Policy and Development, 2(2), 193. https://doi.org/10.24294/jipd.v2i2.858

Javorcik, T., & Havlaskova, T. (2022). The Incorporation of Digital Technology into Education from the Point of View of School Principals and ICT Coordinators. 2022 20th International Conference on Emerging ELearning Technologies and Applications (ICETA). https://doi.org/10.1109/iceta57911.2022.9974862

Kay, R., Schellenberg, D. (2019). Comparing BYOD and one-to-one laptop programs in secondary school classrooms: A review of the literature. In: Society for information technology & teacher education international conference. Association for the Advancement of Computing in Education (AACE), 1862–1866.

Lai, K., & Pratt, K. (2004). Information and communication technology (ICT) in secondary schools: the role of the computer coordinator. British Journal of Educational Technology, 35(4), 461–475. Portico. https://doi.org/10.1111/j.0007-1013.2004.00404.x

León-Jariego, J. C., Rodríguez-Miranda, F. P., & Pozuelos-Estrada, F. J. (2020). Building the role of ICT coordinators in primary schools: A typology based on task prioritisation. British Journal of Educational Technology, 51(3), 835–852. Portico. https://doi.org/10.1111/bjet.12888

Mawere, T., Manjeese, C., & Chigada, J. (2022). Secondary school teachers' perceptions of BYOD among learners within the classroom. South African Computer Journal, 34(1). https://doi.org/10.18489/sacj.v34i1.952

McGarr, O., & McDonagh, A. (2013). Examining the role of the ICT coordinator in Irish post-primary schools. Technology, Pedagogy and Education, 22(2), 267–282. https://doi.org/10.1080/1475939x.2012.755132

Neumajer, O. (2020) Innovative concept of the function of the ICT coordinator/methodology (Czech). Řízení školy. 17(12): 6–8.

OECD (2010). Are the new millennium learners making the grade: Technology use and educational performance in PISA. Centre for Educational Research and Innovation Paris: CERI-OECD.

Pettersson, F. (2018). On the issues of digital competence in educational contexts—A review of literature. Education and Information Technologies, 23(3), 1005–1021. https://doi.org/10.1007/s10639-017-9649-3

Preston, C., Younie, S. (2015) Taking the Tablets: engaging the professional community in systemic change impacting on the pupils, the teachers and school policy. In: Handbook for Digital Learning in K-12 Schools, Springer. pp. 1–23.

Redecker, C. (2017) European Framework for the Digital Competence of Educators: DigCompEdu. Publications Office of the European Union.

Skues, J. L., & Cunningham, E. G. (2013). The role of e-learning coaches in Australian secondary schools. Journal of Computer Assisted Learning, 29(2), 179–187. Portico. https://doi.org/10.1111/j.1365-2729.2012.00488.x

Strudler, N., & Hearrington, D. (2008). Quality Support for ICT in Schools. International Handbook of Information Technology in Primary and Secondary Education, 579–596. https://doi.org/10.1007/978-0-387-73315-9_34

TALIS (2019). TALIS 2018 Results (Volume I): Teachers and School Leaders as Lifelong Learners. OECD.

Umar, I. N., & Hussin, F. K. (2014). ICT Coordinators' Perceptions on ICT Practices, Barriers and its Future in Malaysian Secondary Schools: Correlation Analysis. Procedia - Social and Behavioral Sciences, 116, 2469–2473. https://doi.org/10.1016/j.sbspro.2014.01.593

Watkins, R., Smith, D., & McBeth, M. (2019). iPads or computer labs? A technical communication classroom study. E-Learning and Digital Media, 16(5), 348–366. https://doi.org/10.1177/2042753019861838

Woo, D. (2023). The leadership of ICT coordinators: A distributed perspective. Educational Management Administration & Leadership, 51(2), 308–323. https://doi.org/10.1177/17411432209797

Woo, D. J., & Law, N. (2020). Information and communication technology coordinators: Their intended roles and architectures for learning. Journal of Computer Assisted Learning, 36(4), 423–438. Portico. https://doi.org/10.1111/jcal.12407

Zounek, J., Juhaňák, L., & Záleská, K. (2022). Teachers and Their Use of Digital Technologies in School. Young People and Learning Processes in School and Everyday Life, 47–84. https://doi.org/10.1007/978-3-030-90040-3_3