

# SCHOOL DIGITALIZATION FROM THE TEACHERS' PERSPECTIVE IN RUSSIA

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## ABSTRACT

In this study, we would like to show the analysis of latent factor structure of school digitalization from the teachers' perspective based on pilot SELFIE (Self-reflection tool for digitally capable schools) data. The survey of 685 teachers who took part in the pilot SELFIE study in Russia were subjected to an exploratory factor analysis. Five factors of technology-enhanced teaching emerged. Taking into consideration the lack of recent studies in internal drivers of digital transformation in Russia, this study contributes to the understanding of changes happening within a complex system such as the school system is. Further perspectives for digital transformation's aspects analysis based on SELFIE data are also proposed.

## KEYWORDS

ICT in School Education, Digital Transformation of Schools, Innovative Teaching and Learning

## 1. INTRODUCTION

Nowadays the integration of ICT into education still seems very promising from the perspective of government, IT companies and digital evangelists. We know that innovative teaching enhanced by digital technology, contributes to the 21st century skills of students, so it become sufficient for modern school to employ the digital technologies potential. However, regarding the technology-supported educational reform there is a certain gap between declared digital-oriented goals of education policies and classroom practices that are slow to change (Cuban, Kirkpatrick and Peck, 2001; Vrasidas, 2015).

The national context of digital innovations in Russian schools during the last 10 years can be characterized by the following initiatives:

1. Federal Dedicated Program "Development of Informatization in Russia for the Period up to 2010" that includes some regional educational initiatives for educational services and software development.
2. In 2010, new educational standards were introduced considering 21st century skills as a necessary part of students' learning outcomes.
3. In 2010, «Education System Informatization» federal project sponsored by the World Bank was completed. The objective of this project was to support schools in the pedagogical use of ICT in teaching and learning.

The deficit of current national school informatization action programmes is supposed to be covered by priority project «Digital school» (Russian Federation, 2017), currently under development. At the same time the level of ICT usage and pedagogical change in Russian schools may be identified as low according to many experts. It means that for successful programmes' implementations the evidence-based approaches on recent data should be offered.

The primary aim of this research is to explore the latent factor structure of digital transformation in Russian school through the perspective of school teachers. The main motivation for this study is the fact that very few past studies aimed to identify the factors affecting teachers' pedagogical use of technologies in Russian context. At best, only small-sampled studies were conducted dedicated to ICT competence as a main driver of changes.

Regarding large-sampled studies in which Russian schools took part during the last 10-15 years, it is possible to name SITES 2006 (Law et al., 2008) and Innovative Teaching and Learning Research (ITL) in 2011 (Shear et al., 2011). In the SITES 2006 the teacher-level factors of pedagogical use of ICT are highlighted, focusing on connectedness, traditional importance and life-long learning. This criteria may be sufficient for digital-age learning, according to more recent works. ITL proved that innovative practices dissemination should be supported with additional efforts and measures in Russia naming collaborative environment, professional development, a shift toward student centricity, and digital infrastructure among factors of teaching in the digital age.

In respect to the growing role of school teachers for knowledge economy, this paper addresses the question of drivers of pedagogical use of ICT in the Russian classrooms. In our analysis, we want to identify the latent factor structure that explains the nature of technology-enhanced teaching in Russia suggested by the pattern of responses. So the research question can be formulated as follows: which latent factors should be considered as influencing the pedagogical use of digital technologies among Russian school teachers'?

The knowledge of how teachers are changing their ICT related practices tailoring them to the dynamic context can serve as a tool for education strategy's elaboration.

## 2. METHODOLOGY

To carry out all analysis in this study we used R software with psych package.

### 2.1 Sample

In this study, the dataset of teachers' questionnaires (N=685) was drawn from the SELFIE tool dataset, in primary, lower secondary and secondary schools. SELFIE tool is developed by the European Commission Joint Research Centre. In 2017 it was piloted in more than 600 schools from 14 European countries. Based on DigCompOrg (Kampylis et al, 2015) framework, SELFIE tool helps to make visible the core of educational transformation in school to educators from the perspective of three main actors of the school system, namely school leaders, teachers and students. As a tool, it aims to support schools in reflecting their digital capability and practices. The main focus of the tool is learning, and not technology. The validity of the tool was confirmed (Munoz Castano et al., 2018).

Schools for the study were chosen from IITE and UNESCO Associated Schools Project Network (UNESCO ASP) within the scope of the SELFIE project pilot where Russia took part in October 2017.

### 2.2 Procedure

To obtain the study objective, the Exploratory Factor Analysis (EFA) was performed. The initial number of items was 60. The sample size (N=685) is adequate for the factor analysis as the case-to-variable ratio is 10:1. To ensure the degree of reliability of the SELFIE questionnaire, we calculated Cronbach's Alpha coefficient, which was found to be 0.96, indicating that the level of reliability of the Teachers' questionnaire of SELFIE is excellent.

To check the sampling adequacy for exploratory factor analysis, we also made the Kaiser-Meyer-Olkin sampling adjustment test and the Bartlett square test which ( $p < 0.001$ ) showed that all variables from the dataset fit well. As KMO was 0.96 and in the Bartlett a Chi-square = 27751.92, it indicated that we could continue to the EFA.

The sample was initially analyzed with maximum likelihood (ML) extraction methods and promax rotation. After the first step of EFA some items were omitted from further analysis as they have low factor loadings ( $< 0.50$ ). Items with missing values (optional questions) were also excluded from the analysis. In addition we eliminated items related to the SELFIE user experience. So the number of factors for EFA was 25.

With the reduced number of items we analyzed the sample with ML extraction method and promax rotation again. Here we used oblique rotation as factors were assumed to be correlated (Dean, 2009). Now it was possible to extract five factors that explained the 60.1% of variance.

### 3. RESULTS

In Table 1 the results of factor analysis are summarized. For interpretation of factors, we decided to discard the factor loadings of less than 0.50. Analysis of items on each factor emerged 5 areas of digital transformation in school from teachers' viewpoint. Each factor consists of varying quantity of items, grouped in five categories.

Table 1. Promax rotated factor structure: reduced dataset with 25 variables

	% of common variance	Name of the factor	№ of items
Factor 1	9,3%	Pedagogical Leadership	3 items
Factor 2	10,3%	Shift toward student centricity	4 items
Factor 3	15,9%	Digital infrastructure	7 items
Factor 4	15,5%	Digital-age learning environment	7 items
Factor 5	9,3%	Digital culture	4 items

Factor 1, «Pedagogical Leadership», comprised 3 items related to the contribution of teacher to the school digital strategy and to the regular review of the outcomes of using digital technologies in teaching and learning. This factor is aligned with DigCompOrg framework and «Leadership and governance practices» element (Kampylis et al, 2015). This factor claims the role of teachers' engagement to the holistic vision on digitalization, and how teachers understand the importance of open discussion and skilled communication digital technologies in school (Department of Education and Skills, 2015).

Factor 2, «Shift toward student centricity», contains 4 items capturing how teachers perceived digital technologies in teaching and learning, and how they evaluate its potential (Scherer et al., 2015). This factor proves the idea of the way how student-centered practices affect student learning outcomes (Shear et al., 2011).

Factor 3, «Digital infrastructure» contains 7 items, pointing out the digital infrastructure for learning. This factor is aligned with DigCompOrg framework and its «Infrastructure» element.

Factor 4, «Digital-age learning environment», contained 7 items related to the digital environment in school and described the way of using digital technology for teaching and learning. It reveals the changing role of pedagogical approaches with the focus on 21st century skills.

Factor 5, «Digital culture» comprised 4 items, capturing how teachers empower their students with digital skills by building digital culture (Scherer et al., 2015). This factor mainly referred to the developing of relevant skills for successful participation in modern social life (Kampylis et al, 2015) and knowledge economy.

### 4. CONCLUSION

The current study mainly aimed to explore latent factors that encompass digital transformation in school from teachers' perspective in Russia. This analysis is an initial step towards the explanation of the effective use of digital technologies in schools based on SELFIE data.

Our results suggest 5 factors of ICT incorporation in teaching and learning. Interestingly, that neither collaboration nor ICT competence factors were explored among them. So it is possible to say that teachers tend to focus on new pedagogical practices and innovative approaches rather than on general digital skills. At the same time, collaborative culture in schools is the subject for deeper analysis on SELFIE dataset. Limitations of this study include reliance on self-report data, and participating schools have an access to the perfecting methods and teaching materials which UNESCO ASP provide them with, so it might influence teachers' responses.

The latent factor structure obtained shows the need to integrate corresponding measures for more effective use of digital technologies in the school education. It can be crucial for investment optimization on ICT for teaching and learning programmes, and for next school informatization action programmes.

As such, the results of the study could also inform key stakeholders, e.g. policy makers, school leaders and principals, teacher educators on how to take measures to better support Russian teachers for pedagogical uses of ICT in their classrooms. Based on factor structure findings we can accentuate two parts of practical measures:

- teachers' professional development in schools should include additional possibilities, such as mentorship, development of the school as a learning community and different informal activities. It aligns with factors 1 and 5. The design of professional development model and its implementations is a subject for further studies.
- from organizational perspective, some new activities and policies should emerge in order to support student-shift centricity, as well as digital culture in teachers' community.

Further work will include more detailed interpretation of factors and confirmatory factor analysis in order to establish the construct validity. The next step could be the analysis of factors that may be used as predictors of innovative ICT use in Russian classrooms. To carry out this type of activity the regression analysis of technology enhanced teaching practices and contextual factors at the teacher's school must be planned. In addition to it, the analysis conducted on wider sample will help to elaborate factor structure depending on school characteristics.

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