Toward a model of learning innovation integration: TPACK-SAMR based analysis of the introduction of a digital learning environment in three Russian universities

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Abstract

Digitalisation is penetrating higher education (HE) in Russia. The study explores how three Russian universities have been integrating the Skyes digital learning platform to transform English as a foreign language (EFL) educational practices. The article outlines the main characteristics of the platform, recounts the steps in adopting the technology and addresses the emerging changes to learning and teaching. Students' and teachers' perceptions are examined to review the implementation process. The research is designed as a case study; the methods used are semi-structured interviews and online questionnaires. The study framework combines the Technological Pedagogical Content Knowledge (TPACK) model and the Substitution, Augmentation, Modification, and Redefinition (SAMR) model for a holistic approach to investigating innovation integration in a university setting. TPACK is used to analyse the changes associated with teachers' knowledge of technology, pedagogy and content. SAMR helps to reflect on the current use of the platform showcasing technology integration along substitution, augmentation and modification levels. Based on the findings, the paper discusses the factors influencing the implementation of the Skyes platform and proposes recommendations for its successful integration; they highlight the importance of motivation, feedback both from teachers and students, clear assessment of the learning outcomes, TPACK transformation plan and alignment between the innovation and educational regulations.

Keywords Digital learning environment · Technology integration · EFL · Higher education · TPACK · SAMR

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1 Research background

1.1 Digitalisation in the Russian education policy

Today the application of digital technologies is a ubiquitous phenomenon. Although the new technologies were primarily intended to facilitate business, educators soon realised their potential for learning and teaching and began to invest in their development (Genova, 2019). Digitalisation has become pivotal for the Russian education policy as well ("On Education in the Russian Federation", 2012). In particular, within the national project "Education" (National project "Education", 2020), which is being implemented in 2019–2025, there is a federal project "Digital Educational Environment". The latter aims at creating a high-quality digital learning environment in Russian educational institutions.

The Russian system of higher education (HE) is also actively involved in the process of digitalisation. The Ministry of Science and Higher Education has established the Council for Digital Development and IT, which is in charge of the issues related to digital transformation in science and higher education (https://minobrnauki.gov.ru/ru/activity/digitalcouncil). Additionally, there appeared the programme "Digital Economy of the Russian Federation 2024" (https://data-economy.ru). It consists of such projects as "personnel for the digital economy", "information infrastructure", "information security", "digital technologies", "digital state administration", and "artificial intelligence". All these projects affect the way Russian universities are currently being transformed.

1.2 Digital EFL learning technologies

Technologies for digital learning have evolved greatly since the invention of the Internet. Digital learning environments apply various technology-based methods for learning processes and instruction (Wheeler, 2012). The newest Web 3.0 period began due to the spread of mobile devices and appearance of more advanced technologies such as cloud computing and 3D virtualisation (Dominic et al., 2014). Examples of these newest technologies include personal learning environments, social semantic web, virtual worlds, and personal avatars (Hussein, 2012). The emergence of mobile devices also enabled the development of mobile assisted language learning, which provides learners with new opportunities to study a language anytime and anywhere (Kukulska-Hulme & Shield, 2008).

Golonka et al. (2014) classified the specific technologies that are widely applied for language learning into the following types:

- classroom technologies which include course management systems, interactive whiteboards, and ePortfolios;
- individual study tools which comprise corpora, electronic dictionaries, glosses, intelligent tutoring systems, grammar checker programmes, and automatic speech recognition and pronunciation programmes;

- network-based social computing tools which cover virtual world and serious games, social networking, chats, blogs, forums, and wiki.

In compliance with the new agenda, Russian universities must transform teaching and learning in various disciplines, in particular, EFL, which entails a number of issues. Although English is a part of the curriculum of most undergraduate programmes, the number of hours allotted is minimal (Kazantseva et al., 2016; Rasskazova et al., 2017), and the learning technologies are often outdated (Nikolaev & Chugunov, 2012). Consequently, the desired goals are not achieved.

Therefore, the use of digital technologies for learning and teaching English seems promising. This research explores the experience of Russian universities integrating the Skyes digital learning environment.

1.3 Rationale

The aim of this paper is to investigate the experience of Russian universities integrating the Skyes digital learning environment, to reveal the miscellaneous issues associated, and to elaborate recommendations for the successful implementation of the learning innovation integration.

The significance of the issue is grounded in the urgent demand of the research devoted to the problem stated. A literature search was conducted for the purpose of collection of existing peer-reviewed articles and books containing the information about digital learning innovations utilised for EFL at Russian universities. The following key words and phrases were used: *digital learning platform, digital learning environment, learning innovation, technology integration* in combination with *EFL, Russian higher education, and Russian universities*, with Boolean operators AND and OR through the search tool at the library of Tomsk State University. No literature meeting the given criteria was found, which is illustrative of the scientific novelty of the current work.

Importantly, this research can attract greater attention to the issues related to educational digital technologies. The description of the learning innovation integration along with the recommendations developed could contribute to an environment where multiple stakeholders, such as educators, students, university administration, and educational policy-makers can collaborate for successful learning innovation integration. The findings can be helpful for further research on learning innovation integration, the barriers associated, and the use of TPACK and SAMR models for designing and evaluating the integration process.

2 Theoretical framework

2.1 Integrating technology into teaching: SAMR and TPACK models

This research relies on the use of Mishra and Koehler's (2006) Technological Pedagogical Content Knowledge Framework (TPACK) and Puentedura (2014)

Substitution, Augmentation, Modification, and Redefinition (SAMR) models for analysing the process of educational technology integration. Created by Punya Mishra and Matthew Koehler (2006), TPACK is a framework considering the relationships between content, pedagogy and technology and aiming at effective technology-enhanced instruction (Hilton, 2016). Harris et al. (2009) emphasise the essential role of relationship within the framework — not only technological, pedagogical and content knowledge are important, but also the interactions of these components in a certain context. Thus, there are seven components of TPACK including three primary forms of knowledge: technological knowledge (TK), pedagogical knowledge (PK), and content knowledge (CK); and the components at the intersections: pedagogical content knowledge (PCK), technological content knowledge (TCK), technological pedagogical knowledge (TPK), and technological pedagogical content knowledge (TPCK) (Mishra & Koehler, 2006).

Another aid to teachers in integrating technologies into their work is the SAMR model developed by Dr. Ruben Puentedura (2014). Similar to TPACK, it is context-specific. Each use of technology is approached as a different task: substitution, augmentation, modification, and redefinition. The substitution and augmentation levels are interpreted as "enhancement", while the modification and redefinition levels are associated with "transformation". Although visually organised in a ladder form, the SAMR model is not essentially hierarchical. The levels do not prescribe a movement from the lower level to the upper one but rather the choice of a level most relevant to the task (Hilton, 2016). However, sequential progress through the SAMR model is an option as well, and this enables teachers to improve their TPACK (Geer et al., 2017).

Combined, the TPACK model and the SAMR model reinforce each other to provide valuable insight into where challenges emerge and opportunities exist when choosing technologies for student learning. TPACK helps to contextualise the teacher knowledge required for technology integration. SAMR assists in analysing the specific levels used for enhancement and transformation and presents an opportunity to examine the integration from both the teachers' and students' perspectives (Kihoza et al., 2016).

This study explores how three Russian universities have been integrating a digital learning platform, Skyes, to transform EFL educational practices. TPACK and SAMR allow for exploring the process of its integration.

2.2 Barriers to the introduction of digital learning environments for EFL

Barriers that may hinder learning innovation integration include insufficient level of professional development of teachers (Hawkins, 2002a, 2002b), their lack of time, acceptance, motivation and confidence (Hawkins, 2002a, 2002b; Jones, 2001; Raman & Yamat, 2014; Schmid, 2009), deficient digital infrastructure and absence of technical support (Morris, 2012), usage gap and outcome gap (Lim et al., 2013), and neglecting students' perspective and opinion (Gosper et al., 2007). These barriers hold true in the EFL context (Campbell & Geertsema, 2017; Liu, 2009). The Russian educational policy adds another significant barrier, which is the university's necessity to comply with the Federal State

Educational Standards (FSES). The latter are official requirements for implementing educational programmes at all levels (Lenskaya, 2013; Mustafina & Biktagirova, 2016). Overall, the barriers cause institutional resistance that may negatively impact technology integration.

Institutional resistance is natural in higher education (Kavanagh & Ashkanasy, 2006). At the same time, it is often intertwined with individual resistance and may occur at macro, mezzo and micro levels (Bryant et al., 2014). Previous research shows that in order to overcome resistance-related issues it is necessary to take certain steps:

- to develop a shared vision on the required changes and short- and long-term goals (Davies & Davies, 2012), because the right vision is essential for progress (Nanus, 1992). However, top-down measures are difficult to avoid completely due to a time limit typical for the change implementation (Holmes et al., 2013);
- to maintain favourable organisational culture with high quality communication (Cunliffe & Eriksen, 2011), because educational change can cause resistance for social reasons (Fullan, 2013); and
- to create feedback, because systematic monitoring is vital when introducing an innovation (Davies & Davies, 2012); and
- to invest in teachers' technical knowledge and professional development (Hilliard, 2015) with sustained and systematic professional development programmes (Garrison & Vaughan, 2013); and
- to provide training for administrative and technical personnel, and student support services (Battaglino et al., 2012); and
- to evaluate learning outcomes of implementing new learning strategies based on final grades, retention and completion rates, engagement, persistence and efficacy (Davis et al., 2018).

2.3 Description of the digital environment

Skyeng is the largest online English school in Europe and the biggest edtech company in Russia ("RBC names 35 largest" 2019). Skyes is one of the company's products specially designed for English learning at Russian universities (https://uni.skyeng.ru). It represents a cloud-based platform with interactive exercises, audio, video, pictures, GIFs, tests, and texts. The core features of the platform are (https://uni.skyeng.ru):

- Skyes comprises over 3,000 content units (lessons and tasks) that can be combined based on students' progress.
- Tasks are checked automatically, and a teacher is able to monitor task completion and progress records with a breakdown of skills for each student.
- Teachers are able to assign tasks for an entire group or individually and build a personalised learning trajectory for each student.

The platform is intended to be used both in the classroom and for home assignments for students' independent work as a blended learning tool. Skyes allows teachers to reduce the amount of routine work, for example, searching for learning materials, assigning and checking activities. Students can benefit from new learning materials in terms of both visual representation and content, interactivity (instant feedback from the platform), visual display of skills development (progress record, badges), and ability to complete home assignments anywhere and anytime via either a desktop computer, or a mobile device.

3 Methodology

3.1 Research design

This work speculates on the findings from a mixed-methods study designed to explore the experience of Skyes integration at three Russian universities. The study examines students, teachers and administrators' experience of the platform integration. The paper advocates for an environment where every stakeholder's opinion is taken into account. The purpose of the research is to develop recommendations for better implementation of educational digital technologies. To do this, analytical matrices utilizing the SAMR and TPACK models based on the research findings were created. TPACK is intended to help highlight the dimensions of technological, pedagogical and content knowledge in the process of technology integration (Harris et al., 2009). Notably, in this study, only TK, CK, and PK are taken into account as they are primary TPACK components. Further research is necessary to consider their intersections. SAMR is used to reflect on the levels of integration and review the process of introduction against targeted outcomes (Tunjera & Chigona, 2020). Thus, the combination of the two models is expected to provide valuable insights.

The research is designed as a case study, that is an in-depth investigation of a particular issue (Ruffa, 2019). The study uses several methods: semi-structured interviews and online questionnaires. Semi-structured interviews are used to ensure that not only the inquired information is provided but also to leave room for unanticipated responses which might contribute to the findings (Tunjera & Chigona, 2020). The interviews included open-ended questions based on the conceptual framework of SAMR and TPACK and concerning the conditions created for teachers and students, the impact of Skyes on the educational process, and the students and teachers' digital literacy. The semi-structured interviews findings were complemented by the data obtained from mass online questionnaires. The questionnaires were developed with Google Forms and filled in by the teachers and students who used the platform. They contained questions about user experience, perceived value, technical infrastructure, the ability to integrate the platform into the existing learning

and teaching process, and willingness to use it further. The research scope includes three Russian universities.

3.2 Participants, data collection, and analysis

According to the national classification of higher education institutions, University 1 is a leading regional research university, University 2 is a state pedagogical university, and University 3 is a leading federal university. The data were collected during the period of Skyes platform testing (2nd semester, 2019) and afterwards (1st semester, 2020). The respondents were teachers, students, and administrators of the three universities.

Participants were recruited through online questionnaires on the Skyes platform. The questionnaires were voluntarily filled in by both students and teachers. The students had different levels of English competence, and the majority self-reported pre-intermediate level of English. Most of them were in their first year of study and were doing General English and English for Specific Purposes. This study did not intend to take into account such demographic characteristics of the participants as gender, age, and ethnic origin. These correlations are to be investigated in further research.

The total number of respondents is shown in Table 1.

The respondents' answers were analysed through calculating percentages, rounded off to one decimal. The data on each university were presented separately; no comparison between the universities was intended. The low relative numbers of the participants might be caused by the voluntary nature of their participation in the online questioning, and the turmoil due to the COVID-19 related emergent transition to the distant mode of learning.

Three semi-structured interviews were conducted with administrators who were project leaders in the targeted universities: 1) a faculty representative in charge of Skyes testing (University 1); 2) a dean of the department implementing Skyes (University 2); and 3) a vice-rector for digital transformation (University 3). The data collected were analysed according to the way TPACK and SAMR might hypothetically overlap based on the platform design and affordances (Table 2). Table 3 represents the TPACK and SAMR indicators demonstrated in the real learning process — the data obtained from the interviews and online questionnaires were analysed in the SAMR and TPACK framework, and the final analytical matrix for all the institutions was filled in.

Table 1 The number of online questioning respondents in three targeted universities

Targeted university	Students	Teachers
University 1	67 (9.6% of total 697 using the platform	8 (50% of total 16 using the platform)
University 2	118 (8.4% of total 1400)	21 (67.8% of total 31)
University 3	138 (9.3% of total 1478)	7 (63.6% of total 11)

Table 2 The Skyes platform in the TPACK-SAMR framework

	Substitution	Augmentation	Modification	Redefinition
TK	The platform replaces the traditional form of homework assessment. Teachers substitute homework with the assignments on the platform and monitor the results on the platform	Students analyse their mistakes due to the embedded option of immediate feedback and therefore are able to augment their learning track. Teachers consult students on personalised track augmentation via the platform	Students request recommendations, manage personalised learning tracks and organise platform activities based on the built-in learning analytics system. Teachers use learning analytics and detailed progress records to adjust the learning track on the platform	Students create personalised learning activities on the platform in accordance with their learning objectives. Teachers transform all classroom activities to implement them on the platform
PK	Teaching strategies aimed to enhance receptive language skills are transferred to the platform (for example, listening, grammar drill, reading, tests). Teachers recognise the benefits and limitations of such a learning approach	Teachers cease homework assessment in the classroom and exercise more student-centered and collaborative classroom strategies using the platform	Teachers employ blended learning formats to implement a wider range of teaching strategies, for example, problem-based learning and provide a more personalised classroom experience	A comprehensive shift to student-centered teaching strategies. Students design their learning tracks: choose the materials, formats, schedule, and intensity of learning based on the feedback and recommendations from the platform. Teachers act as mentors
CK	Digital content replaces analogous materials fully or in part	Teachers provide students with a wider range of content in order to complement the existing course track	Digital content is used in order to cater to more complex learning objectives (for example, students' multimedia projects). Teachers develop or inquire about specific interactive content in order to improve the learning process	A paradigm shift in the perception of EFL content knowledge: both students and teachers become 'owners' of technological learning and are able to collaborate with the content developers and to contribute to the shared digital content

Table 3 TPACK-SAMR indicators observed at the universities

	Substitution	Augmentation	Modification	Redefinition
TK	All the universities demonstrate: - the platform replaces the paper-based homework assessment - teachers substitute homework with the platform assignments and monitor the results on the platform	All the universities often demonstrate: - students analyse their mistakes based on the immediate feedback by the platform and augment their learning track: choose additional tasks and master deficient skills - teachers monitor individual students profiles and provide personalised feedback on the platform	All the universities sporadically demonstrate: - students hone their digital literacy: request recommendations, manage personalised learning tracks and organise platform activities based on the built-in learning analytics system - teachers harness the platform technological potential: use learning analytics and detailed progress records	No indicators observed
PK	At University 1, most teaching strategies remained the same; the platform is used as a supplement	Teachers of University 2, University 3, and sporadically at University 1 ceased homework assessment in the classroom and exercised more student-centred and collaborative classroom strategies using the platform: pair and group work, task-based learning	Teachers of University 2 and University 3 occasionally employed blended learning formats and implemented a wider range of teaching strategies: problem-based learning and flipped classroom	No indicators observed
CK	At all the universities, digital content replaced analogous materials fully or in part	At all the universities, in most cases teachers provide students with a wider range of content in order to complement the existing course track: they juxtapose interactive and non-interactive content according to their objectives	No indicators observed	No indicators observed

4 Findings

4.1 The Skyes platform in the TPACK-SAMR framework

The Skyes integration policy includes a semester-long pilot which comprises the following activities:

- Teacher training course. It encapsulates TK (for example, the ways to apply learning analytics in order to build individual tracks for students), PK (for example, approaches to integrate a digital platform in a learning/teaching process), and CK (for example, what kind of interactive learning materials are most effective in a digital environment).
- The evaluation of students' language skills. The evaluation is conducted in a form of an entry test via the platform or by teachers in order to be able to measure the impact after the technology has been introduced.
- Ongoing monitoring of students' and teachers' activity and a final test. The monitoring results in a performance report with the students' progress records and teachers' performance indicators.
- Technical and methodological support. It is provided by the Skyes team via a helpline and email throughout the pilot integration.

In addition, the interview data allowed for speculating on how the introduction of Skyes may impact learning and teaching in the TPACK-SAMR framework. Table 2 is intended to describe possible levels of Skyes integration envisaged by the platform design and affordances in terms of TK, PK, and CK.

4.2 University 1 findings

The interview with a University 1 representative shows that the introduction of Skyes has become possible due to the rector's initiative. As the new technology was an option, this allowed the EFL teachers for more experimentation and, hence, some used the platform with varying degrees of intensity, while others did not use it at all. It should be noted that the experiment caused some resistance amongst the staff:

The teachers are afraid that the technology might replace them.

At the same time, there appeared a number of enthusiastic teachers. Nevertheless, neither the teaching staff nor the students fully understood why they should use the platform. In general, their engagement is described as low. Using the platform is envisaged as involving extra expenses. Thus, there is still no final decision on the adoption of the technology. In addition, there is no leader in charge of the platform promotion.

Systematic feedback from the students was not collected during the experiment. However, personal conversations revealed some complaints about technical issues:

The mobile application is not working, whereas using mobile phones is more convenient for students.

There are additional complaints that the teachers had no opportunity to test the content of the platform beforehand. Furthermore, there occur difficulties with adjusting the platform tasks with the classroom activities. Finally, the interviewee complained that the learning outcomes of the platform users were not assessed and examined against those of non-users.

The teachers' questionnaire data demonstrate that 75% of the respondents used the platform, and 87% of them were either fully or rather satisfied. Sixty-three percent had few technical problems, while 37% did not have any. The students' involvement and interest (62%), interactivity and accessibility for the students (62%), the teacher's time saving (50%) and a more effective use of the time for independent work (50%) seemed to be the main benefits. Initially, 38% had a complete understanding of how to integrate the platform into the current educational process, and another 62% had an approximate understanding. Seventy-five percent wanted to continue using the platform to some extent. Eighty-eight percent considered the presence of their own textbook impeded the Skyes implementation, and 63% noted the difficulty of the alignment between the Skyes and the existing curriculum.

According to the students' questionnaire, 93% of the respondents were either fully or rather satisfied with the experience of using the platform, and 72% indicated that the platform motivated them for further work; 91% admitted the usefulness of this work. The majority (55%) used the platform 1–2 h a week, 21% used it less than 1 h. The students often encountered such difficulties as technical issues, the incomprehensibility of tasks, the problem with accessibility, and the vagueness of the teacher's instruction for learning on the platform. At the same time, 82% understood how learning on the platform would contribute to the final assessment. Seventy-eight percent would like to continue using the platform including 17% who would prefer to expand its use, while 12% would like to use it less.

4.3 University 2 findings

The interview shows that University 2 decided to implement the Skyes platform to meet the requirements of the FSES that prescribe providing students with the learning materials:

> We have FSES of HE, which states that you ought to provide one textbook for two [students], or to have a distance educational environment.

Although at the beginning of the year a part of the staff showed some resistance, later they changed their attitude.

> There were purely psychological problems that caused the necessity to sit down with the teachers and talk. But by the middle of the year everyone, in general, was happy, because they did not need to check homework.

The platform users' academic outcomes were not assessed and gauged against those of non-users. However, the interviewee states that the new technology has contributed to raising student-orientedness.

If we talk about the Skyes as a platform, it is surely student-centred.

Also, the teachers made the assessment totally clear for students. The students knew that completing the tasks weighed 50% of the overall course assessment.

If a student fulfills all the tasks on the platform, they pass the course.

In addition, the teaching staff and students highlight that the Skyes digital system is user-friendly and has appropriate technical support.

We did not experience any problems in regard to the technical support from the Skyes platform.

The teachers' questionnaire shows that about 91% of respondents used the platform, and 86% of them were either fully or rather satisfied with the platform. Sixty-two percent did not have many technical problems, and 29% had none at all, whereas 5% of respondents encountered a large number of them. The main benefits seem to be interactivity and accessibility for the student (76%), teacher's time saving (62%), more efficient use of the time allotted for independent work (53%), and the growth of student involvement and interest (29%). Initially, 67% had a complete understanding of how to integrate the platform with the current educational process, and another 33% had an approximate understanding. Sixty-seven percent wanted to continue using the platform to a larger or former extent, 24% to a smaller extent, and 5% did not want to use it further. Forty-eight percent considered the presence of their own textbook impeded the Skyes implementation, 38% noted the difficulty of the alignment between the Skyes and the existing curriculum, and 24% did not expect the students to become active platform users.

The students' questionnaire indicates that 75% of the respondents were either fully or rather satisfied with the experience of using the platform, and 40% indicated that the platform motivated them for further training; 79% considered the training useful. The majority (49%) used the platform 1–2 h a week, 23% used it less than 1 h. The students often encountered such difficulties as technical issues, the incomprehensibility of the tasks, the problem with accessibility, the vagueness of the teacher's instruction for learning on the platform. At the same time, 61% realized how their learning with the platform would contribute to their final assessment. Sixty-four percent would like to continue using the platform including 3% who would prefer to expand its use, while 20% would decrease the extent of its use and 9% would completely terminate its usage.

4.4 University 3 findings

The interview with the head of the project on the implementation of Skyes in University 3 shows that the motivation for its introduction was the lack of English teachers. The latter happened because of the spike in the number of the students.

The Radiophysics Department has grown by six times since the 1990s.

Half of the English classes were replaced with the independent work on the Skyes platform which allowed the administration to avoid expenses on hiring additional staff. Moreover, the platform proved to be a useful distance learning tool during the COVID-19 pandemic.

Our timetable indicates the platform for the [English] class instead of a room.

In the perception of innovation, at the beginning of the experiment there was a resistance to educational innovation, but it was overcome.

It was obvious there had to be a teachers' riot: Skyeng is bad, and we are cool. There was a riot.

Both the students and the teachers are tech-savvy. However, some teachers were not satisfied with the platform content. In addition, not everyone adjusted their teaching methods to the integration of the Skyes platform.

Some teachers are still applying their own methodology.

Regarding the transformation of the learning process, the platform enables individualisation and student-centredness. The need to change the teacher's role was noted:

I think that in English [learning] the teacher's role will change, but the University will still need a lot of them [teachers]. Their roles include mentoring, accompanying, teaching in difficult situations, and adaptation.

The development of a monitoring system and advisory services with educational analytics is believed to play a special role. However, the platform users' academic outcomes were not assessed and gauged against those of non-users. A technological assessment map was developed according to which the work on the platform contributed 30% to the overall course assessment.

The teachers' questionnaire demonstrates that about 29% of the respondents use the platform, and 86% of them are either fully or rather satisfied with the platform. However, 29% wanted to cease or decrease the platform use. Fourteen percent had significant technical problems, while 37% had none or few. The teachers' time saving (57%) along with interactivity and accessibility for the students (57%) seem to be the main benefits. Initially, 29% were unaware of how to integrate the platform with the current educational process. Seventy-two percent considered the presence of their own textbook and the difficulty of the alignment between the Skyes and the existing curriculum had impeded the Skyes implementation. Forty-three percent were intended to continue using the platform.

According to the students' questionnaire, 69% of the respondents were either fully or rather satisfied with the experience of using the platform, 55% considered the training useful. Sixty-six percent indicated that the platform failed to motivate them for further training. Sixty percent used the platform 1–2 h a week, 29% used it less than 1 h. The students often encountered some difficulties, namely, the incomprehensibility of tasks, technical difficulties, the vagueness of the teacher's instruction for learning on the platform, and the problem with accessibility. Forty-three percent

would like to continue using the platform including 5% who would prefer to expand its use, while 21% would like to use it less, and 24% are no longer willing to use it.

4.5 TPACK-SAMR based analysis

The TPACK-SAMR based analysis was used for designing both Table 2 and Table 3. Table 2 described possible levels of Skyes integration envisaged by the platform design and affordances in terms of TK, PK, and CK. Table 3 highlights the TPACK-SAMR indicators demonstrated in the real learning process at the three universities. The data obtained from the interviews and online questionnaires were analysed, and the final analytical matrix for all the universities was filled in (Table 3).

5 Discussion and conclusion

The TPACK-SAMR approach revealed varied levels of integration of Skyes at three Russian universities. The integration was analysed based on TK, CK, and PK as primary TPACK components considered against SAMR levels. In regard to TK, all the universities exemplified the indicators at the levels of substitution, augmentation and modification. Concerning PK, University 1 demonstrated substitution indicators, while University 2 and University 3 showed augmentation and occasionally modification indicators. In terms of CK, all the universities displayed the preponderance of substitution indicators. In this regard, the universities manifested the following attitudes. University 1 had an intention to raise the level of teachers' PK and to enable student-centredness. Additionally, they admitted the necessity to improve CK. University 2 was satisfied with the level of implementation of the platform as the teachers' knowledge level allows for full-fledged platform usage. The teaching staff at University 3 requested to develop a monitoring system and recommendation services within the educational analytics as this could contribute to the improvement of both PK and TK. They highly evaluated the platform opportunities to implement blended learning and enhance student-centredness.

The study discovered the main reasons for the Skyes implementation at the universities. For University 1, it was an attempt to improve students' English skills with help of an innovative technology. The decision to integrate Skyes was initiated by the Foreign Languages department, and the teachers volunteered to participate in the experimental implementation of the Skyes platform. In the cases of University 2 and University 3, a top-down implementation was observed. For University 2, integrating Skyes was a way to comply with the FSES textbook requirement. University 3 decided to implement the Skyes platform in order to manage teacher shortage and limited budget.

At all the three universities, the implementation faced teacher resistance. At University 2 and University 3, resistance was related to the fear of replacing teachers with technology. Other reasons for resistance included the unwillingness to depend on an external supplier (University 1), the reluctance to use new teaching materials

(University 2), and the fear of change (University 3). These instances confirm that resistance is natural in organisations and is caused by a variety of both institutional and individual reasons (Kavanagh & Ashkanasy, 2006).

Both the university administrations and the Skyes support team utilised different measures to overcome teacher resistance. Skyes provided systematic monitoring and feedback, which is pivotal for dealing with resistance issues (Davies & Davies, 2012). Also, University 1 sought to develop a shared vision on the required changes since the quality of communication flows adds to success (Cunliffe & Eriksen, 2011). However, due to the time-consuming communication with different stakeholders, the implementation process at the University 1 took longer than at University 2 and University 3 that chose to employ a more top-down approach. The teachers were compelled to use technology, and the implementation procedure was strictly regulated. Apparently, the top-down management turned out to affect the degree of teachers' awareness of how to integrate the platform with the current educational process, which varied among the teachers from 38% (University 1) to 67% (University 2) and 71% (University 3).

Therefore, the following recommendations can be proposed to ensure a more successful implementation of Skyes:

- The motivation for introducing educational innovation should be clarified to all stakeholders.
- Institutional resistance should be envisaged as normal while introducing any innovation.
- Feedback from students and teachers is important.
- It is pivotal to have a clear assessment of the learning outcomes of the platform users against those of non-users.
- It is essential to clarify regulatory management actions: there ought to be a plan for the transformation of teachers' TPACK.
- Alignment between the innovation and educational regulations is significant.

These recommendations might be extrapolated to integration of similar learning innovations. Growing teachers' TK, PK, and CK to advance through SAMR levels turned out to be critical, which correlates with the claim highlighting the importance of teachers' sustained professional development (Garrison & Vaughan, 2013; Hilliard, 2015).

6 Limitations

Findings of this study of learning innovation integration in EFL are limited by the universities involved and specific of the platform implemented.

Data availability The data are available upon request from the authors. The dataset does not include respondents' personal information.

Code availability Not applicable.

Declarations

Conflict of interest No potential conflict of interest is reported by the authors.

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