MODERN DIGITAL SOLUTIONS FOR L2 EDUCATION AND THEIR PROSPECTS

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Abstract. This article considers the modern solutions that are currently being implemented in thedigitalization of second language (L2) education in the world in general, with a particular focus on the English language, and in Russia in particular, with a particular focus on the Russian language. The article first discusses the two factors mainly contributing to the need to develop digital solutions in the L2 education and learning field, namely the rising population mobility andmigration levels and the rapid development of digital solutions and their implementation in various sectors in the recent decade. The article demonstrates why the rise in population mobilityand migration levels in and around the world, together with the advancement of digital solutions in the wider educational and learning space, in the past two decades of the twenty-first century have necessitated the development and implementation of digital solutions for L2 education and learning. On this basis, the article carries out a concrete analysis of the surge in the development, implementation, and adoption of digital solutions in L2 education and learning, together with theprospects for further advancements in the field, particularly a study of the various novel game- changing digital products and solutions that are being offered on the L2 education and learning market by educational institutions and centers of higher learning, followed by an investigation oftheir effectiveness, drawbacks, and areas on which they could be improved in this field. Further, an investigation is conducted on the increasingly complex requirements for linguistic skills amongprofessionals working in various industries in the Russian Federation and across the world that have to do with the rising need to create a workforce with the necessary skills and knowhow to implement digital solutions in L2 education, as well as on how various economic structures have raised their demand for these competencies against the background of the rapid globalization of industry and commerce at large.

Keywords: population mobility, migration, digitalization, digital solutions, artificial intelligence, language training, innovation, technological development, L2 education, L2 learning.

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Introduction

At the turn of the 21st century, L2 education transitioned from a traditional to a modern andmore integrated method of delivery. This transition is generally considered as the basis for the advent of digital solutions in the L2 education and learning space. And while the focus of many organisations has been on improvement in language proficiency and oral communication, authors(Correa, 2011; Garrett-Rucks, 2013; Yamada, 2010) have pointed out how the integration of

higher-order and critical thinking skills in language learning has been minimal at best, particularlywhen it comes to language learning in elementary levels. Tai, T. Y. et al. have looked at the how VR technology is transforming education by providing authentic learning experiences. Meaning VR tech products are moving towards replacing human assistance and human tutors while offering many benefits that were not there before, primarily in terms of convenience and ease of data access.In their paper, Li, P., & Lan, Y. (2022) point out that while many of the original technologies for computer-assisted language learning (CALL) that came about due to the advent of the computer era have continued to be widely used as the standard technologies for the past 30 years, recent years have witnessed a fundamental shift towards highly-interactive digital language learning (DLL) methods that are easily integrated with current communication technologies, including mobile phones, the Internet, and apps. Today, as

described by Warschauer, M. (2004), this digitalisation has radically transformed all sectors of the global economy, from production and service provision to education and training. In the education sector, particularly linguistics and second-language (L2) learning, digitalisation is now playing a key role in the development and provision of a wide range of high-tech products and solutions for a better teaching and learning experience (see Carol A. Chapelle, Shannon Sauro (Éds.)). Educational institutions have begun successfully adopting numerous digital language teaching and learning techniques in their programmes as they try to make the shift to digital and AI-based learning (see Kumar, E., & Sreehari, P. (2009), Kokoç, M., Akçapınar, G., & Hasnine, M. N. (2021), Al-Ahdal, A. A. M. H. (2020), Godwin-Jones, R. (2018)). On the part of tech producers and developers, AI-development companies have begun accelerating the pace at which they are developing game-changing solutions (see, particularly, Graesser A. C., Chipman P., Haynes B. C., Olney A. (2005), Junaidi, J., Hamuddin, B., Julita, K., Rahman, F., Rianita, D., & Derin, T. (2020), Lan Y.J., Spector M., Lockee B.B., Childress M.D. (2016) and Pikhart M. (2020). This has exacerbated the demand formore comprehensive digital solutions, that is, digital solutions catering to all major areas of education and learning, which, in turn, makes a thorough analysis of the various solutions that are currently available on the market, their effectiveness in different spheres of education and learning,and their prospects for further integration in the education sector extremely relevant. Looking intothe future of digitalisation in L2 education and learning, in his article, Warschauer, M. (2004), Mark Warschauer described the future of CALL as dependent on many various factors, primarilydevelopments in applied linguistics, changes affecting language learning and languages themselves, and sociological aspects of professional language learning.

Materials and Methods

This article will focus on L2 education and learning as applied to the Russian and Englishlanguages. In today's rapidly-changing world, many various factors are necessitating the development of digital solutions for L2 education in educational and learning institutions around the world. Among these are two primary ones:

1. the rise in the migration levels among traditionally linguistically-different countries andregions, and
2. the advent of the digital age and the rapid integration of digital solutions in education and learning in general.

To study the rise in the migration levels among traditionally linguistically-different countries and regions, it is important to consider current mobility and migration statistics for the past decade or so, with a particular emphasis on the Russian Federation.

The increasing mobility and migration of significant portions of the populations of many countries around the world has, in recent years, accentuated the importance of effective communication for both personal and professional purposes. In particular, recent years have witnessed the younger generation and the working-age group increasingly choosing to move to other parts of the world in search of greener pastures in terms of both educational and job opportunities. As such, in the destination countries, language competencies are increasingly playing an important role in the interaction of people of diverse backgrounds in educational and learning spaces. It has become more beneficial for young people to be multilingual rather than monolingual, as this means they are able to more effectively communicate with other people fromdifferent backgrounds.

Like many countries around the world, the Russian Federation has experienced a surge inits migration levels in the past decade.

Figure 1 below shows the total national and international migration in the

RussianFederation between 1990 and 2021 by flow.

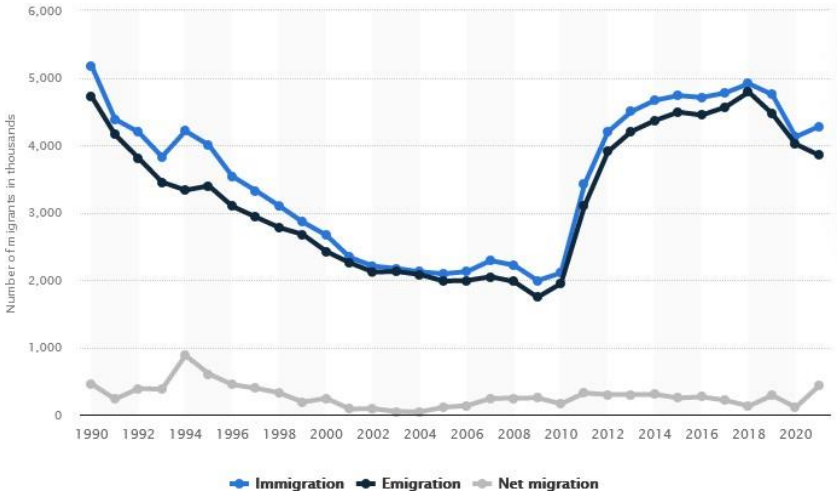

Fig. 1. Total national and international migration in the Russian Federationbetween 1990 and 2021 by flow [Source: Russian Federal State Statistics, Statista, 2022]

As is evidenced by the graph, the Russian Federation experienced a sharp increase in its immigration and emigration rates from the beginning of 2010 up to the end of 2019, which coincided with the beginning of the COVID-19 pandemic.

To give a clearer picture, it is important to look at the main countries from which these population groups are emigrating. These statistics are presented in Figure 2 below.

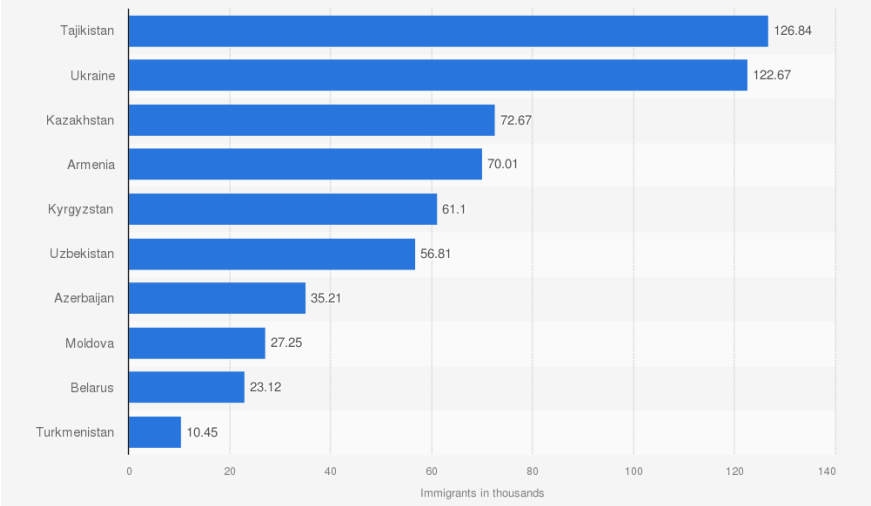

Fig. 2. Migrant population of Russia by country of origin, in 1,000 source: Russian Federal State Statistics, Statista, 2021]

The figure shows that the majority of immigrants coming into the Russian Federation originate from the former Soviet states mostly sharing borders with the country. As these states have their own languages, this necessitates a corresponding increase in the volume of L2 educationin the Russian language in Russia.

Globally, the bulk of the drive in the emigration of the working-age population groups is to OECD countries. Newly-qualified professionals from different backgrounds and speaking different languages are finding employment and emigrating to other countries speaking languagesthat they either know to a limited extent, or do not know at all. Data from the UN report (United Nations, Department of Economic and Social Affairs, Population Division (2017)) suggests that the majority of the migration occurs between neighboring states. However, between 2000 and 2017, the share of migrants born in Africa and Northern America living in a country outside of theregion in which they originated increased significantly. Their new destinations are often regions of different linguistic and dialectical variations, which, as in the case of the Russian Federation, all the more necessitates the modernization of L2 education tools and techniques.

Figure 3 below shows the number of international migrants classified by region of origin and destination as of 2017.

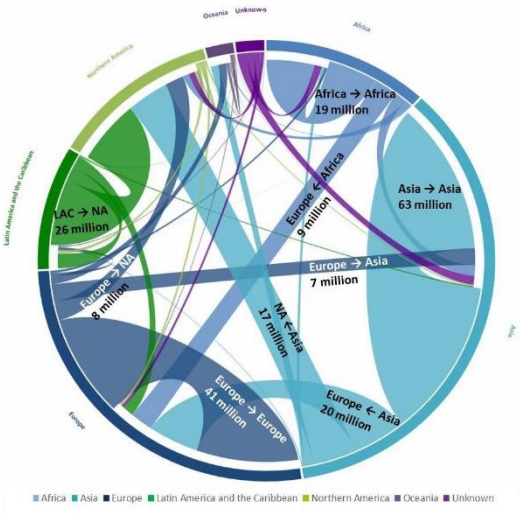

Fig. 3. Number of international migrants classified by region of origin and destination, 2017
[Source: United Nations (2017a)
Notes: NA refers to Northern America, LAC refers to Latin America and the Caribbean]

It is clear from the figure that the mobility of parts of the populations of various regions ofthe world has become acute. The diagram shows that the migration within the same geographicalregions remains high, with, for example, the migration within Africa at 19 million, Asia at 63million, and Europe at 41 million. Migration between different geographical regions has also beenon the rise, an example being the migration from Africa to Europe at 9 million, Europe to Asia at7 million, Asia to Europe at 20 million, Europe to Northern America at 8 million, Latin Americaand the Caribbean to Northern America at 26 million, and Asia to Northern America at 17 million.

All this increasing interaction between different cultures and groups of people means the need to learn second languages has also become acute. Since English has become the most widely-spoken language across the developed world, L2 education in the English language will be requiredto give the incoming groups of people the ability to fit in their new environments, be they workplaces, educational and learning institutions, or social environments

L2 education and learning in today's global society is complicated by a variety of factors.This has been further exacerbated by the COVID-19 pandemic, the measures to curb which have resulted in more acute difficulties in language learning among both children and adults (see Tai, T. Y., Chen, H. H. J., & Todd, G. (2022)). Important to note here is that human nature has alwaysdictated that proper language learning be based on physical social interaction. Against this background both in the pre-COVID-19 and post-COVID-19 periods, the linguistics sector, particularly tertiary learning institutions, has begun to rapidly adopt many various AI-based digital products and solutions that high-tech companies are developing and introducing to the market at an unprecedented scale.

The advent of computer- assisted and digital L2 learning / teaching has over the years led to the development of various specific methodologies:

1. Computer-Assisted Language Learning (CALL) describes an interactive L2 learning / teaching method through which learners are able to achieve their training objectives at their own pace and ability. CALL uses computer technology in teaching and learning procedures at all stages

– lecture presentation, practical work, and feedback. CALL became relevant due to more affordable prices of computer technology, which meant that more educational institutions could now afford to purchase and integrate the necessary tools and services.

Table 1 below presents some of the more widely-used CALL resources.

Table 1. Some of the more widely-used CALL resources [Source: NCELP]

Resource	Description	Cost	Dashboard / Monitoring	Vocab Lists	Platform	Additional Notes
Quizlet www.quizlet.com	Mobile and web-based study application that allows students to study information via learning tools and games. Quizlet trains students via digital flashcards and various games and tests based upon sets of terms and definitions.	Free version £ Quizlet Go £ Quizlet Plus £ Quizlet Teacher - £36/year	Yes (£ version)	Extensive lists already created by community for textbooks, exam boards & topics. User-defined & can be copied and edited from existing sets.	Web, iOS, Android	Students now need (free) account to access sets. Easy swapping of term and definition (L1-L2, L2-L1). Accompanied with machine automated audio pronunciation. Scaffolded learning sequence. Easy, automated creation of hard copy flashcard, test, vocabulary lists. Teacher version ad-free and allows class creation. Images can now be added. Quizlet Live game feature.
MEMRISE www.memrise.com	Mobile and web-based language learning platform which uses flashcards as memory aids, but also offers user-generated content. Includes community created "courses".	Free version £ Pro - £99 lifetime, £45/year	Yes, through courses	Extensive lists already created by community for textbooks, exam boards & topics. User-defined & can be collated into courses.	Web, iOS, Android	Similar to Quizlet with a greater emphasis on language learning "courses". Students need login to access. Chatbots to help you in real world situations on selected languages. Coming Soon: Grammarbot, video library, Pro Chats.
duolingo www.duolingo.com www.schools.duolingo.com	Mobile and web-based language learning platform based around sentence level translation. Strong course/gamification/recycling structure. Variety of translation, reading, listening and speaking activities. Clean interface.	Free	Yes, through schools.duolingo	Topic or grammar point based – fixed.	Web, iOS, Android, Windows	Students need login to access. www.schools.duolingo.com allows easy creation of classes and assignment of specific topics/grammar points or an amount of work to complete with each student working at their own level. Duolingo Chatbots and Stories now offer better-contextualised language. Includes some say aloud tasks on mobile version (Duolingo determines task types). Includes proficiency test.
www.languagesonline.org.uk	Extensive collection of free activities based around topics, vocabulary grammar and some textbooks (Encore, Caminos, Logo). Match-up, gap fill, dialogue ordering, listening, games	Free	No	Topic or grammar point based – fixed. Includes links to Quizlet sets.	Web	Beginner – A2 resources. Useful for directing students to grammar point work. Includes grammar point explanations.
textivate www.textivate.com	Textivate generates a wide range of interactive activities based on your own text and / or matching items. It works with texts of up to 500 words and / or up to 200 matching items.	Free (only access others' resources) £ Premium - £50/year	Yes (£ version)	User defined	Web	Good tool for automatically recycling language in various activity formats. No audio.
Pronounce Live (Sanako) www.pronouncelive.com	Pronounce Live is a web application for pronunciation practice. You can listen to authentic speech models read any text or words, record your own voice for comparison and receive immediate feedback.	Free trial 2 weeks £ subscription TBC	Yes	User defined	Web, iOS, Android	Strong potential for practising symbol-sound relationships on user-defined content. Instant student feedback on pronunciation.

Call has offered several benefits in Russian and English language learning and teaching,including that it:

- enriches the language-learning experience;
- serves as an interface connecting a learning institution to the outside world;
- bridges purely academic and theoretical concepts with the practical

needs of the outside world;

- functions as a 'surrogate instructor;
- facilitates collaborative and cooperative learning;
- is highly adaptive for performing repetitive tasks;
- provides fully reliable feedback;
- offers a realistic medium (for example, combining listening activities with visuals);
- is the perfect tool for integrating reading, writing, speaking and listening skills;
- offers various appropriate learning approaches;
- serves as a ready-reckoner for all language learning / teaching queries (see Kumar, E., & Sreehari, P. (2009), Warschauer, M. (2004)). Figure 4 below shows an interactive scheme of CALL.

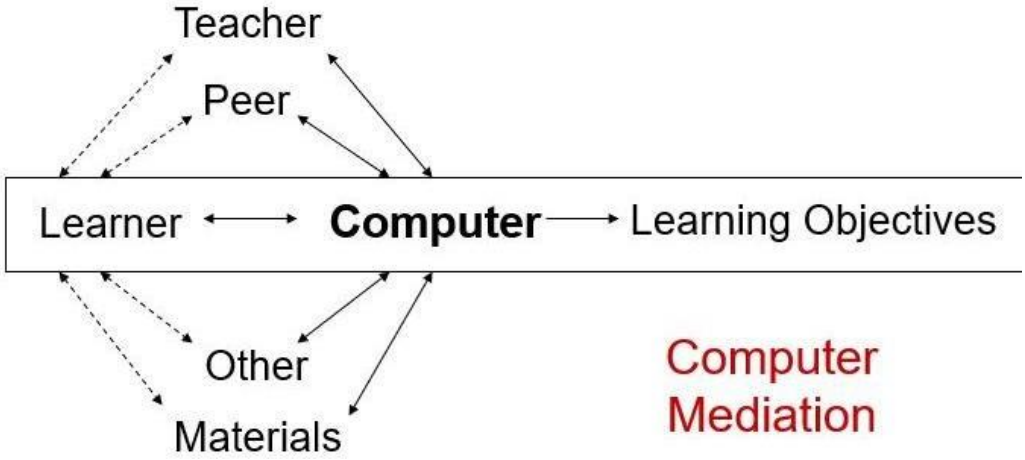

Fig. 4. CALL interactive scheme [Source: Levy & Hubbard (2005)

As the above diagram shows, in CALL, L2 learners use the computer to interact with peers,teachers, and learning tools and materials broadly to achieve set learning outcomes.

CALL has been the dominant L2 teaching / learning method for the past 30 or so years when computer innovation reached its peak. However, even as many

of the methods used by CALL earlier are still widely adopted as the standard language teaching / learning methods today (examples are gap-filling/cloze tests, multiple choices, flashcards, and sentence reordering, both in L2 classrooms and on the web), fundamental differences have begun to emerge between the earlier CALL-based solutions and today's highly interactive, web-based, app-based, and mobile- enabled DLL methods (Li, P., & Lan, Y. (2022)).

2. Digital Language Learning (DLL) refers to language learning platforms and tools that employ digital technologies or technological enhancements. In this context, DLL may also refer to language learning practices that use digital platforms and tools. Theoretically, DLL is meant to assist in identifying the differences between elementary language and adult L2 language learning, and how the learning context and characteristics of the learner contribute to these differences. DLL-based language pedagogies can use practical examples derived from analysing learner behaviours, cognitive and affective processing, and neural correlates. The fact that DLL is present in a wide variety of disciplines can be instrumental in the integration of cognitive, social, affective, and neural dimensions of L2 learning with new and emerging technologies, primarily VR, AI, andbig data analytics (Li, P., & Lan, Y. (2022)).

The recent years characterized by a rapid and widespread shift from computer-based to digital-based technologies have witnessed a shift from CALL to the adoption of DLL in L2 learning / teaching. One critical skill that employers are looking for in the 21-century is for someone to be able to use a language effectively for all forms and interaction and communication.

The evolution of technologies that are employed for learning and teaching languages in line with the general trends in education can clearly be seen by analysing how the time is allocated to suit specific theoretical foundations, applied technologies, and trends in the educational sector. As outlined by

Warschauer (see Warschauer, M. (2004)), the 1970s and 1980s were peculiar in that the behaviourist paradigm was prevalent across the entire CALL field; in that time, the interactionbetween the computer and the learner took the form of a stimulus-response relationship. In the 1980s and 1990s, behaviourism, which had dominated language teaching, was superseded by the cognitive approach; be that as it may, as Gardner stated (Gardner, 1984), the actual paradigm shift from behaviourism to cognitivism occurred two decades earlier. This period was marked by an emphasis on communicative exercises. Language learning and grammar, which had earlier been characteristic of the educational process, was superseded by fluency, which became the major focus in language learning. During this period, many educators began extensively employing CALL software and language games. The 2000s came to be characterised by an authentic cohesion between learning and social interaction as two mutually-sustaining approaches (Al-Ahdal, A. A. M. H. (2020)) and the increasing popularity of social media and multimedia technologies (Mayer,R. E. (2005)).

In an interesting development, in the 2010s, Chun (Chun, 2019) expanded the framework laid out in Warschauer's perspective (Warschauer, Fotos and Brown, 2004) by adding seamless digital technologies and other technologies with extended language learning spaces to DLL, thus blurring the boundary between formal and informal learning. Learning has become a part of its environment, a fact that facilitates e-learning, multimedia learning, and blended learning with heavy reliance on ubiquitous computing, mobile apps, and wearable devices. Such technological advances have greatly promoted multimedia and multimodal learning in all subject areas, and in the last year due to the pandemic, the pace of development has been further accelerated.

DLL has been rapidly developing in the past 5 years. Major advancements have been achieved in Mobile-Assisted Language Learning (MALL), virtual reality

(VR), and digital game-based language learning (GBLL).

Mobile-Assisted Language Learning (MALL)

Mobile-Assisted Language Learning (MALL) is similar to CALL, with the only difference that MALL uses a handheld mobile device instead of computer technology. MALL provides second-language learners with the following:

- a ubiquitous language teaching / learning approach;
- possibility of receiving immediate feedback;
- independent and targeted language learning practice.

The benefits of MALL for second-language learners is that besides basic language and communication skills, it provides them with a set of other specific skills that are vital especially intoday's digital world. These skills include social interactivity, context awareness, connectivity, individuality, and immediacy. MALL also encourages new learning methods, as it highlights continuity or spontaneity of access and interaction across different contexts of use.

MALL has increased in popularity with the rapid adoption of mobile devices such as smartphones, tablets, and smartwatches that have successfully redefined the way in which language learning / teaching is conducted. Mobile devices are breaking the boundaries of traditional learning / teaching methods by providing access anywhere and anytime. More importantly, MALL gives the learner the opportunity to master a new language in the real-life context. According to Lai and Zheng (Lai and Zheng, 2018), three key features distinguish MALL as an important language learning / teaching methodology: personalization, authenticity, and connectivity. Tu, Zou and Zhang (Tu, Zou and Zhang, 2020) then later expanded on these and alsoidentified portability, real-time interaction, and situated learning. Some of the most commonly used MALL products and services include commercial products such as *Google Translate*, whichprovides camera photo translation services. Companies like *Instagram* and *WhatsApp* give social

networking groups the opportunity to conduct L2 learning / teaching and interact with native speakers online.

Game-Based Language Learning (GBLL)

The majority of young people, sometimes called the "smartphone generation", are die-hardgame fanatics. As such, recent years have witnessed a marked increase in research on how games could be used for education, particularly L2 learning / teaching. It is against this background that game-based language learning (GBLL) has become popular in recent years and continues gainingmomentum as a viable and scalable solution (Mayer, 2016). GBLL games are designed to be highly engaging and beneficial, structured strictly according to educational objectives and goals. The majority (90%+) of the research on GBLL has thus far focused on English L2 learning / teachingand has employed video games and immersive gaming platforms.

GBLL has specific characteristics for learners.

Figure 5 below shows the positive correlations between learners' motivation, self-efficacy, and autonomy, and their implementations of game-based language learning and self-regulated language learning.

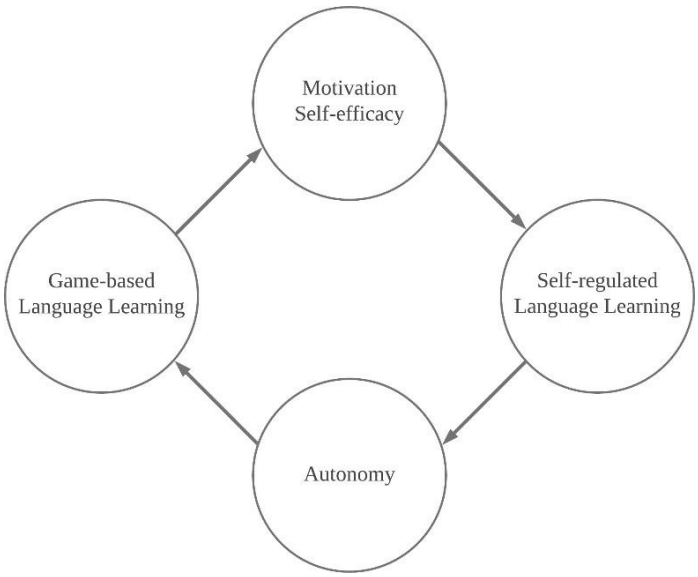

Fig. 5. Positive correlations between learners' characteristics, and their implementations of GBLL

As is clear from the diagram, learners' motivation and self-efficacy encourage self- regulated language learning.

Virtual Reality (VR)

The education sphere, particularly L2 learning / teaching, is increasingly employing virtualreality (VR) technologies for a better experience. VR refers to a wide range of high-tech virtual environments and products that include dynamic 3D displays projected on computer monitors (desktop or tablet virtual environments; VE); on large screens/walls in amphitheatres, rooms, or specialised cubicles outfitted for 3D images (e.g., CAVE systems); on head-mounted displays (HMD); through devices that show digital image enhancements ('augmented reality' or AR); andthrough a blend of virtual and real-world objects projected onto HMDs ('mixed reality' or MR). This broad range of VE, VR, AR, and MR vary in immersion (e.g., 360-degree views vs. limited wide-angle views), interactivity (extent of action and movement), social presence (whether there is feeling of being there), and ultimately realism (how realistically VR simulates the real world).

There are two types of VR (Robertson, Card & Mackinlay, 1993): immersive VR (iVR) and non-immersive VR. Both types are for creating authentic environments to enable learning through active and self-exploratory discovery in the virtual environments (Dede, ReferenceDede2009).

The above game-changing shifts in the area of language learning that happened over the past few decades clearly show that DLL will continue concentrating on the development and adoption of new approaches. Today, every part of our lives is now relying on big data and AI one

way or another. Education is one sector that is set to immensely benefit from the advantages brought about by AI technologies (see Godwin-Jones, R. (2018)), of which language learning is amajor part. AI and language apps are now being widely used to analyse different types of errors inthe work of L2 learners

(Graesser A. C., Chipman P., Haynes B. C., Olney A. (2005)) and provideinstant feedback on correct grammar and hints on best writing, and there are many other examplesof how AI and big data have become a bedrock of L2 language learning in recent years.

Results and Discussion

The analysis carried out in this work revealed a number of interesting trends. Firstly, whilethe use of CALL has continued even to the present day, the majority of organizations have fully embraced DLL technologies as the standard technologies for L2 education and learning. Secondly,increasing mobility across the world, particularly from former Soviet states to the RussianFederation and from former colonies to English-speaking countries, has necessitated a further needfor the adoption of more advanced technologies for teaching and learning both the Russian languages and English. Against this background and realising this rising demand, AI-developers have begun developing more advanced digital technologies based on both the older CALL and the currently-trending DLL technologies. This is making L2 education more technology-focused andhighly interactive. However, the article revealed the apparent shortcomings of these developments, including the lack of accessibility and the rather slow pace of development.

Conclusion

The rapid development of digitalization and AI has led to the rise in the development and adoption of many various language learning technologies, tools, and solutions particularly for English L2. DLL has been proven to be an important approach that many educational institutions,industries, and various organizations have begun utilizing. The basis for the development of DLL,primarily starting from CALL, was analyses. The DLL solutions that are currently available on the world market have been identified, while the prospects for their further

development and the rise of other products and solutions were investigated. It is therefore possible to conclude that DLL is here to stay, and against these backgrounds, educational institutions, businesses, and industriesin general must begin concerting their efforts in harnessing the benefits of DLL. Further, there is a need for a cohesive approach in which businesses and industries must work with educational institutions to train better equipped professionals ready for a global approach to business characterized by a multilingual operating environment.

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СОВРЕМЕННЫЕ ЦИФРОВЫЕ РЕШЕНИЯ ДЛЯ ИНОЯЗЫЧНОГО ОБРАЗОВАНИЯ И ИХ ПЕРСПЕКТИВЫ

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Аннотация. В этой статье рассматриваются современные решения, которые в настоящее время внедряются в цифровизацию иноязычного образования в мире в целом, с особым акцентом на английский язык, и в России, в частности, с особым акцентом на русский язык. Сначала в статье обсуждаются два фактора, которые в основном обусловливают необходимость разработки цифровых решений в сфере иноязычного образования, а именно растущая мобильность населения, уровни миграции и быстрое развитие цифровых решений, и их внедрение в различных секторах в последнее десятилетие. В статье показано, почему рост мобильности населения и уровней миграции в мире, наряду с продвижением цифровых решений в более широком образовательном пространстве, за последние два десятилетия двадцать первого века обусловили необходимость разработки и внедрения цифровых решений для иноязычного образования и обучения. Исходя из этого, в статье проводится конкретный анализ всплеска разработки, внедрения и внедрения цифровых решений в иноязычное образовании, а также перспектив дальнейших достижений в этой области, в частности, исследование различных предлагаемых новых цифровых продуктов и решений, меняющих правила игры на рынке иноязычного образования образовательными учреждениями высшего образования с последующим исследованием их эффективности, недостатков и областей, в которых они могли бы быть улучшены в этой области. Кроме того, проводится исследование все более сложных требований к лингвистическим навыкам среди специалистов, работающих в различных отраслях промышленности в Российской Федерации и по всему миру, которые связаны с растущей потребностью в создании рабочей силы, обладающей необходимыми навыками и ноу-хау для внедрения цифровых решений в иноязычное образование, а также о том, как различные экономические структуры повысили спрос на эти компетенции на фоне стремительной глобализации промышленности и торговли в целом.

Ключевые слова: *мобильность населения, миграция, цифровизация, цифровые решения, искусственный интеллект, языковое обучение, инновации, технологическое развитие, иноязычное образование, обучение иностранным языкам*.

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