

L2 EDUCATION IN THE DIGITAL ERA: POST-PANDEMIC PROSPECTS

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Abstract. This article considers the general rise in the digitalization of second language (L2) education in the world in general and in Russia in particular. A concrete study of the various novel game-changing digital products and solutions being offered on the L2 education market is made, followed by an analysis of their effectiveness and impact on this market. A special emphasis is made on the impact of the COVID-19 pandemic on the acceleration of the development and adoption of digital products and solutions in L2 education and training, together with the prospects for further advancements in the field. Further, an investigation is conducted on the increasingly complex requirements for linguistic skills among professionals working in various industries in the Russian Federation and across the world, and 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: *digitalization, COVID-19 pandemic, language training, innovation, technological development, L2.*

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Introduction

Digitalisation has radically transformed all sectors of the global economy, from production to service provision. 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. Educational institutions have begun successfully adopting many digital language teaching and learning techniques in their programmes. This has exacerbated the demand for more comprehensive digital solutions, thus making a thorough analysis of the various solutions currently available on the market, their effectiveness in different spheres, and their prospects for further integration in the education sector necessary and apt.

Overview and theoretical foundations







The challenges of today's global society are increasingly becoming difficult to solve due to the lack of effective communication across multiple languages. 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 [17]. Important to note here is that human nature has always dictated 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, have 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
 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.
 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.
 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.languageonline.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.
 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.
 [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 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 repetitious 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 [16].

Figure 1 below shows an interactive scheme of CALL.

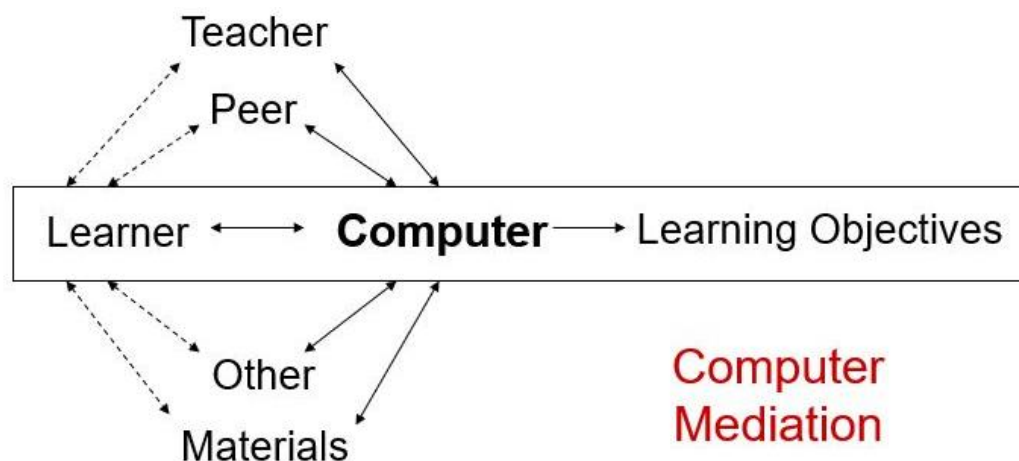


Figure 1 – CALL interactive scheme [Source: Levy & Hubbard (2005)]

It is clear from the diagram that in CALL, the L2 learner uses 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 [6].

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 provide a platform for understanding differences between child language and adult L2 learning, and the effects of learning context and learner characteristics. Practically, findings from learner behaviours, cognitive and affective processing, and brain correlates can inform DLL-based language pedagogies. Because of its highly interdisciplinary nature, DLL can serve as an approach to integrate cognitive, social, affective, and neural dimensions of L2 learning with new and emerging technologies including VR, AI, and big data analytics [1].

The recent years characterised 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. The ability to use a language effectively for communication and social interaction has become a critical skill for the 21-century. Shifts in the application of technology for language learning and teaching that follow the general trends in education can be observed in terms of different emphases and focuses of the time based on different theoretical foundations, technological development, and educational paradigms. As outlined by Warschauer [18], between the 1970s and the 1980s, the behaviourist paradigm had dominated language learning and computer-assisted teaching – that is, the entire CALL field; during this period, the computer-learner were treated in a stimulus-response relationship due to behaviourism, and drill-and-practice remained the main method. The cognitive approach rejected

behaviourism for language learning in the 1980s and the 1990s, although the actual paradigm shift from behaviourism to cognitivism occurred two decades earlier (Gardner, 1984). During this period, communicative exercises were emphasized, and fluency, rather than language analyses and grammar, was the major focus of language teaching. CALL software and language games also began to flourish during this period. Next, in the 2000s, the authentic context of learning and social interaction was highlighted [2] and social-cognitive dimensions of learning shed light on language education and research. These developments also grew alongside the increasing popularity of social media and multimedia technologies (e.g., videos that can incorporate text, graphics, audio, and animations; Mayer [9]).

Based on Warschauer's (Warschauer, Fotos and Brown, 2004) perspective, Chun (Chun, 2019) expanded the framework by adding to the focus of DLL in the 2010s seamless digital technologies, technologies that have extended language learning spaces and blurred the boundaries of formal and informal learning. Learning is no longer isolated from the environment; instead, it is embedded in the context in which authentic learning takes place. This development goes hand-in-hand with today's focus on e-learning, blended learning, and multimedia learning, aided significantly by 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.

Considering these paradigm shifts for language learning in the past decades, it is possible to predict that DLL in the later part of the 21st century will continue focusing on the development and adoption of new approaches. Already now, big data and AI are impacting every aspect of our lives and our society, from the environment (energy, climate, ecosystem, space) to human behaviour (aging,

health, education). AI technologies, such as machine learning, automatic speech recognition, and natural language processing (NLP), no doubt also have profound implications for education [8]. Language learning is no exception in this regard. There has been an unprecedented increase in the integration of AI and language applications: for example, mobile apps with image recognition and NLP turn the real world into a language learning setting; automatic evaluation systems analyse the errors in L2 learners' writings [1] and provide instant feedback on correct grammar and hints on best writing; the combination of VR and intelligent agents creates immersive and authentic contexts allowing language learners to have social interaction in real-life like situations (e.g., Nicolaidou, Pissas & Boglou [10]); and virtual agents through interactive dialogues can enhance learners' language performance (e.g., Graesser, Chipman, Haynes & Olney, [4]; Junaidi, Hamuddin, Julita, Rahman & Derin, [5]; Tai & Chen, [17]); these are only a few of the many examples in recent years.

To truly take advantage of the available AI technologies, there is also need to make use of the big data readily available during language learning, along with the relevant data analytic tools. For example, in a smart learning environment, the entire learning process can be logged on a key-stroke or step-wise level, and the learner data can be automatically analysed and visualized. Based on such analytic results, a personalized learning plan can be recommended and the learning materials that fit individual learning profiles can be appropriately provided (Kokoç, Akçapınar & Hasnine [6]; Yang, Chen & Ogata, [19]). Better still, such personalized feedback can be provided in real time, providing instant information to allow learners to adjust their pace as they learn, to see their up-to-the-point achievements, weaknesses, and learning behaviour patterns. For the learner, learning opportunities are available anywhere and anytime (Pikhart, [12]); for the educator and researcher, making use of the data generated in such

environments would guide the design and implementation of precise and personalized education (Godwin-Jones, [3]; Lan, [7]; Yang, [19]).

Results and discussion: Novel DLL solutions for the 21st century

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).

1. 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 in today'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 [11].

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 also identified portability, real-time interaction, and situated learning. Some of the most commonly used MALL products and services include commercial products such as *Google Translate*, which provides 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.

2. Virtual Reality (VR)

The education sphere, particularly L2 learning / teaching, is increasingly employing virtual reality (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 specialized 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); and through 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, Reference Dede2009).

As VR becomes more accessible and portable, more computational resources and tools are also available (e.g., Turbosquid 3D models and Unity

development tools), which enables educators to develop real-life like environments more easily (e.g., garden, kitchen, library, MTR station, school, shopping mall, street, supermarket, and zoo). However, there remain several limitations of current VR-based applications for L2 learning: (a) sample sizes are small in most studies, limiting the generalizability of findings; (b) descriptive results, rather than statistically tested findings, are usually reported (Wang, Lan, Tseng, Lin & Kao, 2020); (c) popular VR applications (and DLL tools in general) such as House of Language VR (Oculus Gear) remain limited in their scope of coverage and number of languages; (d) most of the popular VR headsets (e.g., HTC Vive) remain bulky, and may be unsuitable for younger users. These limitations, we believe, can be overcome in future large-scale studies with future technological developments that make VR more portable and easier to use.

3. Game-Based Language Learning (GBLL)

The majority of young people, sometimes called the “smartphone generation”, are die-hard game 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 gaining momentum as a viable and scalable solution (Mayer, 2016). GBLL games are designed to be highly engaging and beneficial, structured strictly according educational objectives and goals. The majority (90%+) of the research on GBLL has thus far focused on English L2 learning / teaching and has employed video games and immersive gaming platforms.

GBLL has specific characteristics for learners. Figure 2 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.

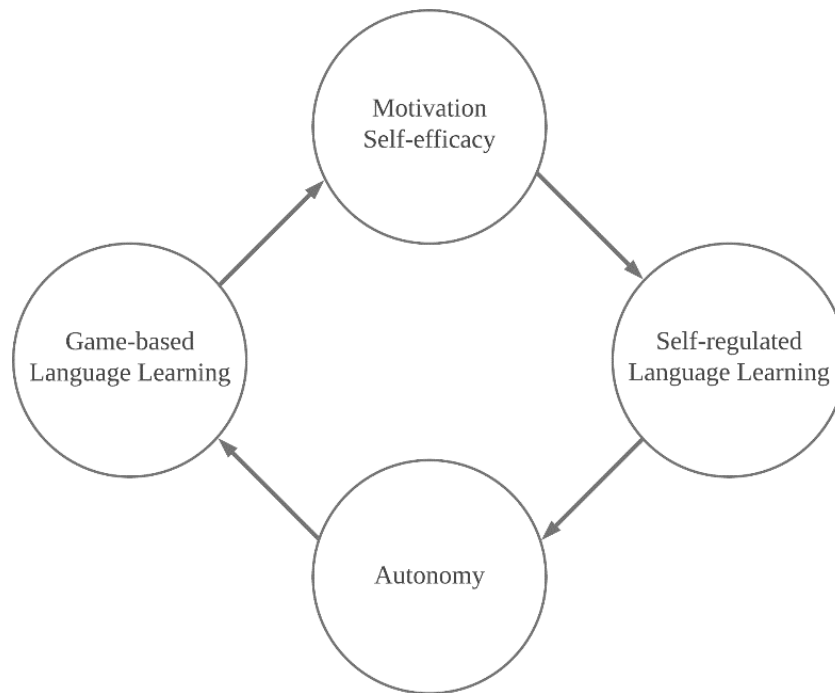


Figure 2 – Positive correlations between learners' characteristics, and their implementations of GBLL [Source: <https://doi.org/10.1371/journal.pone.0243827.g005>]

Conclusion

The rapid development of digitalisation 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 organisations have begun utilising. The basis for the development of DLL, primarily starting from CALL, was analysed. 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 industries in general must begin concerting their efforts in harnessing the benefits of DLL. Further, there is 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 characterised by a multi-lingual operating environment.

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