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Research paper



Technology-enhanced language learning: Recent developments and what to expect next

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Abstract

One of the key characteristics that are expected from a contemporary instructor is being able to creatively implement innovation in his/her day-to-day teaching activities. An example of such innovative approaches to teaching is the integrated teaching of, for instance, STEM subjects with foreign languages (FL). The latter can be successfully achieved via technology-enhanced learning (TEL) approach. Currently, there are numerous apps and platforms available or still being developed for teaching STEM subjects, which could be combined with learning FLs in order to ensure successful learning outcomes even more. However, the full educational potential of TEL tools for teaching FLs should be investigated and disclosed beforehand. To this end, the present paper provides an overview of the most recent developments in technology-enhanced language learning (TELL). It firstly surveys state-of-the art and then gives an insight into what to expect from the near future studies on TELL.

Keywords: *Technology-enhanced language learning; foreign language; innovative education; state-of-the-art.*

1. Introduction

1.1. The changing teaching and learning contexts

It is no secret that in their day-to-day practice, educators creatively combine a variety of teaching methods and instruments. An example of such activities is integrated foreign language teaching/learning. It occurs when while teaching a foreign language, teachers also tackle a variety of topics related to, e.g., science, technology, engineering, or mathematics (STEM). Previous studies emphasize that such interdisciplinary approach to teaching is plausible and indeed necessary in educating the contemporary society [20].

The present society lives in the times when cutting edge technologies are being developed on a daily basis. It is only natural that the teaching and learning process cannot lag behind. Therefore, various types of technologies, especially Information and Communication Technologies (ICT), are specifically devised to be utilized in teaching and learning processes. Existing technologies are also adapted in different teaching and learning contexts. That is not to forget that teachers themselves develop technologies, too. The aforementioned circumstances are the reason behind why such terms as 'technology-enhanced', 'technology-assisted', 'technology-enriched', 'technology-based', 'technology-supported', or 'technology-mediated' teaching and learning appear. Even though it is important to keep up with the changing world and introduce technologies into the classrooms, their full educational potential and possibilities (e.g. in integrating foreign languages and STEM disciplines) are yet to be discovered. This paper supports the view that it is first important to understand what makes a certain technology or method work efficiently, only then can it be employed in another context or with another subject.

One of the areas where a lot of scientific effort is currently being invested in is technology-enhanced language teaching and learning (TELL). The current paper provides an overview of the most recently published investigations on technology-enhanced foreign language learning and reports on the following findings: (a) target language and specific skills, (b) technology used for teaching/learning, (c) tools for gathering data, (d) samples and their characteristics, (e) key findings, and (f) directions for future studies.

1.2. The purpose of the investigation

In essence, the goal of this paper is twofold. It firstly aims to give an overview of the current research on technology-enhanced language teaching/learning. More precisely, it focuses on scientific papers that were published in 2017 and seek to disclose how by using certain technologies language learners obtain more knowledge and desired skills. Then, based on the suggestions provided by the authors of the papers, it suggests what is yet to possibly come in the future research on how technologies in language learning can make the process really effective.

1.3. The structure of the paper

The paper is structured as follows: Section 2 provides a brief theoretical explanation of technology-enhanced language learning and STEM education, Section 3 explains how data were collected, Section 4 elaborates on and discusses the main findings, and Section 5 draws the conclusion.

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2. Literature overview

2.1. Technology-enhanced language learning and STEM

As was previously noted, there are quite a few terms when it comes to defining the phenomenon when such technologies as ICT are used in the context of teaching and learning languages. The present investigation supports scholars who claim that the term 'technology-enhanced teaching/learning' is the broadest one and encompasses the rest. To be more specific, technology-enhanced language teaching and learning is understood as a form of teaching/learning adapted (i) to be accessed in a distance, electronic, virtual or another way, by employing technologies, (ii) to organize teaching/learning, (iii) to interact, and (iv) carry out other teaching/learning-related actions in an online environment [28].

One of the goals of foreign language instruction is to provide students with a possibility to learn in authentic environments. When physically travelling to the target language country is not an option, it can be achieved by means of technology. A lot of scientific endeavor has been directed at this specific aim. For example, scientists have found a means for students to learn and practice a variety of subjects in an enticing, motivating, and fun way – gamification [2].

Technologies are also present in teaching STEM subjects (i.e. science, technology, engineering, and mathematics). More importantly, it is claimed that one of the biggest advantages of STEM is that it provides real-world context [9]. In addition, studies on STEM integration in the everyday teaching and learning processes indicate that students find it motivating [9]. It is important to note that the reflection of real world practices and motivation are very important features that both, language teaching/learning and STEM have in common. The current paper suggests that technology-enhanced STEM teaching/learning could be combined to achieve even better learning outcome as well as to motivate and engage students. However, to try this in practice, it is vital to study the most effective aspects of both first.

3. Method

3.1. The selection of data sources

Following the framework proposed in [7], the current paper analyses relevant papers from 10 scientific journals that according to Google Scholar Metrics have top publications in the category of Educational Technology. Google Scholar lists 20 such scientific journals in total. All available journals were inspected by looking for papers that were published in 2017 and had the keywords 'technology-enhanced learning' and 'language learning' in them. To make sure that not a single paper that would be of importance for the overview is lost, the researcher also went through all the issues of the 20 scientific journals manually. For the final overview, a total of 28 scientific papers was chosen from the subsequent journals: (i) Computers and Education, (ii) British Journal of Educational Technology, (iii) The International Review of Research in Open and Distributed Learning, (iv) Journal of Computer Assisted Learning, (v) Educational Technology Research and Development, (vi) Language Learning and Technology, (vii) TOJET: The Turkish Online Journal of Educational Technology, (viii) IEEE Transactions on Learning Technologies, (ix) Journal of Educational Computing Research, and (x) Education and Information Technologies.

At first, more than 28 publications on technology-enhanced language learning were found. However, the current overview only includes papers that meet the following criteria: (a) were published in 2017, (b) present research as opposed to state-of-the-art overviews, book reviews, and likewise, (c) deal with foreign language teaching/learning as opposed to native language teaching/learning, and (d) report on successful learning outcomes as opposed to solely measuring attitudes or assessing the ability to use previous knowledge.

3.2. Data analysis

The selected papers are analysed by employing content analysis. According to [7], such approach enables the researcher to produce a comprehensive portrayal of certain phenomena, which is achieved through categorization of the identified concepts. The forthcoming sections categorize and discuss the findings by drawing on the aforementioned approach.

4. Findings and discussion

4.1. Target languages and particular skills

The results of the present survey indicate that 23 studies out of 28 selected focus on teaching/learning English. The remaining target languages are German, Spanish, Malay, Chinese, and Korean. The fact that English is the top taught and learnt language comes as no surprise, but it is rather alarming that there are so few other foreign languages that are instructed by employing technologies. It should also be noted that the studies were mostly carried out in Asian countries (e.g. Taiwan, China, South Korea, and Malaysia) as well as Turkey, Greece, and Cyprus. The five languages other than English were taught in South Korea, USA, and Canada. As the majority of experiments took place in Asian countries, the results should be evaluated cautiously as they are not necessarily applicable to, e.g., the European context.

Table 1: Target languages, their skills, and the number of papers that address them

SKILLS						
Vocabulary acquisition	Writing	Listening	Speaking	Pronunciation	Reading	Unspecified
TARGET LANGUAGE: English						
13	6	5	3	1	1	1
TARGET LANGUAGE: German						
22						
TARGET LANGUAGE: Spanish						
					1	
TARGET LANGUAGE: Malay						
1	1					
TARGET LANGUAGE: Chinese						
	1					
TARGET LANGUAGE: Korean						
	1				1	

The majority of the studies address vocabulary learning (Table 1). This is also evident if one looks at the most common keywords present in the titles of the selected papers (Fig.1.). One can see that the keywords 'English' and 'EFL' (i.e. English as a Foreign Language) are among the largest items, which indicates that they also belong to those that appear most frequently. Other foreign languages are underrepresented, but one can also notice that other language skills are also rather prominent.

The fact that vocabulary is the most commonly investigated element of a given foreign language is not difficult to explain. Vocabulary is the key element that affects other language-related skills, i.e. speaking as well as listening and reading comprehension [18]. Nevertheless, not all of the papers specify what type of vocabulary that is, i.e. whether it is verbs, nouns, adverbs, or other types of lexis.



Fig.1: A word cloud (produced at wordsift.org) that indicates the most common keywords in the titles of the papers under investigation (the larger the word, the more common)

4.2. Tools and devices used for increasing students' skills

It can be once again claimed that foreign language instructors have to be really creative in their job. Some of them are so tech-savvy that they go as far as creating and developing their own apps and platforms that their students can use for acquiring new skills and knowledge. The surveyed studies confirm the aforementioned claims. The majority of the tools used are developed by instructors themselves (e.g., [4], [5] or in collaboration with other specialists). Most of the tools are designed to be accessed on a PC. There are fewer tools that are designed for mobile. This does not come as a huge surprise bearing in mind the context in which the investigations were carried out (the instructor cannot hope that everyone owns a smart phone with the necessary software). Some of the experiments were based on using already existing platforms, such as social media (e.g. WhatsApp), wikis, vine, video games, concordancers, and annotation tools (see Table 2).

Some studies also focus on using different types of technology when they are combined with non-traditional teaching/learning methods, such as flipped learning (e.g. [1]). With more research and experiments, this also suggests good results for integrating technology-enhanced foreign language teaching/learning into STEM or vice versa.

4.3. The tools used for gathering data

To support and validate findings, studies rely on multiple types of data sources. The vast majority of the studies under investigation are based on triangulation of methods and data sources. They mostly use a mixture of both, qualitative and quantitative methods, and combine a quasi experiment (pre- and posttests to assess the possessed language skills) with questionnaire or interview data (to obtain feedback on the media used, self-reported learning outcomes, autonomy, attitudes, and likewise). More importantly, the experiments were carried out and data were gathered in periods that vary from a couple of weeks to a semester. Thus, none of the studies provide insight on long-term results of technology-enhanced language learning. This suggests that the results must therefore be interpreted with caution.

4.4. Samples and their characteristics

The participants that took part in the surveyed investigations can be categorized into two major groups, namely, pupils and students. Some studies indicate the exact age of their participants, whereas others only note the average age. Therefore, it can be only approximately estimated that the youngest pupils that experienced technology-based foreign language instruction were nine years old on average. Nevertheless, the majority of studies carried out on pupils seem to focus on individuals who are 15-17 years old. When it comes to university level students, most of the investigations are conducted on the youngest segment, i.e. students who are around 18-20 years old on average. The oldest participant is reported to be 58 years old. However, there is only one study that includes participants of such age [24]. Even though the market for learning foreign languages is considerably vast and there are numerous adults who want or have to learn languages, no studies on these specific age groups were found. There were no investigations on how various types of technology are being used to teach languages to the elderly either.

Table 2: The technology-enhanced tools used

Author(s)	The tool(s) used
[1]	Edmodo
[3]	WhatsApp
[4]	Educational game "The Conference Interpreter"
[5]	Mobile app
[6]	PDA with a GPS sensor
[8]	Jigsaw tasks on slides
[10]	Google Docs, Glogster, NaturalReader
[11]	OpenSimulator Project-CLILiOP
[12]	The Content Management System
[13]	Augmented Reality game
[14]	Computer game
[15]	Vine
[16]	e-glosses
[17]	e-book
[18]	My English Vocabulary Assistant mobile edition MyEVA Mobile
[19]	e-book
[21]	Video game World of Warcraft
[22]	Mobile PC learning system
[23]	Mobile learning system
[24]	e-portfolio
[25]	Personal response system EnClicker
[26]	Analytical Writing Discussion Forum
[27]	Online discussion forum eLearn
[29]	Digital annotation tool Hylighter
[30]	Happy English Learning System
[31]	Context-aware technologies on PC
[32]	Augmented Reality
[33]	Clickers

The majority of the studies include participants of both sexes. However, only a couple of the investigations have an almost equal number of males and females. This does not come as a surprise because all of the studies employ convenient sampling. That is, individuals who give foreign language instruction, carry out experiments on their own students in order to see what can be improved. On the one hand, having a convenient sample ensures easier access and possibility to have follow-up interviews for clarification, if needed. On the other hand, not having a balance between the sexes results in researcher not being able to disclose any differences between how or whether male and female students acquired the addressed set of skills in comparison to the opposite sex.

Furthermore, there are cases when students are chosen specifically because they exhibited more interest in the course and participated more actively (e.g. [29]). It would also be of use to interview students who were not at all active, which would help to better understand the reasons behind the lack of their investment in course assignments. To improve a tool whose purpose is to increase learners' skills, it is important not only to understand what is effective, but also to investigate what does not work that well and try to remove the existing obstacles.

Furthermore, some of the experiments that were carried out on university students, were on those whose major is or is related to linguistics. However, the studies do not really discuss the implications of the latter fact on the learning results. That is, students of linguistics and related fields, as opposed to the representatives of

STEM subject areas, may possess more knowledge about strategies that can help them learn certain content better.
There are two more important aspects when it comes to describing the participants. They are language proficiency and experience of operating the piece of technology used for the designed experimental task. When it comes to the reported participants' language proficiency, all of them have had at least some previous training of the target language, which ranges from approximately two to ten years. Interestingly enough, even though scholars carry out research on technology-based learning process, unlike [22-23], not all of them mention their participants' previous experience of using the same or at least a similar device, online platform, game, and likewise. Taking into account such information might be really important, because it has been proven that being familiar with a piece of technology has a positive effect on the learners' outcome [22].

4.5. The key findings

The majority of the research papers claim to have achieved positive results for learning outcome. In the cases where experiments were carried out (thus there was an experimental and a control group), it is stated that the group that used a certain type of technology as a medium for learning, achieved better results. The latter is either confirmed on a basis of post-test results or is grounded on self-reporting interviews. In addition, it is emphasized that the students' motivation, self-confidence, and autonomy increased. The latter is because some of the online platforms that were used in the learning process were seen as enticing. Moreover, students claim that they would like to use them again [15], [22]. The reason behind the latter results be because the technologies used allowed students to interact without losing their face and do so as well as learn at their own pace, without anxiety or negative feelings [14], [17].

4.6. Directions for future studies

Some scholars suggest that the same methodology and tools could be adapted and used in teaching different subjects, such as Math [23]. The latter is one of the STEM subjects. Since the use of certain tools show promising results for the outcomes of learning languages, the contents and parts that worked the most successfully can be integrated with instruction of the STEM subjects. In essence, the papers admit their limitations in terms of time frame and sampling. Therefore, they suggest that similar studies should be carried out on larger samples in lengthier periods of time and in other contexts (i.e. other countries).

5. Conclusion

In total, 28 relevant original research papers from 10 different scientific journals (based on top 20 educational technology journals acc. to Google Scholar) have been analysed. The article reports on the following findings: (a) target language and specific skills, (b) technology used for teaching/learning, (c) tools for data gathering, (d) sample and its characteristics, (e) key findings, and (f) directions for future studies. More precisely, the results of the survey indicate that only five of the research papers explored some tools used for teaching a language other than English (which is an alarming result for other world's languages). The studies employ such elements of technology-enhanced language learning as apps, social media, and other digital platforms. The tasks are primarily designed to address vocabulary acquisition as well as writing, listening, speaking, and to some extent, reading and pronunciation. Even though the vast majority of the papers employ mixed quasi-experimental methods, in which quantitative data analysis relies on statistics, their samples are arguably not at all representative. Moreover, the studies are not longitudinal, thus the highlighted benefits may be temporary. The former and the latter reasons indicate that the positive learning results indicated by all the studies are to be interpreted with caution. To design efficient language learning tools for the contemporary ubiquitous learners, longitudinal studies that involve more students need to be carried out, which is exactly what the studies under investigation promise for the future to studies come.

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