Technology Integration in the Classroom: A literature review

La integración de la tecnología en el aula: una revisión de literatura

L'intégration de la technologie dans la salle de classe: une révision littérature

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Abstract

The following article discusses one of the most current topics: technology in education, emphasizing in a very crucial aspect as it is technology integration. Consequently, the text first provides a general overview of the term with different perspective on the matter since it summarizes the latest research trends towards the topic of technology integration (TI). Furthermore, the article promotes an analysis of its pros and cons helping the reader to take a stand on TI and education. Finally, the relevance to the Costa Rican context of such intricate topic is discussed in order to shed some light to it.

Keywords: Education, distance learning, technological barriers.

Resumen

El siguiente artículo discute un tema de actualidad: la tecnología en educación, enfatizando lo crucial que es la integración de la tecnología. Por lo tanto, el texto primero brinda un panorama general del concepto de integración de la tecnología con diferentes perspectivas debido a que resume las más recientes líneas de investigaciones en el tema. Además, el artículo promueve un análisis de los pros y contras acerca del tema para así facilitar una toma de decisiones sobre la integración de la tecnología y la educación. Finalmente, se comenta sobre la relevancia en Costa Rica de este tema tan particular.

Palabras clave: Educación, educación a distancia, barreras tecnológicas.

Résumé

L'article suivant analyse un sujet d'actualité: la technologie en éducation en mettant l'accent sur ce qui est crucial pour son intégration en classe. C'est pourquoi, cet article commence par un panorama général du concept d'intégration de la technologie à partir des diverses perspectives où il présente aussi une synthèse des plus récentes lignes de recherche dans le domaine. À travers de cette analyse, l'article vise promouvoir la réflexion sur les avantages et les inconvénients de la technologie afin de faciliter la prise de désistions sur leur intégration dans l'éducation. Finalement, on discute l'importance au Costa Rica de ce sujet si particulier.

Mots-clés: Éducation, enseignement à distance, barrières technologiques.

Introduction

Current world events have changed the course of educational practices. One of the undeniable results of this change has been the impact of technology in the teaching-learning process. It is not that technology was not used in the past because since the 1930s TVs and other technological gadgets have been present in school. But today technology becomes the main mean for enhancing teaching practices through distance education and provides an innovative alternative to traditional methods. Consequently, it is expected that both teachers and students are technologically savvy. In Liao et al.'s[1] words «Digital literacy has become an essential skill [which] stakeholders have demanded be incorporated in [all levels of] education».

In fact, the report Estado de la Educación 2021 (Costa Rican yearly analysis on current education issues) indicates[2] that pre-service and in-service teachers look for opportunities to learn more about technologies that can be applied in the classrooms because «When technology is integrated into instruction in conjunction with effective teaching practices, it can enrich and enhance teaching and learning processes»[3]. In other words, the combination of appropriate teaching practices and technology has become highly valued in today's education since «it has been widely acknowledged that integrating technology into teaching generates a better quality of teaching and learning»[4].

Technology Integration (TI) is not a simple task. There are barriers and challenges to overcome before claiming a classroom has effectively incorporated technology. Consequently, the following article reviews current research trends towards the topic of TI, its benefits, its most common deterrents, and its relevance to the Costa Rican context.

Literature Review

The topic of TI is not new. Dinc said that «Technology integration in education has been studied for more than four decades»[5]. In fact, in 1980s the term was first employed by Seymour Papert, a brilliant mathematician, who worked with Jean Piaget and co-invented the Logo educational programming language[6] nonetheless, in the last years technology has taken a place of privilege in education, and it is necessary to examine the latest research and related

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[1] Yin-Chan Liao, Anne Ottenbreit-Leftwich, Michael Karlin, Krista Glazewski and Thomas Brush, «Supporting change in teacher practice: Examining shifts of teachers' professional development preferences and needs for technology integration», *Contemporary Issues in Technology and Teacher Education 17*, n.° 4 (2017): 523.
[2] Programa Estado de la Nación, *Octavo Estado de la Educación 2021: Resumen* (San José, Costa Rica: CONARE-PEN, 2021), 38.
[3] Okan Önalan and Kurt Gökçe, «Exploring Turkish EFL teachers' perceptions of the factors affecting technology integration: A case study», *Journal of Language and Linguistic Studies 16*, n.° 2 (2020): 626.
[4] Yang Gong and Chun Lai, «Technology integration into the language classroom: Developmental trajectory of beginning teachers». *Frontiers of Education in China 13* (2018): 1.
[5] Emre Dinc, «Prospective Teachers' Perceptions of Barriers to Technology Integration in Education», *Contemporary Educational Technology 10*, n.° 4 (2019): 384.
[6] Michael Lodi and Simone Martini, «Computational thinking, between Papert and Wing». *Science & Education 30*, (2021): 885.

literature. As a result, this text has the goal of identifying well documented sources from published works to reach a simple literature review. According to Machi and McEvoy a simple literature review «documents, analyzes and draws conclusions about what is known about a particular topic»[7]. So, this paper encompasses the revision of scientific publications about TI into English as a Foreign Language teaching and learning.

There are many reasons for writing a literature review on the TI matter. First, the topic at hand is directly linked to the current state of education since most learning centers (namely schools, high schools, and universities) will continue offering online classes. Therefore, students, teachers and administrators must master this concept and the literature review is an easy-access input. As Machi and McEvoy state, a literature review serves the purpose of being «a comprehensive understanding of the current knowledge of the topic»[8]. In addition, this type of article helps researchers with the identification of other potential areas for research or gaps for further research because the text compiles different findings. Especially now that «Technology has been integrated in classroom teaching in meaningful and transformative ways»[9], researchers will find more opportunities for investigation. Another reason for a literature review is the relationship between TI and ESL/EFL (English as a Second Language / English as a Foreign Language) learning. Aydin mentions that «The fact that the language of technology used all over the world is English points out English classes as the first places to do technology integration»[10]; This means that to take full advantage of the technology one should be knowledgeable in the English language. Otherwise, many of the positive aspects might be lost in translation. As a result, the present literature review stands for not only an extensive overview of TI to serve as the jumping-off point for future research projects, but also the chance «to reconsider what good and effective teaching means in a digital age and how to combine what is important from the past with the tools of the future»[11].

Definition of Technology Integration (TI)

TI is a key component of educational practices everywhere[12]. However, not everyone involved in the teaching-learning process recognizes what it is. In fact, «Recent research has shown that access [to technology] alone does not

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[7] Lawrence A. Machi and Brenda T. McEvoy, *The literature review: Six steps to success* (California: Corwin A SAGE publishing company, 2016), 3.

[8] Machi and McEvoy, *The literature review: Six steps to success*, 1.

[9] Sukanlaya Sawang, Peter O'Connor and Muhammad Ali, «Using Technology to Enhance Students' Engagement in a Large Classroom», *Journal of Learning Design 10*, n.° 1 (2017): 12.

[10] Belgin Aydin, «Three birds with a stone: Technology integration in language education with reverse mentoring model», *Journal of Teacher Education and Educators 6*, n.° 2 (2017): 177.

[11] Hamid Reza Mahboudi, Farahman Farrokhi and Ali Akbar Ansarin, «A Review on Application of Computers in Education Inside and Outside of Iran», *Advances in Language and Literary Studies 8*, n.° 4 (2017): 31.

[12] Programa Estado de la Nación, *Octavo Estado de…*, 54.

automatically equate to greater or higher quality of technology integration»[13]. In order words, to take full advantage of technology at hand, something else is required, namely knowledge or willingness, since technology alone does not imply its integration into educational practices. First, the technological infrastructure per se will not impact the teaching-learning process if the educators do not have the skills to implement them. Also, the technological knowledge represents an advantage in educational settings because most students are digital natives, «children [and teens] raised in a digital, media-saturated world, [who] require a media-rich learning environment to hold their attention»[14].

To begin, the first part of the TI equation is technology itself and in educational settings it takes many forms. The most common ones are divided in hardware such as desktop computers, laptop computers, digital camera/camcorders, digital microphone, DVD player/recorder, tablets, mobile phones, projectors, smart interactive whiteboards; student response systems (e.g., clickers), Web 2.0 Technologies (e.g., Google Classrooms, Google Drive, Google Hangout, Teams, Zoom, Dropbox, etc.), communication applications like email, IM, WhatsApp, Telegram, audio/video conferencing system, and the Internet itself. The second part refers to the strategies and attitudes towards technology that allow its merging with a subject or area of study. Almalki defines TI as «the enhancement of the educational environment with technology»[15]. In other words, TI enriches the learning process since the educators are responsible for «the appropriate selection and use of technology within a... lesson or unit to facilitate or enhance student learning of the content»[16].

Dinc also says that «technology integration is about how to use technology to support the way of teaching»[17]. Meaning that technology becomes an aid in the delivery of the lesson since TI is construed «in terms of how teachers utilize technology to do familiar tasks more productively and how this utilization can re-shape these tasks»[18]. Another element of TI is the end result of its application in scholarly institutions since TI «is defined as the application of technology to improve the educational environment [and to] support classroom instruction through creating opportunities for learners to complete assignments on the computer rather than the normal pencil and paper»[19]. In other words, the implementation of TI looks forward to making the teaching-learning process better.

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[13] Vanessa W. Vongkulluksn, Kui Xie and Margaret A. Bowman, «The role of value on teachers' internalization of external barriers and externalization of personal beliefs for classroom technology integration», *Computers & Education*, n.° 118 (2018): 70.

[14] Hamid Reza Mahboudi, Farahman Farrokhi and Ali Akbar Ansarin, «A Review on …: 30.

[15] Amal Almalki, «Integration of Technology among Saudi EFL Teachers», *English Language Teaching 13*, n.° 8 (2020): 160.

[16] Dinc, «Prospective Teachers' Perceptions…: 383.

[17] Ibíd., 382.

[18] Abbas Pourhosei Gilakjani, «A Review of the Literature on the Integration of Technology into the Learning and Teaching of English Language Skills», *International Journal of English Linguistics 7*, n.° 5 (2017): 96.

[19] Ibíd.

On the other hand, TI can be characterized from the teachers' standpoint. According to Gilakjani,

> technology integration is defined in terms of teachers applying technology to develop learners' thinking skills. [Also] technology integration is the utilization of technology tools in general content areas in education in order to permit learners to use computer and technology skills to learning and problem-solving.[20]

So, TI is construed as a companion for the teachers in today's learning and teaching process since it not only fosters 21st century much needed soft skills of critical thinking and problem-solving but also the content area itself.

In addition, Afridi[21] and Önalan[22] portray TI in three categories depending on the use of technology in the classroom and on the intended learning outcomes. They are for instructional preparation or online teaching activities, as a learning tool or hardware-based (laptop, desktop, tablet, etc.) teaching activities, and for instructional delivery or web-based teaching activities. Therefore, the three previous classifications of TI usage cover several aspects related to the teaching practice in and out of the classroom because TI «means the effective and productive use of technology in all the dimensions of procedures including the necessary infrastructure, curriculum, and teaching-learning environments»[23].

Furthermore, Papert's definition is also a valuable one since it takes into consideration pedagogical elements from his work with Piaget. Papert said that technology integration is «the result of his *constructionist* approach to education, where social and affective dimensions are as important as the technical content»[24]. This quote mentions the term *constructionist*, which derives from constructivism (Piaget's theory) and fosters the concept that technology enables learning. So, in a way, the integration of technology in the classroom has its pedagogical component as well. Second, Papert addressed two revealing factors in teaching the social and affective dimensions, which suggests that those dimensions are valuable whether technology is integrated in the learning experience or not.

Finally, a TI discussion will be incomplete if the term Technological Pedagogical Content Knowledge (TPACK) is not addressed because it is a key aspect in any TI conceptualization.

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[20] Ibíd.

[21] Tahira Afridi and Abid Hussain Chaudhry, «Technology Adoption and Integration in Teaching and Learning at Public and Private Universities in Punjab», *Bulletin of Education and Research 41*, n.° 2 (2019), 130.

[22] Önalan and Gökçe, «Exploring Turkish EFL teachers…: 627.

[23] Ugur Basarmak and Nazire Burcin Hamutoglu, «Developing and Validating a Comprehensive Scale to Measure Perceived Barriers to Technology Integration», I*nternational Journal of Technology in Education and Science 4*, n.° 1 (2020): 54.

[24] Lodi and Martini, «Computational thinking, between…: 885.

Technological Pedagogical Content Knowledge

According to Zoch, TPACK is a «framework [that] recognizes that teachers should integrate technological knowledge with subject matter learning, rather than focusing only on technological knowledge at the expense of appropriate pedagogy or the content»[25]. In other words, TPACK highlights the importance of weaving technology into the learning process without obscuring the subject matter. In addition,

> this framework promotes the understanding that teaching with technology requires a whole other set of pedagogical skills and that each program, tool, and piece of software requires different genre knowledge. At the same time, while technological knowledge is important, it is not necessarily a prerequisite or even a predictor of who will integrate technology.[26]

So, the concept of TPACK comes with a challenge to teachers since it first requires both kind of knowledge: pedagogical and technological, sometimes even specific ones. Then, teachers combine both of them during the learning activities.

In addition, TPACK is understood as the *know-how* of TI since «TPACK emphasizes the importance of preparing teachers to make sensible choices in their uses of technology when teaching particular content to a specific target group»[27]. In other words, a teacher, who is aware of TPACK, is capable of choosing when and what kind of technology should be applied during the teaching-learning process because the «educators understand how knowledge of technology, pedagogical knowledge and content knowledge is interrelated and how they interact with each other»[28].

Consequently, learning about the implementation of TPACK in the classroom is necessary for teachers; that is why; «Technology integration was the second most common topic for professional development (67 % of teachers)»[29]. The reason behind this interest in TI derives from its multiple academic benefits and the needs met when technology is integrated.

Benefits of Technology Integration in Education

TI has earned many merits because of the positive results in the teaching-learning process. These advantages range from its outcome on the learning

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[25] Melody Zoch, Joy Myers and Jennifer Belcher, «Teachers' engagement with new literacies: Support for implementing technology in the English/language arts classroom», *Contemporary Issues in Technology & Teacher Education 17*, n.° 1 (2016): 26.

[26] Ibíd., 27.

[27] Jo Tondeur, Natalie Pareja Roblin, Johan van Braak, Joke Voogt and Sarah Prestridge, «Teacher educators as gatekeepers: Preparing the next generation of teachers for technology integration in education», *British Journal of Educational Technology 50*, n.° 3 (2019): 1190.

[28] Ibíd., 1203.

[29] Shonta Harrell and Yvette Bynum, «Factors affecting technology integration in the classroom», *Alabama Journal of Educational Leadership 5*, (2018): 14.

process to motivating educational personnel to learn more about technology. Its benefits also include «making teaching interesting and more productive in terms of advancements»[30].

First of all, the favorable washback effect of TPACK is the real asset in academic settings since both teachers and students profit from TI practices. Hafifah and Sulistyo's words assert the beneficial element of TI by saying that «Teachers, as well as students, are welcoming ICT [Information and Communication Technology] as new ways to promote modern and efficient learning activities to enhance better achievement in English»[31].

The one group enjoying on the plus side of TI is students. According to Gilakjani «The use of technology helps learners get involved and learn based on their interests [since] technology satisfies both visual and auditory senses of the learners»[32]. It means that TI considers the students' academic pursuits and at the same time improves «students' engagement, motivation, computing skills, and the ability to study independently and collaboratively»[33]. In fact, other side effects of TI on students are «Learners' motivation, improvement of learners' academic ability, increase self-confidence, increase language proficiency and academic skills, lower learners' anxiety»[34].

Another benefit is experienced by teachers. By experiencing firsthand all these positive outcomes, they get encouraged to look for ways to integrate technology in the classroom. Afridi and Chaudhry say that «the teachers are motivated to struggle for learning [technological] skills in order to improve their teaching and satisfy their students»[35]. In other words, teachers make an effort to become technologically literate to be «able to find ways in which technology could support [academic] practices, rather than focus solely on ways to use technology for the sake of using it. In this way, the use of technology meaningfully supported their teaching and goals»[36].

Due to the avails of TI, experienced teachers look for opportunities to learn more about it; even though, «nowadays, most beginning teachers have grown up with digital technologies and typically enter the profession with a set of technical skills»[37]. In other words, many professionals in the educational field did not grow up with technology and have taught using more traditional or conventional methodologies and resources. Nonetheless, these more experienced educators have accepted the current academic demands (e.g. teaching online classes

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[30] Gilakjani, «A Review of …: 95.

[31] Gusti Nur Hafifah and Gunadi Harry Sulistyo, «Teachers' ICT Literacy and ICT Integration in ELT in the Indonesian Higher Education Setting», *Turkish Online Journal of Distance Education 21*, n.° 3 (2020): 187.

[32] Gilakjani, «A Review of…: 95.

[33] Dinc, «Prospective Teachers' Perceptions…: 382.

[34] Gilakjani, «A Review of …: 98.

[35] Afridi and Chaudhry, «Technology Adoption and…: 135.

[36] Melody Zoch, Joy Myers and Jennifer Belcher, «Teachers' engagement with…: 42.

[37] Jo Tondeur, Ronny Scherer, Evrim Baran, Fazilat Siddiq, Teemu Valtonen and Erkko Sointu, «Preparing beginning teachers for technology integration in education: Ready for take-off?», Technology, *Pedagogy and Education 26*, n.° 2 (2017): 158.

through conference calls; using interactive gadgets and tools; experimenting with the web 2.0, among others) to implement technology in their classes and «As the teachers became more comfortable with using digital tools and finding ways to obtain more technology, they also started taking risks to be able to integrate technology»[38]. This might mean that teachers have welcomed TI principles and, the more they put them into practice, the more at ease they are. In fact, it has been observed that the teachers have «tendency and willingness to use computers in their classes»[39] up to the point of choosing «their own favorite multimedia and software that creates more interactive lesson»[40]. So, teachers have got used to technology because of the frequency of its usage and the positive academic results. This action results in multiple benefits for the students and the teachers themselves.

Benefits of TI in the language classroom

Technology integration is part of most content areas classes, including language. There are some examples of TI employment in the English classes to illustrate the general benefits mentioned before. For instance, instructors can «design audio-visual narrative themes including the learner's actual participation»[41]. They can also make «their lectures colorful and interesting by showing colorful slides to the students»[42]. The combination of audio-visual aids with the language content has brought a new air to the English classes since «It is very useful in establishing [affective and learning] connections between teacher and students»[43]. In addition, the «inclusion of audio-visual aids has improved teaching and learning»[44], which impacts the teacher's rapport with the learners in a positive fashion.

Another language skill that has been benefited from TI is writing. For example, teachers have planned the «exchange of students' written work via the Internet (e.g., email attachments, digital drop boxes etc.)»[45]. Meanwhile, others have chosen virtual collaborative writing strategies and the use of online blogs and wikis to develop CALL (Computer Assisted Language Learning)-based materials when teaching writing[46].

Another side-effect of TI in the language class is a shift in the language teaching methodology, which in turn, has motivated the learners «to take active part in learning processes»[47] and to become «more interested in learning […] foreign

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[38] Melody Zoch, Joy Myers and Jennifer Belcher, «Teachers' engagement with…: 36.
[39] Önalan and Gökçe, «Exploring Turkish EFL…: 639.
[40] M.Gilakjani, «A Review of the…: 99.
[41] Ibíd.
[42] Afridi and Chaudhry, «Technology Adoption and…: 137.
[43] Kashif Ali Sabiri, «ICT in EFL teaching and learning: A systematic literature review», *Contemporary Educational Technology 11*, n.° 2 (2019): 180.
[44] Ibíd., 180.
[45] Afridi and Chaudhry, «Technology Adoption and…: 136.
[46] Sabiri, «CT in EFL…: 186.
[47] Ibíd.

language skills»[48]. This reborn interest may be related not only to the variety of activities but also to the range of resources teachers have access to. These days

> The most frequent activity is finding material resources related to the lessons taught. It is proven already that ICT gives teachers huge access to collect, download and use materials from the internet before teaching. Teachers can find all kinds of teaching audio, printed and visual teaching materials easily through the internet.[49]

One final benefit of TI in the language class is the possibility to cater students with academic or physical needs. That's why, «It was alleged that technology could be the answer for the inequity and inaccessibility with features such as text-to-speech, speech-to-text, audio, and digital formats, and differentiate instruction»[50]. In other words, TI is responsible for «changing classroom configurations»[51] to adapt to all students and for making virtual learning «time-saving and more reliable»[52].

Even tough «ICT integration has improved teaching and learning methods by removing the barriers of time and place»[53], there are plenty of obstacles and deterrents to overcome to successfully integrate technology in the classes.

Challenges to Technology Integration

Deciding whether including technology in the classes is worth doing, is an epic endeavor. Many situations come to play and some of them outweigh the benefits of TI. These situations are called obstacles or barriers and they «might constitute a complex structure that is encountered in almost every environment for different reasons and contains several variables in the teaching-learning process»[54]. This means that taking down a barrier requires some serious studying and careful planning, due to its complexity. Based on an analysis of the reasons and variables behind each barrier it has been discovered that they can be divided in two groups named by Ertmer as «first order barriers» and «second-order barriers»[55].

Generally speaking, Ertmer's Barrier to Technology Integration model says that

> Having access, support, and training are what Ertmer (1999) referred to as «first-order barriers» and are only part of what might explain why technology integration remains low in classrooms. She also identified «second-order

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[48] Gilakjani, «A Review of…: 102.
[49] Hafifah, and Sulistyo, «Teachers' ICT Literacy…: 191.
[50] Dinc, «Prospective Teachers' Perceptions…: 382.
[51] Afridi and Chaudhry, «Technology Adoption and…: 124.
[52] Sabiri, «ICT in EFL…: 180.
[53] Ibíd., 186.
[54] Basarmak and Hamutoglu, «Developing and Validating…: 55.
[55] Ibíd.; Dinc «Prospective Teachers' Perceptions…; Vanessa W. Vongkulluksn, Kui Xie and Margaret A. Bowman; Melody Zoch, Joy Myers and Jennifer Belcher «The role of value…; Önalan and Gökçe «Exploring Turkish EFL…

barriers», what she considered to be the «true gatekeepers» to technology implementation. They include teacher attitudes, beliefs, knowledge, and skills.[56]

Consequently, the obstacles that prevent teachers from blending technology with content are in both ways: external and internal[57]. Even though, the most efficient manner to tear down the barriers is to provide schools with technology and to teach educators how to use the technology, the density of the barrier demands a more thoughtful and elaborate solution.

The first order barrier

This first barrier is directly related to the teachers and students access to technology devices and software. Some examples are «the lack of technological equipment, not enough number of computer labs, internet connection problems and lack of resources, lack of time, lack of training opportunities, and lack of funding and support»[58]. In addition, it has been stressed out that in some institutions they do have some kind of «technology initiatives», but «poor infrastructure, inadequate technology, lack of sufficient technological tools, effective professional development (external factors)»[59] affect its proper usage.
In fact, to make use of the technology in the classroom, teachers must make arrangements that «demand additional time and effort» like the «access to wireless Internet in the classroom had to be arranged. In addition, teachers had to reserve the devices in advance, verify that batteries were fully charged, make sure that all apps were installed and be prepared for possible technical contingencies»[60] among others.

To sum up, the first barrier is observed in two main areas: the lack of technological resources or equipment and the lack of facilities to integrate technology in class. If any of the previous scenarios takes place in an educational setting, the results would be prejudicial for the students and teachers alike since «these first-order barriers were shown to have negative effects on how and how much teachers integrate technology in the classroom»[61].

Second order barriers

The second barrier encompasses teachers' negative attitudes, stigmas, prejudice and biased towards technology and it refers «to the extent to which teachers believe that technology can help fulfill instructional goals they identified as most important for their students»[62]. In other words, it alludes to the educators' core values and beliefs towards the place of technology in the classroom.

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[56] Melody Zoch, Joy Myers and Jennifer Belcher, «Teachers' engagement with…: 26.

[57] Dinc, «Prospective Teachers' Perceptions…: 384.

[58] Ibíd., 383.

[59] Harrell and Bynum, «Factors affecting technology…:12.

[60] Natalie Pareja Roblin, Jo Tondeur, Joke Voogt, Bram Bruggeman, Griet Mathieu and Johan van Braak, «Practical considerations informing teachers' technology integration decisions: the case of tablet PCs», *Technology, Pedagogy and Education 27*, n.° 2 (2018): 10.

[61] Vanessa W. Vongkulluksn, Kui Xie and Margaret A. Bowman, «The role of value on teachers…: 71.

[62] Ibíd.

Consequently, it is the most difficult and the strongest barrier to overcome because the educators' current knowledge and skills as well as their current attitudes and beliefs towards technology prevent them from using technology[63].

These beliefs and attitudes toward TI shape «the extent to which teachers integrate technology in their classroom as well as the quality of this integration…»[64]. Therefore, it is claimed that «Teachers' capacity and attitude toward ICT determines the success of ICT integration in English Language teaching»[65]. As a result, convincing educators of TI and changing their mindset is required for a successful educational experience since their «beliefs and attitudes have been regarded as the most powerful predictors of teachers' use of technology in the classroom»[66].

In detail, some of the teachers' misconceptions are related to their role in the classroom. For instance, «the fear of 'losing control' over classroom management led teachers to adopt more conservative and teacher-centered approaches»[67]. Meanwhile, others «prefer to keep a tight rein on learning, that is to say, to remain dominant due to fear of technology and its supposed powers»[68]. On the other hand, other educators diminish the merits of TI in the classroom since «Many people argue the computer does all the work for the students, not allowing them the opportunity to digest what they have learned»[69]. At the same,

> teachers' scepticism (sic) concerning the added value of tablets [or any type of technological device] to support student learning is striking [because they] questioned whether and how [technology] could be integrated in ways that truly enhance their instructional practices, and hence improve student learning.[70]

Researchers[71] have found that some of these conceptions originated in the teachers' past experiences and their own insecurities due to «Lack of confidence, insufficient or lack of competence, resistance to change, lack of time, lack of effective training, insufficient or lack of technical supports, limited computer accessibility, and negative attitudes»[72].

But the one that truly hinders TI is the absence or the inadequacy of training. Most of the researchers[73] claim that poor training conceives technology in a secondary, «very limited way, mostly for non-instructional purposes such as

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[63] Basarmak and Hamutoglu, «Developing and Validating…: 55.

[64] Vanessa W. Vongkulluksn, Kui Xie and Margaret A. Bowman, «The role of…: 70.

[65] Hafifah, and Sulistyo, «Teachers' ICT Literacy…: 191-192.

[66] Önalan and Gökçe, «Exploring Turkish EFL…: 627.

[67] Natalie Pareja Roblin, Jo Tondeur, Joke Voogt, Bram Bruggeman, Griet Mathieu and Johan van Braak, «Practical considerations informing…: 13-14.

[68] Hamid Reza Mahboudi, Farahman Farrokhi and Ali Akbar Ansarin, «A Review on…: 36.

[69] Ibíd., 40.

[70] Natalie Pareja Roblin, Jo Tondeur, Joke Voogt, Bram Bruggeman, Griet Mathieu and Johan van Braak, «Practical considerations informing…: 11.

[71] Almalki; Basarmak and Hamutoglu; Önalan and Gökçe.

[72] Mahboudi, Hamid Reza, Farahman Farrokhi and Ali Akbar Ansarin, «A Review on Application…: 37.

[73] Ibíd.; Önalan and Gökçe; «Exploring Turkish EFL…; Vongkulluksn et al; Hafifah, and Sulistyo, «Teachers' ICT Literacy…; Almalki «Integration of Technology…

completing administrative tasks or using it for communication»[74] or relegates it «to support administrative purposes as opposed to instructional purposes»[75]. This happens because the lack of initial and ongoing training in TPACK makes teachers «afraid to integrate ICT in their teaching practice»[76]. Furthermore, some educators experience anxiety towards technology since they «did not have the ability to overcome the technical difficulties that they faced when applying new technologies»[77]. So, it becomes evident that «inadequate technology integration agendas»[78] or the absence of them foster the teachers' misconceptions and strengthen their negative beliefs and values towards technology since «training experience influences teachers ICT skills as well as their attitude toward ICT»[79].

Another aspect that impacts TI in the academic setting is the school culture, because it embodies the administrators' view in terms of time management and workload when implementing technology methodology. First of all, «The integration of a new technology often requires additional time and effort from teachers»[80] because the teachers must be proficient in the subject matter, the chosen technology resource and how to combine both (TPACK). All this demands time during the preparation and implementation stages, which is why

> many teachers report that using technology is more elaborate and time-consuming than more traditional teaching practices, and they do not feel they have an adequate amount of time to teach with technology or to plan for how to teach with it.[81]

In addition, «EFL teachers in ICT inclusion [pointed out] the time constraint as the teachers have to cover the syllabus on time. This retards them in integrating ICT skillfully»[82] because there are many academic tasks on top of integrating technology for the same amount of time. That is why, «Teachers also perceive technology integration negatively due to the amount of time it takes to integrate into the curriculum through additional training and planning»[83].

To sum up, the external and internal barriers educators must face to integrate technology in the classroom need to be addressed and fixed to fully enjoy the TI benefits. But the most pertinent solutions for «the adoption/internalization of technology and its integration into teaching-learning for the purpose of improving education has remained limited despite substantial amounts of

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[74] Önalan and Gökçe, «Exploring Turkish EFL…: 627.
[75] Yin-Chan Liao, Anne Ottenbreit-Leftwich, Michael Karlin, Krista Glazewski and Thomas Brush, «Supporting change in…: 523.
[76] Hamid Reza Mahboudi, Farahman Farrokhi and Ali Akbar Ansarin, «A Review on Application…: 36.
[77] Almalki, «Integration of Technology…: 161.
[78] Vanessa W. Vongkulluksn, Kui Xie and Margaret A. Bowman, «The role of…: 71.
[79] Hafifah, and Sulistyo, «Teachers' ICT Literacy…: 193.
[80] Natalie Pareja Roblin, Jo Tondeur, Joke Voogt, Bram Bruggeman, Griet Mathieu and Johan van Braak, «Practical considerations informing…: 1193.
[81] Melody Zoch, Joy Myers and Jennifer Belcher, «Teachers' engagement with…: 27.
[82] Sabiri, «ICT in EFL teaching…: 181.
[83] Harrell and Bynum, «Factors affecting technology…: 15.

money, time, and energy for integrating technology into learning environments»[84].

Suggestions to Integrate Technology

Costa Rican researchers[85] [86] [87] agreed with the international studies' results in the sense that teachers want to integrate technology in their classrooms, but the barriers have stopped them. Consequently, «it is time to rethink the idea of integrating technology into the curriculum and aim to embed technology into teaching to support the learning process»[88]. This appeal to ponder on a more sensible approach to technology is perceived in two main areas: a teachers' accompanying partner and the administrators' presence.

Firstly, educators «should be provided with technical assistance»[89] because «More organized and frequent training of ICT applications needs to be done to increase teachers' ICT skills»[90]. A by-product of the effective and frequent training is the teachers' confidence in their knowledge, which means that «The correlation between teachers' ICT literacy and ICT training and implementation is also obvious, training experiences generate teachers' ICT literacy»[91]. In addition, training is perceived as an opportunity of professional growth and the «efforts should therefore devote more attention to the development of teachers' subject-specific technological pedagogical content knowledge»[92]. Consequently, «Teachers, as agents of change, should also be provided with training opportunities» either in the form of an initiative or from a more knowledgeable peer.

Pairing up with a colleague who grasps the TI philosophy provides plenty of advantages. One of them is motivation. «[Teachers] agreed on the peer support as an encouraging factor. Peer support has also been mentioned by many other teachers as a facilitating factor in the process of technology integration»[93]. In addition, fellow teachers become role models who foster «scaffolding authentic technology experiences […] this might help them to see the utility, value and feasibility of using a particular technology and/or teaching strategy»[94]. In order words, more inexperienced teachers imitate those who know more. Other

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84 Basarmak and Hamutoglu, «Developing and Validating…: 54.

85 Gina Torres Calderón, «Panorámica costarricense del uso de la tecnología en enseñanza de segundas Lenguas», *InterSedes 19*, n.° 40 (2018):128-147.

86 Programa Estado de la Nación en Desarrollo Humano Sostenible, *Resumen Séptimo Informe Estado de la Educación* (San José, Costa Rica: Masterlitto, 2019).

87 Ida Fallas and Magaly Zúñiga, *Estudio Las tecnologías digitales de la información y la comunicación en la educación costarricense (Informe Final)* (San José: PEN, 2010).

88 Mohammad Reza Ahmadi, «The use of Technology in English Language Learning: A literature review», *International Journal of Research in English Education 3*, n.° 2 (2018): 116.

89 Gilakjani, «A Review of…: 101.

90 Hafifah, and Sulistyo, «Teachers' ICT Literacy…: 194.

91 Ibíd., 195.

92 Natalie Pareja Roblin, Jo Tondeur, Joke Voogt, Bram Bruggeman, Griet Mathieu and Johan van Braak, «Practical considerations informing…: 14.

93 Önalan and Gökçe, «Exploring Turkish EFL…: 640.

94 Jo Tondeur, Natalie Pareja Roblin, Johan van Braak, Joke Voogt and Sarah Prestridge, «Teacher educators as…: 119.

authors recommend training as a hands-on activity because they claim that «to learn about technology integration by evaluating, and (re-)designing curriculum materials can also be a promising strategy»[95].

The second area refers to the actions the administration or stakeholders can make to promote TI in the classroom. There are some suggestions for situations to be changed in the school context that have a special impact since they are carried out by an educational authority. For instance, «Administrators can support teachers' successful technology integration by modeling technology use, showing the value they attach to technology integration, encouraging teachers to move beyond traditional teaching and letting teachers be autonomous to take risks»[96]. Furthermore, the administrators should pay attention to the school needs; so that, «the relationship between schools' provision of technology support (e.g. access to resources, unified vision for technology use, opportunities for professional development) would directly translate to teachers' perceived support on first-order barriers»[97]. As a result, the stakeholders have the responsibility to look for a balance in the expansion of technological spaces and equipment with the teachers' technical knowledge because it has been shown that «while increasing technology access in the classroom is important, ensuring that teachers have positive value beliefs towards technology is also an important part of overcoming teachers' perception of external barriers to technology integration»[98]. In other words, having schools and academic centers with stocks of technological equipment and resources is necessary but not the most important. In fact, instead of «spend[ing] millions of dollars building a technology infrastructure that could support widespread classroom technology integration, the next step would be to ensure the effective use of available tools by bridging the value-gap that is present in the teacher population»[99].

Conclusion

In conclusion, the literature analyzed showed that the findings on TI benefits and its more common deterrents confirm that «Globally speaking, the computer based (sic) technologies' adoption and integration in teaching at universities is appreciated, utilized and supported»[100]. Consequence of such recognition, it became compelling the study of this concept from a theoretical perspective to avoid common misunderstandings or improper teaching practices since it is frequent that «the technologies available in educational environments are neither integrated into the subject content nor take characteristics of the target audience into consideration, and they are just used plainly»[101]. This means that TPACK is not fully embraced yet in academic contexts not only because of the

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[95] Jo Tondeur, Ronny Scherer, Evrim Baran, Fazilat Siddiq, Teemu Valtonen and Erkko Sointu, «Preparing beginning teachers…: 161.

[96] Önalan and Gökçe, «Exploring Turkish EFL…: 628.

[97] Vongkulluksn, Vanessa W, Kui Xie and Margaret A. Bowman, «The role of…: 72.

[98] Ibíd., 79.

[99] Ibíd.

[100] Afridi and Chaudhry, «Technology Adoption and: 124.

[101] Basarmak and Hamutoglu, «Developing and Validating…: 63.

barriers previously mentioned, but also because of the administrators and policy makers' educational vision.

It is also perceived that «education has to change because there has been a generational shift due to technological change»[102]. Technological integration cannot be a construct or an ideal scenario anymore because technology have permeated every aspect of the students', teachers', and administrators' lives. However, such a transformation is not an easy one because of barriers such as «Lack of technological equipment in classrooms, lack of computer-based teaching resources, the effect of traditional teaching approaches on instructional practices, inadequacy of in-service training and insufficiency of time»[103].

That is why, the first step towards a successful technology integration is teacher's acceptance of the benefits of technology in the classroom. As Vongkulluksnetal said «Teachers who believe that technology is valuable in the classroom tend to amplify the access they have and place less weight on access constraints when they make judgments about how much external barriers exist in their school context»[104]. So, the first step in technology integration depends on teachers who are willing to change the chalk and a board for a mouse and a screen.

Another step is to take a second look at Papert's vision of technology integration and Ertmer's work on barriers because they proposed ideas and principles that are stil valid. Therefore, analyzing what these researchers found in regards to today's situation will bring up new ways of addressing technology integration in the classroom and overcoming the barriers in a more efficient manner.

Finally, technology integration is a topic that is enriched with new practices and new research data every day because the technological applications in school are vast and many. What prevails though is that educators combine their passion for teaching with technology to obtain better academic and personal results since «teachers can effectively infuse technologies into the curriculum and use technologies to transform their instructional practices»[105].

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[102] Hamid Reza Mahboudi, Farahman Farrokhi and Ali Akbar Ansarin, «A Review on…: 30.
[103] Önalan and Gökçe, «Exploring Turkish EFL…: 629.
[104] Vanessa W. Vongkulluksn, Kui Xie and Margaret A. Bowman, «The role of…: 79.
[105] Gong and Lai, «Technology integration into…: 2.

References

Afridi, Tahira and Abid Hussain Chaudhry. «Technology Adoption and Integration in Teaching and Learning at Public and Private Universities in Punjab». *Bulletin of Education and Research 41*, n.° 2 (2019): 121-143. https://eric.ed.gov/?id=EJ1229437

Ahmadi, Mohammad Reza. «The use of Technology in English Language Learning: A literature review». *International Journal of Research in English Education 3*, n.° 2 (2018): 115-125. DOI: 10.29252/ijree.3.2.115

Almalki, Amal. «Integration of Technology among Saudi EFL Teachers». *English Language Teaching 13*, n.° 8 (2020): 160-167. DOI: https://doi.org/10.5539/elt.v13n8p160

Aydin, Belgin. «Three birds with a stone: Technology integration in language education with reverse mentoring model». *Journal of Teacher Education and Educators 6*, n.° 2 (2017): 177-190. https://dergipark.org.tr/en/pub/jtee/issue/43273/525698

Basarmak, Ugur and Nazire Burcin Hamutoglu. «Developing and Validating a Comprehensive Scale to Measure Perceived Barriers to Technology Integration». *International Journal of Technology in Education and Science 4*, n.° 1 (2020): 53-71. https://eric.ed.gov/?id=EJ1232798

Dinc, Emre. «Prospective Teachers' Perceptions of Barriers to Technology Integration in Education». *Contemporary Educational Technology 10*, n.° 4 (2019): 381-398. https://doi.org/10.30935/cet.634187

Fallas, Ida and Magaly Zúñiga Céspedes. *Estudio Las tecnologías digitales de la información y la comunicación en la educación costarricense (Informe Final)*. San José, Costa Rica: PEN, 2010. http://hdl.handle.net/20.500.12337/789

Gilakjani, Abbas Pourhosein. «A Review of the Literature on the Integration of Technology into the Learning and Teaching of English Language Skills». *International Journal of English Linguistics 7*, n.° 5 (2017): 95-106. DOI:10.5539/ijel.v7n5p95

Gong, Yang and Chun Lai. «Technology integration into the language classroom: Developmental trajectory of beginning teachers». *Frontiers of Education in China 13*, (2018): 1-27. https://doi.org/10.1007/s11516-018-0001-5

Hafifah, Gusti Nur and Gunadi Harry Sulistyo. «Teachers' ICT Literacy and ICT Integration in ELT in the Indonesian Higher Education Setting». *Turkish Online Journal of Distance Education 21*, n.° 3 (2020): 186-198. https://dergipark.org.tr/en/pub/tojde/issue/55722/762050

Harrell, Shonta and Yvette Bynum. «Factors affecting technology integration in the classroom». *Alabama Journal of Educational Leadership 5*, (2018): 12-18. https://eric.ed.gov/?id=EJ1194723

Liao, Yin-Chan, Anne Ottenbreit-Leftwich, Michael Karlin, Krista Glazewski and Thomas Brush. «Supporting change in teacher practice: Examining shifts of teachers' professional development preferences and needs for technology integration». *Contemporary Issues in Technology and Teacher Education 17*, n.° 4 (2017): 522-548. https://www.learntechlib.org/p/178710/

Lodi, Michael and Simone Martini. «Computational thinking, between Papert and Wing». *Science & Education 30*, (2021): 883-908. http://dx.doi.org.cidreb.uned.ac.cr/10.1007/s11191-021-00202-5

Machi, Lawrence A. and Brenda T. McEvoy. *The literature review: Six steps to success*. California: Corwin A SAGE publishing company, 2016.

Mahboudi, Hamid Reza, Farahman Farrokhi and Ali Akbar Ansarin. «A Review on Application of Computers in Education Inside and Outside of Iran». *Advances in Language and Literary Studies 8*, n.° 4 (2017): 29-42. http://dx.doi.org/10.7575/aiac.alls.v.8n.4p.29

Önalan, Okan and Kurt Gökçe. «Exploring Turkish EFL teachers' perceptions of the factors affecting technology integration: A case study». *Journal of Language and Linguistic Studies 16*, n.° 2 (2020): 626-646. Doi: 10.17263/jlls.759264

Pareja Roblin, Natalie, Jo Tondeur, Joke Voogt, Bram Bruggeman, Griet Mathieu and Johan van Braak. «Practical considerations informing teachers' technology integration decisions: the case of tablet PCs». *Technology, Pedagogy and Education 27*, n.° 2 (2018): 1-17. https://doi.org/10.1080/1475939X.2017.1414714

Programa Estado de la Nación en Desarrollo Humano Sostenible. *Resumen Séptimo Informe Estado de la Educación*. Seventh Edition. San José, Costa Rica: Masterlitto, 2019.

Programa Estado de la Nación. *Octavo Estado de la Educación 2021: Resumen*. San José, Costa Rica: CONARE-PEN, 2021

Sabiri, Kashif Ali. «ICT in EFL teaching and learning: A systematic literature review». *Contemporary Educational Technology 11*, n.° 2 (2019): 177-195. DOI: https://doi.org/10.30935/cet.665350

Sawang, Sukanlaya, Peter O'Connor and Muhammad Ali. «Using Technology to Enhance Students' Engagement in a Large Classroom». *Journal of Learning Design 10*, n.° 1 (2017): 11-19. https://eric.ed.gov/?id=EJ1127721

Tondeur, Jo, Natalie Pareja Roblin, Johan van Braak, Joke Voogt and Sarah Prestridge. «Preparing beginning teachers for technology integration in education: Ready for take-off?». Technology, *Pedagogy and Education 26*, n.° 2 (2017): 157-177. DOI:10.1080/1475939X.2016.1193556

Tondeur, Jo, Ronny Scherer, Evrim Baran, Fazilat Siddiq, Teemu Valtonen and Erkko Sointu. «Teacher educators as gatekeepers: Preparing the next generation of teachers for technology integration in education». *British Journal of Educational Technology 50*, n.° 3 (2019): 1189-1209. doi:10.1111/bjet.12748

Torres Calderón, Gina. «Panorámica costarricense del uso de la tecnología en enseñanza de segundas lenguas». *InterSedes 19*, n.° 40 (2018):128-147. DOI: 10.15517/ISUCR.V19I40.35659

Vongkulluksn, Vanessa W., Kui Xie and Margaret A. Bowman. «The role of value on teachers' internalization of external barriers and externalization of personal beliefs for classroom technology integration». *Computers & Education*, n.° 118 (2018): 70-81. https://doi.org/10.1016/j.compedu.2017.11.009

Zoch, Melody, Joy Myers and Jennifer Belcher. «Teachers' engagement with new literacies: Support for implementing technology in the English/language arts classroom». *Contemporary Issues in Technology & Teacher Education 17*, n.° 1 (2016): 25-52. https://www.learntechllb.org/p/15101 0/