Challenges and Affordances of Developing Receptive and Productive Skills via Technology-Based Instruction

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Abstract

The need to learn about the wide range of emerging educational technologies and the result of their implementation for second language learning purposes led to conducting the present review article. To this end, a rigorous review was conducted to provide a hierarchy of challenges versus affordances ahead of second language (L2) teachers who use technology-based instruction. One hundred thirty-two peer-reviewed articles published from 2014–2020 were included in the present review. The review was conducted on blended and distance L2 learning studies elaborating on receptive and productive language skills. The challenges and affordances reported by 132 articles were collected and arranged based on their frequency and were visualized in four separate skill-based hierarchies. Indicating the distribution of challenges versus affordances concerning language skills, the findings have significant pedagogical and theoretical implications for researchers and practitioners in the blended and distance L2 learning-teaching field.

Keywords: computer-assisted language learning (CALL); interactive technology and smart education; blended learning; distance learning; L2 language skills

Introduction

To avoid lagging behind the fast growth of emerging technologies in terms of application and origin, it is highly critical for the second language (L2) scholars and teachers to converge them into an instructional curriculum (Coşkun & Marlowe, 2020). Therefore, to clarify the state of knowledge in the L2 blended and distance learning research, 132 articles were reviewed with a focus on reported challenges and affordances concerning receptive and productive language skills

The collected data were visualized via hierarchical diagrams at two levels of challenges and affordances. The challenges were included in the study to facilitate identifying areas and issues in need of research and the affordances were included in the study to serve the L2 teachers as a pedagogical road map in selecting and utilizing affordances concerning language skills.

Since those in the L2 profession frequently discuss language teaching in terms of skills (Blake, 2016), the present study classified selected articles in terms of receptive (listening and reading) and productive skills (speaking and writing) in keeping with Payne

(2020). The present review article aimed at bridging the gap of a study informing the L2 teachers and researchers about the reported challenges and affordances of developing the L2 skills in a single article. The theoretical significance of the study lies in shedding light on issues and challenges that reportedly need to be addressed and overcome in future studies. The pedagogical significance of the study lies in its conveying of skill-oriented hierarchies of affordances that are reportedly available in the computer-assisted language learning (CALL) environment. The list of affordances and challenges provides teachers with an instructional manual to refer to and find out about the efficacy and deficiency of technology-based tools in teaching receptive and productive skills in blended and distance learning contexts.

The main contribution of the study for the CALL practitioners is to inform them about the latest findings in the technology-based second language learning field. Bringing together a variety of affordances reported for language learning-teaching purposes as a result of access to open data such as adaptive learning environments, learning analytics, and open educational resources by scholars (Colpaert, 2018; Hsieh & Huang, 2020) serve as a roadmap for researchers as well as teachers.

Method

To capture the affordances and challenges ahead of L2 teachers using technology-based instruction, the publication dates of conceptual and empirical articles published by journals specializing in technology-based language learning research were set to the years 2014–2020. To ensure the inclusion of all major findings in the field, primary electronic databases such as Wiley, ERIC, Sage, EBSCO, Taylor and Francis (Tandf), Web of Science (WOS), and Emerald were searched to the point of saturation. Studies published by peer-reviewed journals in CALL-related research, such as Computer Assisted Language Learning, ReCALL, Language Learning & Technology (LLT), and book chapters were also searched. Additionally, related key networks and associations related to CALL and literature snowballing were sought as well (see Figure 1). The data from the selected studies (n=132) were coded in terms of research methods, participants, language skills, reported issues and challenges and reported affordances and opportunities. Content analysis was adopted to analyze and report findings following Dochy (2006) and Lin and Lan (2015). Given the heterogeneous nature of selected studies, a meta-analysis was not adopted in this review (Garg et al., 2008; Petticrew & Roberts, 2006).

In the present study, the studies were coded concerning challenges (i.e. observed and tested limitations that can impede the use of technology-based instructional tools) and affordances (i.e. observed and tested advantages that can facilitate achieving a technology-assisted instructional objective). One hundred thirty-two peer-reviewed articles (e.g. critical review articles; conceptual articles, and research report articles) elaborating on language skills in CALL were included in the study. Different study designs from experimental to meta-analysis were included in the literature review. In line with Smith and Lafford (2009), results reported by selected studies were ranked for their focus on language skills. A hierarchy of the frequency of reported challenges and

affordances was generated concerning receptive and productive skills, highlighting issues and opportunities to be addressed by future studies (see Figures 2, 3, 4, and 5).

To arrive at a comprehensive set of relevant studies, potentially relevant sources were systematically screened and tested by searching for keywords (e.g. challenges of computer-assisted L2 learning, affordances of computer-assisted L2 learning, computer-assisted L2 reading, computer-assisted L2 writing computer-assisted L2 listening, computer-assisted L2 speaking) to identify relevant sources in primary electronic databases and platforms plus hand searching of related key journals, networks and associations, websites, personal contacting, and literature snowballing (see Figure 1).

Figure 1
Visual representation of the search and selection process
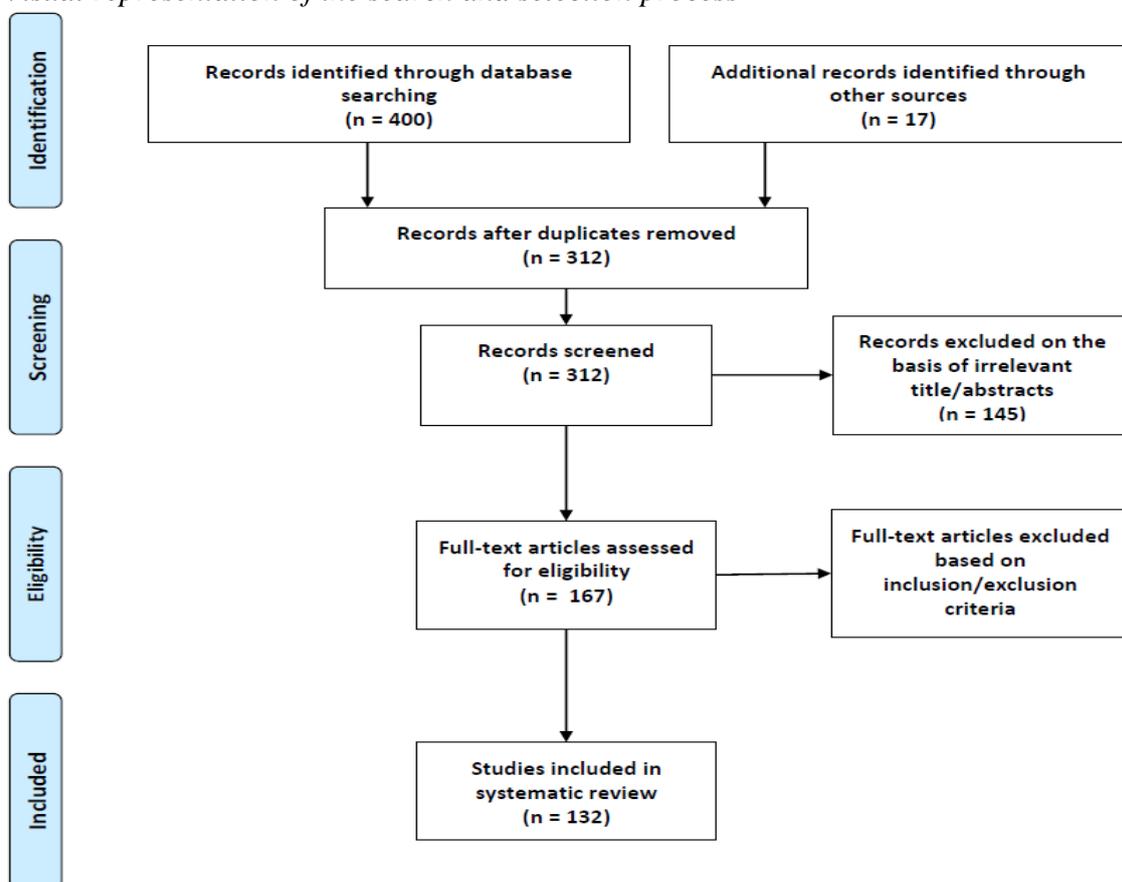
To ensure the inclusion of all major findings in the field, major-related databases such as Linguistics and Language Behavior Abstracts, PsychINFO, International Bibliography, Education Resource Information Center, Social Science Citation Index, and MLA were searched to the point of saturation. The data from the selected studies (n=132) were coded in terms of study methods, participants, language skills, reported issues and challenges, and reported affordances and opportunities. Narrative content analysis was adopted to analyze and report findings in keeping with Dochy (2006). Given the heterogeneous nature of the selected studies, the meta-analysis was not used based on previous recommendations (Garg et al., 2008; Petticrew & Roberts, 2006).

The articles included in the study were rigorously reviewed to collect the required data in response to the following research questions:

Q1. What are the most frequently reported affordances and challenges ahead of L2 teachers using technology-based instruction to develop a listening skill?
Q2. What are the most frequently reported affordances and challenges ahead of L2 teachers using technology-based instruction to develop a speaking skill?
Q3. What are the most frequently reported affordances and challenges ahead of L2 teachers using technology-based instruction to develop a reading skill?
Q4. What are the most frequently reported affordances and challenges ahead of L2 teachers using technology-based instruction to develop a writing skill?

Results

Research question 1

Results to the reported affordances and challenges ahead of L2 teachers using technology-based instruction to develop listening skill from 2014–2020.

Table 1
Sample of Reported Challenges and Affordances ahead of L2 teachers using interactive technology and smart education to develop listening skill

Author(s)	Methodology	Participants	Language skill(s)	Statements Reporting issues & challenges	Statements Reporting affordances & opportunities
Kam et al. (2020)	Experimental	60	Listening	Future studies may consider real-time and partial captioning options	Efficacy of captioned videos in enhancing L2 listening outcomes
Chen & Chen (2019)	Mixed methods approach	39	Listening	Conducting further studies on the video-annotated listening review mechanism	Efficacy of video-annotated listening review mechanism

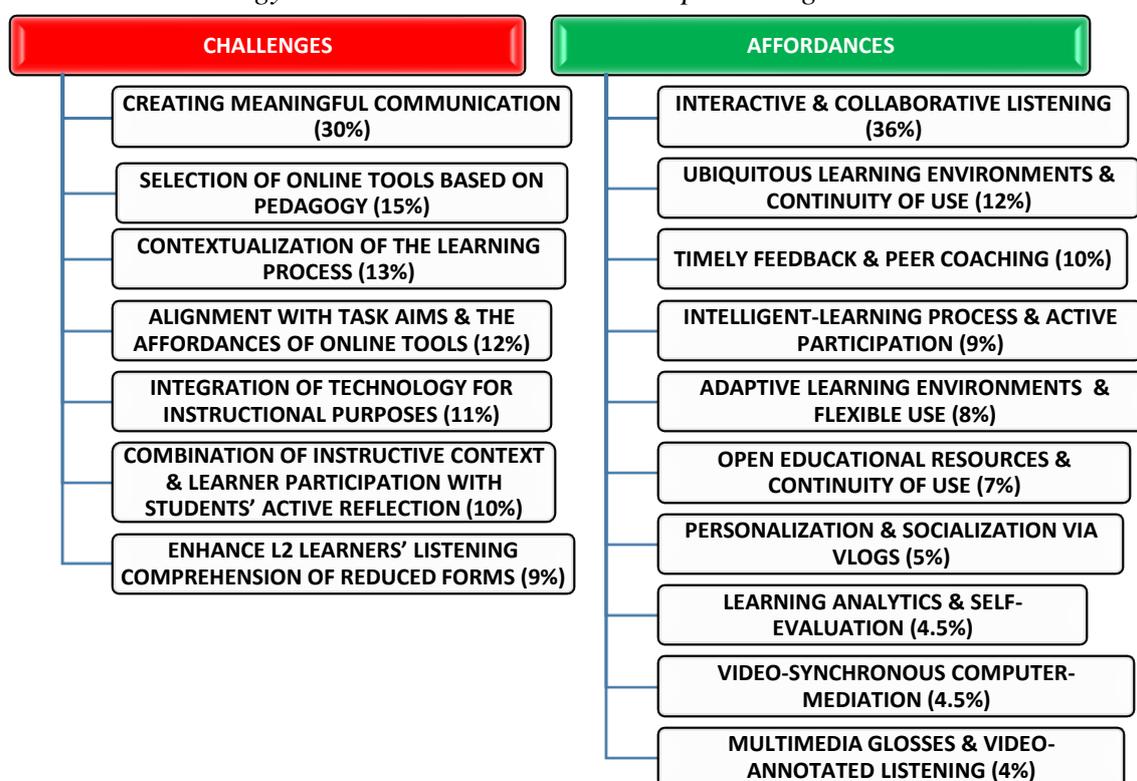| Aldukhayel (2019)	Mixed methods approach	389	Listening	When vlogs are considered for teaching, the focus should be on meaning rather than on form and comprehension rather than accuracy	Efficacy of Vlogs in L2 listening
Tan, et al. (2019)	Experimental	52	Listening	Turning listening tasks into collaborative listening activities	Effectiveness of a digital pen-based learning system with a reward mechanism to improve learners' metacognitive strategies in listening
Colpaert (2018)	Perspective	Not applicable	All skills	Contextualization of the learning process	Learning analytics, adaptive learning environments, and open educational resources
Bozorgian & Alamdari (2018)	Experimental	180	Listening	Incorporating multimedia into a syllabus	Efficacy of multimedia listening comprehension
Çakmak & Erçetin (2017)	Quantitative -Qualitative	88	Listening	A mobile learning environment for reading poses a special challenge with small screens	Access to glosses facilitated recognition and production of vocabulary

Kukulska-Hulme & Viberg (2017)	Review	Not applicable	All skills	Integration of technology (e.g. animated agents and virtual tutors) for instructional purposes	Effectiveness of Mobile collaborative language learning in terms of timely feedback, flexible use, personalization, continuity of use, active participation, socialization, self-evaluation, and peer coaching
Levak & Son (2016)	Mixed methods approach	35	Listening	The selection of online tools based on pedagogy	Online tools can be used to facilitate interaction between learners and illustrate the need for
Kato et al. (2016)	Quantitative -Qualitative	75	Listening Speaking	Teachers are faced with challenges to create meaningful interactions	The solution is adopting video-synchronous computer-mediated communication
García-Sánchez & Luján-García (2016)	Quantitative	100	All skills	Combination of instructive context and learner participation with students' active reflection	Effectiveness of ubiquitous learning environments for developing EFL students' skills
Matthews et al. (2015)	Quasi-experimental	66	Listening	Investigating the comparative success of similar pedagogical approaches with different target languages	Higher word recognition among those who received Computer-mediated input, output, and feedback
Yang & Chang (2014)	Quantitative -Qualitative	44	Listening	The challenge of reduced forms learning in	The potential of annotated keyword captions in

				authentic informal conversations	developing overall listening comprehension and reduced forms learning

Figure 2 displays the hierarchy of the most frequently reported affordances and challenges ahead of L2 teachers using interactive technology and smart education to develop listening skills from 2014–2020.

Figure 2

Hierarchy of reported challenges and opportunities ahead of L2 teachers using interactive technology and smart education to develop listening skill

CHALLENGES	AFFORDANCES
CREATING MEANINGFUL COMMUNICATION (30%)	INTERACTIVE & COLLABORATIVE LISTENING (36%)
SELECTION OF ONLINE TOOLS BASED ON PEDAGOGY (15%)	UBIQUITOUS LEARNING ENVIRONMENTS & CONTINUITY OF USE (12%)
CONTEXTUALIZATION OF THE LEARNING PROCESS (13%)	TIMELY FEEDBACK & PEER COACHING (10%)
ALIGNMENT WITH TASK AIMS & THE AFFORDANCES OF ONLINE TOOLS (12%)	INTELLIGENT-LEARNING PROCESS & ACTIVE PARTICIPATION (9%)
INTEGRATION OF TECHNOLOGY FOR INSTRUCTIONAL PURPOSES (11%)	ADAPTIVE LEARNING ENVIRONMENTS & FLEXIBLE USE (8%)
COMBINATION OF INSTRUCTIVE CONTEXT & LEARNER PARTICIPATION WITH STUDENTS' ACTIVE REFLECTION (10%)	OPEN EDUCATIONAL RESOURCES & CONTINUITY OF USE (7%)
ENHANCE L2 LEARNERS' LISTENING COMPREHENSION OF REDUCED FORMS (9%)	PERSONALIZATION & SOCIALIZATION VIA VLOGS (5%)
	LEARNING ANALYTICS & SELF-EVALUATION (4.5%)
	VIDEO-SYNCHRONOUS COMPUTER-MEDIATION (4.5%)
	MULTIMEDIA GLOSSES & VIDEO-ANNOTATED LISTENING (4%)

The hierarchy displays challenges and affordances in ascending order concerning their frequency. According to the reviewed articles, creating meaningful communication (30%) is the most frequently reported challenge, and interactive and collaborative listening skill development (36%) is the most frequently reported affordance (see Figure 1).

Affordances

Kato et al. (2016) suggested video-synchronous computer-mediation as an affordance in ongoing courses to create meaningful communication for developing listening-speaking skills purposes. García-Sánchez and Luján-García (2016) reported the

effectiveness of ubiquitous learning environments to develop EFL learning affordances in terms of learner motivation, learner engagement, and use of interactive strategies. Reviewing studies on mobile collaborative language learning, Kukulska-Hulme and Viberg (2017) indicated many affordances including timely feedback, flexible use, personalization, continuity of use, active participation, socialization, self-evaluation, and peer coaching (Andujar, 2016; Berns et al., 2016; Hwang et al., 2016; Troussas et al., 2014; Wong, et al., 2015). Exploring the potential influences of multimedia glosses on listening skill and incidental vocabulary learning, Çakmak and Erçetin (2017) reported the affordances of facilitating production and recognition of vocabulary among those who had access to glosses (i.e. dual and single-mode glosses).

Cárdenas-Claros (2020) conducted a qualitative study to conceptualize feedback in CALL context with a focus on listening skills and reported that computer-mediated feedback eases task completion and facilitates listening skills via regulating listening comprehension processes.

Liu and Zhang (2020) analyzed the internal consistency of computer automatic scoring by examining 15 expert raters' scoring. They reported that "The low bias rate of computer automatic scoring indicates that computer automatic scoring is better than human raters in terms of inner-consistency" (p.1). Their findings provide evidence in support of the efficacy of automatic scoring as an assessment affordance compared to manual scoring.

Challenges

Kukulska-Hulme and Viberg (2017) reported the challenge of integration of technology (e.g. animated agents and virtual tutors) for instructional purposes and the need to be addressed in future studies, an issue emphasized by Mohamad Ali et al. (2015). Exploring the impact of different forms of captions (i.e. keyword-only, full, and annotated keyword) on listening comprehension, Yang and Chang (2014) confirmed the affordances of developing overall listening comprehension and reduced forms learning. They addressed the challenge of reduced forms learning in authentic informal conversations by investigating the captions' potential and confirmed the use of captions as a solution to enhance L2 learners' listening comprehension of reduced forms. Levak and Son (2016) emphasized the challenge of "alignment with task aims and the affordances of online tools" (p. 12) and reported the affordance of facilitating interaction via online tools.

Research question 2

Results to the reported affordances and challenges ahead of L2 teachers using technology-based instruction to develop speaking skill from 2014–2020.

Table 2

Sample of Reported Challenges and Affordances ahead of L2 teachers using interactive technology and smart education to develop speaking skill
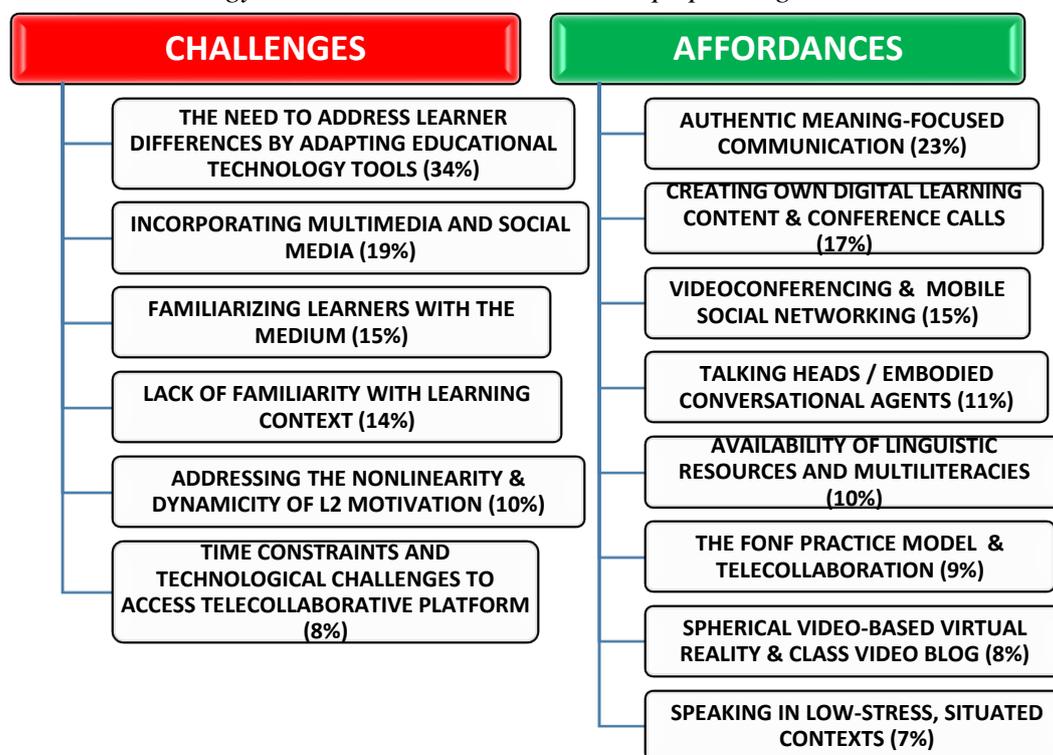
Author(s)	Methodology	Participants	Language skill(s)	Statements Reporting issues & challenges	Statements Reporting affordances & opportunities
Chien et al. (2020)	Quantitative - Qualitative	69	Speaking	Praise feedback favorable but criticism feedback unfavorable	Effectiveness of spherical video-based virtual reality
Shadiev et al. (2019)	Review	Not applicable	Not applicable	Familiarity with learning contexts	Authentic and familiar learning context increase motivation
Castañeda (2019)	Longitudinal	53	Speaking	More research is needed on input, presentational output, and interpersonal output activities	Effectiveness of doing task-based activities via *Voice Thread technology* to develop conversational interactions
Bahari (2019a)	Quantitative - Qualitative	67	Listening speaking	The need to address learner differences by adapting educational technology tools	The effectiveness of the FonF practice model by addressing dynamicity and nonlinearity of L2 motivation
Tecedor & Campos-Dintrans (2018)	quasi-experimental design	48	Oral skills	Familiarizing learners with the medium	Fluency and accuracy of presentational skills
Yang (2017)	Qualitative	6	Speaking writing	Different rate of information-seeking questions between learners from different nationalities	Efficacy of synchronous intercultural online exchange
Sun, et al., (2017)	quasi-experim	72	Speaking	The majority of complaints were related to hardware	Developing speaking fluency via mobile social networking

	ental design			issues	
Jin (2017)	Qualitative	7	Oral skills	Investigate the potential of integrating WeChat communication in a foreign language context	*WeChat* use in a language-focused study abroad context
Fuchs (2016)	Case study	10	Oral skills	Time constraints and technological challenges to access telecollaborative platform	Efficacy of telecollaboration in developing interactive negotiation
Liu (2016)	Mixed methods approach	42	Oral skills	Blending a class video blog into face-to-face instruction	Effectiveness of class video blog for oral proficiency development
Romana Correa (2015)	Qualitative	12	Speaking	Developing speaking skill is a demanding task	Oral reinforcement of both language fluency and course contents

Figure 2 displays the hierarchy of the most frequently reported affordances and challenges ahead of L2 teachers using interactive technology and smart education to develop speaking skills from 2014–2020.

Figure 3

Hierarchy of reported challenges and opportunities ahead of L2 teachers using interactive technology and smart education to develop speaking skill

CHALLENGES	AFFORDANCES
THE NEED TO ADDRESS LEARNER DIFFERENCES BY ADAPTING EDUCATIONAL TECHNOLOGY TOOLS (34%)	AUTHENTIC MEANING-FOCUSED COMMUNICATION (23%)
INCORPORATING MULTIMEDIA AND SOCIAL MEDIA (19%)	CREATING OWN DIGITAL LEARNING CONTENT & CONFERENCE CALLS (17%)
FAMILIARIZING LEARNERS WITH THE MEDIUM (15%)	VIDEOCONFERENCING & MOBILE SOCIAL NETWORKING (15%)
LACK OF FAMILIARITY WITH LEARNING CONTEXT (14%)	TALKING HEADS / EMBODIED CONVERSATIONAL AGENTS (11%)
ADDRESSING THE NONLINEARITY & DYNAMICITY OF L2 MOTIVATION (10%)	AVAILABILITY OF LINGUISTIC RESOURCES AND MULTILITERACIES (10%)
TIME CONSTRAINTS AND TECHNOLOGICAL CHALLENGES TO ACCESS TELECOLLABORATIVE PLATFORM (8%)	THE FONF PRACTICE MODEL & TELECOLLABORATION (9%)
	SPHERICAL VIDEO-BASED VIRTUAL REALITY & CLASS VIDEO BLOG (8%)
	SPEAKING IN LOW-STRESS, SITUATED CONTEXTS (7%)

The hierarchy displays challenges and affordances in ascending order concerning their frequency. According to the reviewed articles, the need to address learner differences such as learner anxiety, learner needs, learner motivation, etc. by adapting educational technology tools (34%) is the most frequently reported challenge and authentic meaning-focused communication (23%) is the most frequently reported affordance (see Figure 3).

Affordances

Shadiev et al. (2019) reviewed studies with a focus on familiarity with learning context. They confirmed the lack of familiarity as an issue that can negatively influence the learning process and the presence of it as an affordance that can increase L2 learner's motivation. Chien et al. (2020) confirmed the affordances of using spherical video-based virtual reality as a way of peer feedback provision in terms of improving learners' perception, reducing anxiety, and increasing motivation. To explore the potential behind blending a class video blog into face-to-face instruction for oral proficiency development, Liu (2016) conducted a year-long investigation. The study revealed the effectiveness of using a class video blog as an affordance for oral proficiency development. Exploring the potential affordances in *WeChat* use in a language-focused study, Jin (2017) reported four affordances: authentic meaning-focused communication, availability of linguistic resources and multiliteracies, easy access to native speakers, space for new identity creation. Exploring the impact of conference calls on promoting speaking skills, Romana

Correa (2015) confirmed the effectiveness of conference calls in progressing and reinforcing L2 fluency as well as course contents. The study suggested learners be on hand before the conference calls to solve technical problems if any before the actual scheduled time. Sun, et al., (2017) reported the affordance of developing speaking fluency via mobile social networking. They highlighted the advantages of mobile social networking in terms of engaging learners in collaborative learning and providing interaction opportunities outside the class time. Exploring the impact of mobile social networking, they confirmed the affordance of **s**peaking in low-stress, situated contexts among those participants who received the treatment based on mobile social networking.

To examine the efficacy of digital storytelling for developing the speaking skill of foreign language learners, Yang et al. (2020) conducted a quasi-experimental study and reported the affordances of digital storytelling in terms of offering meaningful and authentic L2 learning opportunities. Digital storytelling can potentially create a user-friendly interface that facilitates collaborative learning and boosts learners' nonlinear dynamic motivation (Bahari, 2020a), develops writing skills (Tanrıkulu, 2020), and speaking skills (Le, 2020).

Challenges

Exploring the potential behind computer-based language learning, Pennington and Rogerson-Revell (2019) referred to some affordances such as autonomy, exposure to a variety of speech types, mobility, and multimodality as well as some challenges such as incorporating multimedia and social media and 3D animations to improve speaker accents as emphasized by previous studies (Fouz-González, 2017; Mompean & Fouz-González, 2016). Exploring the efficacy of the FonF practice model as a framework to develop oral skills, Bahari (2019b) reported the affordances of the FonF practice model in terms of developing oral skills at form, meaning, and communication levels. The study also reported the challenge of addressing the nonlinearity and dynamicity of L2 motivation and learner differences by incorporating tools and affordances of educational technology. Tecedor and Campos-Dintrans (2018) reported the affordance of videoconferencing activities in terms of progressing fluency and accuracy of presentational skills. They also reported the challenge of familiarizing learners with the medium as an issue ahead of the researchers and program designers.

Voice recognition technology (VRT) as an affordance of technology-based L2 instruction that reportedly develops speaking skills (Zou et al., 2020) results in some challenges. First, it fails to recognize non-native accents (Liakin et al., 2015), second, it fails to give feedback and evaluation of speaking performance (Zou et al., 2018) because of underdeveloped prosodic system features that need to be addressed in future studies.

Research question 3

Results to the reported affordances and challenges ahead of L2 teachers using technology-based instruction to develop reading skills from 2014–2020.

Table 3
Sample of Reported Challenges and Affordances ahead of L2 teachers using interactive technology and smart education to develop reading skill

Author(s)	Methodology	Participants	Language skill(s)	Statements Reporting issues & challenges	Statements Reporting affordances & opportunities
Hsieh & Huang (2020)	Quasi-experimental research design	49	Reading	Diverse classroom activities & interactions were more important than the technology to draw students' attention	The e-book had a positive impact on listening comprehension. e-book intervention resulted in higher test scores compared to the print book
Abrami et al. (2020)	Review	17 Articles	Reading	High-implementing vs. low-implementing teachers	Effectiveness of interactive multimedia reading development
Tavakoli et al. (2019)	quasi-experimental research design	83	Reading	Addressing reading motivation in the CALL	Efficacy of CALL-mediated TBLT on motivation for L2 reading
Yang & Qian (2019)	Mixed methods approach	138	Reading	The need to expand computerized dynamic assessment	Promoting L2 English learners' reading proficiency through computerized dynamic assessment
Lin, et al., (2019)	Review	28 Articles	Reading	Theoretical framework to address MALL features and issues is crucial	Efficacy of implementing mobile learning for developing reading

McTigue et al. (2019)	Critical Review	28 Articles	Reading	game-based technology for reading instruction has not met the learning potentials of young readers	Effective game-based reading instruction for adults
Varol, & Erçetin (2019)	Quasi-experimental	120	Reading	Further studies required	Effectiveness of lexical glosses over topic-level glosses & pop-up conditions in electronic reading
Lee et al. (2018)	Data-mining approach	132	Reading	Identifying hidden learner types and provide personalized CALL instruction	Effectiveness of glossary types
Tse et al. (2017)	Quantitative -Qualitative	100	Reading	Limited capability of video-based flipped class instruction for boosting L2 learning motivation	Effectiveness of video-based flipped class instruction
Lin (2014)	Quantitative -Qualitative	84	Reading	Learner textbook and reading strategy for mobile language learning	Developing reading achievement and a greater appreciation of online activities via tablet PCs

Figure 4 displays the hierarchy of the most frequently reported affordances and challenges ahead of L2 teachers using interactive technology and smart education to develop reading skills from 2014–2020.

Figure 4

Hierarchy of reported challenges and opportunities ahead of L2 teachers using interactive technology and smart education to develop reading skill
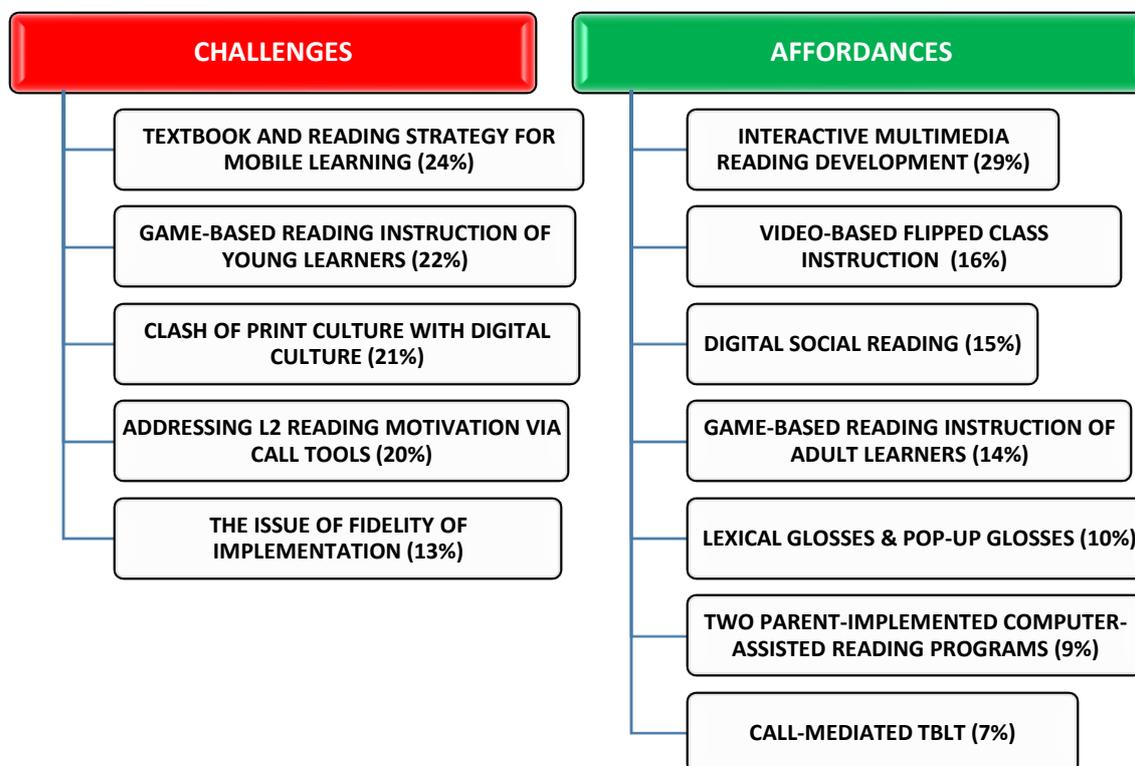
The hierarchy displays challenges and affordances in ascending order concerning their frequency. According to the reviewed articles, textbooks and reading strategy for mobile learning (24%) is the most frequently reported challenge and interactive multimedia reading development (29%) is the most frequently reported affordance (see Figure 3).

Affordances

Abrami, et al. (2020) examined the effectiveness of ABRACADABRA as a tool for interactive multimedia reading development and confirmed that "ABRA-based instruction does work" (p. 14). Therefore, interactive multimedia reading is added to the hierarchy of affordances that assist L2 teachers using interactive and smart education.

To explore the impact of glosses on L2 learner's comprehension and recall in electronic reading, Varol and Erçetin (2019) conducted a study on one hundred twenty L2 learners. They confirmed the affordances of lexical glosses over topic-level glosses (that led to longer reading times) and pop-up conditions (separate window vs. pop-up window) that led to more frequent lookup behavior among L2 learners. Blyth (2014) reported annotated reading as an affordance of digital social reading that has not only changed teachers' perception of reading but also served as a bridging activity between print culture and digital culture. Accordingly, digital practices have developed from individual reading activities to social pedagogical activities.

Exploring the effectiveness and ineffectiveness of video-based flipped class instruction, Tse, et al. (2017) reported the issue of the limited capability of video-based flipped class instruction for boosting L2 learning motivation as well as the affordances of teaching effectiveness and academic subject satisfaction. Accordingly, Jiang, et al. (2020) confirmed the challenges of managing the in-class gap between prepared and unprepared learners in flipped classes reported by Wang and Qi (2018).

The study conducted by Pérez-Segura et al. (2020) reported higher motivation among EFL learners who benefited from the affordance of the use of clicker and Audience Response Systems to develop receptive skills. Pindiprolu and Marks (2020) reported higher gains in phonics and phonemic awareness among rural school students who used two parent-implemented computer-assisted reading programs compared to their reading-proficient peers. Ronimus et al. (2020) used tablet computers in a study to find out the impact of a mobile game on reading skills and reported higher word reading fluency among the experimental group. They also reported the inefficacy of including spelling and phonological tasks in game-based activities to increase transfer effect on word reading.

Challenges

The critical review conducted by McTigue, et al., (2019) reported that game-based reading instruction has failed to meet the instructional purposes of young readers in contrast to adult readers who have more significantly benefited from game-based reading instruction. Despite their explanations and attempts to attribute the reported differences to theoretical frameworks adopted by the reviewed studies, further studies are required to address this issue and clarify the reasons behind the differences in the effectiveness of game-based reading instruction for different age groups. One of the challenges reported in the reviewed studies is the issue of the fidelity of implementation among CALL teachers. Given the diverse pedagogical abilities of L2 teachers to use blended and distance learning tools and affordances, some teachers can be described as high-implementing while others are low-implementing which can cause instructional differentiations (Bahari, 2020b). Exploring the effectiveness of glossary types, Lee et al. (2018) reported the challenge of identifying hidden learner types and provide personalized CALL instruction in future studies. Lin (2014) investigated the impact of tablet PCs on English learners' perceptions, reading ability, and online activities and reported the affordances of reading achievement and a greater appreciation of online activities. Accordingly, the study put forward a challenge ahead of future studies to address two trends of study: learner textbooks and reading strategy for mobile language learning.

Research question 4

Results to the reported affordances and challenges ahead of L2 teachers using technology-based instruction to develop writing skills from 2014–2020.

Table 4

Sample of Reported Challenges and Affordances ahead of L2 teachers using interactive technology and smart education to develop writing skill

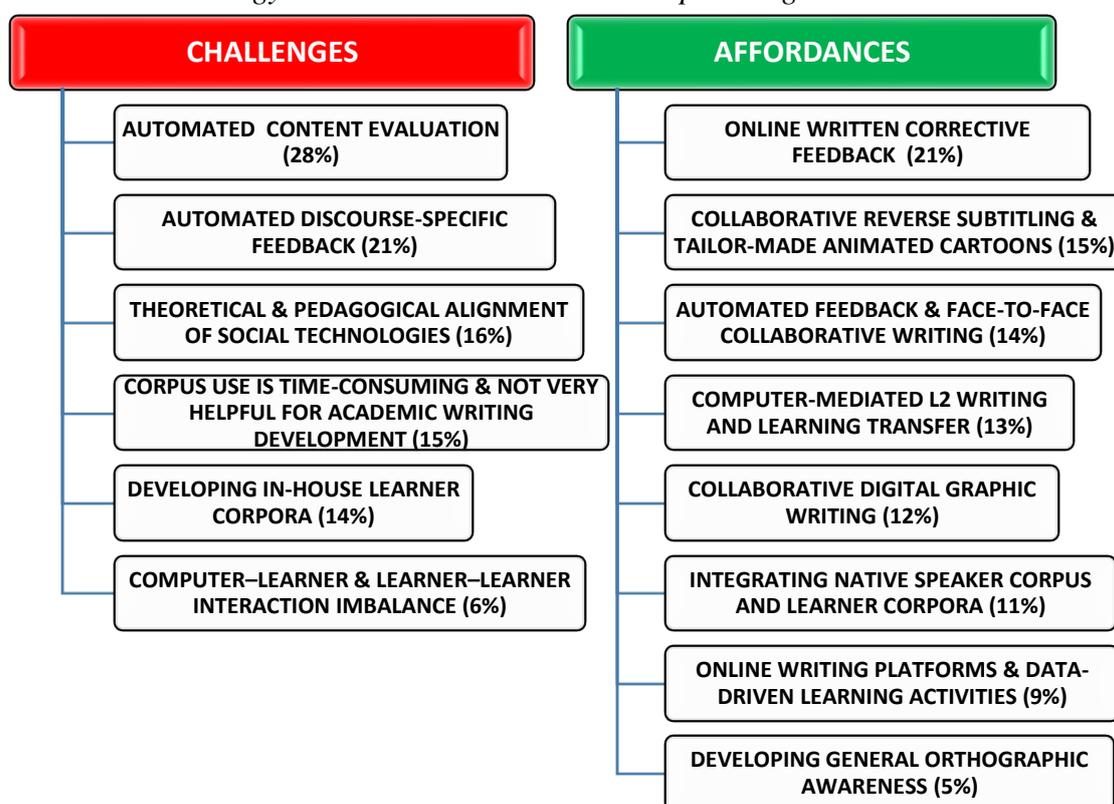| Author(s)	Methodology	Participants	Language skill(s)	Statements Reporting issues & challenges	Statements Reporting affordances & opportunities
Hsieh (2020)	Case study	56	Writing	The imbalance between computer–learner and learner-learner interaction	Integrating online resources to develop collaborative learning
Bakla (2019)	Quantitative -Qualitative	112	Writing	Technical challenges of creating tailor-made animated cartoons	Tailor-made animated cartoons in teaching punctuation in EFL writing
Kılıçkaya (2019)	Quantitative -Qualitative	48	Writing	Digital reading revision	Collaborative digital graphic writing
Lee (2019)	Qualitative	25	Writing	The challenge of measuring writing fluency	Digital game-based learning improves creative writing and student motivation
Saricaoglu (2018)	Quantitative -Qualitative	32	Writing	Automated content evaluation	Automated feedback to generate discourse-specific feedback
Amiryousefi (2017)	Quantitative -Qualitative	76	Writing	Collaborative versus individual prewriting planning on computer-mediated L2 writing	Improved computer-mediated L2 writing and learning transfer

Talaván et al. (2016)	Quantitative	68	Writing	The complexity of audiovisual translation	Efficacy of collaborative reverse subtitling in terms of written production skills
Wong & Hsu (2016)	Quantitative-Qualitative	31	Writing	Component structure and spatial configuration of the Chinese characters	Developing general orthographic awareness via game-based learning
Lee et al. (2016)	Quantitative-Qualitative	16	Writing	"differences between the frequencies of the specific skills used for each function"	*The Writing Portal* is a successful online tool to support learners during the writing process
Parmaxi & Zaphiris (2016)	Review	Not applicable	All Language skills	the challenge of theoretical and pedagogical alignment of social technologies	Effectiveness of Web 2.0 technologies
Chang (2014)	Qualitative	5	Writing	It's time-consuming, difficult to use for constructing sentence structures, and not very effective in the structural aspect.	Corpus use to develop academic writing
Cotos (2014)	Quantitative-Qualitative	31	Writing	Developing in-house learner corpora to identify and tackle issues relevant to learners	Combining learner and native-speaker data as an effective practice
Huang (2014)	Quantitative-Qualitative	40	Writing	Potential problems of using	data-driven learning activities can

				concordance activities for independent learning	improve L2 writing in terms of the lexico-grammatical use of abstract nouns

Figure 5 displays the hierarchy of the most frequently reported affordances and challenges ahead of L2 teachers using interactive technology and smart education to develop writing skills from 2014–2020.

Figure 2

Hierarchy of reported challenges and opportunities ahead of L2 teachers using interactive technology and smart education to develop writing skill

CHALLENGES

- AUTOMATED CONTENT EVALUATION (28%)
- AUTOMATED DISCOURSE-SPECIFIC FEEDBACK (21%)
- THEORETICAL & PEDAGOGICAL ALIGNMENT OF SOCIAL TECHNOLOGIES (16%)
- CORPUS USE IS TIME-CONSUMING & NOT VERY HELPFUL FOR ACADEMIC WRITING DEVELOPMENT (15%)
- DEVELOPING IN-HOUSE LEARNER CORPORA (14%)
- COMPUTER–LEARNER & LEARNER–LEARNER INTERACTION IMBALANCE (6%)

AFFORDANCES

- ONLINE WRITTEN CORRECTIVE FEEDBACK (21%)
- COLLABORATIVE REVERSE SUBTITLING & TAILOR-MADE ANIMATED CARTOONS (15%)
- AUTOMATED FEEDBACK & FACE-TO-FACE COLLABORATIVE WRITING (14%)
- COMPUTER-MEDIATED L2 WRITING AND LEARNING TRANSFER (13%)
- COLLABORATIVE DIGITAL GRAPHIC WRITING (12%)
- INTEGRATING NATIVE SPEAKER CORPUS AND LEARNER CORPORA (11%)
- ONLINE WRITING PLATFORMS & DATA-DRIVEN LEARNING ACTIVITIES (9%)
- DEVELOPING GENERAL ORTHOGRAPHIC AWARENESS (5%)

The hierarchy displays challenges and affordances in ascending order concerning their frequency. According to the reviewed articles, generating automated written content evaluation (28%) is the most frequently reported challenge, and online written corrective feedback (21%) is the most frequently reported affordance (see Figure 4).

Affordances

Kılıçkaya (2019) explored the effectiveness of collaborative digital graphic writing and reported positive perceptions of the learners who believed that collaborative digital

graphic writing not only assisted them to do digital revising but it was an entertaining, creative and collaborative affordance. Exploring the potentials behind collaborative game-based learning, Wong and Hsu (2016) tried to figure out whether they can enhance orthographic awareness via game-based learning or not. They confirmed the affordance of game-based learning to develop general orthographic awareness as well as create more active learner participation. Their findings were confirmed by Poole & Clarke-Midura (2020) who reported that digital games developed writing skills by offering interactive and contextualized learning environments and allowing immediate feedback. Patiño et al. (2020) confirmed the affordance of integrating fine and gross motor skills along with information and communication technologies in developing writing skills in keeping with previous studies (Genlott, & Grönlund, 2013; Wollscheid et al., 2016). Patiño, et al. (2020) emphasized "the relevance of interdisciplinary integration around the development of writing" which requires curriculum designers of 21st-century schools to incorporate emerging learning-to-write technologies in keeping with the evolution of instructional technologies (p. 494). Lee et al. (2016) reported that *The Writing Portal* as a supplementary online writing platform provided affordances to support L2 learners' needs during the writing process by addressing multiple tasks. However, they failed to explain how *The Writing Portal* as a writing affordance addressed writing challenges of L2 learners, except for a brief reference to the observed frequency differences between the specific skills used for each function, without providing helpful explanations. Exploring the effectiveness and ineffectiveness of collaborative versus individual prewriting planning on computer-mediated L2 writing, Amiryousefi (2017) reported the affordances of improved computer-mediated L2 writing and learning transfer. Exploring the efficacy of collaborative reverse subtitling for writing skill development, Talaván et al. (2016) reported the affordance of collaborative reverse subtitling in terms of written production skills. They also reported the challenges of audiovisual translation which requires further research in the field. Lin et al. (2020) reported the affordance of augmented-reality context-aware ubiquitous writing application in developing EFL learners' self-regulated writing proficiency. They introduced a five-step procedure to develop digital and multimodal literacy and emphasized ubiquitous writing practice.

Nguyenn et al. (2020) reported the affordance of storytelling in terms of developing L2 learners' writing skills, confidence, and motivation by using authentic materials. Trying to tell their stories, experimental participants used more vivid words and vocabulary to retell their stories which led to higher confidence and motivation among them. The use of authentic learning materials not only reflects real-life situations and objects but also keeps learners motivated to continue the learning process while developing their writing in terms of content and structure.

Yeh et al. (2020) explored the impact of video-making on developing writing skills and observed higher meaning-making skills and conscious self-regulation of different contexts among participants who received treatment (i.e. video-making as opposed to video watching). Reported affordances of video-making on developing writing proficiency include providing realistic and authentic scenarios (Meyer & Forester, 2015), establishing collaborative activities (Dahya, 2017), and meeting the variety of learner differences (Bahari, 2020c; Dzekoe, 2017).

Challenges

To explore the effectiveness of Web 2.0 technologies in CALL, Parmaxi and Zaphiris (2016) investigated Web 2.0 tools used for L2 learning-teaching purposes. They confirmed the effectiveness of these tools in language skills development, whereas they highlighted the challenge of theoretical and pedagogical alignment of social technologies. Therefore, future studies need to elaborate on the theoretical and pedagogical integration of technology in CALL to assist L2 teachers to overcome this challenge. Chang (2014) indicated a number of issues concerning corpus use such as that it's time-consuming, difficult to use for constructing sentence structures, and not very effective in the structural aspect. Exploring the impact of integrating native-speaker corpus and learner corpora as part of data-driven learning pedagogy, Cotos (2014) reported the affordances of combining learner and native speaker data as an effective practice for developing writing skill in terms of diversity, accuracy, and frequency of learners' use of adverbials. The study also suggested L2 teachers develop in-house learner corpora to identify and tackle issues relevant to their students. Exploring the efficacy of automated feedback, Saricaoglu (2018) reported the challenge of generating automated discourse-specific feedback and evaluating writing content via automated systems. Jiang et al. (2020) reported the challenge of priority of face-to-face instruction over computer-mediated instruction to teach writing skills. They argued that the associated primary skills evolved in learners during face-to-face collaborative contexts are more facilitative than technology-based contexts to develop writing skills. Besides that, they suggested a cognitive load of the learning process in a computer-mediated learning environment as another evidence to support their argument.

Discussion

Based on the reported findings, including Levak and Son (2016) who emphasized the challenge of "alignment with task aims and the affordances of online tools" (p.12) it is necessary to consider a variety of factors that originate from the learner differences before utilizing reported affordances. Among several factors is the learner style (e.g. field-dependent and field-independent) that calls for the use of different affordances (Bahari, 2020d; Parmaxi & Zaphiris, 2016). Therefore, CALL practitioners are suggested to consider individual learner differences before implementing the aforementioned affordances to develop receptive and productive skills in blended and distance learning contexts. The emergence of developed educational tools and technologies makes it possible to cater to learner-specific needs concerning individual learner differences without having to resort to the use of traditional one-size-fits-all approaches. Reported affordances enable L2 teachers to address the immediate needs of learners during the learning process with technology (e.g. developing accuracy of productive skills and fluency of receptive skills; Barrett, & Liu, 2016; Kwak, 2017).

Contradictory results of the studies on similar issues plus the nonlinearity and dynamicity of individual learner differences require the CALL L2 teachers to consider several issues before using the aforementioned affordances. For example, L2 teachers need to decide in advance whether to focus on form or meaning, since some students mostly pay attention to the form (Kim, 2015; Wang, 2016), while others mostly pay attention to the content (Neumann & McDonough, 2015). Therefore, L2 teachers should consider a variety of issues before implementing the aforementioned affordances and take

necessary pedagogical measures (i.e. to decide which tool(s) fit the learning context, learning process, and more importantly the individual learner differences) to overcome the aforementioned challenges.

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Contradictory results of the studies on similar issues plus the nonlinearity and dynamicity of individual learner differences require the CALL L2 teachers to consider several issues before using the aforementioned affordances. For example, L2 teachers need to decide in advance whether to focus on form or meaning, since some students mostly pay attention to the form (Kim, 2015; Wang, 2016), while others mostly pay attention to the content (Neumann & McDonough, 2015). Teachers who use massive open online courses (MOOCs) need to consider a number of challenges including interaction difficulties with native speakers (Sokolik, 2014), online socialization activities (Schulze & Scholz, 2018), and efficacy for skill-based subjects (Sallam et al., 2020). The L2 teachers need to consider the aforementioned affordances and their potential advantages before implementing and take necessary pedagogical measures to overcome the reported limitations of the aforementioned challenges.

Reviewing different studies conducted across the world, the authors noticed that they all addressed English language skills as if it is the only language that exists in the world or it is the only language that should be analyzed and reported by major CALL journals. Given the rare studies on multilingual CALL, the theoretical implication of the study is the critical need to address this problem theoretically and practically in future studies. The issue of monolingual bias within CALL studies has been mentioned previously (Buendgens-Kosten, 2020; Ortega, 2017; Sauro, 2016). Therefore, future studies are suggested to expand CALL studies by elaborating on challenges and affordances ahead of multilingual teachers using technology-based instruction. It is time to delve into the CALL challenges and affordances for teaching and learning languages other than English. Given the imbalanced focus of computer-assisted L2 learning programs on receptive skills compared to productive skills (Golonka et al., 2012; Sung et al., 2015), future studies need to address this issue. The next theoretical challenge ahead of the studies in the CALL field is the need to introduce and use comprehensive metaphors for encompassing and conceptualizing L2 learning and teaching tools and affordances concerning the emerging technologies (Reinhardt, 2020). Future studies are suggested to implement the latest findings of synthesis technology and speech recognition for L2 teaching and learning concerning challenges such as teacher training and cognitive issues (Cheng et al., 2020).

Moving forward, the CALL teachers are strongly suggested to select and use the aforementioned affordances to develop receptive and productive language skills based on

individual learner differences that nonlinearly and dynamically vary from one learner to another (Bahari, 2020c). It is pedagogically critical for L2 teachers to consider the reported challenges and take the suggested measures by studies along with their innovative measures before experiencing them while developing language skills via blended and distance learning tools and affordances. The main pedagogical contribution of the prepared hierarchical challenges and affordances for the CALL teachers is that they can simply refer to them as a manual prior to teaching language skills with technology-based technologies.

Teachers need to consider both affordances (e.g. physical interaction, speaking to robots, higher retention, expression of emotions, and humanoid appearance, etc.) and challenges (e.g. mixed results concerning the impact of robots' social behavior on learning and learners' motivation and the need to design socially supportive and personalized robots, etc.) of robot-assisted L2 teaching in their pedagogical strategies (Engwall & Lopes 2020; Iio, et al., 2019; Randall, 2020; Parmaxi & Demetriou, 2020; van den Berghe et al., 2019).

Pedagogically, teachers need to consider the appropriate functionalities (e.g. reminding learners of their progress, giving feedback, promoting learners' awareness, etc.) of technology-based affordances that they use to facilitate the process of L2 instruction in terms of receptive and productive language skills (Sung et al., 2017).

Conclusion

In a pandemic-ready world, the findings of the current review paper inform the L2 teachers and researchers about the challenges and affordances that need to be considered in blended and distance learning contexts as there is an emergency to shift to e-learning. The findings of the study visualized as hierarchical data conveying theoretical affordances and challenges can inform the researchers of the field about the issues and limitations that need to be addressed in future studies. The findings also guide the L2 teachers to be well-prepared to overcome the potential challenges and to decide what affordances to use concerning learner-oriented factors (learner style, learner motivation, learner anxiety, learner needs, etc.) to meet learner needs. The CALL practitioners need to equally incorporate the required tools and develop the usability and authenticity of content in L2 instruction websites concerning both receptive and productive skills. They need to consider using multimodal resources (e.g. audio, visual, and spatial; Morell, 2015), developing learner skill and autonomy (Shih, & Liu, 2015), and facilitating teacher-student feedback, and meeting nonlinearity and dynamicity of individual learner differences (Bahari, 2020c).

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