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INTEGRATING HTML5-BASED SPEECH RECOGNITION WITH LEARNING MANAGEMENT SYSTEM TO ENHANCE EFL LEARNERS' PRONUNCIATION SKILLS

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Abstract. *HTML5 (HyperText Markup Language version 5) is currently integrated with almost all web-based applications due to its compatibility with numerous types of multimedia content including music, video, and animation. This exploratory study focused on the application and assessment of an HTML5-based plugin called H5P as a Computer Assisted Pronunciation Training (CAPT) tool in developing the pronunciation skills of intermediate-level learners of English as a foreign language (EFL). The target words were initially recorded with their correct pronunciations and then the audio files were imported into H5P to create interactive exercises. The H5P was then integrated with the institutional Learning Management System (LMS). The practice was implemented on n=188 EFL learners enrolled in the General Foundation (GFP) of a university college in the Sultanate of Oman. The efficacy of the approach was assessed through the perspectives of students by using student questionnaires and a student focus group discussion (FGD). The study yielded encouraging findings since most of the students agreed that the use of HTML5 as a CAPT tool was helpful in enhancing their pronunciation skills as it provided automatically generated instant feedback, was easy to use, and could be used by students autonomously at their own pace. Although the impact of software on student achievement in terms of pronunciation skills could not be gauged and the sample was limited to one institution, the study has useful implications for EFL teachers and curriculum designers on using HTML5 for developing pronunciation skills. Further studies are necessary to investigate the pedagogic potential of CAPT resources to develop a high level of competence in EFL learners' pronunciation.*

Key words: *EFL, HTML5 based tools, Technology enhanced learning, Speaking skills*

1. INTRODUCTION

Pronunciation plays a vital role in second language learning as it is a sub-component of speaking that determines the extent to which mutual understanding occurs among communicators (Batool, Sarwat and Shahzad 2021); (Mahdi and Al Khateeb 2019). Good speaking requires good pronunciation skills as poor pronunciation distorts the communication process, especially when communicating with people outside one's immediate linguistic environment or speech community (Tsojon and Nuhu Aji 2014). The purpose of the

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development of EFL learners' pronunciation is not only to imitate native speakers but also to achieve communication and intelligibility at the highest form of comprehensibility between speakers (Kang 2010). Lee, Jang and Plonsky 2015 concluded that pronunciation instruction and activities have a statistically significant impact on EFL learners. Yet, despite the importance pronunciation instruction holds, it is mostly ignored in language classrooms (Nair et al. 2017). One reason could be that teaching pronunciation is challenging. Teachers are left in the dark about how and what to teach in pronunciation and are unfortunately confronted with conflicting methods (Batool et al. 2021). Thus, the incapability of choosing an agreeable method of how, what, and when to teach pronunciation leads to the absence of solid pedagogical content for pronunciation which makes teachers become hesitant and view teaching pronunciation as secondary (Darcy, Ewert et al. 2012).

Integration of technology in pronunciation teaching and learning has gained attention in the recent past (Rogerson-Revell and Pamela 2021). The use of CAPT programs has grown with the recent proliferation of web-based mobile apps enabling opportunities for language production and individualized feedback. Adding value to the traditional pedagogic methods, the technology driven tool, CAPT, maximizes opportunities for exposure to a broader variety of spoken language, which allows students to study pronunciation on their own. In essence, CAPT resources have the potential to provide "an individualised, stress-free, self-paced learning environment with limitless access to a wide range of multimodal material as well as opportunities for immediate, customised feedback" (Rogerson-Revell and Pamela 2021, p.52). Thus, CAPT seems promising since it allows teachers to provide pronunciation lessons beyond their instructional abilities (Levis 2007) and has been used widely. Levis and Pickering (2004) explored the impact of visual representation on L2 acquisition and used the computerized speech laboratory program, Al Jerf (2015) used visual mind-mapping software to teach pronunciation, and Osmani (2014) used the online visual dictionary.

Nevertheless, according to researchers in the field (Cox et al. 2019; Batool et al. 2021; Luo 2016; Mahdi and Al Khateeb, 2019; Neri et al. 2008; Munro and Murray 2018; Robin 2022) the effectiveness of CAPT has not yet been synthesized to the required potential. Some researchers have documented that current CAPT programs can have the ability to record, show graphics, use sounds, etc. (Cucchiariini, Strik, and Boves 2000). Therefore, a comprehensive analysis of the effect of implementing CAPT on EFL pronunciation classrooms is essential (Mahdi and Al Khateeb 2019).

As for Omani EFL learners, research focusing on their pronunciation skills is rather limited. Furthermore, Morley (1987) notices that for the last decades, teachers who teach pronunciation have put emphasis on teaching suprasegmentals, i.e., intonation, rhythm and stress, however, according to Levis (1999) the significance of this method is not clear as it is taught separately from other components of the English language. Other EFL teachers in Omani HEI contexts believe that teaching pronunciation should come at a later stage when the learners are already at an advanced level of language (Zarzycki 2020). In line with previous research, Grim and Strum (2016) conducted a study with 57 ESL teachers and 292 ESL students to assess their perspectives on pronunciation and found that some of those teachers did not view pronunciation as a fundamental skill or as a basic component of language teaching, thus not prioritizing it in their course curricula. Similarly, the EFL learners rated other language skills as more important than pronunciation. Furthermore, the neglect of pronunciation teaching also stems from teachers feeling inadequate or disqualified to teach pronunciation due to their own lack of formal pronunciation training (Cox et al. 2019). This limitation of pronunciation

instruction competence has been documented in various contexts around the world such as Australia by Fraser (2000), the UK by Burgess and Spencer (2000); Foote, Holtby, and Derwing (2011) in Canada, and Derwing (2008) in the USA. In the above studies, the educators demonstrated a lack of training in how to teach pronunciation since their responses were not explicit as to which specific aspects of pronunciation were challenging and needed to be taught in their EFL classrooms.

The students' struggle with pronunciation is the result of the low priority given to explicit pronunciation in EFL classrooms (Algahazo 2015). As such, teachers ought to familiarize themselves with different techniques which EFL learners use to communicate when the pronunciation barrier is problematic. The interference of the mother tongue is one of the major factors that cause numerous difficulties in EFL learners' pronunciation. Omani EFL learners have been experiencing certain pronunciation obstacles strictly related to the recognition and production of different English speech sounds, vowels, and consonants (Thakur 2020). This roots back to the complex orthographic system the English language has and the incoherent relationship between English and Arabic (Zarzycki 2020). The interference of L1 (Arabic) with the English language (L2) makes it difficult for Arab EFL learners to pronounce English words correctly. For example, Omani EFL learners face difficulties in producing English sounds that are missing in their L1 (Arabic). Other factors include confusion about certain sounds which exist in one language, but not the other, and the lack of learners' knowledge of English pronunciation rules (Mahdi and Al Khateeb 2019). Thus, this paper calls for a CAPT intervention to consider pronunciation as an integral part of classroom activities (Gilakjani & Ahmadi 2011) and measures the effectiveness of its implementation on language learning through student perceptions.

Experts in the field of ELT have declared the lack of research conducted on supporting pronunciation teaching, curriculum, material design, and testing (Robin 2022). Critical decisions on how to create systematic and reliable EFL pronunciation instruction are necessary since it has not received any academic attention up to date. Although a comprehensive review of literature on pronunciation has given some insights into how its instruction and assessment have progressed in recent years, many challenges exist such as choosing the appropriate approach, time constraints, and the lack of confidence and training in this area, which all lead to pronunciation instruction neglect (Gilbert, 2008). Yet, the effects of CAPT on pronunciation teaching have just recently been studied and findings mainly demonstrate positive outcomes (Mahdi and Al Khateeb 2019). Therefore, despite having pronunciation instruction as one of the most difficult areas to teach in ELT in many contexts in the world including Oman, many projects that have been funded, aimed at developing testing and evaluating frameworks for an integrated approach to teaching pronunciation in EFL contexts (Mahdi and Al Khateeb 2019). The outcomes of these projects assisted in the improvement of participants' pronunciation, the development of instructional frameworks, techniques, and the production of instructional materials. Nevertheless, there is still a need for more material design and pedagogical variations with a solid curriculum as EFL learners of today demand contextualized and innovative learning activities with recent technological developments (Fraser 2000; Gilbert 2008). Another aspect of pronunciation that has not been explored much is the learners' perspective on the pronunciation instruction used by their teachers and their preference in teaching approach and testing (Alghazi 2015). While some work has investigated the extent to which the current research findings are making into the classroom via instructors' beliefs and practices

(Buss 2016; Breitzkreutz, Derwing & Rossiter 2001; Burgess & Spencer 2000; Foote, Holtby, and Derwing 2011; Henderson et al. 2012), this research exclusively explores EFL learners' perspective on the use of CAPT, to be precise, HTML5, in enhancing their pronunciation skills. Many institutions have already started using free and open-source software (FOSS) technologies to create educational content. FOSS allows developers independence by offering a variety of customization options based on the needs of the class or subject (Naidu et al. 2017). Very little is known about pronunciation beliefs and classroom practices in the EFL context, especially in Omani HEIs, thus the current study directly addresses this gap by reporting on an investigation of the beliefs and practices of n=188 EFL learners on the use of HTML5 as a CAPT tool to understand the advancement of pronunciation practices and how it reflects and meets their needs in the context of Oman. The following are the research questions that this study intends to investigate:

1. How is HTML5 integrated into the institutional LMS to facilitate pronunciation skills training?
2. What are the perceptions of EFL learners on the role of HTML5 in enhancing their pronunciation skills?

2. LITERATURE REVIEW

Pronunciation training has undergone a profound change because of the implementation of CAPT where it has been extensively investigated to examine the effectiveness of computers on pronunciation. Gambari et al. (2014) and Rahnavard and Heidar (2017) investigated the role of CAPT in improving EFL learners' pronunciation in English. The results of these studies also revealed the positive impact of CAPT on foreign language pronunciation. Despite growing interest in pronunciation from researchers and teachers in the field, there is still wide discussion on how much priority is given to pronunciation in classrooms, curriculum design, assessment, and textbooks (Henderson et al. 2012). Regardless, many EFL learners understand the importance of pronunciation for successful communication and therefore are keen to benefit from CAPT apps and systems (Zarzycki 2020). However, technological novelty tends to lack pedagogic rigor with poor quality control to evaluate its effectiveness in teaching or assessing pronunciation skills. Thus, the tension between technology and pedagogy is a key issue in CAPT and has been well documented in the research (Rogerson-Revell 2011; Levis 2018; Pennington 1999; Pennington and Rogerson-Revell 2019). One of the difficulties is that there is no obvious fit between language learning pedagogies and digital technologies, thus, many CAPT resources are regarded as less innovative pedagogically (Revell 2019). As technology progresses, pedagogy regresses since the conventional methods of teaching such as audiolingual, repetition and drilling are not sufficient to develop effective communicative or phonological competence in a language. Nevertheless, the use of CAPT tends to be quite limited in terms of pedagogic structure and content with little or no evidence of an underlying phonological syllabus or clear aims and outcomes. A common criticism of CAPT tools is that they adopt a 'one size fits all' approach, providing generalized content and feedback to all the EFL learners, instead of individualized support (Derwing and Munro 2015; Levis 2018). Yet, many studies have reviewed the role of CAPT programs and concluded that they improved learners' phoneme production. In fact, the use of CAPT as an automated assessment has a good use for diagnostic purposes in ELT (Revell 2021; Lou 2014; Neri et al. 2008). The potential benefits from this are eliminating

human bias and error where this technology can accurately assess the discrimination of sounds and comprehensibility of speech. It evaluates proficiency based on accuracy, in relation to a native speaker model, without any consideration of criteria such as the frequency, persistence, and salience of errors underpinning intelligibility and fluency. It simply focuses on proximity to a native speaker model (Zarzycki 2020). Another common concern is over the pedagogic accuracy of the content and technical reliability of tools. However, the use of HTML5 in this study has enabled the authors to help diagnose individual student pronunciation needs accurately and provide instant, customized and targeted materials with automated feedback.

HTML5 is the latest version of the HyperText Markup Language (HTML) that is used to create and structure content on the World Wide Web. It was released in 2014 and provides a number of new features and enhancements over previous versions of HTML, including improved semantic elements, multimedia support, improved form controls, offline storage and better performance (Leelawong and Willemsen 2018). HTML5 is designed to be more efficient, leading to faster loading times and improved performance. It has also been widely adopted by web developers and is supported by all major web browsers, making it an essential technology for modern web development. Furthermore, the role of HTML5 in pronunciation instruction and assessment provides support for speech recording through the microphone via the Web Real-Time Communication Application Programming Interface (WebRTC API) (Martínez-Ávila and García-Peñalvo 2017). The WebRTC API provides JavaScript methods for accessing the microphone and camera of a user's device, allowing for real-time audio and video communication in the browser. In simple words, HTML5 which derives from H5P provides speech support where it has a feature called "Speak the Words" where users can listen to the text being read out loud to them. This feature can be useful for language learners, or for anyone who wants to listen to text instead of reading it. This feature uses the Speech Synthesis API which is part of the Web Speech API and allows speech synthesis in the browser (Willemsen and Leelawong 2017).

The use of HTML5 as a CAPT tool gives simple and immediate feedback on the learners' perception of pronunciation features including accurate and timely feedback for them to notice discrepancies between their production and the target L2 model (Ehsani and Knodt 1998). The software's voice recognition feature (spoken error tracking system) provides a pronunciation score as a tick if the word is pronounced correctly and/or provides a written form of the mispronounced word in case the word is mispronounced. Therefore, this study used HTML5 as a CAPT tool to provide immediate, customized feedback on both learners' perception and production of the target language pronunciation (Leelawong and Willemsen, 2018).

Other than having HTML5 as a tool that gives automated feedback on pronunciation, it is a mobile assisted language learning software as well. This can have an enormous impact on L2 pronunciation teaching and learning (Pachler et al. 2010). The availability and functionality of HTML5 in mobile devices leads to an increase in informal, self-directed out-of-class mobile learning, where smartphones give the EFL learners the opportunity to create 'impromptu sites of learning' (Bachmair and Pachler 2014; Kukulska-Hulme et al. 2017). A recent meta-analysis demonstrated that mobile learning was more effective in informal instructional settings than in formal settings (Sung et al. 2016). Given the relatively small amount of time spent on pronunciation teaching in the classroom, the technologies that enable ubiquitous out-of-class learning must be

welcomed. This digital technology also affords the capacity to motivate and engage learners in developing their pronunciation, yet it is important for teachers, researchers, and developers to consider the affordances of such CAPT resources when evaluating their usefulness, to understand what elements of technology can add value or enhance pronunciation teaching, learning, or assessment (Mahdi and Al Khateeb 2019). Thus, the current research investigates EFL learners' perspective on the use of HTML5 to enhance their pronunciation and the role it plays in their affective involvement in language learning. The next section discusses the research methods.

3. RESEARCH METHODS

To answer the two main research questions guiding this study, an exploratory case-study approach was used. To answer the first research question, the framework for integration of HTML5-based speech recognition software into the institutional LMS, the implementation plan, is discussed in the section titled *Implementation - Proposed Framework*.

To answer the second research question, a mixed method approach (Creswell and Creswell 2019), which is a combination of quantitative and qualitative methods, was used to investigate the usefulness of the software from student perspectives. Two questionnaires were designed and administered, one pre and one post-software intervention. The first questionnaire was a brief one designed to gain student perspectives on the existing pronunciation practice in their classes and comprised two sections. The second questionnaire, a more comprehensive one, aimed at getting insights into the software implementation and also comprised two sections. The first section extracted demographic details while the second one focused on the role of the software in enhancing their pronunciation skills and their affective involvement in language learning. To validate the results of the survey and to gain deeper insights, a Focus Group Discussion (FGD) was conducted (Cohen et al. 2020). The results of the survey were tabulated to arrive at descriptive statistics and the reliability of the results was verified using Cronbach alpha. The results showed the Cronbach alpha value of 0.81 indicating a Good reliability index. The FGD results were transcribed and categorised thematically.

4. SAMPLE

The target population comprised 188 Omani EFL learners (35.1% females and 64.9% males) enrolled in the English Level 3 module of the General Foundation programme (GFP) offered at a private university college in the Sultanate of Oman. The majority (98.4%) belonged to the age group between 17 to 25 years. The English language proficiency of the majority ranged between B1 to B2 on the CEFR scale. The aim of the study was explained to the respondents and consent forms were filled in by them.

5. IMPLEMENTATION - PROPOSED FRAMEWORK

The activities were designed to be implemented through the institutional Moodle-based LMS. The entire implementation process is divided into six phases:

5.1. Setup of Audio support devices: HTML5 allows embedding audio files directly into web pages, making it ideal for spoken English courses. This stage includes audio

recordings of conversations, dialogues, and speeches that learners can listen to and practice. Support devices such as microphones and speakers are set up during this phase.

5.2. Design of interactive activities: This phase includes the design of interactive activities such as quizzes, games, and exercises that learners can complete to test their pronunciation and conversation skills. In this research, authors have implemented speech recognition-based activities for improving English vocabulary.

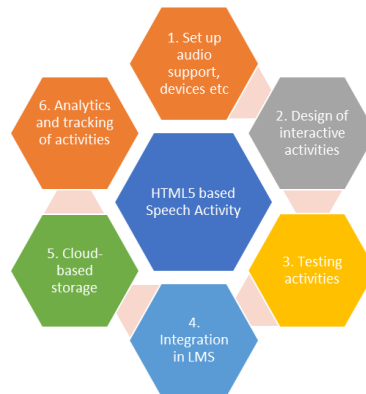


Fig.1. Framework to implement the proposed approach

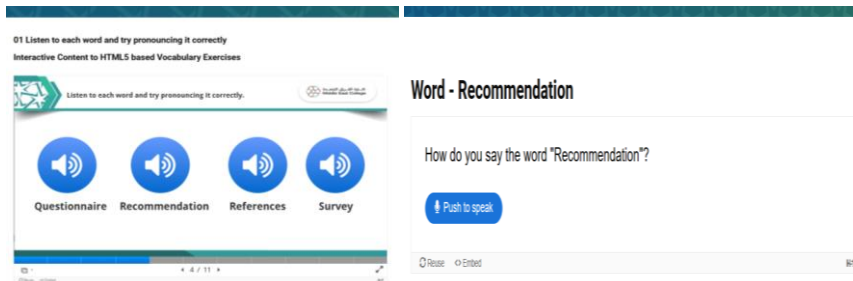


Fig.2. Implementation of H5P based vocabulary activities on Moodle (LMS)

5.3. Testing activities: The activities designed in the previous stage are tested to verify whether the system is able to recognise the spoken words correctly and provide appropriate feedback.

5.4. LMS integration: The system is integrated with LMS, enabling learners to interact with their peers and practice their conversation skills.

5.5. Cloud-based storage: The system uses cloud-based storage to store course materials and learners' progress, making it easy to access the course from any device and allowing learners to continue their studies from where they left off.

5.6. Analytics and tracking of activities: This phase includes analytics and tracking to monitor learners' progress and provide personalized feedback and recommendations.

6. RESULTS AND DISCUSSION

The results gathered from two surveys targeting student perceptions of the software are briefed here.

6.1. Pre-Implementation Survey results

As evident from Figure 1, 70% of learners (excellent+24% and good=46%) appear to be positive about the existing pronunciation practice in classes and 75% agree that there are engaging listening and speaking activities in their classes. This reveals that pronunciation is given importance in EFL teaching at the research site which negates the findings of previous studies that consider pronunciation unimportant at lower levels of EFL teaching (Zarzycki 2020) and debate on how much priority should be given to pronunciation (Henderson et al. 2012).



Fig. 3. Existing pronunciation practice



Fig. 4. Existing speaking activities

6.2. Post-Implementation Survey results

As shown in Fig. 5. Most of the students (73.4%) agreed that multimedia technology integrated into the institutional LMS (MEC Learn) helped them learn correct pronunciation. One of the FGD participants mentioned, “This is an effective tool because the words are recorded in the correct form so we can easily follow the intonation, stress and pitch of the word.” Another one said, “It is good to have an application especially for pronunciation of any word we want, like a dictionary but with voice”. This finding concurs with the results of Samad and Aminullah’s (2019) study on the use of ELSA Speak Software in learning pronunciation.

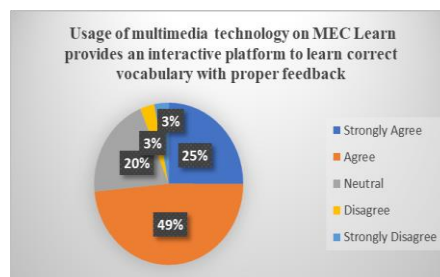


Fig. 5. HTML5 as an interactive tool

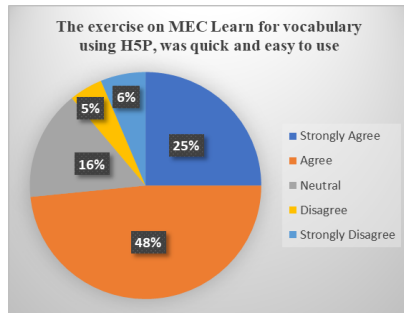


Fig. 6. User friendliness of H5P

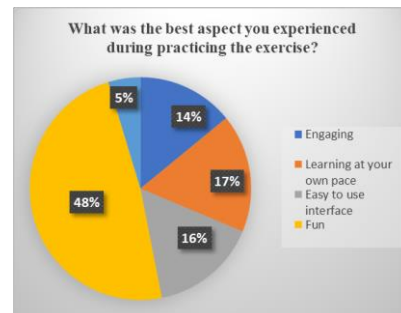


Fig. 7. Best aspect of HTML5

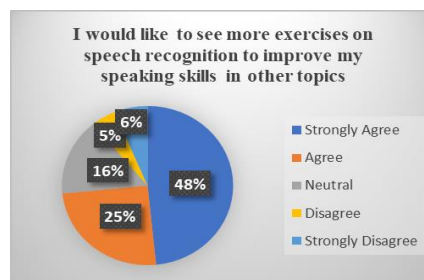


Fig. 8. Students' request more exercises

As evident from Figure 4, a vast majority (81.2%) of students agreed that speech recognition helps in improving their pronunciation and most of them (77%) would like to have more exercises on speech recognition software, refer to Figure 8. Yuan and Liu's (2020) study on the use of Automatic Speech Recognition (ASR) technology on Chinese students and Duong's (2022) study on Vietnamese students also report similar findings. Fouz- Gonzalez (2015) also confirmed the positive role of CAPT in developing students' speaking skills.

In terms of ease of use, as depicted in Fig. 6, which indicates 73.4% of students agreed that the software was easy to use. They also confirmed this during the FGD which is also noted by Ekşi and Yeşilçınar (2016) whose teacher trainees found CAPT easy to use and effective. Regarding students' affective involvement in language learning, as depicted in Figure 7, the best aspect of learning through the software appeared to be the enjoyment (fun=48.4%), followed by autonomy (17.2%), easy interface (15.8%), engagement (14.1%) and instant feedback (4.7%). The positive impact of ASR in developing learner autonomy is also highlighted by Ekşi and Yeşilçınar (2016) and Pennington (1999). The FGD participants also considered learning at their own pace as an essential aspect of CAPT. One of them said, "I can learn it at any time not only inside the class". The provision of quick feedback as an essential characteristic of CAPT is emphasized by Neri et al. (2008) as well although it did not receive a very high rating as compared to the fun aspect and autonomy here.

Although the quantitative findings are mainly positive, some of the drawbacks of the software were shared by students during the FGD. According to one student, "The software just gives a tick if correct and there is no score or marks". This is a limitation of

the way HTML5 was implemented in this study which will be addressed in future implementation. Another one added, "If the words can be segmented and said slowly in parts, it would be helpful for us to follow the sound and say after it accurately". This suggestion will also be considered for future studies.

7. CONCLUSIONS

This paper sought to highlight the current situation of pronunciation instruction in EFL teaching and learning and emphasized the need for enhanced focus on pronunciation training, often neglected or given low priority as compared to other skills. It can be concluded that theoretical knowledge about English pronunciation and phonology should be accompanied by useful web-based resources that the students can utilise for self-study. One of these tools is HTML5. The main purpose of this study was to propose a framework for integrating HTML5 in the institutional LMS and ascertain the overall effectiveness of HTML5 as a CAPT in developing pronunciation skills by exploring EFL learners' perceptions. The respondents were positive about the use of HTML5 and found it a very useful tool in improving their pronunciation skills. Therefore, it can be safely concluded that the use of CAPT (HTML5) had a noticeable impact on FL pronunciation learning as it provided opportunities to develop pronunciation skills with the right input (Mahdi and Al Khateeb 2019).

8. LIMITATIONS AND RECOMMENDATIONS FOR FURTHER STUDIES

Further studies are necessary to investigate the pedagogic potential of CAPT resources to develop a high level of competence in EFL learners' pronunciation. Given a small sample size, let alone the fact that the study was conducted in one HEI in Oman, the results can only be indicative, but not conclusive. Therefore, further investigation and meta-analysis need to be conducted to examine improvement in students' level of proficiency, with a specific reference to pronunciation skills on a larger scale. Moreover, perhaps a comparison of teachers' and learners' perspectives could be conducted to see the alignment of their views. Moreover, the field will benefit from longitudinal studies studying the impact of HTML5 in improving students' pronunciation skills. In addition, studying the pedagogic potential of CAPT resources to acquire a high level of competence in EFL learners' pronunciation are current issues and future directions in the field that are necessary to investigate since they remain a challenging task up to date.

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