http://www.tclt.us/journal/2021v12n2/zhangsl.pdf pp. 29-48

Integrating Augmented Reality into a Task-Based Thematic Language Teaching Unit
(增强现实在任务型主题单元教学中的运用)

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Abstract: This case study explores ways that one type of technology, Augmented Reality (AR), are used with a task-based thematic unit to improve beginning language learners' speaking and listening skills. Researchers and practitioners have started to use AR in teaching languages. The few empirical studies that examined the use of AR in language teaching primarily examine whether AR can improve English language learners' vocabulary and their motivation in learning. It is still not clear how AR can be integrated effectively into the curriculum and no research has been done on how to use AR to improve foreign language learners' speaking and listening abilities. This study adopts the design-based research method, describes the design, development and implementation of an AR component that utilizes the app Post Reality in a task-based unit to improve students' speaking and listening, and examines students' perceptions of utilizing AR in this way. Data were collected using survey and a focus group interview. The results show that students benefit from this learning experience in terms of their speaking and listening skills. The study includes suggestions of ways to make improvements in the use of AR in language learning.

摘要: 此个案研究旨在探索如何将增强现实技术应用到任务型主题单元教学之中以提高中文作为外语学习者的听说能力。虽然已有学者和一线教学人员将这一技术运用到语言教学中，但现有的少数几个实证研究都着重于如何用它帮助学习词汇和加强学习动机。如何将其有效地整合进总体课程设计中，以及如何利用它提高外语学习者的听说能力，目前仍未得到应有的研究。本文采用基于设计的研究方法（设计本位研究法），详细描述旨在提高中文学习者听说能力而将增强现实技术中的后现实应用程序（Post Reality）融入任务型主题单元教学的设计、开发与实施过程，并考察学生对此设计的认知。问卷及焦点小组访谈的结果表明，学生的听说能力均有所提高。学生也对如何更好地运用增强现实技术提出了建议。

Keywords: Augmented Reality, task-based thematic unit, Chinese language speaking, Chinese language listening, curriculum design, design-based research

关键词: 增强现实技术、任务型主题单元教学、中文口语、中文听力、总体课程设计、设计本位研究

1. Introduction

Augmented Reality (AR), "a real-time direct or indirect view of a physical real-world environment that has been enhanced and augmented by adding virtual computer-generated information to it" (Carmigniani & Furht, 2011, p.1), has shown its promise in assisting language teaching and learning (Ramya & Madhumathi, 2017; Zhang, 2018). There is an "obvious connection between AR and current theories of second language acquisition which emphasize localized, contextual learning and meaningful connections to the real world" (Godwin-Jones, 2016, p.9).

Task-based language teaching (TBLT) focuses on using authentic and interactive activities that engage learners to use the target language in meaningful ways (Ellis, 2017; Nunan, 1989; Prabhu, 1987; Skehan, 1998, 2003). The underlying concept of TBLT is that learning is more effective when students focus on the task rather than on the language they are learning (Littlewood, 2004; Prabhu, 1987). TBLT has been proven to be an effective method in the field of English language teaching (Chacón, 2012; Macías, 2004; McDonough & Chaikitmongkol, 2007; Park, 2012; Robinson, 2001) and in teaching Chinese as a Foreign Language (CFL) (Zhang, 2019a, 2019b). Integrating AR into activities based on TBLT should be a productive endeavor that can result in great learning effects.

Studies in the past several years that examined the use of AR in language teaching mostly focused on whether AR could be used to improve English language learners' vocabulary. Many research questions remain unanswered, including how AR could be seamlessly integrated into the curriculum to improve students' learning and motivation; how AR could be used in improving different aspects of learning, such as culture, grammar, speaking, and listening; how AR could be used for students of different age groups and language levels, and; how AR could be integrated with different instructional approaches such as TBLT to make the learning more effective. Furthermore, little research has been done on how to use AR in improving CFL learners' speaking and listening abilities (Zhang, 2018).

To fill in the gap and to explore the feasibility of integrating AR into an activity designed with an established learning method, the current study focuses on describing how an AR project was integrated with TBLT, including the design, development, and implementation of the project, and explores student perceptions. of the use of AR in their listening and speaking practice. The findings of the study will contribute to the field of language education by offering an approach combining AR and TBLT to improve listening and speaking, showing a possible design for such an approach, and outlining the strengths and weaknesses students perceive in the approach.

2. Augmented Reality in language learning

2.1 AR and its categories

AR was first studied by Morton Heilig (1926-1997), while the name was coined by Tom Caudell in the 1990s (Zhang, 2018). The distinguishing feature of AR is that some virtual elements, such as pictures, videos, or 3D animations, are overlaid on the naturally existing environment. This blend of real-world and virtual elements in real time helps create an augmented "real" environment. According to Azuma (1997), AR systems have three important features: A combination of real and virtual dimensions, interactions in real time, and the adoption of 3-D.

AR systems are categorized into two types (Cheng & Tsai, 2012; Wojciechowski & Cellary, 2013): Location-based systems and image/object-based systems. Location-based AR uses geographical location as a trigger of a mobile device's GPS sensor for a virtual overlay (Carmigniani et al., 2011), whereas image/object-based AR uses an image or an object to trigger the superimposed virtual elements through a smartphone or tablet camera. Due to the technical challenges of using the shape of a real object as a trigger, the majority of applications in this category are image-based.

The review study by Bacca, Baldiris, Fabregat, Graf, and Kinshuk (2014) found that the image is the most commonly used form of AR in educational settings. In a review of publications from 2003 to 2018, Zhang (2018) identified ten peer-reviewed empirical studies in which the use of AR was examined in language education. Out of the ten studies, half of the studies used location-based AR and half used image/object-based AR. Bacca et al. (2014) suggested that the image/object-based AR's tracking technology was more reliable than location-based tracking and therefore led to a better user experience. This study focuses on the use of image-based AR to provide learners with a virtual scene in a real environment.

2.2 Related works

AR developed rapidly and has gradually been adopted in many areas of modern life such as advertising, architectural design, entertainment, medicine, and the military (Gurusubramani, SureshAnand, JeganAmarnath, Sathishkumar, & Sheela, 2019; Ha & Hong, 2016; Markouzis & Ressakis, 2016; Yaoyuneyong, Foster, Johnson, & Johnson, 2016; Vaquero-Melchor, & Bernardos, 2019; Von Itzstein, Billinghurst, Smith, & Thomas, 2017). It has also been used in all levels of education (Turkan, Radkowski, Karabulut-Ilgu, Behzadan, & Chen, 2017; Wei, Weng, Liu, & Wang, 2015). It has been shown to increase learning by enhancing problem solving, supporting collaboration and interaction, helping students better understand abstract concepts, improving learning efficiency, motivating learners, and increasing learning enjoyment (Bacca et al., 2014; Huang, Chen, & Chou, 2016; Deshpande & Kim, 2018; Dan & Reiner, 2018; Teng, Chen, & Chen, 2018).

The application of AR in the field of language education is a relatively recent endeavor. Zhang (2018) found that "the number of published studies about AR in language learning has progressively increased year by year" (p. 121). Since Zhang's synthesis study

was published in 2018, the number of peer-reviewed empirical studies on the use AR in language learning has almost doubled. However, there are fewer than twenty in total in the past decade that focused on using AR in language learning. About half of these studies used location-based AR systems (Ho, Hsieh, Sun, & Chen, 2017; Holden & Sykes, 2011; Liu, Holden, & Zheng, 2016; Liu & Tsai, 2013, Perry, 2015; Reinder, Lakarnchua, & Pegrum, 2015; Richardson, 2016; Sydorenko, Hellermann, Thorne, & Howe, 2019; Wu, 2019; Yeh & Tseng, 2020). The other half of the studies used an image-based AR system (Chen, Wang, Zou, Lin, Xie, & Tsai, 2020; Dalim, Sunar, Dey, & Billinghurst, 2020; Hsu, 2017; Ibraham, Huynh, Downey, Höllerer, Huynh,, & O'Donovan, 2018; Redondo, Cózar-Gutiérrez, González-Calero, & Sánchz Ruiz, 2019; Safar, Al-Jafar, & Al-Yousefi, 2017; Solak & Cakir, 2015; Santos, Lübke, Taketomi, Yamamoto, Rodrigo, Sandor, & Kato, 2016; Taskiran, 2018). This section examines the studies using image-based AR systems.

Out of the nine studies that used image-based AR systems, six examined the effect of AR-enhanced systems on learners' vocabulary or alphabet learning; two examined learners' subjective experience, such as the motivational effect and social-affective relationships; and one examined the relationship between the use of captions in the AR materials and the proficiency level of learners. Out of the six studies that examined students' vocabulary, four focused on learning English as a foreign language (Dalim et al., 2020; Hsu, 2017; Safar et al., 2017; Solak & Cakir, 2015), one on learning German words and Filipino words (Santos et al., 2016), and the other on learning Basque words (Ibraham et al., 2018). Three out of the six studies worked with pre-school, kindergarten, or third graders, and the other three worked with undergraduate students or graduate students.

In most of these studies, multimedia materials based on different concepts and underlying theories in the design were integrated in the designed AR system. Santos et al. (2016) treated AR "as a type of multimedia that is situated in authentic environments" (p. 1), and they applied multimedia learning theory as a framework for developing the application. They created a handheld AR system, which displayed different combinations of multimedia elements such as sounds, images, animations, and text in real environments. The use of this system was found to improve adult learners' retention of Filipino words and German words, their attention, and their satisfaction. Hsu (2017), however, designed two AR systems based on the way learners approached the system: either through a self-directed or a linear approach, i.e. a sequential way in which students proceed to the next learning step only after completing the previous step. One of the findings was that the AR educational system based on a self-directed learning approach did not restrict the learning sequence and provided more support in learning.

Ibrahim et al. (2018), on the other hand, designed ARbis Pictus, a novel system for immersive language learning through the dynamic labeling of real-world objects in AR. Learning in this study occurred in a controlled learning environment while learners used Microsoft HoloLens with an AR head-mounted display. The application was set up in a room where all the objects were placed. The learner could walk around the room with the head-mounted display to locate the object, see the labels, and interact with the labels to get multimedia information about the object. Their results indicate that this system is both more effective and more enjoyable for the majority of participants than flashcards.

Dalim et al. (2020) explored whether using a combination of AR and speech recognition technologies, called TeachAR, could enhance preschoolers' learning of English terms for colors and shapes and English words for spatial relationships and their enjoyment of learning. Encouragingly, AR not only helped increase the children's knowledge and learning enjoyment but also enabled young children to finish certain tasks faster. Solak and Cakir (2015) examined the efficacy of using some materials designed with AR technology to improve EFL undergraduate learners' motivation level in English vocabulary learning. Their results suggested that these materials had a positive impact on increasing learners' motivation towards vocabulary learning in the language classroom.

Safar et al. (2017) examined two apps, AR Flashcards Animals-Alphabet and AR Alphabet Flashcards, which presented English alphabet initials of different pets. When the pets were clicked, a three-dimensional letter would appear accompanied by the sound and animated movements of each animal. The use of these apps significantly increased the amount of kindergartners' interactions with the English alphabet lesson, which had a strong linear relationship to their scores on the alphabet test.

Chen et al.'s study (2020) examined the effects of captions in an AR-enhanced, theme-based contextualized learning activity on junior high school students' English learning effectiveness, motivation, and attitude. Their findings suggested that captions did not affect knowledge comprehension, but English proficiency played a significant role in it. However, students demonstrated positive motivation toward learning from AR-enhanced, contextualized learning. Redondo et al. (2019) showed that the use of AR improved three- to six-year old children's English language learning, increased their motivation, and helped them establish more positive socio-affective relationships. Taskiran (2018) used a game-based approach to AR in teaching EFL and found that this method provided learners enjoyable and motivating experiences.

While a majority of these studies showed the importance of using AR in vocabulary learning and in motivating students to learn the language, none have focused on how AR was implemented in teaching or if the way it was integrated maximized the students' learning. Most importantly, there are no studies investigating the results of using AR for practicing learners' speaking and listening skills. In order to find an effective way to implement AR in daily teaching and to examine the feasibility of appropriately implementing AR for the purpose of improving learners' speaking and listening skills, an exploratory study was needed.

As AR could provide contextual visualization and learning interactivity (Ibáñez, Di Serio, Villarán, Delgado, & Kloos, 2014; Teng et al., 2018), AR could be used to enhance the already established TBLT method of teaching, where tasks are designed to focus on meaning, learners, and authenticity (Ellis, 2003). In TBLT, technology should be utilized to promote a focus on meaningful communication and make the tasks more practical so that students gain pragmatic skills for their future real communication in the target culture beyond the classroom (Chapelle, 2001; González-Lloret, 2016). In this case, AR could be used to make a task more interactive and contextualized. Therefore, this study was designed to show how AR could be combined with TBLT in a real teaching context and discover if this design could benefit learners' speaking and listening skills.

3. Research questions

This study aimed to answer the following two questions:

1) When AR is integrated in TBLT with a focus on improving learners' listening and speaking skills, what is the learners' perception of the design?
2) What are the strengths and weaknesses of the design in improving learners' listening and speaking skills? What should be done to improve the design for future use?

4. Methodology

This study adopted the design-based research (DBR) method due to the nature of the research questions. AR was used in assisting language learning mostly in an experimental context. It was not clear how it could be integrated in a real teaching context to help maximize students' learning. Since Brown (1992) called for a migration of the effective interventions from "our experimental classroom to average classrooms, operated by and for average students and teachers, supported by realistic technological and personal support" (p. 143), DBR has been used by and for educators "to increase the impact, transfer, and translation of education research into improved practice" (Anderson & Shattuck, 2012, p. 16). The key features of DBR includes being situated in a real educational context, focusing on the design and testing of the intervention, collaborating closely between researchers and practitioners, and developing design principles that could "guide, inform, and improve both practice and research in educational contexts" (p. 16). DBR stresses the importance of iterative refinement and the continuous evolution of the design (Wang & Hannafin, 2005).

4.1 Participants

Fourteen second-semester CFL learners, eight males and six females, participated in this study. The group included 13 undergraduate students and one graduate student with diverse learning backgrounds, including engineering, linguistics, global resources, computer science, and business. None of these participants had used AR technology before. Out of the 14 participants, 12 completed the survey.

4.2 The design of the AR-enhanced task

Research shows that connecting the curriculum with real life using proper support motivates students in learning (Burden & Kearney, 2016). On deciding how the curriculum should be connected with the real world, "controlled task interactions, particularly those requiring a single and convergent outcome such as information gap tasks" are preferred over "opened-ended, such as opinion exchanges or free conversation" because the former provides "an optimal linguistic environment" for language learning (Nakahama, Tyler, & van Lier, 2001, p. 380). Considering these findings, it was important to find an AR activity that incorporated real-world interactions that related to a current learning unit in a structured way. A scavenger hunt at the university bookstore, a location that is easy for

students to access and has a variety of items for them to explore, was determined to be an ideal location that would incorporate well into the shopping unit.

Post Reality is an AR app that allows the user to turn a simple poster or a portion of document into an augmented reality experience. The interface of Post Reality is intuitive and easy to access, and it provides good management options for users. It takes a few seconds to install the app on a smartphone or tablet. Once it is installed, the app uses the device camera to scan a marker on a poster or a document. The marker is loaded with different contents such as text, animation, images, charts, or videos. When the marker is scanned, the virtual contents pop up on the smartphone or the tablet, allowing students to express themselves in a variety of ways by integrating multimedia with paper-based posters.

To help learners develop a higher level of proficiency, the fourth type of tasks in Ellis' (2017) classification was adopted, that is, tasks that are both focused and output-based. A task is focused when it is designed to "elicit the processing of specific, pre-determined linguistic features;" a task is output-based when it requires "speaking and/or writing to achieve the outcome" (Ellis, p. 510). This type of task provides opportunities for the negotiation of meaning while using pre-determined linguistic features. To make the task more engaging and collaborative, a pair/group project would be better than an individual project. Working with classmates could: (1) motivate students; (2) help them to learn from each other; (3) allow the creation of materials in different formats such as a conversational style, and; (4) save time because each student could contribute to completing the project.

4.2.1 Pre-task activity

Before beginning the activity, students learn all the new vocabulary about shopping, clothes, colors, prices and the related sentence structures for shopping. They also practice using these words and structures in communicative activities in pairs or groups in the classroom. They next go to the bookstore and find two items (one must be a clothing item), noting the price, color, and size of each item as well as details such as when the item is used and by whom. To prepare them for using the technology, students download and install the Post Reality app on their phone or a borrowed one from the language center at the university. The instructor/researcher demonstrates how a device downloads and uses Post Reality to scan and watch videos.

4.2.2 Task 1: Make a video presenting two mysterious items

In pairs or groups, students present the two items they have identified in an interesting format that does not mention the name of the object but that allows others to guess what the two mystery items are through their presentation. Reinder, Lakarnchua, and Pegrum (2015) pointed out that "designing AR tasks may encourage more use of descriptive language" (p. 254). To encourage the students to use as many different kinds of language as possible, especially language used in the context of daily conversation, the students are encouraged to use a conversational style in the video. The students write a skit about the two mystery items using correct grammar and vocabulary. They are instructed to

find a native speaker to proofread the script and give feedback. Their final skit has to be approved by the instructor/researcher for accuracy in expression. Each pair/group uses the skit to create a 1-3-minute video.

The sound quality of the video is particularly important because people need to hear it clearly in a public environment. Students' conversations in the video should be: clear and loud; use correct grammar, tone, and pronunciation, and; be fluent. The videos are then connected to the markers on a poster posted at the university store. Figure 1 shows the posters in the university bookstore. Each poster has two markers numbered in Arabic numerals.

Figure 1 Posters with markers (highlighted in yellow squares and rectangles) on the pillars of the university bookstore

4.2.3 Task 2: Use AR and locate mysterious items in the bookstore

In pairs or groups, the students go to the store with their phones, find the posters, scan the markers, watch the videos, locate the mystery items, take a photo of the items, and send the photos to the instructor/researcher.

4.2.4 Post-task activity

The whole class goes over the items in the photos and finds out if the items class members located are the items the groups presented in each video. Figure 2 shows the flow of the task design.

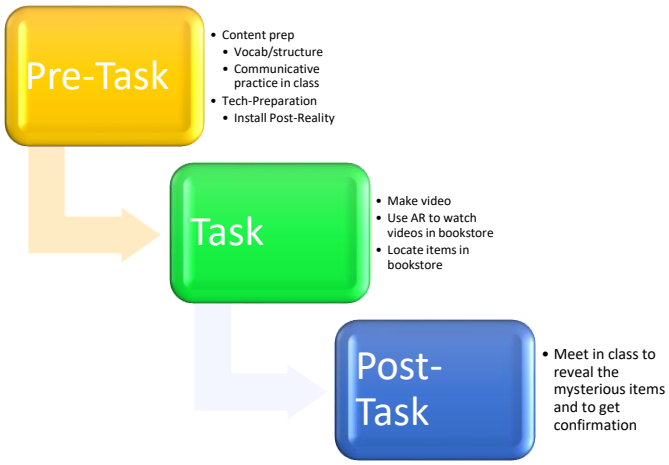

Figure 2 The flow of the task procedure

4.3 Procedures

This AR-enhanced task was the final component of the shopping unit. For other units (such as dining, transportation, and weather) students completed an in-class presentation.

The task lasted three weeks (week 6 to week 8 of the semester). Students had many opportunities to learn the unit vocabulary and structures in weeks 6 and 7 during the pre-task stage. At the beginning of week 7, students were given instructions for completing the task and a demonstration of how the AR app worked. They were asked to write their skit outside of class meetings. Students finished writing the skit in consultation with the instructor/researcher, got feedback from native speakers, revised the skit, and got approval from the instructor/researcher to shoot the video based on their finalized skit. The videos were then connected with the AR markers on the posters previously designed by a graphic designer. During week 8, the students found time outside of class to use AR in the bookstore to locate the items. At the beginning of week 9, the whole class spent 20 minutes looking over the items they located and confirming with their classmates that they found the correct items. See the figure 3 for the timeline of the project.

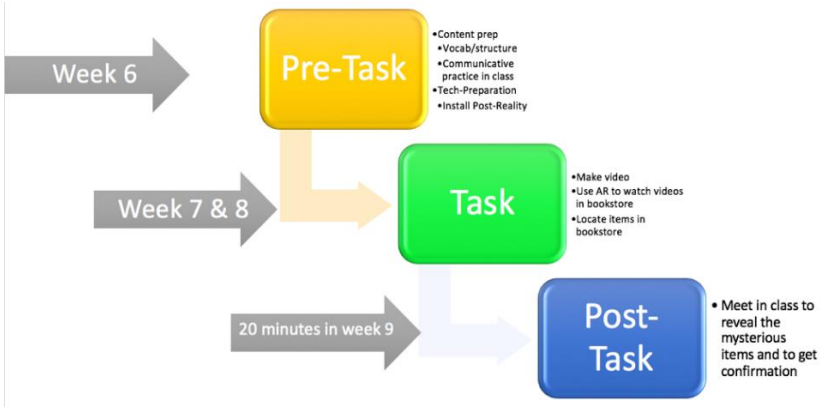

Figure 3 The timeline of each stage of the task

4.4 Data collection and data analysis

The researcher conducted a post-task survey and focus group interviews. The survey had five sections. The first section gathered demographic information. The second section asked multiple questions about the process of completing the project, such as the amount of time used (including the amount of time they spent on writing/revising/finalizing the skit, using AR and locating the items in the bookstore, and taking photos of the objects and sending the photos to instructor), challenges, and their enjoyment in the process of doing the project. The third section asked about the things that they liked or disliked about the project and why. The fourth section contained Likert scale items about what they learned from completing the project. The fifth section compared the project to the oral performance and in-class presentation, asking what advantages or disadvantages the AR project had for their learning styles.

An informal interview asking for students' opinions of the project efficacy and suggested improvements was conducted with a focus group. The data from the survey and the interview were read closely by the instructor/researcher to identify different themes (Corbin & Strauss, 1990). The different themes were compared and similar themes were grouped into a single category. A second researcher examined the data, and both researchers agreed on the themes and categories identified.

5. Findings and discussion

Results showed that during the Scavenger Hunt AR project, students spent about 4 hours in total to finish this project. They used about 31% of that time working on the skit, 25% of that time creating the video, 34% of that time watching their classmates' videos and locating items, and 10% of the time taking photos of the items they located and sending the photos to the instructor.

Six 2-minute long videos were created. Some groups used new vocabulary in order to make the video fun and coherent and contain enough specific information about the items. When there was new vocabulary, explanation of the new vocabulary was given in the video. These, along with their best pronunciation and tones, all had helped the other pairs/groups achieve a better understanding of the video content and therefore helped with their locating the items. As a result of careful preparation of the videos and careful attention when watching the videos, most groups located the right items described in each video. Figure 4 shows how the poster was used in the bookstore.

Figure 4 Using a phone to scan the marker on the poster to activate the video on the phone

To make the video engaging, some groups used props, professional microphones, and post-production sound editing. Group members underwent a process of negotiation to reach an agreement on how to present the information well and make it engaging while also making it hard to guess. Students used different creative means to describe the items in a detailed fashion without revealing the name of the items. For example, one group wrote a dialogue in which the customer pretended that he had forgotten how to say the name of the goods he intended to buy. Therefore, he had to describe the color, the usage, and the price of the object he wanted to buy to the clerk. In another video, a student asked for suggestions on what birthday present he could give to his best friend. The group members gave him two ideas without telling him what the name of the presents was, but instead carefully described the price, color, shape, and the uses of the items. In another video, the pair did a guessing game. They asked each other to guess what the object described was. During the guessing game, one asked what the color and price of the item were, what it was used for, when it was normally used, and so on. Figure 5 shows the photos some groups took after they successfully located the items.

Figure 5 Photos of items successfully located by one group

5.1 Students' perceptions

All students reported that they enjoyed doing the project, particularly the scavenger hunt. Students said that they "had never done anything like that for previous language classes." They thought that the most enjoyable part was to pick which items to describe and "the puzzle component of it" and seeing "what people found and how off or close they were." They also thought that the most fun part was to try "tricking people with difficult but locatable objects." While it being fun is one main reason that they enjoyed doing this project, there were other factors that played an important role.

First, students reported improved language skills through doing this project, with ten out of 12 students saying that this project was beneficial in improving their listening comprehension. One student said, "Listening to other people speak was the most beneficial part about the project since I got exposed to different accents and pronunciations, which helped my listening skill quite a bit." Another student expressed a similar view, "I'd have to say the listening was probably the most beneficial, because listening is the hardest part of learning a new language for me." They also reported that this project had helped her "understand how to ask questions and answer appropriately in Chinese." When asked whether doing this project had helped them improve their writing, speaking, and listening skills, they thought that all three skills improved through doing this project, with 2.6 out of 5 in writing, 3.33 out of 5 in speaking, and 3.67 out of 5 in listening. See figure 6.

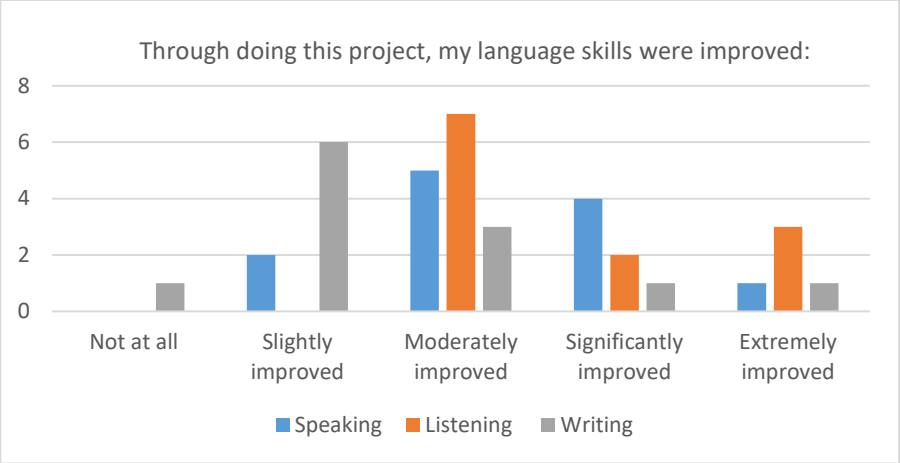

Figure 6 Students' self-reported improvement in different language skills

Second, this project gave students an opportunity to develop their social skills. A majority of students expressed that what they liked the best about this project was that they could work with a partner or in a group, "could see the creative parts of my friends," and could "hear and observe my peer's work." One student said that he liked this project because he could "make friends" and work together to "trick" other classmates and make it hard to guess the items. Most of them developed a great rapport with their groups because of the many interactive elements of the assignment.

Third, the project gave them an opportunity to build other skills, such as the technology skills when making a video and practical language skills when using their

shopping vocabulary to write the skits. In addition, the project connected class learning with the learners' real life. Some students really liked doing this project because it was an on-campus activity the required them to "go around campus" and "go to new places."

The fourth reason was the novelty effect. Four students liked the project because they got to "try something new," and "it was a nice change from the normal exam," and because of "the uniqueness in tech."

The last reason that students gave for enjoying this project was that it gave them an opportunity to create a video instead of doing the usual live, in-class presentation. Some students said that even though the video took longer than the in-class presentation, it put less pressure on them. They were able to rehearse, record, and delete until their video was satisfactory to them, which in turn, gave them the opportunity to practice more.

5.2 Challenges the students faced

Despite the fact that all students enjoyed doing this project, students did face a few challenges. One challenge was the amount of time that they had to spend creating the video and carefully watching each group's video. For instance, one student said, "[O]verall the augmented reality project was fun but probably took twice the time that the presentation did. Because of the time difference, I think I would rather do another oral presentation." Another challenge was posed by the limitation of the Post Reality app: its inability to rewind videos. Students "had to start videos all the way over if something was missed." Some students also expressed frustration with finding specific items because of their similarity in color, design, and price.

Despite the challenges they had in completing this project, when asked whether they would like to do similar activities in the future, a majority of the students said yes (see figure 7).

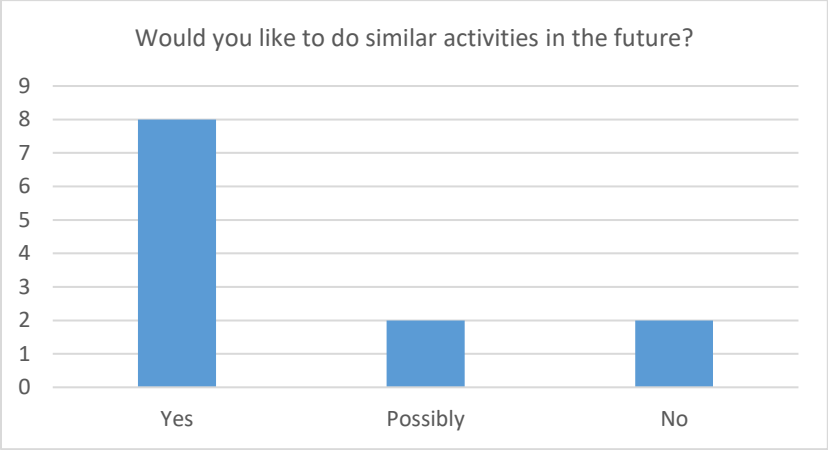

Figure 7 Students' intention to do similar activities in the future

Out of the nine students who said yes, three said that if they were to do the activity again, the app used should have a rewind function. The two students who expressed

reluctance to do a similar activity again also said that it consumed too much time, especially around the time of mid-terms. One student in the interview suggested that the teacher "maybe do not make points based on how well we find the items" because some movies were hard to understand.

These findings roughly correspond to students' answers to the question of whether they prefer this kind of activity to the oral presentations in class (see Figure 8). Nine people preferred this kind of activity and three preferred the oral presentation in class. While the major reason was that it was fun and that they could practice their listening and speaking skills more, another reason was that they were nervous about speaking in public: "Speaking in front of several people always makes me nervous, and when I feel nervous, I cannot show everything I prepared." On the other hand, the reasons that the oral presentation was preferred include: (1) they could "get experience talking in front of people"; (2) the in-class oral presentation made them feel "more pressure to not mess up" which motivated them to practice more; (3) they could get "immediate feedback," and; (4) it took less time.

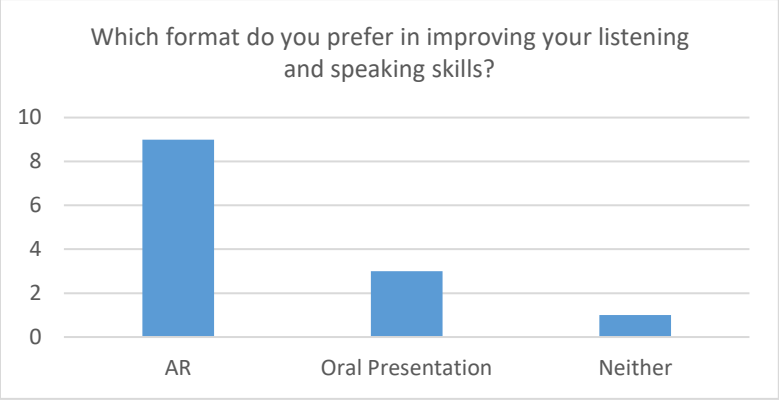

Figure 8 The preferred format of exercises for improving listening and speaking skills

5.3 Improvements needed

From the answers to the above-mentioned questions, the majority of students really enjoyed doing this AR activity, but it could be improved. First, the project could be scheduled to avoid midterm or final exam times. Additionally, students could be given more time to complete the project. Second, a better AR app should be implemented so that rewind functionality is available. With technology changing rapidly, some better-designed apps might become available. Third, each video created for the AR project should be reviewed more thoroughly by the teacher to be sure it is well made. This concern reiterates the need to give more time to the assignment and emphasizes how important a good learning community is to the learning of each and every person in the community. However, it is inevitable that some students will not have the capability to produce a video that all other learners can understand. To adjust for this difficulty, students should be allowed to select a few of the videos, perhaps 50%, to find the described items. This solution helps alleviate the first concern about the amount of time the project requires and reduces the consequences of lower-quality videos.

5.4 Design principles drawn

Based on the strengths and weaknesses of the design, some design principles can be drawn from this study. First, take advantage of the features of AR and apply them in real-life situations to give students more exposure to the target language and enable learning to move between formal and informal settings (Lai, 2017). Second, apply the AR features to make the pedagogical design more engaging and motivating and to enable interaction and collaborative learning (Chapelle, 2001; Warschauer, 1997). Third, choose the best AR tool free of charge that one can find to give students the maximum flexibility to meet their practical needs. Fourth, properly time the projects that require students to work collaboratively on authentic tasks to avoid the times when a majority of students are stressed during the semester. Finally, make sure that all the deliverables shared are error-free and of high quality so that students can maximize their learning from each other.

6. Conclusion

The AR-enhanced task-based learning project benefited the students' learning, especially their listening and speaking. It gave students an authentic purpose, which is, as researchers point out, one of the important features of TBLT tasks (Ellis, 2017; Nunan, 1989; Prabhu, 1987; Skehan, 2003). When they make the videos and complete the information-gap task, students use the target language to provide a close description of items and watch videos repeatedly. With an authentic purpose and their peer audience in mind, students sought various formats for their videos that would express what they wanted to convey. Because AR made the task authentic and engaging, students were motivated to finish the task. In the process, they improved their listening and speaking skills.

In addition, the AR technology used with TBLT not only offers convenience for students to connect classroom learning with real life, but also extends their learning beyond the classroom. AR used this way in completing a TBLT task in groups/pairs also enhances students' socialization while also being student-centered and communicative. Furthermore, they are required to ask a native speaker to proofread their skits before making them into a video. They also have to get confirmation from the other groups about whether the artifacts they found are the right ones or not. Sometimes they have to interact with the personnel in the store to make their scavenger hunt more effective. By collaborating with their partners and interacting with people outside of the classroom such as interacting with the shopping assistants in the bookstore and native speakers on campus, the students practiced their team-work skills and social skills. This way of using AR greatly increases students' opportunities to socialize with others both in the target language and in their native language.

This AR assignment also encourages student collaboration and creativity. These traits of the design satisfy the evaluative criteria set by Reinders and Pegrum (2017) for evaluating mobile language learning resources, which also apply to the use of AR. These criteria echo the calls for synergies between technology use and TBLT for the purpose of enhancing the quality of TBLT and promoting students' engagement in foreign language learning (González-Lloret & Ortega, 2014; Ziegler, 2016). In addition, being exposed to

the new technology (AR) and given the opportunity to use it in their learning enhanced their technological literacy. The way the AR was used in the project has also eased the anxiety and pressure some students would face in the other situations without using the AR, such as during in-class presentations. Even though the students spent relatively more time on the AR project than they would on an in-class presentation, they not only improved their language skills, but also enjoyed the whole learning process, were more motivated to learn, practiced their social skills, and improved their technological literacy.

This study used exploratory and design-based research methodologies to investigate whether an AR-enhanced task benefits learners' speaking and listening skills, discover students' perceptions of this task, and determine what can be improved in the design. The study shows one successful way of using the proven pedagogical method TBLT in a real, educational context to enhance learners' speaking and listening skills and give students greater convenience, enjoyment, and engagement in learning. The design described in this study along with the strengths and weaknesses of the design described in the results could shed some light on and provide some guidance for practice in similar contexts.

That said, this study also has limitations. For example, even though focus group interviews and post-surveys are the best methods to find answers to the research questions for this designed-based exploratory study, the students' self-reported views on their language skill improvements call for further confirmation which could be found in experimental studies in the future using pre- and post-assessments of their speaking and listening skills.

We have only begun to explore the learning affordances of AR and how to integrate AR in pedagogical approaches in real teaching context. Future studies could explore how AR can be used in other established pedagogical approaches such as project-based learning, theme-based language instruction, and other communicative-language instruction approaches. Researchers and practitioners could also collaborate with each other to find out the best way to integrate AR in improving other aspects of language learning, such as grammar learning, reading, and writing. It is also important to pay attention to the rapid development of AR technology and to new learning affordances AR technology might provide. New affordances could lead to more interesting studies.

Acknowledgement: I would like to thank those students who participated in this study. I thank Dr. Jacob Larson, the director and David Tang, the student assistant at the Language Studies Resource Center for the tech support. I am also grateful for the inspirations and supports from my colleagues, Jennifer Musgrove and Dr. Nadia Jaramillo. This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

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