Virtual Reality (VR) is Already a Reality in Accounting Instruction: An Action Research Approach

ABSTRACT

Using Technological Pedagogical Content Knowledge (TPACK) as the theoretical support of this study, the objective was two-fold. First, it intended to describe the usage of a VR tool called Virbela Frame through action research. And second, to show preliminary findings of the VR use in an accounting graduate course. A total of 45 students were enrolled in the Analysis of Financial Statements course and were the participants of the present study. The findings are divided into two parts: self-reflection and student feedback. Concerning my reflections, the VR usage was a challenging experience since it took me out of my comfort zone. I needed to learn it and there were not many people to talk to about its use in accounting education settings. At the same time, I could enhance myself at teaching and thinking creatively. Regarding student feedback, it was reported that Virbela Frame was interesting, cool, and different from what students are used to. Among students' suggestions, the most important is the inclusion of activities to be done within the platform. Even though I had shown Virbela Frame to students, I did not do any activity within it. It is a relevant suggestion I will take in account in future opportunities.

Keywords: Virtual reality; Accounting education; Action research; Online teaching; Active learning.

1. INTRODUCTION

As a professor of accounting, I constantly reflect upon my teaching strategies in order to deliver content in the best way possible. At the end of each course I teach, I ask students to provide their feedback on how I can improve my teaching skills and the course content. I then use it to incorporate new teaching practices into my subsequence courses. Besides student feedback, I attend academic events where I can gain additional insights into teaching accounting. In particular, there are sessions where presenters and attendees discuss multiple teaching strategies to enhance student learning.

When I was attending one of these sessions at the 2021 American Accounting Association (AAA) Spark Meeting, one thing had captured my attention: virtual reality (VR). I cannot estimate the extent to which accounting professors have adopted VR, especially in Brazil. There is little research carried on VR in accounting education as well. Therefore, I believe it represents a novel tool for most of accounting faculty, including me. After having attending that session, I proposed myself to learn how to utilize a VR tool so that I could implement it in my classes to provide a different experience to my students.

In order to implement VR into accounting instruction, I utilized an action research approach (Paisey & Paisey, 2005; Tripp, 2005). "Educational action research is principally a strategy for the development of teachers as researchers so that they can use their research to improve their teaching and thus their students' learning" (Tripp, 2005, p. 445). Action research has been employed in multiple ways to help improve accounting education (Cunningham, 2008; Doran, Healy, McCutcheon, & O'Callaghan, 2011; García-Unanue, Felipe, & Gallardo, 2015; Paisey & Paisey, 2003, 2005). Based on this, *the objective of this study is two-fold. First, it intends to describe the usage of a VR tool called Virbela Frame* (https://learn.framevr.io/). *And second, to show preliminary findings of VR use in an accounting graduate course.*

VR technology has recently sparked the attention of scholars because of the advances in visual and interacting capacities (Radianti, Majchrzak, Fromm, & Wohlgenannt, 2020). VR combines distinct technology resources to simulate environments and stimulate the users' perceptual sense (Guo, 2019). Its incorporation in accounting courses allows instructors to provide a more vivid environment and experience to students. A key advantage is that the instructor can personally design an environment to achieve the educational goal of the course. VR is also applicable to a wide range of courses due to its versatility and can be utilized synchronously and asynchronously. For this reason, incorporating VR into accounting instruction may benefit student learning.

2. BACKGROUND

2.1. Technological Pedagogical Content Knowledge (TPACK)

Prior research has shown that VR benefits learning in numerous aspects and from different theoretical lenses (Chavez & Bayona, 2018; Jensen & Konradsen, 2018; Radianti et al., 2020; Suh & Prophet, 2018). To enable the benefits of VR, accounting instructors must plan its implementation and use. An influential framework employed to facilitate the incorporation of technology into teaching is the TPACK (Koehler & Mishra, 2008, 2009; Mishra & Koehler, 2006). It is composed of three basic elements (technology, pedagogy, and content) and the overlap concepts among them. Figure 1 shows the TPACK framework.

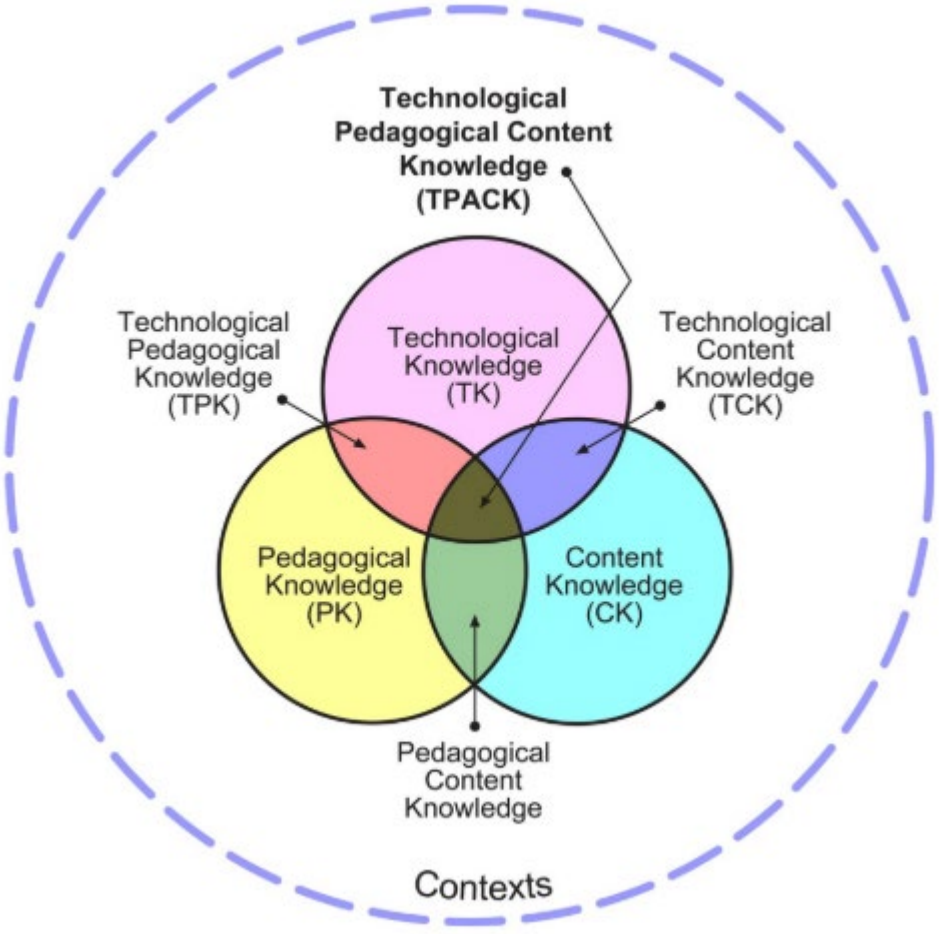

Figure 1. The TPACK framework and its knowledge components
Source: Koehler and Mishra (2009, p. 63).

Content knowledge (CK) represents the teacher's knowledge about the content that is taught or learned and includes concepts, theories, ideas, evidence, established practices, and so

on (Koehler & Mishra, 2008, 2009; Mishra & Koehler, 2006; Shulman, 1986). *Pedagogical knowledge* (PK) has to do with the teacher's knowledge of the educational process and objectives, as well as a deep understanding of student learning, student evaluation, class planning, and teaching methods (Koehler & Mishra, 2008, 2009; Mishra & Koehler, 2006). *Technological knowledge* (TK) is the teacher's ability to use both traditional (e.g., books, chalk, and blackboard) and modern technology resources (e.g., virtual learning environment, student response systems, online homework systems) to educate individuals (Koehler & Mishra, 2008, 2009; Mishra & Koehler, 2006).

Pedagogical Content Knowledge (PCK) is associated with the teaching of a particular content (Koehler & Mishra, 2008, 2009; Mishra & Koehler, 2006; Shulman, 1986). It combines the teacher's ability to teach and his/her knowledge on that specific content. *Technological Pedagogical Knowledge* (TPK) "is knowledge of the existence, components, and capabilities of various technologies as they are used in teaching and learning settings, and conversely, knowing how teaching might change as the result of using particular technologies" (Mishra & Koehler, 2006, p. 1028). *Technological Content Knowledge* (TCK) represents the teacher's ability to teach a specific content using technology resources that are available to him/her. It also relates to changes in content provoked by the advances in technology tools (Koehler & Mishra, 2009). Finally, *Technological Pedagogical Content Knowledge* (TPACK) brings together all prior components. It is "the basis of good teaching with technology and requires an understanding of the representation of concepts using technologies" (Mishra & Koehler, 2006, p. 1029).

In my case, I had to learn how to operate a VR tool (technological knowledge) and find an opportune teaching strategy (pedagogical knowledge) to accommodate it to teach accounting (content). Since my academic background is in accounting, my main challenge was to match VR with an educational strategy. The details on the implementation and use of VR in accounting instruction are discussed in the next sections.

2.2. VR Technology and Accounting

"Virtual reality technology, as its name implies, is to use computer technology to virtualize reality and build a virtual environment exactly the same as reality, or even more in line with the user's idealization" (Guo, 2019, p. 38). Similarly, Suh and Prophet (2018) consider that "VR refers to technology that generates an interactive virtual environment that is designed to simulate a real-life experience" (p. 78). "VR can be used for simulation-based education,

where students and learners can practice new skills in a simulated environment that enables correction, repetition and non-dangerous failure and at the same time offers access to interaction with expensive or far-away environments" (Jensen & Konradsen, 2018, p. 1516). Prior research classifies VR into two categories, namely non-immersive and immersive:

> Non-immersive VR is technology that displays virtual content via a computer screen without additional equipment to amplify the immersive experience. Users interact with non-immersive VR using traditional interfaces, such as keyboards and mice […] In contrast, immersive VR environments allow users to interact the technology via more complex tracking systems, such as head-mounted displays that track motion and provide deeper immersion because displays change in accordance with minute movements. Head-mounted displays block out visual cues from the users' physical environments to create a more controlled, restricted environment than that of non-immersive VR" (Suh & Prophet, 2018, p. 78).

According to Jensen and Konradsen (2018), the year of 2013 was remarkable for VR technology as the company Oculus Rift launched a new generation of head-mounted displays (HMDs) at a reasonable cost for consumers in general, followed by its competitors in the next couple of years. Since then, the immersion feature has been significantly improved and the VR technology has become more affordable. "Immersion describes the involvement of a user in a virtual environment during which his or her awareness of time and the real world often becomes disconnected, thus providing a sense of 'being' in the task environment instead" (Radianti et al., 2020, p. 2).

Along with immersion, interactivity has been found to be a crucial characteristic when using VR in the learning process (Chavez & Bayona, 2018; Plancher, Gyselinck, Nicolas, & Piolino, 2010; Thomson et al., 2005). The capacity of one to interact with the virtual environment is key for a positive experience. Educators need to make sure that students interact with virtual materials and other participants. Researchers have found that child pedestrians (aged 7, 9, and 11) cross roadsides more quicker and missed fewer safe opportunities to do so after training in a VR environment (Thomson et al., 2005). This ability to interact with a near-to-real simulation takes relevant part in learning.

The literature on the juxtaposition between VR and accounting is yet to be developed. Thus far, only a few studies exist, and even fewer are published in academic journals. There are previous studies published in conference proceedings (Guo, 2019; Zou, 2019), practice-oriented journals (Buckless, Krawczyk, & Showalter, 2012; Johnson & Middleton, 2008), and academic journals (Hornik & Thornburg, 2010). One of these does not focus solely on VR (i.e. Zhou (2019)) and others use Second Life™ to discuss VR (Buckless et al., 2012; Hornik & Thornburg, 2010; Johnson & Middleton, 2008). Notably, there is room for exploring VR in accounting settings.

Zou (2019) offers some ideas in which VR can be utilized in accounting. “VR aims to assist the accountants in making better sense of the vast financial data generated by every company. It also can be used to devise different kinds of approaches to business development” (Zou, 2019, no page). Likewise, VR may be useful in accounting education (Guo, 2019; Zou, 2019). Guo (2019) supports that “the combination of virtual reality technology and accounting teaching ingeniously and scientifically can provide a new teaching mode, and also can carry out human- computer interaction, construct a realistic and dynamic teaching classroom” (p. 38). For this reason, the usage of VR in accounting learning processes are equally important. VR can simulate (i) business meetings between accountants and their clients, (ii) inventory departments with which accountants must keep regular contact, (iii) factory facilities so that accountants can understand the fabrication process of a certain product, (iv) many and different types of inventories that requires auditing, and so forth.

Hornik and Thornburg (2010) analyzed the success of using Second Life™ to promote a more engaging learning environment and how it affected student performance. A final sample of 106 first-year financial accounting students participated in the study. Results showed that Second Life™ was able to provide a more engaging learning process, which in turn it would lead to higher academic performance. On the other hand, it was also found that students who have experienced adverse reactions when using Second Life ™ (e.g., dizziness and nausea) had their grades decreased.

Due to its versatility, VR can be used in a variety of manners to teach accounting. Instructors must align it with the course’s objective. It is worth noting that some accounting educators might resist using VR, as they prefer older teaching approaches or lack the knowledge to deal with modern technology tools, for instance (Watty, McKay, & Ngo, 2016). Despite that, my belief is that this resistance tends to fall as accounting practice absorbs new tools and new generations of accounting faculty entry universities.

3. METHOD

3.1. Research Strategy

Methodologically speaking, I use action research in this study since it assists professors improving their teaching and consequently their students’ learning (Tripp, 2005). Tripp (2005) considers imperative to understand action research as one of many types of action inquiry research, which is a generic term for processes that follow a cycle where one enhances practice

by taking action and inquiring it. A visual representation of a basic inquiry cycle is reported in Figure 2.

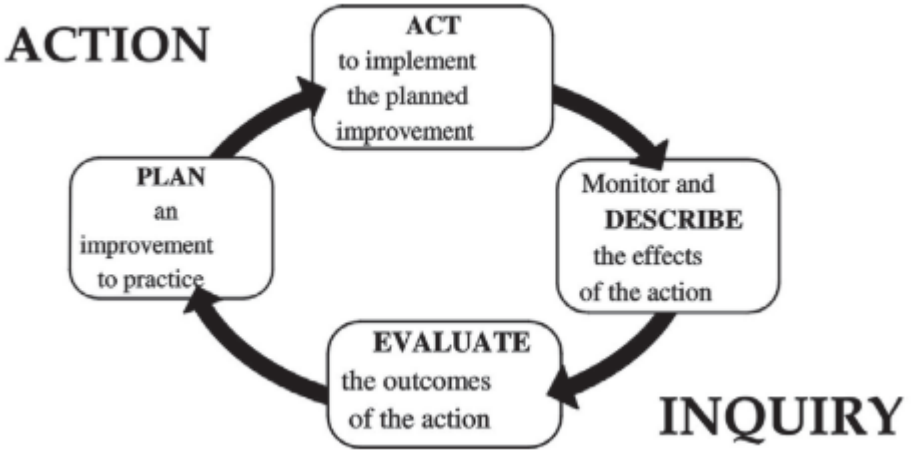

Figure 2 - The four-phase representation of the basic action inquiry cycle
Source: Tripp (2005, p. 446).

In the first phase (plan), the researcher identifies the problem and establishes a plan to solve it. The second phase (act) is when the researcher takes action to solve the problem by implementing his/her plan. In the third phase (describe), the researcher monitors and describes the effects of his/her action. After observing the effects, the researcher evaluates them (phase four) and incorporates adjustments into his/her plan to be implemented again in future opportunities. This cycle repeats until the problem is solved satisfactorily.

Among the types of action research, I selected the practical action research (PAR) approach[i]. Its main characteristics include (i) flexibility to work as the researcher finds it adequate. In PAR, there is no "follow the book." In order to solve the problem, there are no pre-defined answers or methodology steps that can be followed. The researcher has to use the resources at his/her disposal to creatively construct a plan to sort out the problem; and (ii) the decisions about what, how, and when are based on the researcher's professional experience. Given that there are no pre-established steps to follow, the researcher's experience is essential to implement the action successfully.

3.2. Context of the Study

Following Figure 2, I started the first phase by detecting the problem. The problem was that I did not want to teach accounting exclusively through traditional methods (i.e., lecture). I

felt as though I needed to offer a different experience to my students as well. And after I had attended the AAA 2021 Spark Meeting, the VR idea came up. The presenter of the session at that Spark Meeting talked about Virbela Frame and it was something new to me. From this point on, I began to design my plan. First, I had to learn how to use Virbela Frame. Second, I needed to think about ways to implement it. That was when I decided to adopt the "learning by doing" approach to learn Virbela Frame and to implement it asynchronously in my course.

Phase two (act) started in middle June and ended in early July. This was the duration of the Analysis of Financial Statements (AFS) course I was teaching. AFS course is a component of the specialization (lato sensu) program in accounting and tax management of a public higher education institution (HEI) located in the South region of Brazil. A total of 45 students were enrolled in this course. I inserted Virbela Frame in the course syllabus and explained it to the students. Virbela was used asynchronously with the usual classes. Students could access and interact with it whenever they liked. It encourages active learning as students are the ones to take actions and visit the VR platform.

The third phase was to monitor and describe the activity. The virtual environment comprehended financial reports, a collaborative room, information on the big four auditing companies, videos from accounting professional bodies and public sector entities, and national and international banks' websites. Students were instructed to be even more respectful since their actions affected other active participants in a real-time fashion. The virtual environment can be found here: https://framevr.io/uelcontzen. In the final phase (evaluate), I self-reflected on this activity as well as gathered students' opinions about Virbela Frame and the virtual environment I created through an online questionnaire.

4. FINDINGS

4.1. Self-reflection

It was a challenging process that I went through. At the session of the Spark Meeting, the presenter provided the audience with valuable information to encourage it to use Virbela Frame. As one of the spectators, I wanted to test it in my classes. I was fascinated with the details and the versatility of Virbela Frame. It could really deliver a distinct learning experience to students.

It brought me many benefits. I could improve myself at teaching and thinking creatively. Even though the frames (templates) are already available, the professor needs to design them

according to what he/she thinks is appropriate. The virtual environment/simulation must be aligned with the educational goals of the course. Since I wanted it to be an environment where students could access it asynchronously, I carefully selected accounting and financial files that would be relevant for them, including national and international materials. Virbela Frame took me out of my comfort zone mainly because I had to learn it. Additionally, I think Virbela Frame broadened my perspectives on education. It has the power to complement face-to-face education in multiple ways, especially for those students who are not able to visit industries, agricultural companies, and other business models. With VR, the professor can simulate these scenarios so that the students can better understand the business activities.

Teaching with VR does have some costs. First, it takes time and effort to think and design a virtual environment. The instructor will have to adjust the environment at many points in time until it can be considered satisfactory. Also, there are a few professors of accounting to discuss it with, since VR is a relatively new tool in accounting education. Moreover, I even got dizzy sometimes as I rotated the files, figures, and my view when designing the virtual environment. This adverse effect was perceived in prior research as well (Hornik & Thornburg, 2010). When it happened, I would take some time away from my laptop to rest. I recommend the same for those who experience it. These barriers should not demotivate accounting instructors, though. I believe that, if well implemented, VR provides a distinct teaching and learning experience for professors and students.

4.2. Student Feedback

At the end of the AFS course, I asked students to answer a questionnaire about the virtual environment I had created. Some students found it interesting and cool. Others reported that Virbela Frame is a platform that is unusual for students' daily routine and should be utilized with other students. I sympathize with these perceptions. Because VR is new in accounting education practice, some of its benefits are yet to be discovered. But students did recognize the usefulness of VR.

Among students' suggestions, the most important is the inclusion of activities to be done within the platform. Even though I had shown Virbela Frame to students, I did not do any activity within it. It is a relevant suggestion I will take in account in future opportunities. It was also reported that Virbela Frame could be used for group activities and presentation purposes. In addition, students could be encouraged to read written materials and watch videos to teach

introductory topics. Due to its versatility, I think the suggestions are adoptable and I will think more deeply about them to improve my teaching skills with VR.

5. FUTURE INTENTIONS

This study has provided a description of the usage of a VR tool in a graduate accounting course in Brazil and shown some qualitative findings about self-reflections and students' feedback. To the best of my knowledge and based on my literature review, VR is a relatively recent topic in accounting education literature and practice. For this reason, it needs higher dissemination so that accounting instructors can use it more often with their students. I intend to share it with my colleagues and through presentations at events. This manuscript is also a project to spread information about VR.

My future intentions on VR are (i) to experiment other platforms and design environments for different accounting courses, (ii) to combine VR with other teaching strategies, such as storytelling in which the student follows the story of a company from its origin to its end within a VR platform; (iii) to upload more relevant files for accounting and finance students to my current virtual environments and make other improvements; and (iv) use VR for accounting education research.

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[i] A more detailed discussion on the types of action research can be found in Tripp (2005).