Conceptualizing pedagogical processes in video-based learning: cognitive, behavioral, and affective roles of video technology in teaching practice

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Abstract: Five pedagogical processes concerned with the usage of video technologies by teachers for educational purposes are conceptualized and presented. The pedagogical processes are a teacher's internal thinking processes when trying to involve VT in teaching and provide a pathway to a teacher's cognition in a holistic manner. These processes play affective, behavioral, and cognitive roles in video-based learning and involve the teacher's general role in the use of video technology (role awareness), their selection of videos for teaching (selection), choice of a learning environment for teaching (environment-fit), use of innovative technology for teaching (creative process) and the overall value attached to using VT for teaching (value attribution). The pedagogical processes presented are viewed through the lens of the TPACK theoretical framework and conceptualizes how an optimal pedagogical outcome can be achieved by their amalgamation.

Keywords: video-based learning; pedagogical processes, TPACK, theoretical framework

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1 Introduction

The introduction of modern computer technologies has vastly changed the way teachers and students interact. Until recently, education technology was treated as separate but necessary to pedagogy (Mishra & Koehler, 2006). Training pre-service teachers in technology education was not a priority until the mid-1990s and it was largely maintained as a separate course in teacher education programs (Graham, Culatta, Pratt, & West, 2004).

Continuing technological developments enabled videos to be accessed faster, more easily and across multiple platforms and devices. Video can now be viewed on multiple (student owned) devices and in multiple formats before, during or after class. The increasing prevalence of technology in education is driving the viability and availability of online teaching and open academic resources. Video technology (VT) is playing a role in facilitating these developments (Bates, 2019). Woolfitt (2015), for example, believes that, "Education is undergoing a major shift" and that "brick-and-

mortar classrooms are opening up to rich media content, subject matter experts, and to one another" (p. 5). This swift change has largely been influenced by technological trends and enthusiasm of people of all cultures as well as the rise of the use of digital technology and widespread access to the Internet.

The shift in educational pedagogy to include technological literacy has led to the conceptualization of technology as a form of pedagogical competence in teaching practice (Koehler & Mishra, 2008). This involves the skills and processes required to operate particular VTs in teaching practice. These skillsets complement teacher knowledge, thus enabling the effective use of videos in educational technology.

2 Objectives

This paper conceptualizes the pedagogical processes involved in using VTs in the classroom and how these pedagogical skills contribute to teacher knowledge. Pedagogical processes are a teacher's internal thinking processes when trying to involve VT for teaching and provide a pathway to a teacher's cognition in a holistic manner. The pedagogical processes are then viewed through the lens of the TPACK theoretical framework and conceptualizes how an optimal pedagogical outcome can be achieved by their amalgamation.

3 TPACK theoretical framework

This study is viewed through the lens of the Technological Pedagogical and Content Knowledge (TPACK) and is diagrammatically illustrated in Figure 1. TPACK conceptualizes effective teaching and learning with the use of technology by combining teachers' knowledge of pedagogy, content, and technology in their pedagogical practice (Mishra & Koehler, 2006, 2009). The TPACK theory offers insight into seven unique domains of knowledge that is common in teachers. These domains include teachers' knowledge of their content or curriculum (content knowledge, CK), knowledge of effective teaching practices (pedagogical knowledge, PK) and relevant technological competence needed for integrating technology to teaching and learning (technological knowledge, TK). The remaining TPACK teacher domains shaped by the use of VT include how their teaching techniques match lesson content (pedagogical content knowledge, PCK), how technological competence may be relevant for preparing content (technological content knowledge, TCK), and how teaching practice may be transformed using specific VT (technological pedagogical

knowledge, TPK) (Mishra & Koehler, 2006). A combination of these domains is known as technological pedagogical and content knowledge (TPACK) (Mishra & Koehler, 2006).

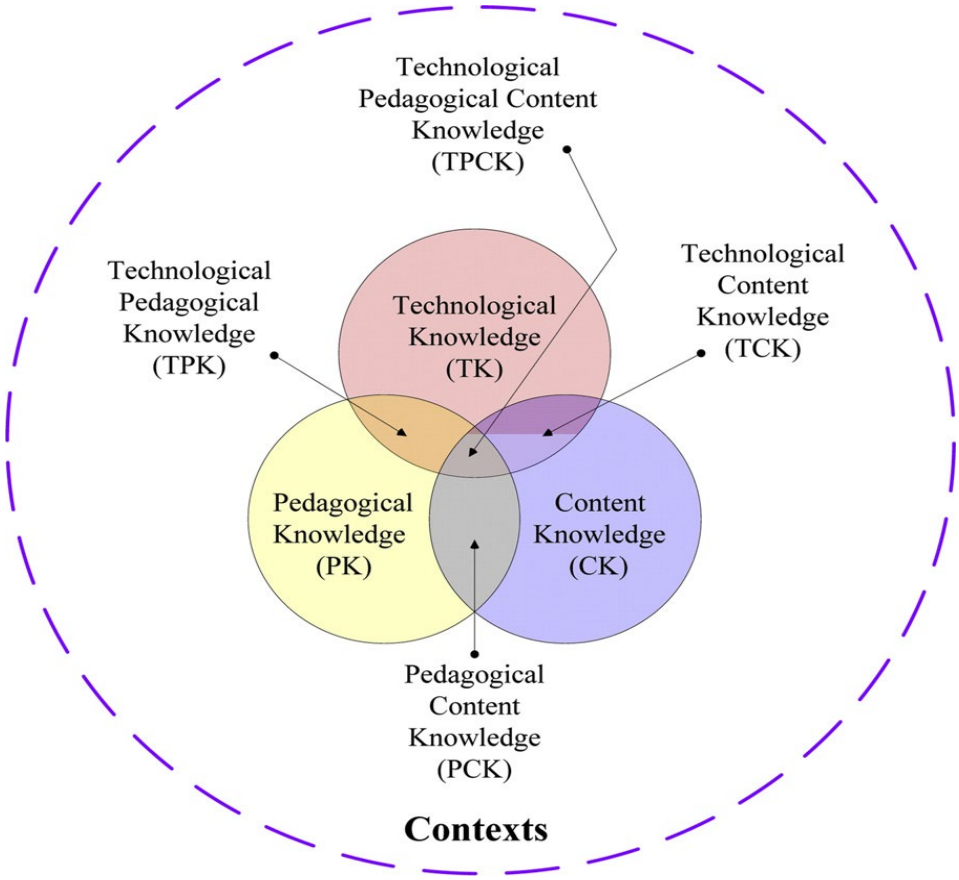

Figure 1. The framework revised TPACK (the intersection of CK, PK and TK) (Jang & Tsai, 2012, p. 329)

TPACK framework is one of the main pedagogical frameworks to understand teacher knowledge and offers a diverse insight on several domains of teacher knowledge. However, one of the weakness of TPACK is that it focuses on the theoretical aspects of learning and does not consider the experiential knowledge of the teacher as an important component in teaching practice.

Most researchers recommend the TPACK framework as a lens through which the complex challenges posed by the integration of technology in teaching is viewed (e.g., Graham, 2011; Mishra & Koehler, 2006). However, there are issues with it in spite of its common acceptance (Graham, 2011; Graham, Burgoyne, et al., 2009; Graham, Cox, & Velasquez, 2009; J. Harris & Hofer, 2009).

For instance, the digital divide where teachers have different levels of access to appropriate technology, may hinder the effective application of the TPACK framework (e.g., Ertmer, 2005; Scherer, Tondeur, & Siddiq, 2017). Another issue is that there is no guarantee that students will accept the subject matter being taught just because technology is being used in teaching (Mishra & Koehler, 2006). There may also be other external factors at play that may affect the effective integration of technology in teaching other than the knowledge domains alone considered in TPACK (Ertmer & Ottenbreit-Leftwich, 2010; Voogt, Fisser, Pareja Roblin, Tondeur, & van Braak, 2013). Such factors include (but not limited to) socio-demographic, geographical, educational and technological factors. For example, teachers and students who are in a remote rural area may never be able to effectively integrate technology into the classroom regardless of how much knowledge of technology (TK) they may have because of their poor access to the Internet.

4 Pedagogical processes, attitudes and the use of video technology

Attitudes are generally the way we consistently respond to things or class of objects and the processes that influence life's practices (Ostrom, 1969; Poulou & Norwich, 2002). These involves the affective, cognitive and behavioral attitudinal processes. Affective processes are sympathetic nervous responses of emotions, which can be relevant in pedagogy as teachers' respond to educational VT through responses and statements of affect that enhance their teaching practice. Pedagogical processes can also be conceptualized as teacher's behavioral responses to teaching practice, especially with respect to overt actions and verbal statement concerning the use of VT in the classroom. However, the perceptual pedagogical responses that involve cognitive processes may be manifested in ways that involve the teacher's statements of beliefs and perceptual appreciation of the use of VT in teaching practice (Poulou & Norwich, 2002). These distinctions serve as a classification system to facilitate comparison of how different pedagogical processes shape the way teacher's respond to the use of VT in their teaching.

This section explores the different pedagogical processes involved in the use of VT in teaching and the role they play in classroom settings as attitudinal responses to the use of VT. These processes include the selection of appropriate video content by the teachers (video selection process), choosing a conducive learning environment or classroom for playing educational videos (video environment-fit process) and the

recognition of the role of teachers in using VT within the classroom (role awareness process). These first three processes are likely to lead to other two aspects: the exploration of other innovative ways of teaching using VT (creative process) and ascribed value attached to using VT for educational purposes (value attribution process) (Ajloni, 2019). These five pedagogical processes will be discussed in subsequent sections.

4.1 The video selection process

The possibility of using videos is hindered by the teacher's inability to select appropriate video content or VT for their teaching. The video selection process is used in a cognitively-relevant manner, such that it aids in the learning experience, since students are likely to rely on visual images that have been stored in their memory through VBL (Kozma, 1991). As a cognitive response to the use of VT, the video selection process helps in mapping out relevant concepts in the content in order to maximize learning outcomes. Kozma (1991) reasons that mapping the study content learned through the use of VT helps students to build rich representations of the subject matter as they process the linguistic and visual information that has been presented to them in class. It also involves sourcing videos from different platforms such as YouTube or online educational websites and not relying on a single video for teaching so as to avoid homogeneity of classroom content (Bell & Bull, 2010). This also means that teachers ought to take an eclectic approach in the video selection process by curating a wide range of videos on a subject matter from various perspectives.

Teachers play a huge role in the selection process through selecting appropriate videos to play or use in the classroom. This could be achieved when teachers create their own videos to convey particular knowledge to students, an aspect most likely relevant in the PK domain. The video selection process also involves engaging in activities that combine online video tools with other applications such as live streaming instructional videos and using social media platforms to engage a community of students interested in a particular content (Tamim, 2013). Such activities enable teachers to compare selected learning videos across different cross-cultural contexts in order to enrich the learning experience of students. This also means that this selection process is an exhausting activity that involves comparing a wide-range of educational videos across multiple video-based learning (VBL) platforms but selecting a particular kind of video (e.g., self-made vs. YouTube videos)

may have a transformative impact on learning outcomes, as it either enhances learning or entertains students (Bork, 2012).

4.2 The environment-fit process

This process involves the fit of the learning environment for integrating VT in teaching practice. This is because learning environments can help teachers enhance their teaching activities and assist students to gain a deeper understanding of the subject matter using both visual and sound effects installed in the classroom (Mishra & Koehler, 2006). Indeed, while most teachers generally enrich their teaching content with videos, some of them often struggle with finding a conducive learning classroom environment best suited for the use of VT. Evaluating the suitability of a classroom environment for VBL may be one of the teacher's cognitive response to the use of video since this process may involve an initial mental task that seeks to resolve problems associated with using VT through the teacher's self-efficacy in executing courses of action required to deal with prospective environmental challenges (Poulou & Norwich, 2002).

The environment-fit process is an important component in the use of VT because in order for VBL to take place, the environment is as important as the content being delivered (Torrington, 2018). The changes within the learning environment shape the way videos are used in classrooms. Beginning in the 1980s, several new forms of VT such as Laserdiscs and the Video Home System (VHS) have been determining factors in how a VBL environment is designed. For example, most classrooms make space for projectors and interactive whiteboard as part of the changes on contemporary learning environments. One of the essential resources needed in any contemporary classroom setting where VT is used is the Internet. Without an Internet connection in the classroom, it would be challenging for teachers to engage in the video selection process (discussed earlier) and create their own teaching videos without access to relevant online VT software (Doles, 2016). Classroom environments connected to the Internet make it easier for digital content to be more easily distributed for educational purposes. For example, access to the Internet brings YouTube VBL into the classroom, thus empowering learners to access the latest educational video content (Abbasian & Sieben, 2013).

Using videos for teaching and learning has many benefits (Tucker, 2017). However, the functionality of video usage is contingent on the classroom allocated for learning. Ideally, it should be equipped with Internet connection, camcorders, audio

devices, computer desktop devices, microphones, VCRs, monitor and power source, along with a portable camera on a moveable tripod. Other devices that should be available in VBL environments include data projectors, interactive whiteboards and touch screen tablets since these devices can keep students engaged with the learning environment (Oliemat, Ihmeideh, & Alkhawaldeh, 2018; Paolo, Wakefield, Mills, & Baker, 2017).

Teachers do play a role in ensuring that the classroom fits the required standard of a VBL environment. Therefore, creating a conducive environment is essential for knowledge distribution in VBL (Auerbach & Andrews, 2018). And given that teachers should be experts in their subjects, they are most qualified to determine which learning environment would be needed for teaching and learning the content. For example, teachers could choose the kind of classroom equipment needed and the suitability of the environment for streaming video segments and instructional videos. This shows how the teacher is not only the distributor of knowledge with choice of video at the selection process but also chooses the right learning environment based on their experiences and technological expertise (Hartnell-Young, 2003). The production and use of educational videos include a pedagogical response that involves equipping the classroom with the appropriate resources and requires teachers to adopt more active roles in ensuring that the VBL environment has the necessary set up to function effectively (Engin, 2014).

4.3 The role awareness process

Ideally, video content should match the teaching and learning objectives and these criteria also need teachers to filter suitable videos for students since VT has made it easier to source content (Morgan, 2013). As early as the 1940s when film was first used as an educational tool, the ability to pause a film for discussion was seen as an important role in teaching as it increases students' level of engagement (Harris, 2006). The role-awareness process in the use of video involves the roles teachers play in moderating the time, as well as controlling and creating educational videos (Szpunar, Moulton, & Schacter, 2013). This role awareness is both a cognitive and behavioral response as it involves the teacher's ability to self-evaluate and perceive the needs of the students and how to effectively respond to them through their own actions or behavior (Poulou & Norwich, 2002).

Paolo et al. (2017) outlined four role-awareness steps in producing classroom videos: planning, development, delivery and reflection. These steps are supposed to

guide teachers when using VT in their classrooms and are models for understanding the role of the teacher in VBL. The planning steps include drawing attention to the fundamentals, such as the intent of the video, available VT hardware and software and general sensitivity to the length of video. This is a crucial phase in which teachers highlight the need for the video to maximize social presence. This step mostly involves developing a plan that addresses not only the intent of the video, but also what technology is available and best suited to the audience. The teacher's comfort level with VT and availability of equipment essentially guide the planning phase. In addition, teachers with advanced knowledge of their subject area would be more likely to engage their students with curriculum in the role awareness process than those less familiar with their subject area since they are aware of what should be expected from the course. The second step that follows the planning phase, development, begins with a script to be covered for the video content. Following the introduction of the script in the first phase, ways of using videos should be covered in the development phase. This includes introducing the course or unit content, modelling the role-play in terms of how to convey the content of the unit, explaining or informing the difficult concepts in order to bridge an understanding and allow for student feedback.

Furthermore, the delivery phase involves disseminating learning videos in traditional, hybrid or blended and online settings. An example is when the teacher flips the classroom by asking students to watch a video and directs them to review it, even before coming to class. In addition, the teacher could also flip the classroom by asking students to view a video before responding to an assignment or ask them to compare and contrast two videos (or questions) where different views are shared in a discussion post (Allala & Al-Jamal, 2019; Paolo et al., 2017). The last step in the teacher's role-awareness process is the reflection phase, which concerns using the video for evaluative tasks. Reflective evaluation is an important step for teachers to seek out feedback from students on classroom videos to assist future course improvement. The role-awareness process involves consistently improving course instruction and making the learning more authentic and accessible to students, thereby further highlighting the role of teachers in video learning environments.

4.4 The creative process

Koehler and Mishra (2008) argue that teachers can use creativity to re-imagine how students are changing the rigid boundaries of learning curriculum to a more dynamic inter-disciplinary thinking. In addition, creativity plays a role in teachers' pedagogical

activities or style by helping them adapt to new demands in teaching practice that go beyond rote test-based learning. Creativity starts from the mind and thus it is critical to understand how teachers cognitively appraise and adapt or respond to VBL. This cognitive process of rethinking VBL may also include reusing and redefining new technology for educational use in the classroom (Mishra & Koehler, 2006). An example of re-thinking the use of VBL may include identifying other innovative ways of using video in teaching practice.

There has been growing research since 2000 about the use of gaming and other innovative experiences in education (Ritzhaupt, Poling, Frey, & Johnson, 2014). Some studies have shown that video games can enhance pedagogical learning activities (e.g., Lavender, 2011; Ritzhaupt et al., 2014). As a significant part of VT, teachers should approach the adoption of video games with a different set of instructional goals and practices that can drive desirable learning outcomes (Sandford, Ulicsak, & Facer, 2006). Achieving such outcomes may involves the implementation of three creative processes in VBL: pre-, in-class and post-creative game play activities (Shliakhovchuk, 2018). The pre-video gameplay activity involves understanding what students already know about a particular topic and then leveraging on that to source relevant games that might illuminate on the subject matter. The in-class gameplay mostly involves deepening the knowledge of the subject matter using creative games while the post gameplay activity focuses on assessment, particularly evaluating the effectiveness of knowledge transfer through the creative use of video games for educational purposes.

The sharp growth in the development of alternative tools for learning makes the creative response an essential part of the pedagogical process. It is a commonly held view that creative video games can be used as a type of reward for students who complete their work (Miller, 2008). Hence, the use of creative games as a conceptual language for alternative pedagogical responses in teaching practice re-defines the creative process as merely a form of entertainment in educational technology to playing an important role in visual and technological literacies needed for VBL (Clark & Ernst, 2009). Just as with other educational technologies, video game technology should not be considered a magic cure, such that plugging a video game into classroom instruction does not guarantee that students will enjoy the process or that the game will meet learning outcomes. The creative process in education is an extension of the role-awareness process whereby teachers explore alternative roles of teaching students. For instance, students aged 10 to 14, after playing the video game

Darfur Is Dying were more willing to help Darfurian people than those who had merely read about the situation in Darfur (Peng, Lee, & Heeter, 2010). Those who played Homeless: It Is No Game felt increased sympathy for homeless people (Lavender, 2011), and after playing Spent, students between 12 and 18 years demonstrated higher levels of active learning about the situation of poor people (Ruggiero, 2014). These are some of the examples of how teachers' innovative genius, through alternative forms of teaching practice, have led to improvement in academic achievement in students. Video games, for example, can combine different types of media, creating immersive experiences for students and allowing them to look at problems from 'behind the scenes.' Thus, adopting video game technology could be a natural progression for an educational system striving to engage students in learning about complex issues (Dahya, 2009).

The creative process is an important phase needed in current generation of learners because it works with the technological enthusiasm of the younger millennial generation, and researchers have noted how it is changing the ways in which students think and learn (Howard, Morgan, & Ellis, 2006). This new creative way of learning and teaching seems to increase students' awareness and consciousness. For example, Clark and Ernst (2009) found that video games can play a role in increasing students' IQs and can enhance other skills such as movement, social skills, visual abilities and collaboration (also see Miller, 2008). Therefore, teachers should take advantage of the desire to engage in video gaming and other forms of VTs since it is a useful innovation and the creative process beneficial in educational technology. However, teachers are solely responsible for ensuring that the video-based content used reflect the genres and symbols of their subject area, which may be conveyed using innovative technologies such as video games (Annetta, Murray, Laird, Bohr, & Park, 2006). In addition, teachers who grew up in the current generation, will need their digital game-playing experiences to assist in designing digitally supported learning programs (Prensky, 2001). Other creative ways can include the use of interactive whiteboards (Miller & Glover, 2010) and online learning platforms (massive open online courses: Dennis, 2012).

4.5 The value attribution process

Attribution has to do with the quality and value attached to the use of VBL in an educational context. The value attached to using VT for educational purposes tend to lend towards the affective function, since this is demonstrated through the teacher's

affection for VBL. This enduring connection to video-based pedagogy can help foster new and imaginative perspectives in designing the content, as it encompasses the creative blending of products and ideas as well as facilitates teaching and learning processes across disciplines (Masats & Dooly, 2011). This is because "video allows one to enter the world of the classroom without teaching in-the-moment" (Borko, Jacobs, Eiteljorg, & Pittman, 2008, p. 418).

Indeed, the education sector is undergoing a transformation, with the adoption of VT to improve teaching styles and outcomes (Oliver, 2015). Multimedia components have become mainstream and offer quality opportunities that support and improve educational delivery (Leijen, Lam, Wildschut, Robert-Jan Simons, & Admiraal, 2009). The affection related to the use of VT is mainly due to the enormous benefits of using videos in teaching practice. There is considerable evidence that the use of VT in the classroom improves both teaching styles and students' learning capacities (Yee, 2016). As an example, video has benefitted learners in scientific disciplines, but it also enhances skill acquisition in dance education. Learners' experiences also improved when using video-based classes (Leijen et al., 2009). Leijen et al. (2009) found that students were able to comprehend the subject matter as part of everyday reality rather than perceiving it in a theoretical form. Using video has many more positive outcomes including enhancing concentration, creating anticipation, energizing or relaxing students for learning (Margaryan & Littlejohn, 2008). It also draws on students' imagination and helps them build connections with other students and instructors, thus setting a mood conducive to learning and building memorable visual images (Berk, 2009). These enormous benefits of VT set the tone for the value attribution process as a technology worthy of admiration, and thus the very reasons why teachers tend to ascribe value to VBL.

The value attached to using VT for teaching practice is related to the benefits of technology (Hsin & Cigas, 2013), since it helps teachers to maximize teaching time, establish effective classroom management, provide multi-modal instruction and greater motivation (Finch, 2018). Teachers may value video because of their need to enhance learning outcomes through visual, graphical, and multimedia representations of study content and because of the capacity of VT to simplify complex phenomena (Tucker, 2017).

5 Pedagogical processes and TPACK

Video technology (VT) may be one of the most effective 21st century media for communication, entertainment, and learning (Fill & Ottewill, 2006). It has become an integral part of the educational process, from elementary through to university levels and international workplace communication. Five pedagogical processes were conceptualized involving selection, environment-fit, role awareness, creativity, and value attribution. These were conceptualized as pedagogical processes that are often utilized in the integration of VT into traditional learning environments, thus helping to shape new VBL markets.

The pedagogical processes can be viewed through the lens of TPACK by considering the criteria for successful integration of technology for educational purposes. Mishra and Koehler (2006) have conceptualized three main criteria for the successful integration of technology for educational purposes: interactivity with video content, engagement, and knowledge transfer or memory.

These three criteria also apply to VT. Teachers can attempt to integrate VT into the classroom by fulfilling these three criteria. These criteria can be fulfilled by engaging in the five pedagogical processes. During this engagement, the teacher will likely be utilizing all three core domains of the TPACK framework. This would ultimately lead to the "goldilocks" balance of CK, PK and TK domains thus resulting in an optimal pedagogical outcome.

The interaction between the integration criteria, pedagogical processes and TPACK domains is explained below. Teachers who are aware of the importance of their role as a teacher would generally want to impact knowledge and maximize the value of their teaching for students (role awareness pedagogical process). Teachers with knowledge of technology should ensure that these criteria are met in their application of VT for teaching as they consider selecting a video that contains the appropriate subject matter (selection pedagogical process). The teacher might spend the extra effort in finding a video that is engaging for the student because the teacher recognizes the value it would derive when students pay closer attention and learn more effectively (value attribution pedagogical process). The teacher might get creative and elect to use interactive VT such as video games (creative pedagogical process) to further ascribe value to the students. The teacher will then present the selected VT in the appropriate teaching environment (when available) to maximize the effectiveness of the knowledge transfer mechanism (environment-fit pedagogical process) (Ajloni, 2019).

When a teacher is engaging in the pedagogical processes and the integration criteria in the manner described above, he/she is, to some extent, either knowingly or unknowingly evoking the CK, PK and TK domains of TPACK. Capturing student's attention and curiosity with innovative technologies such as video games requires the relevant CK and PK (knowledge of how interactive video games may enhance teaching outcomes) domains of TPACK. Knowledge of subject matter (CK) is relevant since the teacher needs to have a grasp of the content being taught to select the right VT (TK). Pedagogical knowledge (PK) is required to know which type of VT (in this case interactive video games) may enhance teaching outcomes. A teacher's pedagogical activities in the space that is finely balanced between CK, PK and TK would most likely increase the value attached to video usage among teachers. This may positively reflect on students' academic performance and achievement, which is one of the end-goals of VBL.

6 Conclusion and discussions

Five pedagogical processes concerned with the usage of video technologies by teachers for educational purposes are conceptualized and presented. The pedagogical processes are a teacher's internal thinking processes when trying to adopt VT in teaching and provide a pathway to a teacher's cognition in a holistic manner. The pedagogical processes presented are viewed through the lens of the TPACK theoretical framework and conceptualizes how an "goldilocks" (optimal) pedagogical outcome can be achieved by their amalgamation.

However, there are barriers and limitations to adopting VT in education, especially when implementing the processes discussed above. For example, poor resources and inadequate training may cause loss of confidence in integrating VT into classroom practice. Lack of training in information technology and VBL may hinder the effective use of VT in teaching practice (Unal & Ozturk, 2012). In order for VT to be effective, educators need adequate training in the creative process to effectively select appropriate videos and manage them in the classroom. Other barriers to using videos in the classroom include the digital divide that might be affecting the use of VT in developing countries (Khasawneh, 2015), paucity of educational information (Bakri, 2013), and the concern that the social elements of teaching (e.g., classroom interaction, student engagement, knowledge transfer) could be swamped by technology. Financial constraints associated with VT may also influence the lack of time and insufficient infrastructure to build a vibrant, dynamic classroom

environment that incorporates the environment-fit model (Joseph, 2012). Menchaca (2014) noted that the lack of teacher confidence and lack of appropriate background knowledge in educational technology can make VBL difficult to implement. Poor access to resources or limited technological experience may also hinder implementation of VBL in developing countries (Mustafa & Cullingford, 2008). Besides, video-based pedagogy faces a number of challenges, for example copyright issues and the proliferation of videos from 'wannabe' teachers and educational video creators who practice as experts without a teaching qualification. Further studies could consider ways to implement these pedagogical processes and what they look like when using VT in teaching practice.

Despite these barriers and limitations, teachers may benefit from a "checklist" of the five pedagogical processes and the core domains of TPACK when attempting to integrate video technology in their teaching. In accordance with the presented conceptualization, having a checklist and ensuring all five pedagogical processes and TPACK domains are not unknowingly omitted will maximize the likelihood of achieving an optimal teaching outcome.

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