Adopting TPACK to Video Technology in the Context of the Jordanian Education System

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ABSTRACT
This paper focuses on the use of video technology (VT) in Jordanian schools. The Jordanian Ministry of Education (MoE) has endorsed the use of VT in schools in recent times thus the number of schools employing VT in Jordan is expected to increase dramatically in the near future. One of the existing pedagogical frameworks that can help in understanding the integration of VT into teaching is TPACK. However, TPACK does not provide sufficient insight or understanding into the integration of this specific form of technology. Therefore, this paper presents the conceptualization of a novel modified theoretical framework specific to VT, namely Video-TPACK, which is adopted from TPACK. This paper then introduces a novel collection of pedagogical processes that can be integrated into Video-TPACK, namely Video-Based Pedagogical Processes (VBPPs). Engaging the VBPPs may encourage a "sweet spot" balance of teacher knowledge domains thus an optimal pedagogical outcome becomes more likely.

1 INTRODUCTION

Jordan is a small country located in the center of the Middle East, with Saudi Arabia to the east, Syria to the north, Iraq to the northeast, the Egyptian Arab Republic to the south, and the Dead Sea, Israel, and Palestine to the west. The number of schools employing Video Technology (VT) in Jordan is expected to increase dramatically in the near future (Oliemat, Ihmeideh, & Alkhawaldeh, 2018), since the Jordanian Ministry of Education (MoE), in conjunction with UNICEF and private schools, has launched its 'Digital Schools Program' to provide students with various technological devices for their learning. Therefore, understanding how teachers' adaptation of educational VTs in the classroom can translate to effective pedagogical practices is paramount (Abu-Samak, 2013; Mubaslat, 2012). Video technology can be defined as "digitally recorded content[s] containing sound and motion that can be streamed, stored or delivered live" (Woolfitt, 2015, p. 4).

Due to the increasing adoption of VT, examining the extent to which Jordanian school teachers use VT is important. Also, insight into the role of video-based technology may illuminate the Jordanian teachers' experience of using technology in teaching (Ajloni, 2019).

A knowledge gap exists in this subject matter as there has been limited research or literature on this topic, especially in the Jordanian context (Ajloni, 2019). Therefore, the present study seeks to begin closing this knowledge gap. To this end, this paper first presents the conceptualization of a novel modified theoretical framework specific to VT, namely V-TPACK, which is adopted from the Technological Pedagogical and Content Knowledge (TPACK) theoretical framework. The reason for the development of this novel theoretical framework (V-TPACK) is because VT is a specific form of technology. Rather than relying on the TPACK theoretical framework to understand the integration of VT into pedagogy, which is for general technology, a novel theoretical framework specific to VT will enhance this understanding and effectiveness. This paper then introduces a novel collection of pedagogical processes, namely Video-Based Pedagogical Processes (VBPPs), into this modified theoretical framework (V-TPACK). The VBPPs categorize a teacher's internal thinking processes, which provide a pathway to a teacher's cognition in a holistic manner.

These VBPPs, first conceptualized by Ajloni (2019), include selecting appropriate video content (selection) and delivered to students in an appropriate environment (environment-fit) whilst satisfying themselves of the value

that these videos may add to the students' learning (value attribution). Teachers should also be creative in their approach (creativity) and be aware of their role as teachers (role awareness).

2 VIDEO TECHNOLOGY AND TEACHING PRACTICE

The introduction of modern computer technologies has vastly changed the way teachers and students interact. Before now, education technology was treated as separate but necessary to pedagogy (Mishra & Koehler, 2006). Training pre-service teachers in educational technology 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).

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

Continuing technological developments enabled videos to be accessed faster, more easily and across multiple platforms and devices. Videos 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 is playing a role in facilitating these developments (Bates, 2019). For example, Woolfitt (2015) 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.

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. These three criteria also apply to VT. Implementation of the VBPPs by teachers will likely fulfil these criteria (Ajloni, 2019). For example, selecting the right videos or engaging students with innovative technologies such as video games may enhance the level of interaction with students thus resulting in better engagement and knowledge transfer. Providing a comfortable learning environment or classroom with the right multimedia devices is likely to engage students and promote an overall positive learning experience.

Another recipe for successful integration of technology in teaching is to make teachers cognizant of their importance and implement their knowledge of the subject matter (content knowledge, CK), pedagogy (pedagogical knowledge, PK) and technology (technological knowledge, TK). These are considered as the three core knowledge domains in the TPACK theoretical framework.

Whilst VT in education is increasingly being adopted, there are barriers and limitations with this evolving trend. For example, poorly resourced and inadequately trained teachers may cause a loss of confidence in integrating VT into classroom practice. Lack of training in Information and Communication Technology (ICT) and Video-Based Learning (VBL) may hinder the effective use of VT in teaching practice (Mustafa & Cullingford, 2008; Unal & Ozturk, 2012). Other barriers 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 (Joseph, 2012). Financial constraints associated with VT may also be an influencing factor contributing to inadequate infrastructure for a vibrant and dynamic classroom environment that aligns with the environment-fit requirement (Joseph, 2012). Besides, VBL 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 (Ajloni, 2019).

3 TPACK THEORETICAL FRAMEWORK

This study has adopted the Technological Pedagogical and Content Knowledge (TPACK) framework as the primary theoretical perspective, which is diagrammatically illustrated in Figure 1. TPACK envisions effective teaching with technology as existing in a space where pedagogy, content, and technology overlap (Mishra & Koehler, 2006, 2009). The framework provides the basis for understanding how teachers can integrate the technological domain of knowledge with other teacher domains so that learners are able to understand the subject matter. It can also be viewed as a guided pathway to successfully plan, integrate, and deliver effective teaching programs that consist of technological integration.

TPACK has three core teacher knowledge domains and are listed as follows (Mishra & Koehler, 2006):
(1) Content Knowledge (CK) → Knowledge of subject matter or curriculum ("what" is being taught);
(2) Pedagogical Knowledge (PK) → Knowledge of effective teaching practices ("how" it is being taught);
(3) Technological Knowledge (TK) → Knowledge of relevant technological competencies (the tools used in teaching);

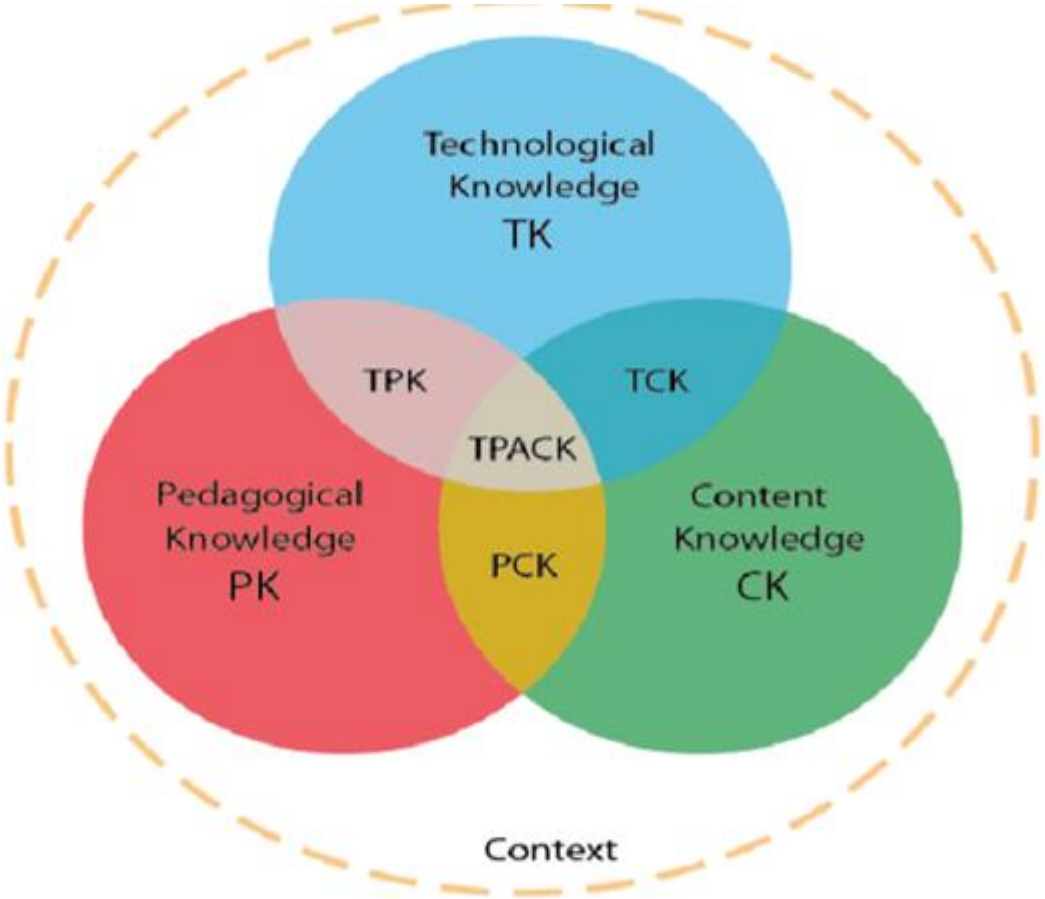

Figure 1: TPACK Framework model (Saad, Barbar, & Abourjeili, 2013, p. 5)

These core domains can be viewed as standalone aspects or in conjunction (or interaction) with each other as schematically illustrated in Figure 1. The interaction of these core domains results in a further four more domains as follows:
(4) Pedagogical Content Knowledge (PCK) → Integrating effective teaching practices into relevant subject matter;
(5) Technological Content Knowledge (TCK) → Integrating technological competence into relevant subject matter;
(6) Technological Pedagogical Knowledge (TPK) → Integrating effective teaching practices with the appropriate technological aids;
(7) Technological Pedagogical and Content Knowledge (TPACK) → The combination of these domains.
From a historical perspective, TPACK is an extension of Shulman's (1986) conceptualization of Pedagogical Content Knowledge (PCK), which "stands for specialized kind of teacher knowledge [that] searches for the influence of technology on adopted pedagogical approaches" (Ocak, 2016, p. 7).

Most researchers recommend the TPACK framework as a lens through which the complex challenges posed by the pedagogical integration of technology can be examined (e.g., Graham, 2011; Mishra & Koehler, 2006). However, despite the robustness of the framework, a number of issues and concerns exist in relation to its use and application (Graham, 2011; Graham et al., 2009; Harris & Hofer, 2009).

An issue that might hinder the effective application of the TPACK framework is the problem of digital divide, in which some teachers may not have computers or a secure internet connection (e.g., Ertmer, 2005; Scherer, Tondeur, & Siddiq, 2017).

Another issue is that the TPACK framework assumes guaranteed acceptance of Content Knowledge (CK) by students when integrating ICT into teaching, which may not necessarily be the case (Mishra & Koehler, 2006). In some circumstances, students may still struggle to comprehend the content regardless of the technology that is used for teaching.

In addition, it is possible that the interaction between the TPACK domains may vary depending on the content area and other contextual factors such as teachers' level of education and the students' socio-demographic profile (Koehler, Mishra, & Cain, 2013). For example, teachers who are technologically illiterate may not be familiar with the important of TK compared to those who are technologically savvy. Therefore, technological integration and trying to achieve effective pedagogical outcomes purely with consideration to TPACK domains may neglect a host of other variables that may also play a significant role (Ertmer & Ottenbreit-Leftwich, 2010; Voogt, Fisser, Pareja Roblin, Tondeur, & van Braak, 2013).

4 VIDEO-TPACK (V-TPACK) - A MODIFIED THEORETICAL PERSPECTIVE

The conceptualization of a novel modified theoretical framework specific to VT, namely Video-Technological Pedagogical and Content Knowledge (V-TPACK), is presented in this section and is diagrammatically illustrated in Figure 2. It is adopted from the TPACK theoretical framework. The reason for the development of this novel theoretical framework is to offer an enhanced understanding (compared to TPACK) of how VT can be effectively integrated in pedagogy. The V-TPACK offers enhanced understanding because it specifically deals with VT whereas TPACK deals with technology in general.

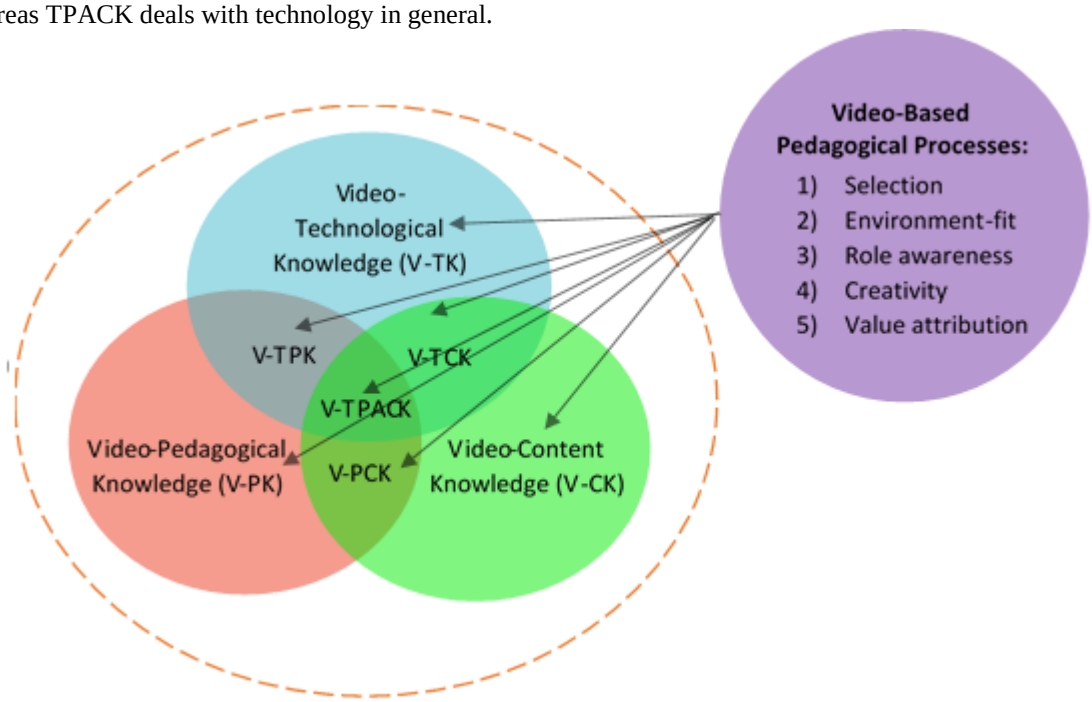

Figure 2: Video-TPACK theoretical framework (modified from TPACK)

Whilst TPACK is well established and widely studied to-date, there is limited research and literature that focuses on the specific relationship between VT and pedagogy. This is one important limitation of using TPACK to study this specific relationship. This gap in research could be addressed with additional studies focusing on the dynamics of V-TPACK (hence expanding on TPACK).

As Shulman (1986) reasoned, teachers' knowledge of effective practice requires transforming content into pedagogical forms that are accessible to learners. It can thus be argued that TPACK can encapsulate this through the recognition of the role of VT in teaching (thus the conceptualization of V-TPACK). The V-TPACK theoretical framework enables teachers to become curriculum planners who transform existing video-based media tools for pedagogical purposes and provides a reference to strike a perfect balance between each of the teacher domains.

All seven teacher knowledge domains from TPACK can be adopted into the V-TPACK theoretical framework. Each of these domains are similar to those in the TPACK framework but specific to VT's rather than in relations to technology in general. The seven domains in the V-TPACK framework are thus V-CK, V-PK, V-TK, V-PCK, V-TCK, V-TPK, and V-TPACK (refer to Figure 2) and are defined below. These domains are novel and have not been used or defined in any other studies.

Video-Content Knowledge (V-CK): The knowledge about the subject matter that is being taught in the context of VT. It is about knowing the theories and facts in a subject matter as well as the rules of evidence, proof to generate justification, and the nature of the inquiry in the field.

Video-Pedagogical Knowledge (V-PK): The knowledge of effective teaching practices with respect to teaching with the aid of VT. Accordingly, this involves knowledge about teaching techniques or methods, educational purposes, characteristics of learners, classroom management, lesson plan development, and ways to evaluate the understanding of learners.

Video-Technological Knowledge (V-TK): The knowledge of how to use emerging and basic VT's in teaching practice. This refers to the use of technology which can operate video devices, troubleshoot problems, notice the advantages and constraints of the VT.

Video-Pedagogical Content Knowledge (V-PCK): The intersection of V-CK and V-PK domains. This represents the simultaneous consideration of these two domains rather than in isolation. The subject matter is organized, adapted and represented for instruction based on effective teaching techniques (Shulman, 1986).

Video-Technological Pedagogical Knowledge (V-TPK): Describes the relationship and interaction between VT tools (V-TK) and specific video pedagogical practices (V-PK). It can also be considered as the link between TPK and VT. It explores the many ways teaching practice is advanced through the use of VT. The practice of teaching with the aid of VT is organized and adapted with consideration to sound pedagogical practices.

Video-Technological Content Knowledge (V-TCK): Intersection of the V-TK and V-CK domains. It describes the taught subject matter (V-CK) through the aid of viewing/displaying with VT which teachers might use as a part of their technological tools (V-TK). V-TCK can also be considered as knowing how VT can transform and create new understanding of a specific content area.

Video-Technological Pedagogical and Content Knowledge (V-TPACK): The intersection between V-TK, V-PK and V-CK domains. Pedagogical reasoning is thus blended with subject matter as well as VT with the understanding of how it can be used to support the teaching and learning objectives and content goals. It represents the "sweet spot" or "goldilocks" where the proportion of each of the ingredients (domains) is in optimal balance.

These domains are interrelated and may in some way or form related to different pedagogical processes involved in using VT for educational purposes. These processes are referred to as the video-based pedagogical processes (VBPP's). The VBPPs is a novel collection of pedagogical processes that categorizes a teacher's internal thinking processes, which provides a pathway to understanding a teacher's cognition in a holistic manner. In this conceptualization, the VBPPs are integrated into the V-TPACK theoretical framework. This is done not only to elevate the understanding of how each domain of V-TPACK can be developed and used in pedagogical practice, but also to act as a guide for teachers' cognitive processes in order to achieve the most favorable development of each of the domains. The integration of these processes is schematically illustrated in Figure 2. There are five elements to the VBPPs and each of these are defined below (Ajloni, 2019):

(1) Selection → Selecting the appropriate video content by the teacher as part of his/her behavior response;
(2) Environment-fit → Choosing a conducive learning environment or classroom for playing educational videos;
(3) Role-awareness → Cognitive response involving the recognition of the role of teachers in using VT within the classroom;
(4) Creativity → Teachers' cognitive response that involves the exploration of innovative methods of teaching using VT as a tool; and
(5) Value attribution → Teachers ascribing value to using VT for educational purposes.

A detailed description of the VBPPs and how they can be integrated into the V-TPACK domains is provided in a later section of this paper. As previously discussed, a favorable pedagogical outcome is likely to result from having all three core domains of V-TPACK in balance. Integrating the VBPPs to each of the domains will assist with developing the potential and balance of the domains. However, there are various factors that may inhibit this. These include external factors such as educational (e.g., private vs public schools), geographic (e.g., rural vs urban areas) and socio-demographic (e.g., age group).

For example, a potential lack of funding for ICT resources in a public school may hinder access of VTs for both students and teachers. In the context of the Jordanian education system, teachers in private schools may have greater access to appropriate technological tools due to their access to more funding from the private sector (Ajloni, 2019). This is an external educational factor that may negatively affect the ability of public school teachers to

fulfill the V-TK domain, thus the ability to achieve an optimal balance of the three core domains will be jeopardized.

Similarly, geographic factors may also play a role. Rural schools in Jordan are less equipped than those in urban areas in terms of ICT equipment and internet access. This may hinder access to VTs for both students and teachers (Ajloni, 2019). In contrast, easy access and up-to-date digital teaching technologies in urban areas, internationalization of urban private schools (most of which might have innovative teachers with international experience) and the general positive attitudes of urban school teachers towards enhancing teaching and learning all contribute to an advantage over rural schools (Harris, Straker, & Pollock, 2017). Therefore, because of this type of geographic factor, teachers in rural schools may find it difficult to exercise their knowledge in the V-TK and V-PK domains compared to their urban counterparts.

An external socio-demographic factor such as gender of the teacher may also have an impact on the teacher's ability to find a good balance in the V-TPACK conceptualization. For instance, female teachers in the Jordanian education system were found to be more knowledgeable and willing to integrate various forms of VTs in their teaching techniques than their male counterpart (Ajloni, 2019). Female teachers in Jordan are thus more inclined to exercise their knowledge in the V-TK and V-PK domains, hence imply they can find a good balance of the core domains in V-TPACK more readily than male teachers.

Integrating technology in classrooms is a complex issue that requires a broader understanding of complicated interactions among multiple components (Koehler, Mishra, & Yahya, 2007). Niess (2005) argued that while VT has become an integral component in schools, teachers must also develop "an overarching conception of their subject matter with respect to technology and what it means to teach with technology" (p. 510). In order to help teachers to better integrate technology into their teaching, educators need to grasp what successful technology integration entails and what the underlying factors are that could foster or hinder it. Some of these factors have been discussed above.

Despite the potential benefits of V-TPACK in understanding effective integration of VT in classrooms, one limitation to the robust usage of this framework is that it is in its early stages of development, and hence the framework is still evolving. Despite V-TPACK being adopted from TPACK, which is well established, elements of the new framework are yet to be fully understood and appreciated.

5 VIDEO-BASED PEDAGOGICAL PROCESSES AND V-TPACK

While the V-TPACK framework emphasizes how the interaction between content, pedagogy and technology is relevant, what is less clear is how these knowledge domains are shaped by the overall disposition toward the integration of VT. The VBPPs categorizes a teacher's internal thinking processes, which provides a pathway to a teacher's cognition towards the integration of VT in a holistic manner. There has been limited to no studies exploring the relationships between different domains of teacher knowledge and VBPPs in relation to the integration of VT in pedagogy. Understanding the nature of these relationships would help clarify how best to integrate VT in teaching practice and which VBPP are most effective for facilitating this integration and enhancing teacher knowledge. In other words, VBPP's involved in teachers' use of VT may shape the domains of knowledge in V-TPACK. There are five elements to the VBPPs (selection, environment-fit, role awareness, creativity, and value attribution) and each of them have been defined in the previous section of this paper. The influence of VBPP's to each of the V-TPACK domains are discussed below.

5.1 Video-based pedagogical processes and the V-PK domain

With respect to the V-PK domain, the selection of the right VT in pedagogical activities could make teacher practices clearer or easier to understand difficult concepts. Similarly, teachers may add value to pedagogical practices by integrating their own experiences or knowledge with respect to VT. The V-PK domain can be conceptualized as the creativity to rethink and re-imagine how teachers in the 21st century can better use modern technologies, including video, to change the boundaries of pedagogy. The creative process in the use of VT plays a role in enhancing learning and teaching practice using innovative techniques. Successful teaching also means teachers being aware of their role in pedagogical practices with the aid of VT and be cognizant of how the use of such aids may enhance the overall experience.

Teaching in a conducive learning environment is essential for knowledge distribution in a classroom where VT is use (Ajloni, 2019). Teachers could choose the kind of classroom equipment they need and the suitability of the environment for streaming video segments and instructional videos. The environment fit process, for example, demonstrates how the teacher is not only the distributor of knowledge with video choice but also choosing the

right learning environment based on their experiences and technological expertise (Subramaniam, Ahn, Fleischmann, & Druin, 2012).

5.2 Video-based pedagogical processes and the V-CK domain

The use of VT may also be beneficial in improving the teacher's content knowledge (V-CK). This knowledge domain is another important model that is often utilized in the classroom. It is understood as "knowledge about the actual subject matter that is to be learned or taught" (Graham, 2011, p. 1954). This can include the knowledge of central facts, concepts, theories, and procedures within a learning field (Mishra & Koehler, 2006). There are several ways VBPPs may shape teacher's V-CK domain.

For instance, teachers skilled in the selection process are more likely to have richer content than those who are less knowledgeable since the videos they choose would enrich their own teaching experience. In addition to this, teachers with demonstrated knowledge of their subject area would find it easier to select appropriate videos for their students, without necessarily overwhelming the students with irrelevant video content (Oz, 2015).

The creative process may be another way of enriching V-CK since teachers may draw on innovative and unconventional techniques in the creative process to enhance their subject matter (Hsu, Liang, Chai, & Tsai, 2013). Similarly, teachers with advanced expertise in their subjects are most likely to create their own versions of videos to help their students learn better than those with insufficient knowledge as part of the creative process (Hasse, 2017).

The environment-fit, role awareness and value attribution processes are also relevant for the V-CK domain. This could mean that teachers may attach or enhance the value to the subject matter been taught, and at the same time could try other innovative ways of preparing their learning content with the aid of VT (e.g., by using video games). Given that these teachers are subject matter experts, they would determine which learning environment with VT might be needed for teaching and learning the content in the environment-fit process. Overall, when using VT, teachers with advanced knowledge of their subject and aware of their role as teachers would be more likely to engage their students with curriculum than those less familiar with their subject area.

5.3 Video-based pedagogical processes and the V-TK domain

Knowledge of VT can also play a role in facilitating learning within educational settings and fostering teacher knowledge. Teachers may select the most appropriate VT based on their knowledge of what is available, which will enhance the overall learning experience for students. However, while using VT has some benefits, Praetorius, McIntyre, and Klassen (2017) have pointed out some challenges in integrating this technology into the classroom. For example, teachers who are not technologically savvy may struggle to effectively integrate the VBPPs and thus potentially result in a lower student educational attainment.

Teaching is unlikely to improve by virtue of having VT available in the classroom alone, such as simply placing a camera in the classroom or allowing students to watch random video clips from YouTube or other platforms. Through the role-awareness process, teachers facilitate enthusiasm and foster curiosity of students by being cognizant of positive pedagogical practices such as encouraging them to adopt new forms of VT when it is available. Teachers should also be knowledgeable on what type of environment would be conducive to learning for the selected VT. For example, the use of interactive VT may sometimes be best presented individual students to achieve the best outcome whereas non-interactive VTs such as watching a video may best be presented to a large group instead.

Through the creative process, teachers may use their knowledge of VT devises to stimulate students' interest and learning (Yee, 2016). For example, technologically savvy teachers may enhance students' learning experience by introducing creative forms of VT, such as interactive video games. Another example is the creation of video content by technologically knowledgeable teachers for their classes, which is also part of the selection process (Couse & Chen, 2010).

Teachers can use their knowledge of VT to attribute value to the learning process by combining the appropriate aspects of different forms of VT to promote a better pedagogical outcome. Isman, Abanmy, Hussein, and Al Saadany (2012) claim that using video in pedagogy has become easier and more engaging for both teachers and students, and that learning occurs more quickly and accurately through the use of VT because of the value attributed to this process. For instance, a physics teacher who is knowledgeable in various forms of VT may choose to utilize an interactive computer simulation software to generate video animations of a science phenomenon. The teacher's exercise of his/her knowledge in VT in this instance has ascribed value to the teaching process by making a difficult science concept easier to comprehend.

5.4 Video-based pedagogical processes and the V-PCK domain

With the conceptualization of the V-PCK framework, a teacher's understanding of how to amalgamate the V-PK and V-CK domains is the key to effective teaching practice in the context of VT. Rather than focusing on developing content and pedagogical knowledge in isolation, it is in this intersection of the two domains that teachers are best able to anticipate students' learning needs for a particular subject matter through the implementation of the VBPPs.

As part of the selection process, teachers may be knowledgeable in the selection of optimal instructional approaches for the subject matter at hand in conjunction with the choice of VT. Teachers may scaffold the learning experience and encourage curiosity in relation to the content being taught through teachers' role awareness. The creative process is also another way of enhancing delivery of a subject matter by employing new innovative pedagogical practices that may be video-based (Jang & Tsai, 2012). For example, when teachers do not integrate technology into their V-PCK, they miss out on the innovative ways VT could enrich student learning, since they revert to their conventional teaching practices (Hansen & Erdley, 2009; Niess et al., 2009).

Teachers can use their knowledge of the subject matter to attribute value to the learning process by combining the appropriate aspects of various forms of VT to their pedagogical practices. The overall learning experience can also be enhanced if teaching of the subject matter is delivered in an environment that is appropriate for the topic and the type of VT aid being used. For instance, an English literature teacher may choose to show his/her students a video of a Shakespearean play (rather than reading from the text), and intermittently pausing the video to explain pertinent dialogues. The teacher knows from previous experience that this method of teaching Shakespearean plays generally results in good knowledge transfer.

5.5 Video-based pedagogical processes and the V-TCK domain

The VBPPs can be applied to the knowledge of how to use VT to develop, design or deliver a subject matter in order to enhance the students' learning experience. For example, in the selection process, choosing the right learning material and the right VT aids can be beneficial in enhancing the learning content that is being developed. The environment-fit process is also an important procedure for the V-TCK domain. As an illustration, science teachers may prefer using a lab setting equipped with the relevant VT tools when teaching their subject matter compared to the conventional classroom (Jang & Tsai, 2012, 2013). Such teachers may choose to take a picture of equipment, record an experiment or integrating some other creative means of VT (such as interactive video games) that will be shared with students as part of the learning content. The role awareness of teachers is reflected in their commitment to ensuring that appropriate videos are used in developing and delivering their content.

Teachers who are aware of their role in integrating VT in their teaching practice are more likely to use available VT tools to prepare their curriculum due to the implied elevated commitment. Such dedication can also extend to exploring other ways of enhancing the study curriculum thus resulting in the attribution of value to the pedagogical practices. The application of all these VBPPs to the V-TCK domain is likely to enhance the overall teaching practice and learning experience.

5.6 Video-based pedagogical processes and the V-TPK domain

The link between VBPP and V-TPK can be understood by exploring the many ways teaching practice is advanced through the use of VT. This is seen in the selection process in which the teacher searches for videos that can help in clarifying, simplifying, or enhancing their pedagogical activities (Yee, 2016). For example, curating online learning videos for classroom use can be one of the ways a teacher incorporates the selection process as part of the V-TPK domain.

As part of the environment-fit process, the focus is on having a technologically-equipped classroom that is conducive to effective learning and advances or contributes to the pedagogical direction of the teacher (Torrington, 2018). For example, teachers who use classroom environments that are equipped with data projectors and good sound systems may likely have a higher level of pedagogical outcomes compare to those who teach in a traditional classroom setting without such technological devices.

Through the role awareness process, teachers may be aware and knowledgeable in effective pedagogical practices, behaviors and attitudes while conveying educational knowledge via the use of VT aids (Eady & Lockyer, 2013). For instance, a teacher may be cognizant of the need to improve his/her knowledge delivery skills by evaluating all VT options, then selecting a particular form of VT that is most suitable for his/her teaching method and objectives.

Through the creative process, teachers may choose to deploy innovative pedagogical activities to complement their use of VT to enhance the overall outcome of their teaching practice. Similarly, teachers may adopt or employ innovative video-based technological strategies to polish and enhance their pedagogical activities. For example, research suggests that most teachers use innovative video games and other contemporary VT's to advance teaching and learning strategies (Shliakhovchuk, 2018).

Lastly, it is important to understand that teachers who adopt some elements of the VBPPs would naturally imply the attribution of value and importance to using VT to advance teaching practice (Levin & Wadmany, 2006). For instance, a teacher who utilises innovation and alternative VTs in enhancing their teaching and managing instructional video content would naturally ascribe value to the educational process. Similarly, teachers who proactively use innovative means to create instructional videos to enhance understanding of a subject matter would demonstrate recognition of the teachers' role in using VT, which in turn amplifies value ascribed to the teaching practice.

5.7 Video-based pedagogical processes and the V-TPACK domain

Depending on the circumstance, some of the VBPPs may be integrated into a one or more domains of V-TPACK. They may also be processes in isolation or may be inter-related to each other. The situations where the VBPPs are integrated into a single domain have been described in the sections above. This section describes the situation where the VBPP's are simultaneously integrated into all three core domains of V-TPACK.

As described in a previous section, the V-TPACK is the intersection of the three core domains (V-CK, V-PK and V-TK) and that there are seven domains in total. The application of VBPPs to all three core domains of V-TPACK maximizes the potential of each one and is thus more likely to result in an optimal pedagogical outcome ("sweet spot").

For example, a teacher may choose to integrate an interactive whiteboard (IWB) (a form of VT, chosen via the selection process) with the subject matter being taught (V-CK), which is done in conjunction with the adoption of a suitable teaching style (V-PK). This may result in an additional appreciation of what kinds of VT's (V-TK) and environments are appropriate for learning (environment-fit process) with this particular form of VT (Jang & Tsai, 2012).

Another example is when a physics teacher attempts to make a difficult science concept (V-CK) more memorable, easier to understand or captures students' attention (value attribution). This may be achieved by selecting an appropriate video clip from the internet such as YouTube (selection process) and then followed up by interactive "hands on" video game pertaining to the content which he/she has created (creative process). In this example, the teacher needs to utilize his/her knowledge of different forms of VT's (V-TK) in order to successfully select and create the most appropriate combination of video clip and interactive game. The teacher would also need to utilize his/her knowledge of various teaching methods and styles in order to recognize that an interactive "hands on" video game would make a difficult scientific concept easy to understand and remember (V-PK).

6 Practical implementations of using video technology in classroom

6.1 Practical issues of the use of video technology

Several practical issues might be considered when video technology (VT) is integrated to the classroom. One important practical issue is the lack of teacher experience on how to integrate VT in the classroom (Abdallah, 2010; Pongsapan, 2014). In this case, teachers might refuse to use VT in classroom because they considered traditional methods to be more effective. Alternatively, these teachers might use VT in their teaching practices, but it is not in effective way. This can be solved by allocating some training session on how to use and integrate VT into teaching practices (Ajloni, 2019).

Another practical issue comes to my mind is a teacher lack of good video-technological equipment or IT support for their respective departments (Greenberg & Zanetis, 2012). A study conducted in Amman, Jordan by Ajloni (2019) explained the variance between teachers who are good in their selection of video and highly value using VT due to the support they receive from their IT departments, compared to who scored lower on these aspects because of the lack of support from their school or IT department (Ajloni, 2019). It was also revealed from the quantitative data that teachers face issues when accessing IT equipment. There are statistically significant differences in selection response and value attribution response, which varied based on the IT support provided by schools. As expected, teachers who are supported by their school departments consistently scored higher in two of video-based pedagogical processes (VBPPs) usage involving the selection of video and value attributed to using video compared to those suggesting dissatisfaction with support for selection process, and for value attribution process. This issue can be solved by increasing the level of IT support from their department which might help

teacher who had already faced some difficulties on how to select and value attributed to the use of video technology in their teaching practices. Perhaps schools should take note that a supportive environment, where the technological aspirations of their teachers can be supported, may enhance their students learning outcomes. Doing so may improve the positive perception of VT in the minds of students and teachers, thus increasing its acceptance as an effective tool for teacher and an improved learning experience may naturally follow (Ajloni, 2019).

In addition, teacher might note the lack of internet access as an issue to their teaching practice. Ajloni (2019) found that teacher who has access to the internet was an influential factor in determining whether VT is adopted into their teaching practice. As indicated in his findings, teachers have indicated that poor connection and constant internet interruptions were common obstacles. This result does not come as a surprise since some studies have highlighted the significant role of access to the internet in teaching practice (e.g., Jamieson-Proctor, Finger, & Albion, 2010; Mishra & Koehler, 2009). One teacher indicated that the use of VT would be welcomed if internet access is more available. One obvious way to improve the acceptance of VT is to make the internet available to all teachers. Teachers who already have internet access might further improve on the acceptance of VT in the classroom if teacher behaviour is consistent with all components of the VBPRs rather than the role awareness and value attribution responses alone.

6.2 Current attitudes

There have been previous studies conducted to discover the relationship between the pedagogical practices and VT (e.g., Tondeur, Van Braak, Ertmer, & Ottenbreit-Leftwich, 2017). However, there are currently limited studies providing insights into this relationship in the Jordanian context.

To close this knowledge gap, it is recommended that Jordanian teachers and the schools from kindergarten to tertiary level will be surveyed to find out the extent and how VT is used by teachers.

7 CONCLUSIONS

The existing pedagogical theoretical framework TPACK, whilst well established and accepted, provides limited insight into the role of VT for teaching in the context of the Jordanian education system. The present study aims to close this knowledge gap by investigating the use of VT for teachers in Jordan.

To investigate this relationship, a modified theoretical framework Video-TPACK (V-TPACK) is conceptualized and presented in this paper. The V-TPACK is derived from the TPACK framework except that it specifically deals with VT rather than technology in general, as is the case with TPACK. The V-TPACK framework expands on the teachers' knowledge through recognition of the role of video technology in each of the teacher domains (V-PK, V-CK, V-TK, V-PCK, V-TCK, V-TPACK).

A novel collection of pedagogical processes, namely Video-Based Pedagogical Processes (VBPPs), are then introduced into this modified theoretical framework (V-TPACK). The VBPPs provides insight into a teacher's cognition and categorizes a teacher's internal thinking processes.

The modified theoretical framework (V-TPACK) not only provides a new perspective in terms of explaining the integration of teaching domains, VBPPs and VT. It may also act as a guide for teachers to the successful adoption of VT into their teaching thus resulting in teachers becoming curriculum planners who transform video-based media tools for pedagogical purposes. In other words, it provides teachers with the means to plan, integrate and deliver effective training programs with the use of VT.

A survey of school teachers in Jordan not only provides an understanding of the nature and extent of VT use by teachers in Jordan, but it is also the first step in understanding the integration of VT into V-TPACK domains in the context of Jordan. The next step of this research (to be considered in future works) is to conduct additional surveys based around V-TPACK and VBPPs to teachers in Jordan in order to further ascertain the nature and extent of integrating VT in teaching practices.

Whilst there are limitations to the V-TPACK theoretical framework and VBPPs, they are one possible combination of theoretical perspectives that may explain the relationship between the integration of VT and a successful pedagogical outcome. Therefore, the V-TPACK and VBPPs may be presented to Jordanian teachers in the future as a pedagogical roadmap to successfully integrate VT for optimal teaching outcomes.

It should be noted that an important aspect of the V-TPACK conceptualization presented in this study is that it focuses on VT in general. Focusing on the umbrella term "video technology" captures the plethora of video-based technologies used in teaching. Whilst this provides a better perspective on a broader spectrum, further studies

could focus on a particular type of VT such as (but not limited to) YouTube, Vimeo, and other video-based platforms. This perspective may be helpful in understanding the specific modalities of video-based technology in teaching and learning, which may further close the knowledge gap on this topic in the context of Jordan. This further study can be considered in future research efforts.

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