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Conceptual Model of Video Learning based on Project-Oriented Problem-Based Learning and Competency-Based Education for Technical and Vocational Education

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Abstract: The objective of this study is to refine and validate the aspects of Project-oriented Problem-based learning (PoPBL) and Competency-based education (CBE) in the instructional video conceptual model for Technical and Vocational Education (TVE). The researcher conducted a survey study, distributing questionnaires to 39 vocational institutions across peninsular Malaysia and Sabah, to determine the compatibility of PoPBL and CBE integration in the learning video. There are 500 respondents provided feedback. To test construct accuracy and item weakness or bias based on the data obtained, researchers used exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) with AMOS 20.0 software to confirm the components based on the constructs obtained. The results indicate there are significant relationship influenced by the elements of learning content, delivery of instruction, video design and video quality. This conceptual model's four elements are critical requirements in the setting of Technical and Vocational Education (TVE) and competency-based education. The findings of this study could be utilised to guide the design of instructional videos, particularly in the TVE, as well as a tool for evaluating current instructional videos.

Keywords: Project Oriented Problem Based Learning, Competency Based Education, Video Learning, TVET

1. Introduction

Technical and Vocational Education (TVE) is unquestionably a driver of national growth (Dahar, Ruhizan, Kamalularifin, & Khair, 2013). The teaching and learning (T&L) process in Technical and Vocational Education (TVE) should emphasise skills-based learning rather than the chalk-and-talk method (Marina & Jamil, 2013). It is critical to use various learning styles and instructional tools to ensure students master a skill or competency before progressing to the next. One of the instructional tools to enhance student learning is integrating technology into the classroom to increase student engagement. In TVE concept of learning is based on the student's learning styles and preferences, they prefer to learn by using visual aids that can provide the simulation related to subject

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content. One of the learning strategies that can be considered for TVE includes Competency-based education (CBE) and Project-oriented Problem-based learning (PoPBL). These two learning types have been used in TVE as one of the most applicable learning approaches.

PoPBL is a hybrid of Problem-based learning (PBL) and Project-oriented learning (PO). PBL, according to Mustapha and Laili (2008), is a learning strategy developed and based on real-world issues. PO is a type of learning environment that prioritises Project-based learning over regular classroom instruction. PO is an approach to establishing a student-centred environment where tasks performed and completed are placed on stude shoulders. Students' experiences with activities reflect real-life reality and drive them (Uziak, Oladiran, Eisenberg, & Scheffer, 2010). PoPBL, according to Krüger-Basener and Kosuch (2009), is a natural educational discipline with two key themes: Project-oriented and Problem-oriented education engaging in daily life. Project-oriented education with practical difficulties necessitates students to form and construct a foundation of knowledge synthesis from diverse domains. In contrast, Problem-oriented education with problem-solving employs any appropriate theory or information (Uziak et al., 2010). During the PBL approach, the teachers introduce the problem, and students brainstorm for possible solutions and justifications based on their content knowledge. In contrast, for PoPBL, the problem is formulated by the students before brainstorming the solutions and justifications. PoPBL attempts to cultivate students' ability to learn, think critically, and solve problems through an instruction process centred on practical tasks (Eliyawati et al., 2020).

Combination of Problem-based learning (PBL) and Project-based learning (PO) approaches deemed to have a better impact on students learning, especially in science-related subjects and, enhancing their teamwork skills (Eliyawati et al., 2020; Yasin & Rahman, 2011). Among other benefits of PoPBL for engineering students are enhancing students' learning initiative and abilities for active learning, innovation, communication, and teamwork, and promoting students' engineering quality (Chen, 2015). Previous research focusing on the implementation of PoPBL in TVET can be considered quite a few. Result from advanced search in Google Scholar with search string allintitle: "PoPBL" "TVET" from 2018-2022 only yielded 19 results, while a broader field scope using search string allintitle: "PoPBL" "engineering" from 2018-2022 yielded only 458 results. The low number of research in this approach opens new opportunities for further exploration that can be performed. Among the studies that have been done include PoPBL as innovative learning strategies that benefit both learners and educators (Rajkumar et al., 2021) and the development of a teaching and facilitating framework for TVE based on PoPBL and Work-based learning (WBL) combined with 21st-century teaching elements (Rus et al., 2020). Most of the results from this past research indicate positive impacts from the integration of PoPBL in teaching and learning to the learners that show increment of soft skills such as responsibility and hard work (Setiarini & Wulan, 2021), develop a positive attitude among the slow learners (Rajkumar et al., 2021) and improve students' mastery of concepts and skills on science topics (Eliyawati et al., 2020).

On the other hand, the CBE approach is widely applied in education to develop and train individuals in job-related skills (Dahar, et al., 2013; Marina & Jamil, 2013). It is a method of structuring academic programmes that emphasise competencies (knowledge, skills, and abilities) rather than classroom time. This method is also used to solve problems, such as the challenge of dealing with rapid technological development and the gap between education and job market needs (Ennis, 2008; Edwards, Sánchez-Ruiz, & Sánchez-Daz, 2009; Gasperini, 2009). According to Levine and Patrick (2019), CBE is often misunderstood as nothing more than flexible pacing, or students advance at their own pace as they demonstrate proficiency. Still, a CBE system includes many other components. In contrast, CBE emphasises deeper, contextualised, and interconnected learning and various evaluations incorporating performance-based displays of proficiency (Levine & Patrick, 2019). Competency also encompasses non-cognitive talents and attributes such as self-awareness, self-regulation, and social skills. Some of these abilities and characteristics may be found in individual taxonomies (Kulik et al., 2020). Meanwhile, previous research on the implementation of CBE and TVE has been done extensively. Searching for the articles with the search string all in the title: "Competency-based education" "TVE" from 2018-2022 on Google Scholar has yielded a result of 5570 related articles indicating the richness of research in this field.

Education in the 21st Century has necessitated integrating technology into the educational system. Digital literacy abilities were identified as one of the primary areas of future skill requirements by the Partnership for 21st Century Learning (Partnership for 21st Century Skills, 2009). Information literacy, media literacy, and information and communication technology (ICT) literacy are all part of it. Not only that, but Target also 4.4 of the SDGs had emphasised "relevant skills, including technical and vocational skills, for employment, decent jobs, and entrepreneurship" among children and adults (United Nations, 2015). It specifically requests that governments report the percentage of young people and adults who have attained a minimum level of proficiency in digital literacy abilities (Antoninis, 2018). It is vital to understand this youth's perspective and beliefs while addressing technology and education. In their research, (Haimi et al., 2020) gathered the perspectives of young people in HEIs, and they feel that VR experiences and 360-degree videos are the future of teaching and learning in Malaysia. This demonstrates that students are ready to include video as part of educational technologies into their classes.

Among the diversity of teaching materials, the use of technology applications such as video during the teaching and learning process can provide significant benefits to instructors and students, promote active and creative teaching and learning, and improve memory in the long run (Ghulam et al., 2015). It's a good idea to use video-based learning as one of the ways to teach, especially in TVE, which aims to produce skilled and knowledgeable students in line with government efforts to produce competent people (Othman et al., 2019). Though technology-based learning has provided several advantages as opposed to their conventional counterpart, video-based learning is not shy from its own issues faced by the learners. For instance, (Lange & Costley, 2020) has reported several common complaints from learners in using video-based learning. This includes the pace of information delivery that is too quickly and too slowly, the intelligibility of the learning that disrupted by the video and text being too small and instructor's voice too low and distorted, the quality of the video being outdated, the lack of media diversity and the congruence of the video that is too poor including extraneous noise in the video. Among all these, the quality of the video has become the most concerning issue in the findings (Lange & Costley, 2020). The quality of video should be created to engage and sensory experience for students. Other than that, video-based learning is also facing issues in terms of comparison with other technology-based learning. Since the technology itself is developing rapidly, the relevancy of video-based learning has become subjects to research around the world. For instance, Gordillo, López-Fernández and Tovar, (2022) has compare the effectiveness for online software engineering education of video-based learning and game-based learning using teacher-authored educational video games and the results show that game-based learning using teacher-authored educational video games was more effective than video-based learning in terms of both knowledge acquisition and motivation. This may lead to the obsolete of video-based learning in the future though further research is required.

In line with the transformations that underpin Education 4.0, which are (i) Redesigning Learning Spaces, (ii) Fluid and Organic Curriculum, (iii) 21st Century Pedagogy, and (iv) Latest Learning & Teaching Technologies, it is pertinent to point out that new ways of pedagogical practices need to be designed and understood to welcome the new paradigm of Education 4.0 (Wong et al., 2019). This includes the integration of technologies such as videos as part of 21st century pedagogy. In Malaysia, the government has highlighted the need for education digitalisation in several policies, including the Malaysia Education Blueprint 2015–2025 (Higher Education), whereby the importance of technology development has been emphasised in Shift 9: Globalised Online Learning, which aims to benefit students with robust cyber infrastructure that can support the use of technologies like video-conferencing, live streaming, and Massive Open Online Courses (MOOCs) through the blended learning model (Ministry of Higher Education Malaysia, 2015). It also stated the focus on outcomes over inputs and the need to actively pursue technologies and innovations that address students' needs and enable greater personalisation of the learning experience.

To date, the demand for immersive and interactive education with the integration of the latest technologies is growing rapidly, including in Malaysia. However, it is important to consider how well end users can accept and readily use cutting-edge and novel learning technologies, which may impart several challenges, including the suitability of the subjects with the technologies proposed, as it might not really be appropriate based on the learners' needs (Mokhtar et al., 2020). As future learning demands for the system to be learner-centered with self-learning as a favourable pedagogical approach (Maria et al., 2019), it is important to provide students with tools and skills that can support this pedagogical approach. This includes the teaching technologies that are flexible and reachable by the students. However, current research shows a concerning outcome as it has been noted that the existing teaching and learning in TVE lacks the interactive nature of digital technology (Mansor et al., 2020). This is crucial as, with the development of technologies nowadays, this should not be happening. There are already problems that may hinder acceptance, and if technologies such as limited access to mobile Internet data and stability issues when using public networks on campus, commonly lead to audio loss, video stutter and other technical annoyances that lessen the overall quality of their immersive VR experience (Haimi et al., 2020), a lack of interactive digital technology will only exacerbate the situation. With that, (Mansor et al., 2020) elaborated on the importance of this e-learning, including flexibility, free and convenient access, social learning, and private groups. Flexibility refers to teaching and learning delivery that can occur at anytime and anywhere.

To encounter this kind of issue, it requires planning that is meticulous and structured. Pal, Pramanik and Choudhury (2019) has noted this in their study that adaptability model is one of the key features in the design of interactive video-based learning, which will address the technical issue regarding the acceptability of transmitted video streams homogeneously across the different type of mobile devices. The study that will be discussed in this article is part of bigger research aiming to develop a conceptual model of instructional video based in technical and vocational education. In the earlier phase of the study, the critical domains and elements have been identified through extensive qualitative research. Thus, the purpose of this study is to improve and validate the aspects of PoPBL and CBE in the conceptual model of instructional video for TVE students. For this, the measurement model analysis was used in this study, which is the exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) using AMOS 20.0 software to ensure that the components were the same as the constructs discovered.

2. Methodology

This study used a quantitative research approach through a survey method. Detailing on sample, instrument, data collection and data analysis are explained in the following subtopic.

2.1 Sample

The sample for this study comes from Vocational Colleges teachers. The teachers selected are those who has used PoPBL and CBE in their teaching and learning process. Total 500 teachers were selected to be the sample through random sampling technique.

2.2 Instrument

The questionnaire used in this research was developed by the research team with PoPBL and CBE domain as the main part of the questionnaire. There are two sections, whereby Section A is for demographical data and Section B is for PoPBL and CBE elements. The developed questionnaire has been validated with Cronbach's alpha α = 0.98 which indicates high reliability and valid to be used in real study. Since the instrument used the English language, a proofread was done beforehand with language expertise. English was used to make it applicable for respondents from different demographic backgrounds. Table 1 shows the description of the questionnaire in each section.

Table 1 - Description of section in questionnaire

Section	Description	No of item
A	Respondent Demography	1
B	Criteria of PoPBL and CBE	
	1. Video Quality	9
	2. Teaching Delivery	7
	3. Video Design	16
	4. Learning Content	54
	Total	**86**

2.3 Data Collection

The questionnaires were distributed to the sample using online survey and handout distribution. The ethical considerations when conducting an online survey were considered and the respondents also understood the criteria set. It is best to note that data collection was done before the Covid-19 pandemic, where these two methods were able to yield good feedback from respondents. A reminder was sent through email to the teachers within a week. For the handout distribution, the answered questionnaire was collected once a week. A note informing both ways of the survey was attached to inform the teachers to avoid repeated answering of the questionnaire. Overall, the data collection has taken approximately a month with a response rate of 100%.

2.4 Data Analysis

Once the questionnaires were collected, the data were analysed accordingly using exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) using Structural Equation Modelling (SEM) with SPSS AMOS software as analysis tool. Data cleaning was done to ensure the reliability of the data. The initial stage, i.e., exploratory factor analysis, explores the acceptable items according to the correct construct group classification and identifies the items that need to be dropped. After obtaining a matrix pattern that complies with the condition of 5 percent non-redundant, as stated by Hair (2010), these items are said to have sufficient variables for this analysis to be accepted. Next, the items received were used as items for the confirmatory factor analysis, which is the second warning analysis for the quantitative study in this study that aims to confirm the construct along with the items in the construct group. This validation factor analysis was performed with SEM using AMOS.

3. Result and Discussion

This study employed IBM SPSS AMOS (Analysis of Moment Structures) Version 23.0 to analyse the research data based on the Structural Equation Modelling (SEM) technique. Specifically, the relationships and their exogenous and endogenous variables covariance were assessed via SEM (Hair et al., 2017). A covariance-based technique was used to test the proposed model of the relationships between the four (4) variables, namely video quality, teaching delivery, video design, and learning content in learning videos. These variables were estimated and measured to determine how important they were in testing the research hypotheses.

3.1 Exploratory Factor Analysis

The data obtained through questionnaires was transferred into the Statistical Package for Social Science software at the initial stage. Then the researcher performs exploratory factor analysis (EFA) to get the right construct and reduce the number of items by identifying problematic items and finding no correlation between variables in the data set (Samuels, 2016). In addition, this factor analysis was conducted to identify the relationship structure between each item and its classification. The constructs obtained from the EFA are from statistical results, not theory. Additionally, EFA can be performed without knowing the correct number of constructs and which items are under the proper constructs.

This EFA was operated using Maximum Likelihood with Promax Rotation to see if observed variables were expected where there was sufficient correlation and obtained the criteria of reliability and validity. Findings from the EFA found that the Kaiser-Meyer-Olkin (KMO) test value is 0.959, which is more than 0.50, indicating enough samples. The Bartlett test value is close to zero (0.000), indicating a relationship between at least some subscales and the data suitable for performing factor analysis (refer to Table 2). KMO values and the Bartlett test show that factor analysis can be done.

Table 2 - KMO and Bartlett's test value

Description		Value
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.959
Bartlett's Test of Sphericity	*Approx. Chi-Square*	7834.192
	Df	435
	Sig.	.000

The value of communality (refer to Table 3) for each variable is relatively high (all values above 0.400 and most 0.600). This value indicates that the selected variables have been adequately associated with factor analysis.

Table 3 - Communalities

Item	*Initial*	*Extraction*
Delivery1	.677	.638
Delivery2	.762	.724
Delivery3	.739	.748
Delivery4	.704	.695
Delivery5	.707	.699
Delivery7	.599	.550
Design3_1	.803	.829
Design3_2	.835	.869
Design 3_3	.806	.824
Quality2_1	.808	.804
Quality2_2	.744	.710
Quality2_3	.843	.887
Quality2_4	.791	.774
Content3_3	.686	.564
Content3_18	.596	.545
Content3_22	.686	.649
Content5_1	.704	.629
Content6_2	.498	.441
Content7_1	.714	.656
Content7_2	.749	.709
Content7_3	.784	.729
Content7_4	.800	.789
Content7_5	.749	.709
Content8_3	.758	.685
Content8_4	.737	.676
Content8_5	.726	.665
Content9_1	.680	.538
Content9_3	.721	.616
Delivery6	.716	.649
Content3_5	.723	.598

Extraction Method: Maximum Likelihood.

Additionally, the reproduced matrix has only five percent non-redundant where it complies with the adequacy of variables and four factor models (refer to Table 4).

Table 4 - Pattern matrix

Item	Factor			
	1	2	3	4
Content7_4	.983			
Content7_5	.922			
Content7_1	.885			
Content7_2	.873			
Content7_3	.788			
Content8_5	.784			
Content8_3	.749			
Content5_1	.728			
Content3_22	.694			
Content8_4	.694			
Content9_1	.689			
Content9_3	.653			
Content3_18	.639			
Content6_2	.627			
Content3_3	.608			
Content3_5	.588			
Delivery3		.952		
Delivery2		.917		
Delivery4		.799		
Delivery5		.760		
Delivery7		.616		
Delivery1		.615		
Delivery6		.584		
Design3_1			.876	
Design3_2			.854	
Design3_3			.754	
Quality2_3				.905
Quality2_1				.839
Quality2_4				.645
Quality2_2				.600

The process of exploration has been done to reduce the problematic items, get the right construct, and identify the structure of the item and its classification. The process begins by looking at the value of communality. Acceptable values should exceed 0.3 (Samuels, 2016). Meanwhile, Table 4 shows that item design2_2 and content1_5 have low values. These items were first dropped until they obtained a communality value exceeding 0.3. The researcher looked at the pattern matrix (as in Table 6) and found that many items share factors and are below 0.3. Therefore, the researcher improved by dropping items that overlapped their classification and had a correlation value of less than 0.3. As a result, the researcher has dropped 56 items out of 86 items (refer to Table 7). According to Watkins (2018), there is no set ratio or number of dropped items. The dropped items only depend on items with low correlation values and overlapping factors. He added that the overlap of factors for the items had confused the researcher when making the report. Therefore, items with low correlation values and factor sharing were dropped.

Table 5 - Communalities value < 0.3

Item	*Initial*	*Extraction*
Design 2_1	.813	.652
Design 2_2	.313	.111
Design 2_3	.792	.550
Design 2_4	.820	.610
Design2_5	.734	.605
Design2_6	.788	.680
Design2_7	.846	.728

Table 5 - Continue

Item	*Initial*	*Extraction*
Design2_8	.757	.591
Design3_1	.872	.844
Design3_2	.899	.886
Design3_3	.854	.829
Content1_1	.763	.574
Content1_2	.825	.690
Content1_3	.873	.723
Content1_4	.824	.703
Content1_5	.398	.061
Content1_6	.815	.684

Table 6 - Matrix patterns that share factors

Pattern Matrix	*Factor*						
	1	**2**	**3**	**4**	**5**	**6**	**7**
Content7_1	.727						
Content 9_2	.707					.308	
Content7_5	.705						
Content6_4	.692				.320		
Content3_24	.673						
Content9_3	.625					.359	
Content6_3	.614					.366	

Table 7 - Dropped items

Dropped Items	
Content1_1	Quality1_1
Content1_2	Quality1_2
Content1_3	Quality1_3
Content1_4	Quality1_4
Content1_5	Quality2_5
Content1_6	Design1_1
Content2_1	Design1_2
Content3_1	Design1_3
Content3_2	Design1_4
Content3_4	Design1_5
Content3_6	Design2_1
Content3_7	Design2_2
Content3_8	Design2_3
Content3_9	Design2_4
Content3_10	Design2_5
Content3_11	Design2_6
Content3_12	Design2_7
Content3_13	Design2_8
Content3_14	Content4_1
Content 3_15	Content4_2
Content3_16	Content4_3
Content3_17	Content6_1
Content3_19	Content6_3
Content3_20	Content6_4
Content3_21	Content8_1
Content3_23	Content8_2
Content3_24	Content8_6
Content8_7	Content9_2

The researcher performed a reliability test for each construct to determine whether this matrix pattern is acceptable. As a result of this reliability test, the researcher found that the Cronbach's Alpha value for each construct is more than 0.9, which is at an excellent level. All constructs are reflective and non-interchangeable. The Cronbach’s Alpha values for each construct are clearly stated in Table 8.

Table 8 - Alpha Cronbach's Alpha value for each construct

Factor	Cronbach's Alpha Range	Number of Items (N)	Stage
Learning Content	0.96	N=16	Excellent
Teaching Delivery	0.93	N=7	Excellent
Design	0.94	N=3	Excellent
Video Quality	0.94	N=4	Excellent

These constructs show sufficient convergent validity because they have a minimum correlation value of above 0.350 for a sample size of 250 to 300 people (Hair et al., 2019).

3.2 Confirmatory Factor Analysis

The researcher used confirmatory factor analysis (CFA) to look at compatibility and confirm the structure of the constructs and items studied (Karmani & Yunus, 2020). Based on Zainudin (2015), the strength of the Fit Model has three categories, namely Absolute Fit, Incremental Fit and Parsimonious Fit. To determine the strength of the Fit Model in this study, the researcher chose one strength index for each strength category of the Fit Model as suggested by Zainudin (2015). Several conditions influence the strength of the Fit Model. For example, the default model must have the value of Root Mean Square of Error Approximation (RMSEA≤0.08), Goodness of Fit Index (GFI≥0.9) (for Absolute Fit category), Adjusted Goodness of Fit (AGFI≥0.9), Comparative Fit Index (CFI≥0.9), Normal Fit Index (NFI≥0.9) and Tucker-Lewis Index (TLI≥0.9) (for Incremental Fit) and Chi-Square/df (Chisq/df or Cmin/dF≤3) (for the Parsimonious Fit category) (Zainudin, 2015). According to Zainudin (2015), many measurements of strength using the Fit Model are used as a reference by most researchers. There is no agreement among researchers about the uniform Fit Model used. Researchers may use any Fit Models and report according to the references studied. As a result of the CFA analysis, the researcher found that the value of factor loading is good, which is more than 0.7 as suggested by Zainudin (2015). Figure 1 shows the factor loading from the analysis.

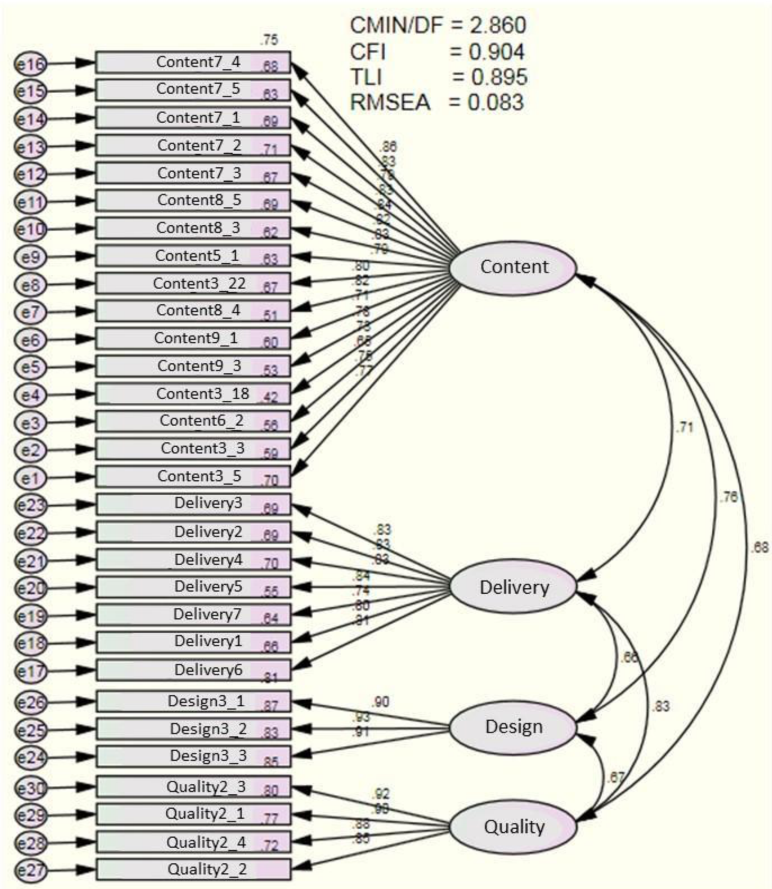

Fig. 1 - Factor loading

Since the TLI value does not exceed 0.9, the researcher has performed modification indices to determine if there is an opportunity to improve the model by referring to the high e value to be connected in the figure of CFA. This process is done by looking at the highest value of e first and then at the value below it, as suggested by

Zainudin (2015). The researchers repeated the same method according to the CFA analysis. Once all the conditions are met, it indicates the elements in the studied factors can be used (Zainudin, 2015). The researchers repeated the same method according to the CFA analysis. Once all the conditions are met, it indicates the elements in the studied factors can be used (Byrne, 2010). Based on Figure 4.2, the researcher has covaried the error terms for the content factor, which is between e12 <__> e13, e12 <__> 15, e15 <__> e16, e7 <__> e9, e7 <__> 10, e5 <__> e6, and e1 <__> e2. As for the delivery factor, the researcher covaried the error terms between e21 <__> 23 and e22 <__> 23. Figure 2 shows the diagram for covariates the error terms.

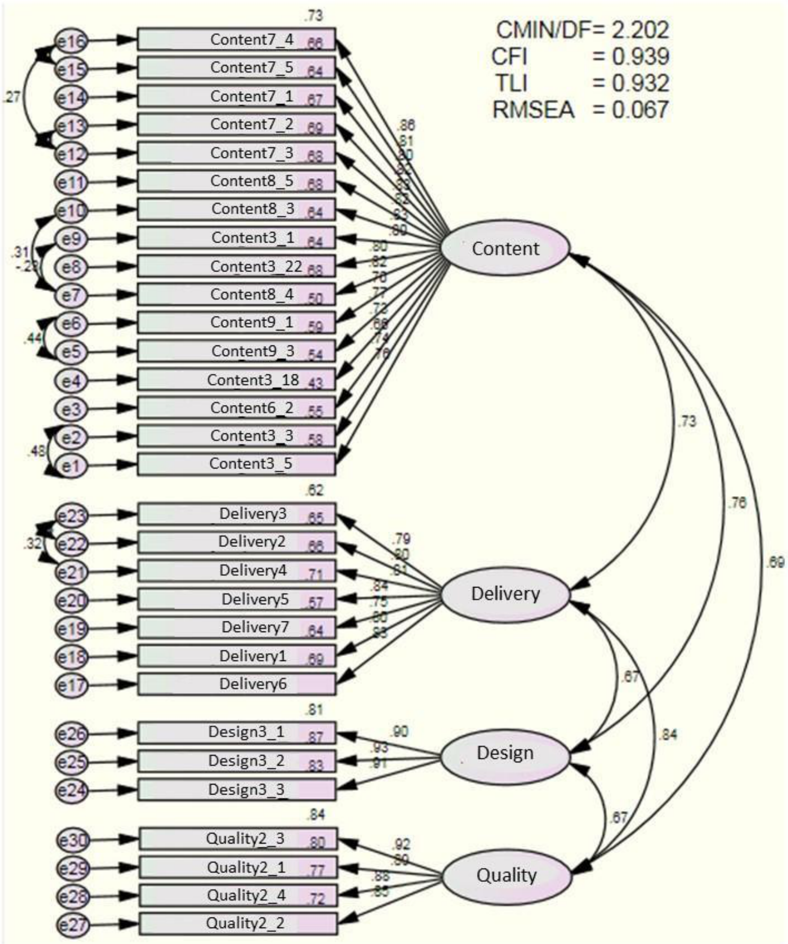

Fig. 2 - Covariate the error terms

After covariation the error term, the researcher calculates estimates and then looks at the output path diagram view. Table 9 shows the strengths of the Fit Model for the conceptual model of video learning or the measurement model that has been performed. Based on Zainudin (2015), this measurement model is adequate.

Table 9 - Fit model for learning video conceptual models based on PoPBL and CBE

Metric	Acquisition Value	Value Proposition
CMIN/DF	2.202	< 3.00
CFI > 0.90	0.939	> 0.90
TLI> 0.90	0.932	> 0.90
RMSEA<0.08	0.067	< 0.08

In addition, the researcher also analysed the conceptual model of video learning for each construct. The first construct is the content construct; the researcher has modified the indices by referring to the highest value. Table 10 shows the Fit Model for this content construct.

Table 10 - Fit model for content construct

Metric	Acquisition Value	Value Proposition
CMIN/DF	2.604	< 3.00
CFI > 0.90	0.957	> 0.90
TLI> 0.90	0.948	> 0.90
RMSEA<0.08	0.077	< 0.08

For the delivery construct, modification indices are also done by covering the error terms for the delivery factors. The Fit Model for this delivery construct can be referenced in Table 11.

Table 11 - Fit model for delivery construct

Metric	Acquisition Value	Value Proposition
CMIN/DF	0.399	< 3.00
CFI > 0.90	0.969	> 0.90
TLI> 0.90	0.979	> 0.90
RMSEA<0.08	0.072	< 0.08

Furthermore, the next construct, which is design, is not involved in modification indices because it has reached the Fit Model that is the value of CFI, GFI for this construct is 1.0, and the value of CMIN/DF is 0 (refer to Table 12). According to Zainudin (2015), if the value of CFI and GFI is more significant than 0.9 and the value of Cmin/df is less than 0.3, the model has achieved the qualified Fit Indexes.

Table 12 - Fit model for design construct

Metric	Acquisition Value	Value Proposition
CFI	1.0	>0.90
GFI	1.0	> 0.90
CMIN/DF	0.0	< 3.00

The quality construct involves modification indices by covering the error terms for the factor. The Fit Model for this construct can be referenced in Table 13.

Table 13 - Fit model for quality construct

Metric	Acquisition Value	Value Proposition
CFI	1.0	>0.90
GFI	1.0	> 0.90
CMIN/DF	0.109	< 3.00

Next, to see the validity of these constructs, the researcher has obtained the value of average variance extracted (AVE). A good AVE value is above 0.7 (Zainudin, 2015). Based on Table 14, the AVE value for each construct is above 0.7. Also, to determine construct validity, the p-value should be smaller than 0.05.

Table 14 - AVE Values for each construct

Construct	Average Variance Extracted (AVE)
Content	0.90
Delivery	0.92
Design	0.97
Quality	0.95

To determine the construct reliability (CR), the researcher has obtained the value of CR by performing calculations manually using the formula proposed by Zainudin (2015). Based on Table 15, all values for each construct are above 0.7. According to Zainudin (2015), CR values above 0.7 are suitable. Therefore, the reliability of the constructs in this study is acceptable.

Table 15 - Reliability values for each construct

Construct	Reliability Values (CR)
Content	0.990
Delivery	0.988
Design	0.989
Quality	0.988

The values of the Comparative Fit Index (CFI), Tucker Lewis Index (TLI), and RMSEA were used to retain and drop items (Zainudin 2015). This study's final findings, which used the CFA measurement model, did not drop any items. They confirmed 30 valid and reliable items to measure the 4 constructs of the conceptual model of video learning based on PoPBL and CBE. To strengthen the reliability and acceptance of this measurement model, the researcher listed the value of squared multiple correlations (SMC) to measure the reliability of these 30 items. The findings in Table 16 show that SMC is at a value of 0.496 to 0.866. There are five items that show a very high SMC value, namely Quality2_3 = 0.845 (Quality), quality2_1 = 0.801 (Quality), design3_1 = 0.810 (Design), design3_2 = 0.866 (Design) and design3_3 = 0.832 (Design). It shows that the variance extracted from quality2_3 items is 84.5 percent for quality construct, 80.1 percent for quality construct, 81 percent for design construct, 86.6 percent for design construct, and 83.2 percent for design construct. Meanwhile, the other 25 items showed a high and strong SMC value to measure the relevant constructs. According to Zainudin (2015), an SMC value of 0.30 or above is an acceptable value to indicate that an item or indicator measures the relevant construct.

Table 16 - Standardised Loadings and Squared Multiple Correlation (SMC) conceptual model of learning video based on PoPBL and CBE for each item

Item	Standardised Loading	Squared Multiple Correlation
Quality2_3	.919	.845
Quality2_1	.895	.801
Quality2_4	.878	.771
Quality2_2	.851	.724
Design3_1	.900	.810
Design3_2	.930	.866
Design3_3	.912	.832
Delivery3	.788	.621
Delivery2	.804	.646
Delivery4	.812	.660
Delivery5	.843	.711
Delivery7	.753	.568
Delivery1	.801	.641
Delivery6	.830	.689
Content7_4	.855	.732
Content7_5	.813	.661
Content7_1	.797	.635
Content7_2	.818	.670
Content7_3	.828	.686
Content8_5	.823	.677
Content8_3	.826	.682
Content5_1	.803	.644
Content3_22	.799	.639
Content8_4	.822	.676
Content9_1	.704	.496
Content9_3	.771	.594
Content3_18	.732	.536
Content6_2	.656	.430
Content3_3	.743	.553
Content3_5	.758	.575

The findings in Table 17 show that the value of SMC is between 0.55 to 0.84. It means variance extracted 78.5 percent quality constructs, 83.5 per cent design, 54.8 per cent delivery and 61.5 per cent content to the conceptual model of learning video based on PoPBL and CBE. It shows that the variance extracted for the four constructs is to measure the conceptual video-based learning on PoPBL and CBE. An SMC value of 0.30 and above is an acceptable value to indicate that an indicator measures related constructs based on Zainudin (2015)

Table 17 - Standardized Loadings and Squared Multiple Correlation (SMC) conceptual model of learning video based on PoPBL and CBE for each construct

Construct	Standardized Loading	Squared Multiple Correlation
Video Quality	.886	.785
Video Design	.914	.835
Teaching Delivery	.740	.548
Learning Content	.784	.615

As a result of this CFA analysis, the researcher was able to formulate a conceptual model of video learning based on Project-oriented Problem-based learning (PoPBL) and Competency-based Education (CBE) has four constructs namely Content, Delivery, Design and Quality. Figure 3 shows the conceptual model of video learning based on Project-oriented Problem-based learning and Competency-based education.

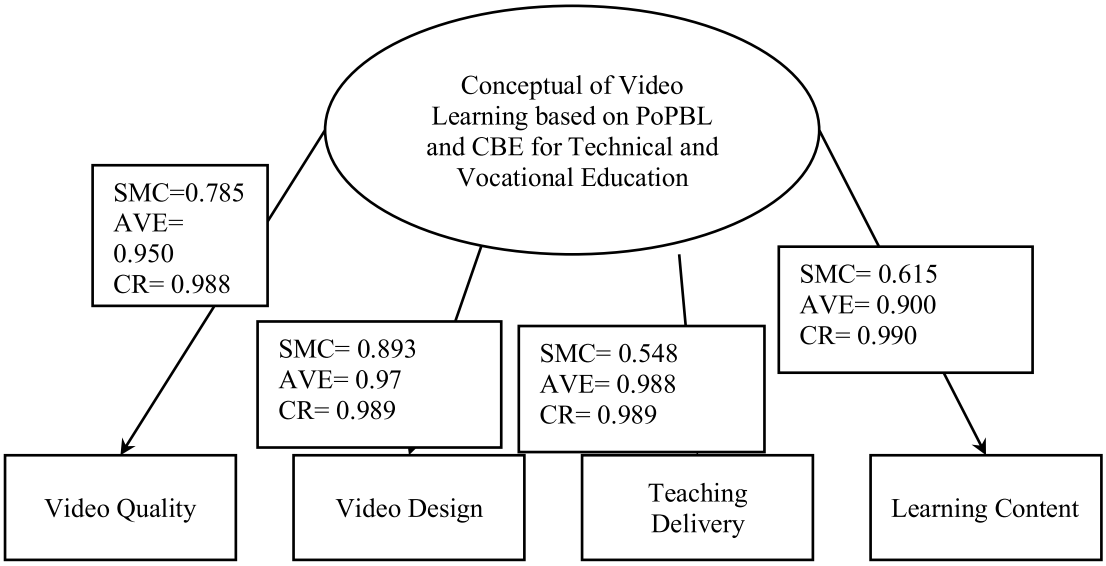

Fig. 3 - Conceptual model of video learning based on project-oriented problem-based learning and competency-based education for technical and vocational education

4 Discussion

The comprehensive analysis work investigated the conceptual model of instructional video based on Project-oriented Problem-based learning (PoPBL) and Competency-based education (CBE) for technical and vocational education. As a result of the interpretation in this study, the researcher has classified the study's findings into four constructs, namely video quality, teaching delivery, video design, and learning content in learning videos. It is proven that the application of PoPBL can improve design and craftsmanship skills, as well as critical thinking skills and experience. In addition, this approach can encourage students to think deeply, encourage creativity, problem solve and develop self-learning skills (Latada & Kassim, 2017). On the other hand, the application of CBE also turned out to be parallel and a necessity in TVET. Practical CBE is crucial in developing human capital that is capable in various ways of meeting the needs of the job market (Othman et al., 2019). Based on this analysis, the researcher formulated a conceptual model of video learning based on PoPBL and CBE that has four constructs, namely video quality, teaching delivery, video design, and learning content. Figure 4 shows the conceptual model of video learning based on Project-oriented Problem-based learning and Competency-based education.

The first construct in this conceptual model is learning content. Based on the result, the criteria of learning content require detailed demonstration from the system to the users, including demonstration on how to use, displaying actual situation, and showing data of the users focusing on their competency. The displaying of these criteria may provide information to the learners on what and why they must learn on that subject. Sharing the learning content including the objectives with students can help in boosting their engagement and help the learners to be on track. The uses of videos also encourage students to take greater responsibility for their learning by enriching memorable learning experiences and authenticity (Ghulam et al., 2015). It is also supported by Giannakos et al. (2016), who found that the learning experience using video can enhance learning and self-instruction.

The second construct is teaching delivery whereby in this construct, the focus is steps and criteria that make the delivery process to be well structured and interactive. As this is a video-based learning approach, the interactive elements must be included since it is the strength of this learning. This is in line with Silverajah and Govindarah (2018), as the study had mentioned that interleaving sequences of videos with interactive exercises gives students opportunities to interact with the content materials. An interactive video is also able to increase learner engagement with the learning process.

The third construct is video quality which focuses on the audio and movement. It must be clear and synchronised. Another interesting finding stated the audio need to have commercial values meaning that the speaker or audio used must be clear and flexible with impeccable enunciation, appropriate pacing, and natural articulateness. This will eventually increase learners' engagement. Overall, it is important for the video used in video-based learning to have good quality as a poor video quality will lead to reduction in concentration, interest, and attention (Lange & Costley, 2020). The production of quality videos according to the national curriculum can contribute to the success of national education in the future (Ghavifekr & Rosdy, 2015). In addition, the use of video in teaching and learning can also reduce the gap between the inequality of the classroom environment and the natural environment (Guseva & Kauppinen, 2018).

The final construct is video design. Like the video quality, video design also must be tailored to the needs of the learners. The result suggested the video needs to be designed with motivational characteristics that encourage learners to learn better. Furthermore, since this conceptual model was developed for TVET that involves adult learners, it is crucial to have their motivation at a high level. This motivation can be increased from having a well-planned model from the first construct as adult learners' motivation level escalated quickly when they realised that their learning makes sense and is relevant to their values and perspective (Muniandy et al., 2018). It is noted that learners who understand and emphasise the related topic will be the main drivers of the success of the learning process as part of their motivation, discipline, and responsibility (Mongkhonvanit, 2017). The use of video in teaching and learning sessions also has a significant and influential impact on influencing and engaging students, motivating students, encouraging weaker students to strive, and making learning more meaningful in line with learning objectives (Giannakos et al., 2016).

All these constructs are components of the complete format for teaching and learning that includes pre - teaching, content delivery, enrichment, testing and formulation that emphasises technical and vocational knowledge among students. The concept and emphasis through these constructs is based on the knowledge of skills that are very suitable for technical and vocational education in the formation of student competencies. This study also proved that the use of technology in education provides great potential for introducing innovative teaching and learning modalities among students with different backgrounds. It is also in line with the opinion of John et al. (2017), who stated that technology can also provide learning experiences like students' life experiences and can support, extend, or change pedagogy and curriculum outcomes. According to Abdul Rahaman et al., (2020), to get more attention from students during the teaching and learning process, the concepts of movement, audio, animation, and simulation should be adopted. Multimedia elements have proven to be effective in increasing students' levels of understanding in mastering a field (Hilal et al., 2015).

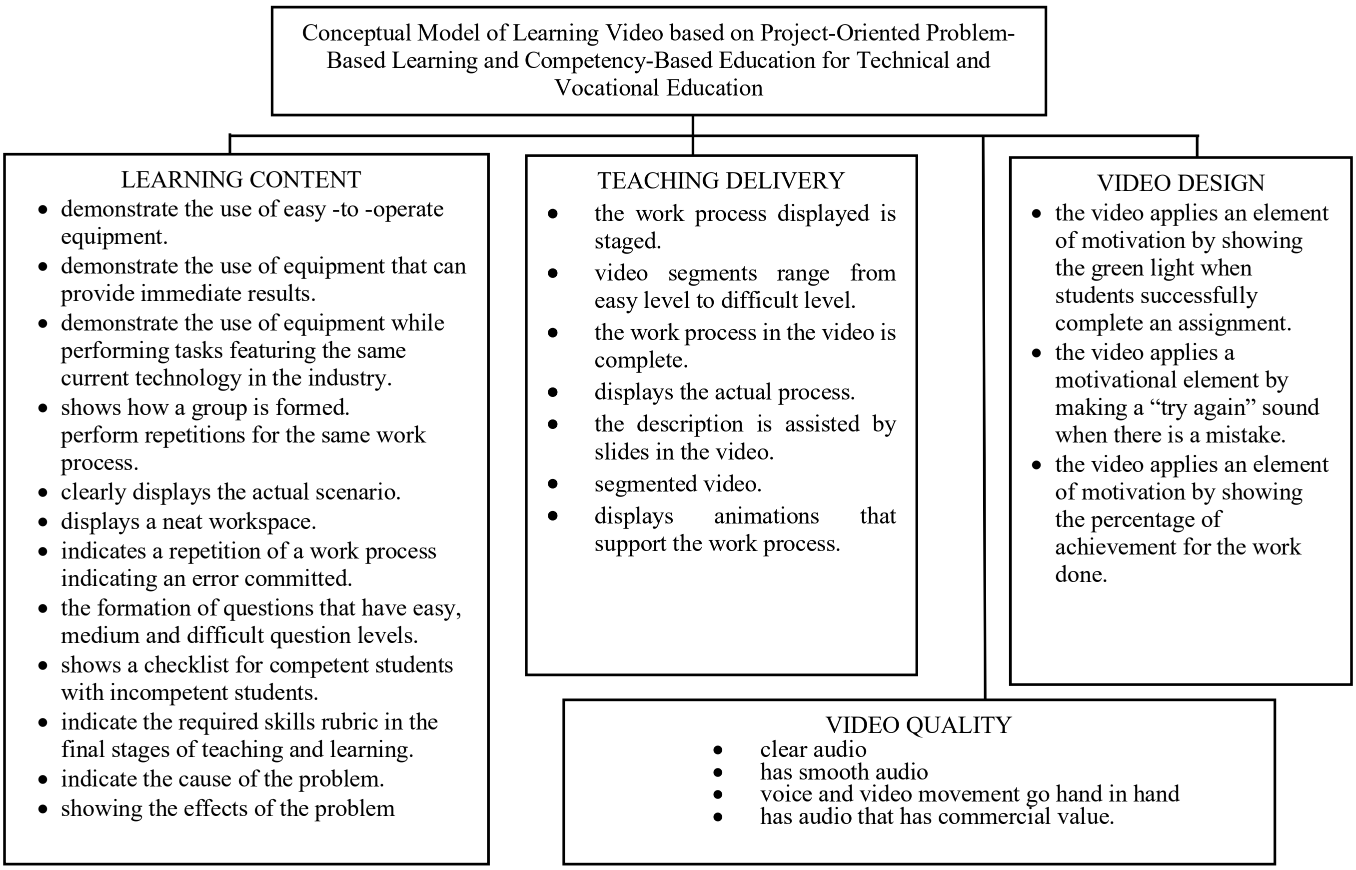

Fig. 4 - Conceptual model of learning video based on project-oriented problem -based learning and competency-based education

5 Conclusion

The purpose of this study is to examine the elements that influenced the development of a conceptual model for instructional video based on PoPBL and CBE for the TVE programme. This study collected data through a survey and analysed it using exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) with the AMOS 20.0 software to confirm the components corresponding to the construction. The findings suggested that the conceptual model of instructional video based on PoPBL and CBE included four constructs: learning content, teaching delivery, video design, and video quality. Within each construct, the criteria were developed to meet the specific requirement of the TVET field, thus making it focus more on technical and practical aspects. For instance, the learning content must display all the structured learning process, showing the actual work, a neat workspace and the competency or skills that learner has to acquire. This is native to TVET, especially when it comes to skills and actual scenarios. Despite the variety of conceptual models on video-based learning available worldwide, the one that is constructed with PoPBL and CBE for the use of TVET is still scarce if not available. Thus, this finding may aid educators in building teaching and learning aids, particularly for video-based learning, by identifying tools that can significantly increase the learning process. Nevertheless, further research may be done before this study results in different levels of education. This study focuses on TVET teachers' perspectives only, thus, the input from other TVET educators, including skills instructors and TVET lecturers, can be explored. The implications of video-based learning discussed in this study provide an improvement of existing TVE learning strategies to students.

In addition, the results of the study can be applied to the designer of TVE teaching materials to be a reference that can be applied to all TVE subjects.

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