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Synthesis of Framework of Virtual Immersive Learning Environments (VILEs) Based on Digital Storytelling to Enhance Deeper Learning for Undergraduate Students

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Abstract

This study aimed to synthesize theoretical and designing framework of Virtual Immersive Learning Environments (VILEs) based on digital storytelling to enhance deeper learning for undergraduate students. Documents analysis and survey research were employed in this study. The procedures were as follows: (1) to examine and analyze the principles, theories and related researches, (2) to study instructional context, (3) to synthesize the theoretical framework, and (4) to synthesize the designing framework. The results revealed that the theoretical framework comprised of four bases was as follows: (1) immersive technology, (2) digital storytelling, (3) Stories evaluation and (4) deeper learning. The designing framework consisted of 4 elements, were as follows: (1) VILEs based on digital storytelling to enhance deeper learning, (2) Supporting Cognitive, (3) Supporting Interpersonal and (4) Support Intrapersonal.

Keywords: virtual reality, augmented reality, digital storytelling, virtual immersive learning environment (VILE), deeper learning

1. Introduction

Virtual learning environments (VLEs) are consolidated within education institutions. Therefore, it does not seem relevant to question their acceptance (Zitter et al., 2011). However, it is a challenge to turn them into an important contribution to enhance deep learning for students. Virtual immersive learning environments (VILEs) is a learning scenario created using virtual reality technology or augmented reality, as well as a learning environment with simulation games and virtual worlds. Virtual worlds like Second Life have been widely utilized. VR which emerged several decades ago is a technology that allows users to explore 3D interactive environments in real time (Sampaio et al., 2010). Virtual environments effectively compliment traditional higher education. VR technologies have been extensively utilized for training professionals in high-risk occupations such as pilots, surgeons, and nuclear power plant operators. Expanding attention has also been paid to AR and its potential to improve on-site construction processes. AR supplements the real world with relevant synthetic data, allowing real and virtual objects to coexist in an augmented space (Azuma, 1997). Numerous studies have developed AR based applications and systems for on-site tasks such as data visualization, work inspection and omission checking (Park et al., 2013). These developments have improved on-site safety performance to some scope. A few studies have also attempted to adapt VR and AR in construction training and education. The integration of technology in education has benefits which can be seen from different aspects. According to Abbot, Townsend, Johnstone-Wilder, and Reynolds (2009) Information Communication Technology (ICT) can improve deep learning, as learners can experience concepts from diverse points of view in ways that would not have been possible otherwise.

Digital Storytelling is the up-to-date version of traditional storytelling. Digital Storytelling is the use and express of interactive media components such as picture, audio, and text in a certain harmony (Ming et al., 2014).

According to Kocaman (2015), Digital Storytelling is an up to date method that is often used in education, caused by the use of traditional storytelling in conjunction with multimedia elements. Many multimedia elements are utilized in the process of creating stories in which Digital Storytelling was used (Kotluk & Kocakaya, 2015). This situation allows for more effective learning environments. According to Hathorn (2005), Klaebe, Foth, Burgess, and Bilandzic (2007), Digital Storytelling is bringing together the skills such as language, literature, and art in virtual environment with the use of technology and represent the story in virtual environment. Digital storytelling which has come out in recent years as a strong learning-teaching tool (Campbell, 2012) can be used at different education levels; however, it is new for higher education and in the process of developing (McLellan, 2006).

Therefore, the researchers recognize the of importance of synthesizing the theoretical framework and designing framework of the VILEs based on digital storytelling to enhance deeper learning for undergraduate students, as a guide line for developing deeper learning for undergraduate students. This framework may help to confirm the validity in design the VILEs based on digital storytelling to enhance deeper learning for undergraduate students.

2. The Purpose of This Study

1) To synthesize theoretical framework of VILEs based on digital storytelling to enhance deeper learning for undergraduate students.

2) To synthesize the designing framework of VILEs based on digital storytelling to enhance deeper learning for undergraduate students.

3. Research Design

Document analysis and survey research were employed in this study.

3.1 Target Group

The target groups of this study consisted of five experts to assess the designing framework of virtual Immersive learning environments (VILEs) based on digital storytelling to enhance deeper learning for undergraduate.

3.2 Research Instruments

The instrument in this study consisted of instrument as following:

1) The experts review recording form for checking the quality of the designing framework. Three educational technology experts and two deeper learning experts were selected to evaluate the designing framework of VILEs based on digital storytelling to enhance deeper learning for undergraduate students by using five scales learning environment evaluation form. The experts selection criteria consisted of (1) the experts must have more than three years of experiences in the educational technology/deeper learning field, (2) the experts must have a related work in educational technology/deeper learning field, and (3) the experts must have experiences in designing learning environments or teaching with undergraduate students.

2) The recording form for synthesis of the theatrical framework of the VILEs based on digital storytelling to enhance deeper learning.

3.3 Data Collecting and Analysis

The procedure of gathering and analysis data were as follows:

1) Synthesis of theoretical framework of VILEs based on digital storytelling to enhance deeper learning. The data were collected by using the recording from for synthesis of the theoretical framework. Summarization, interpretation and analytical description were used to analyze the data.

2) Synthesis of designing framework of VILEs based on digital storytelling to enhance deeper learning. The data were collected by using the recording from for synthesis of the designing framework. Summarization, Interpretation and analytical description were used to analyze the data.

4. Results

4.1 Theoretical Framework

The design theoretical framework of virtual Immersive learning environments (VILEs) based on digital storytelling to enhance deeper learning for undergraduate students are follows:

Designing theoretical framework of VILEs based on digital storytelling to enhance deeper learning for undergraduate students. The researcher is documentary analysed principle, theories, and related researches. Study the context teaching and learning; synthesize the theoretical framework and the designing framework of VILEs based on digital storytelling to enhance deeper learning for undergraduate students. The results show that the theoretical framework of VILEs based on digital storytelling to enhance deeper learning for undergraduate

students comprised of 4 basic theories: (1) Immersive Technology base are follows: Virtual reality: Virtual Reality (VR) is a virtual environment that is established with demonstrating an application to the user in such a way that the user promote belief and acknowledge it as an authentic environment (Yasin et al., 2012); and Augmented reality: Augmented reality (AR) is a mixed environment which mixes virtual and physical environments in immediately. Appliance-based on this technology feel on three bases: tools to track information about physical environments of liking; software and hardware to system computer; and devices to show the human the virtual environment integrated into the physical environments (Webster, 2016). (2) Digital storytelling is full regard as creating stories some topics by use software tools and for generating and distributing this story in the virtual environment (Nguyen, 2011). (3) Stories evaluation (Koerner & Otto, 2017) follows scientific content and knowledge, the plot of the story, Artistic & creative expression, Originality of the story/ resources used, the story as collaborative work, communicating the story effectively, Inclusion of problem solving processes within the story, and Story connectivity. (4) Deeper learning (Pellegrino et al., 2012) bases are the following: Cognitive, Interpersonal, and Intrapersonal. As shown in Figure 1.

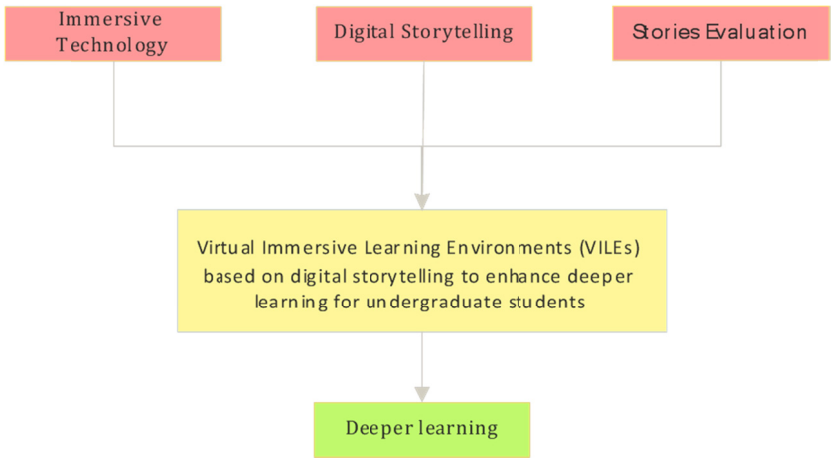

Figure 1. Theoretical framework of VILEs based on digital storytelling to enhance deeper learning for undergraduate students

4.2 Designing Framework

According to this study, the findings of synthesis of the designing framework of the VILEs based on digital storytelling to enhance deeper learning for undergraduate students found 4 crucial bases as the following details:

4.2.1 VILEs Based on Digital Storytelling to Enhance Deeper Learning

The first crucial bases of the designing framework were VILEs based on digital storytelling to enhance deeper learning, it illustrated the underlined theories used to design involves three major components (1) Digital Storytelling, (2) Immersive Technology, and (3) Stories Evaluation. The underlined theories used for supporting for VILEs based on digital storytelling to enhance deeper learning were as follows: Digital Storytelling (Jakes & Brennan, 2005) includes 1) Writing; 2) Script; 3) Storyboarding; 4) Locating multimedia; 5) Creating Digital Story; and 4) Sharing Digital Story. Immersive technology can be categorized into virtual reality (Adams et al., 2016) and augmented reality (Chujitarom & Piriyasurawong, 2017). While stories evaluation (Koerner & Otto, 2017) comprise Scientific content and knowledge, The plot of the story, Artistic & creative expression, Originality of the story/resources used, The story as collaborative work, Communicating the story effectively, Inclusion of problem-solving processes within the story and Story connectivity and relevance. This may help learners supporting for enlarging cognitive structure as shown in Figure 2.

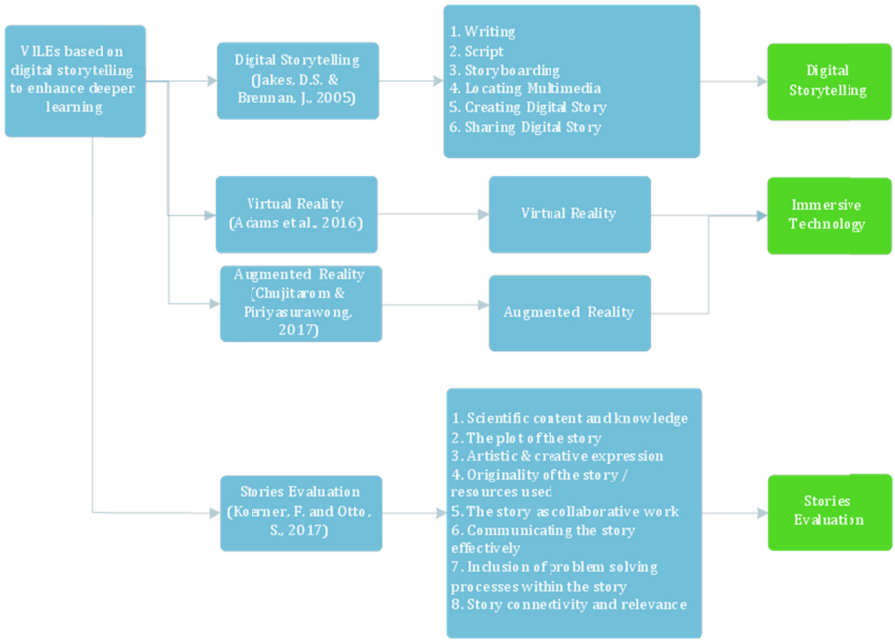

Figure 2. The designing framework of virtual Immersive learning environments (VILEs)

4.2.2 Supporting Cognitive

The second crucial bases of the designing framework were supporting cognitive, it illustrated the underlined theories used to design can be classified into (1) Master core academic content and (2) Think critically and solve complex problems. It is illustrated the relationship between the underlined theories as follows: Coaching. It was designed based on methods in promoting good teaching (Stalmeijer et al., 2009) as the component of Master core academic content. Think critically and solve complex problems: It is illustrated the relationship between the underlined theories as follows: Constructivist theory (Jonassen, 1999). Example of cognitive constructivist is cognitive conflict. Problem Solving involves six steps: (1) Select an appropriate problem, (2) Provide related cases (3) Provide learner-selectable information just-in time (4) Provide cognitive tools (5) Provide conversation and collaboration tools and (6) Provide social/contextual support (Figure 3).

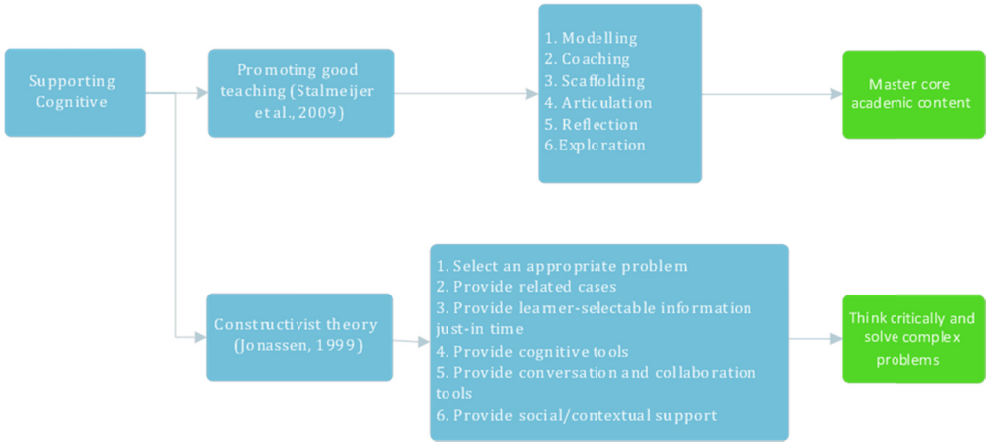

Figure 3. The designing framework of supporting cognitive

4.2.3 Supporting Interpersonal

The third crucial base of the designing framework was Supporting Interpersonal, it illustrated the underline theories used in design the component called “Work collaboratively” and “Communicate effectively” of the

supporting interpersonal. The underlined theories used for Supporting interpersonal were as follows: Work collaboratively (Guide, 2017) and Communication process (Mcpheat, 2010) (Figure 4).

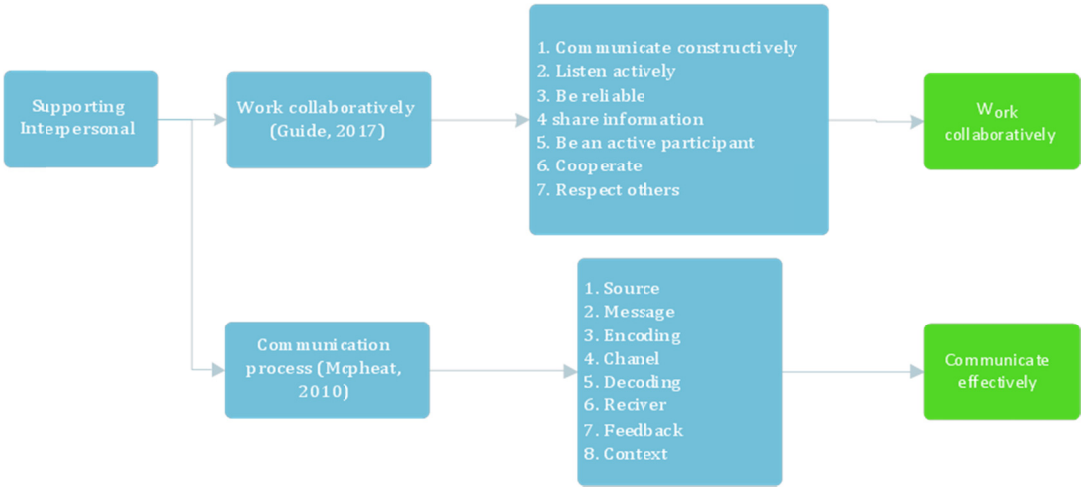

Figure 4. The designing framework of supporting interpersonal

4.2.4 Support Intrapersonal

The fourth crucial base of the designing framework was Support intrapersonal, it illustrated the underline theories used in design the component called "Learn how to learn" and "Develop an academic mindset" of the support intrapersonal. The underlined theories used for Support Learn how to learn were as follows: Helping students take control of their own learning (Nicol & Macfarlane-Dick, 2007): Step 1) Helps, Step 2) Facilitates the development, Step 3) Delivers high quality information, Step 4) Encourages teacher, Step 5) Encourages positive motivational, Step 6) Provides opportunities, and Step7) Provides information. The underlined theories used for support develop an academic mindset were as follows: Four academic mindsets (Farrington et al., 2012). Four mindsets in the first person from the point of view of the learner: Step 1) I am in this academic community, Step 2) My abilities and abilities grow with my efforts, Step 3) I can succeed in this and 4) This work is valuable for me (Figure 5).

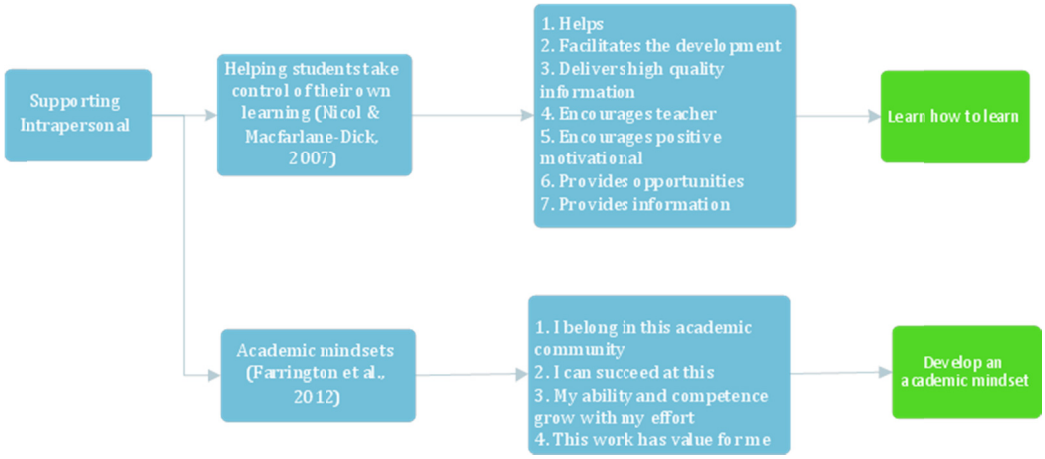

Figure 5. The designing framework of support intrapersonal

Table 1. Element describes the elements of the framework of VILEs based on digital storytelling to enhance deeper learning for undergraduate students.

Element describe the element	describe the designing element of the framework of VILEs based on digital storytelling to enhance deeper learning for undergraduate students
Digital Storytelling	Digital storytelling process includes: The process of creating a digital story is described in six steps (Jakes & Brennan, 2005): • Writing: In this step, the draft of the script has been developed and then will be reviewed and discussed by others. The creator or author begins by searching for topics for the story. Finally, the draft of the script is completed according to comments and assessments. • Script: This script also defines the multimedia elements that will be used in the stories and how to use these multimedia components. In this sense, the script is considered the basis of digital stories. • Storyboarding: The aim of the storyboard process is to see how the movie or digital story will work. Storyboard boards are plans for changing scenes, sequences and effects. The storyboard is used for planning the unity of videos, images, sounds and three-dimensional images. • Locating Multimedia: This step can be defined in two steps (a) to complete the storyboard; the author will search for multimedia components. (Graphics, sounds, animations, videos, photos, music, etc) to be used to increase the efficiency of the script using online sources and drafting in print To a USB flash drive (b) after that will record voice It should be focused and emotional • Creating Digital Story: The digital story is produced using various technologies and software. All components such as videos, music, 3D animations and photos are combined. In order to create digital stories, all components are linked to each other to organize a smooth VR / AR. • Sharing Digital Story: For this step, the most important step will be to share digital stories with people in the social classroom or VR / AR classroom, such as Facebook, YouTube, twitter and so on. Comment from the audience.
Immersive Technology	• VR refers to “virtual learning environments that motivate the real owning of human or thing and substantive sensory ways” (Adams et al., 2016). It uses 3D animation interactions that users can experience with the keyboard and mouse or with a headset designed to immerse users in realistic virtual environments. In addition, some recent applications also allow users to "feel" and interact with objects via forced feedback. To date, applications that are commonly used for VR tools have been trained and learned in the learning environment. • AR has the potential for teaching (Chujitarom & Piriyasurawong, 2017). There are various tools for working with AR capabilities. The lowest level method provides a complex set of tools, libraries and scripting frameworks for application developers. Examples of such tools are ARToolKit, ArUco or Vuforia SDK. These help develop powerful and customizable AR applications. But they need high knowledge in programming languages such as C ++, Java or JavaScript. On the other hand, there are many higher level graphical writing tools on the internet.
Story Evaluation	Stories Evaluation (Koerner & Otto, 2017) process includes: • Scientific content and knowledge: Deep stories in the scientific theory show that will be confirmed; Facts about missions that reflect current scientific knowledge Types of scientific data to be analyzed and compiled or summaries that will be used within the story. • The plot of the story: To what extent scientific vocabulary is used in the plot. How much each story reflects upon students creative thinking skills. How does the story flow and if it makes a functional use of the language. • Artistic and creative expression: The quality of artistic expression or artistic content created by students indicates that students enjoy working together and presenting their creations or knowledge in a non-routine manner. • Original of the story: Traditional methods in selected themes If the original source is developed or created by students for the purpose of the subject. • The story as collaborative work: Effective methods and the number of members of each team working together. • Communicating the story effectively: The story style is sent to friends not only speaking but also using other forms of non-verbal transmission or body language to be evaluated according to its effectiveness. • Inclusion of problem solving processes within the story: If the related problems are different, the students should be advised and corrected in each issue. The more challenging topics are chosen, the knowledge of the key principles associated with the problem is the key. • Story connectivity and relevance: The story is created in different episodes and the inclination of the story as it moves from one scene to another, should be completed.

Master core academic content	Methods in promoting good teaching (Stalmeijer et al., 2009): • Modelling is embodied by teachers when they actively demonstrate and explain skills and procedures to their students. • Coaching refers to teachers observing students and providing specific and concrete feedback on their performance. • Scaffolding emphasises that support from teachers for students' learning must be tailored to students' individual knowledge levels. As students become more competent support can be gradually reduced and finally withdrawn (fading). • Articulation involves teachers questioning students and stimulating them to ask questions. • Reflection involves ways of stimulating students to deliberately consider their strengths and weaknesses. • Exploration is aimed at encouraging students to formulate and pursue personal learning goals
Think critically and solve complex problems	The major methods constructivist theory offer (Jonassen, 1999): • Select an appropriate problem • Provide related cases • Provide learner-selectable information just-in time • Provide cognitive tools • Provide conversation and collaboration tools • Provide social/contextual support.
Work collaboratively	These characteristics include the ability to (Guide, 2017): • Communicate constructively – when student collaborates with others communication needs to be clear, direct, honest, positive and respectful. • Listen actively – this means listening by absorbing, understanding and thoughtfully considering the ideas and beliefs of others. Part of listening is the practice of receiving the information and taking the appropriate time to respond without getting defensive or reacting negatively. • Be reliable – this means being a good, objective source of information, keeping commitments and doing the job to the best of ability at all times. • Be willing to share information, knowledge, and experience. It is important to maintain confidentiality and there is no exception. • Be an active participant – this means those students are engaged in discussions and meetings and take initiatives to support the person, their teams. • Cooperate – look beyond individual differences to focus on what is best for the person being supported and solve problems or issues in positive ways. • Respect others by being courteous and considerate towards all members of the multidisciplinary team, the person student support.
Communicate effectively	The communication process (Mcpheat, 2010) involves multiple parts. These are: • Source: The good source of the communication is the sender, or for our purposes. • Message: The message is simply the information to communication. • Encoding: Encoding is the process of taking the message and transferring it into a format that can be shared with another party. • Chanel: The channel is the method that uses to convey a message. • Decoding: The communication skill required to decode a message successfully include the ability to read and comprehend. • Receive: It's important to realize that each person that receives. • Feedback: The response that gets the result. • Context: The context is the situation which communicating.
Learn how to learn	Helping students take control of their own learning (Nicol & Macfarlane-Dick, 2007): • Helps clarify what good performance is (goals, criteria, expected, standards). • Facilitates the development of self-assessment (reflection) in learning. • Delivers high-quality information to students about their learning. • Encourages teacher and peer dialogue around learning. • Encourages positive motivational beliefs and self-esteem. • Provides opportunities to close the gap between current and desired performance. • Provides information to teachers that can be used to help shape teaching.

Develop an academic mindset	Four academic mindsets (Farrington et al., 2012): • I am in this academic community. • My abilities and abilities grow with my efforts.. • I can succeed in this. • This work is valuable for me.

4.3 The Results of the Expert Synthesis Design

The results of the expert synthesis design were show in Table 2.

Table 2. Experts' evaluation synthesis of designing framework of VILEs based on digital storytelling to enhance deeper learning for undergraduate students

Lists of preconception towards the VILEs based on digital storytelling to enhance deeper learning for undergraduate students	Results of the expert		
Synthesis of theoretical framework	$\overline{X}$	S.D.	Level
1) Contextual base	4.80	0.44	highest
2) Psychological base	4.80	0.44	highest
3) Technologies and media base	5.00	0.00	highest
4) Deeper learning	4.60	0.54	highest
Sum	4.80	0.35	highest
Framework of VILEs based on digital storytelling to enhance deeper learning for undergraduate students components	$\overline{X}$	S.D.	Level
1) VILEs based on digital storytelling to enhance deeper learning	4.80	0.44	highest
2) Supporting Cognitive	4.60	0.54	highest
3) Supporting Interpersonal	4.60	0.54	highest
4) Support Intrapersonal	4.60	0.54	highest
Sum	4.65	0.51	highest
Results	4.72	0.43	highest

The evaluation synthesis of the Designing framework of VILEs based on digital storytelling to enhance deeper learning for undergraduate students was rated at the highest level. Synthesis of the theoretical framework was mean at 4.80 with a standard deviation of 0.35. The framework of VILEs based on digital storytelling to enhance deeper learning for undergraduate student's components was evaluated at 4.65 with a standard deviation of 0.51. These results indicate that each element was deemed to be at the highest appropriate level.

5. Conclusions

Experts' evaluation scores of synthesis designing frameworks of VILEs based on digital storytelling to enhanced deeper learning for undergraduate students has the highest level of appropriateness (Mean = 4.72, S.D. = 0.43) The frameworks of the VILEs based on digital storytelling to enhance deeper learning for undergraduate students consist of 4 aspects: 1) immersive technology, (2) digital storytelling, (3) stories evaluation and (4) deeper learning. As for this study the result illustrates the designing framework of the VILEs based on digital storytelling to enhance deeper learning for undergraduate students consist of 4 processes: (1) VILEs based on digital storytelling to enhance deeper learning, (2) Supporting Cognitive, (3) Supporting Interpersonal and (4) Support Intrapersonal. According to the synthesis of the designing framework base on the theoretical framework that is theories into practices. The nine components in designing the VILEs based on digital storytelling to enhance deeper learning for undergraduate students are as following details: (1) digital storytelling, (2) immersive technology, (3) stories evaluation, (4) master core academic content, (5) think critically and solve complex problems, (6) work collaboratively, (7) communicate effectively, (8) learn how to learn and (9) develop an academic mindset.

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