Effects of Cognitive Styles and Storytelling Patterns with Digital Storytelling Activities upon Critical Thinking Skills of Undergraduate Teacher Students

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Received: March 12, 2021
Revised: April 20, 2021
Accepted: April 27, 2021

Abstract

This research aimed 1) to compare cognitive styles with digital storytelling activities that affect the critical thinking of undergraduate teacher students, 2) to compare storytelling patterns that affect the critical thinking of undergraduate teacher students, and 3) to study the interaction between thinking styles and storytelling patterns with digital storytelling activities that affect the critical thinking of undergraduate teacher students. The samples were 114 undergraduate students at Buriram Rajabhat University who enrolled in Innovation and Educational Information Technology course in the second semester of academic year 2020,

selected by purposive sampling method. The research design was quasi-experimental research using factorial experiment 2x2. The instruments used in this study consisted of online lessons, cognitive style test, lesson plans for digital storytelling activities, and critical thinking scale, The statistics used for analysis were mean, standard deviation and Two-Way ANOVA. The results of the research were as follows:

1. The cognitive styles with digital storytelling activities affecting the critical thinking of undergraduate student teachers were not singnificantly different at the .05 level (F = .476, p = .492).

2. The narrative patterns affecting the judgment of undergraduate student teachers were not singnificantly different at the .05 level (F= .062, p=.803).

3. The interaction between cognitive styles and storytelling styles with digital storytelling activities affecting the critical thinking of undergraduate student teachers were singnificantly different at the .05 level (F= 8.470, p=.004).

Keywords: cognitive style, critical thinking, storytelling, digital storytelling

Introduction

E-learning or online lesson management is suitable for teaching and learning that allows learner to use their knowledge and thinking skills, and apply the online lesson according to the student's aptitude, which is consistent with Prangsorn (2012: 4) who said that one of the key attributes that makes humans different from world animals is having the skills and abilities to think, and thinking is also associated with brain potential that makes humans different. They are divided into three groups, people with skills, people with thinking abilities, and people with high levels of thinking abilities with reasons, creativities. As can be seen in human

societies that are recognized as progressive, there are often many people who are thinkers. Because thinking motivates people to have a desire to know and to produce innovation, it resulted that they had invented the innovative sciences and innovation into society. Differences between individuals involved in that important human thought process. Besides beliefs and attitudes, psychologists and researchers are paying more attention to on what is known as cognitive style.

Later, an educator, Robin (2016: 17-29) studied the application of digital storytelling in support of teaching and learning over the past 12 years. He studied in schools, libraries, community centers, medical, nursing museums, business, and many areas. This is an important phenomenon in the technology to be used to convey stories for the benefit of a wide variety of activities. According to the study, it was found that digital storytelling, when used in teaching and learning management, encourages learners to be proactive creators rather than just receivers. In addition, it promotes the use of the ability of technology to integrate a wide range of media for the sake of communication. A major problem in students' digital storytelling is research, especially cultural constraints that prevent storytellers from fully conveying or sharing their experiences. It affects the management and writing of stories as deeply as possible. Therefore, the main thing in developing learners is the ability to communicate by learning about managing ideas, questioning the story, expanding opinions, and creating interesting stories. This research study, therefore, used digital storytelling methods that affect the critical thinking of undergraduate teacher students along with study different thinking styles and storytelling styles that affect the critical thinking of undergraduate teacher students. The thinking patterns were used to measure the thinking of both language thinking and visual thinking that will be one

of the ways in teaching and learning in order to develop learners to have critical thinking to keep up with the world in the digital age and in the future.

Research Objectives

1. To compare cognitive styles and storytelling activities that affect the critical thinking of undergraduate teacher students

2. To compare narrative storytelling patterns that affect the critical thinking of undergraduate teacher students

3. To study the interaction between cognitive styles and storytelling patterns with digital storytelling activities which affect the critical thinking of undergraduate teacher students

Research Methodology

This research used a quasi-experimental research method. The experimental plan was a posttest 2x2 Factorial Design test with the following steps:

1. The population of this research included 3,131 undergraduate students, Faculty of Education, Buriram Rajabhat University.

2. The sample in this research included 114 undergraduate students at Faculty of Education, Buriram Rajabhat University, who enrolled in the Innovation and Information Technology course in the second semester of academic year 2020. The students completed 20 items of thinking measurements. To classify the samples obtained by selecting a purposive sampling, students were divided into two groups: 54 students who think in verbalizer cognitive and 60 students who think in imager cognitive style, as shown in the table below.

Table 1

Sampling for conducting a digital storytelling comparison experiment with the thinking of the students

Cognitive Style	Storytelling		Total
	Narrative	Compare	
1. Verbaliser Cognitive Style	Group 1 26 students	Group 2 28 students	54 students
2. Imager Cognitive Style	Group 3 30 students	Group 4 30 students	60 students
Total	56 students	58 students	114 students

3. Research Instrument

The research instrument included:

3.1 Online lessons of Innovation and Educational Information Technology course were evaluated by eight experts to examine the suitability to verify the accuracy and appropriateness of the learning activity content. The quality assessment was used as a rating scale according to the Likert method, which had five levels and was analyzed with a suitability score of 4.75, indicating that the online lessons were most appropriate.

3.2 Thinking Pattern Test VVQ was translated into the Thai language by Sukwon Lee, and the researcher required nine experts to assess the appropriateness of the thinking measurement text and then used the data to

improve the thinking measurement. The expert recommendations were then used to improve the IOC finding, the validity of the questions, the expert thinking measurements. Questions with IOC values from 0.50 - 1.00 which was valid accuracy, and questions with an IOC below 0.50 were needed to be improved "not valid." It was found that 20 questions possessed a total IOC of 0.93, indicating that the validity of the thinking measurement was valid.

3.3 Plan for organizing digital storytelling activities in the courses Innovation and educational information technology were evaluated by eight experts to organize digital storytelling activities and to examine the accuracy, suitability, clarity and feasibility of their use. The rating scale was based on the Likert method, which consisted of 5 levels as follows: Level 5 possessed a total average of 4.73, indicating that the quality of the digital storytelling activity plan was most suitable.

3.4 Critical Thinking Scale Based on the essence of Bongkot Tubtieng's Critical Thinking Model (2003), the Critical Thinking Scale consists of one situation and questions in all 6 areas. Eight expert examined the Conformity Index and the content validity index of item objective congruence (IOC) of the Critical Thinking Scale and the IOC was 0.94, indicating that the Critical Thinking Scale was appropriate.

4. Data Collection

This research was semi-experimental research. The research took 10 weeks and 4 hours a week divided into 1,3,5,7,9 weeks of classroom instruction, while week 2,4,6,8,10 were taught online. Therefore, the data were collected in the following order:

4.1 Pre-experimental procedures were as follows:

4.1.1 Let the samples took a thinking scale test in 30 minutes.

4.1.2 Divided the experimental group into 4 groups using measurement scores to obtain experimental groups with verbaliser cognitive style and imager cognitive style.

4.1.3 Orientated students in regular classes about processing of Innovation and Educational Information Technology, explained how to attend classes, teaching activities, duration of classes, communicating, evaluation criteria, student role readiness and instructor roles in the online lesson system. Instructors recommended using online lessons and using the tools on online lessons for each learner to understand how to access online lessons. The instructors can assist learners in learning and provide online consultation channels and familiarize students with familiarity.

4.2 The experiment process was as follows**:**

4.2.1 Learners entered the online lesson system. Students were ready to take a measure of critical thinking before study.

4.2.2 Online lesson instruction in learning activities

Digital storytelling takes a total of 10 weeks to complete, according to the online instruction plan provided. Instructors have grouped into groups of 4 participants. The group's president is responsible for directing the conversation. There was a secretary acting to record and summarize the exchange of ideas on online instruction.

4.2.3 During classroom instruction and learning onsite and online, students attended classes through the online lesson system. The teaching activities were as follows:

4.2.3.1 In a week, each group of learners learned and exchanged ideas 4 hours of learning with learners and instructors.

4.2.3.2 Learners studied online learning materials as they received them from the teaching process, there was teaching materials based on digital storytelling activities.

4.2.3.3 Learners practiced data retrieval, scripting storyboard writing, audio recording, digital storytelling presentation based on rights of publications through classroom instruction and academic learning and teaching online (Microsoft team) each week.

4.2.3.4 Learners learned the lesson online both in classroom and online (Microsoft team). The task submissions and evaluations were scheduled. The learners exchanged idea within a group each week, and between groups, exchange ideas per piece of each group, as required by the instructor. Each group of learners submited activity worksheets to the instructor through an online lesson on online teaching system (Microsoft team).

4.3 Post-Experiment

4.3.1 At the end of online instruction with narrative activities digitalstory, the researcher conducted the test of the learners using the critical thinking questionnaire after class.

4.3.2 Took the critical thinking scale after class with activities digital storytelling with different formats. Asked the two experts rate it and 1 researcher as a total of 3 examiners. The scores were then analyzed for correlation and mean values.

4.3.3 Took critical thinking scores after class with different types of digital storytelling to be analyzed to answer the research objectives.

4.4 Data Analysis

4.4.1 The data were analyzedusing Mean$\bar{X}$ and standard deviation (SD) of learners' critical thinking scores for each cognitive styles andstorytelling patterns.

4.4.2 The data were analyzedto compare different thinking styles with different storytelling pattern that affect the critical thinking of undergraduate teacher students and to study the interaction between cognitive styles and digital storytelling patterns when studying through digital storytelling activities that affect the critical thinking of undergraduate teacher students by using two-wayANOVA.

Results

The results of the study could be summarized as follows:

1. The cognitive styles with digital storytelling activities affecting the critical thinking of undergraduate student teachers were not singnificantly different at the .05 level (F = .476, p = .492).

2. The narrative patterns affecting the judgment of undergraduate student teachers were not singnificantly different at the .05 level (F= .062, p=.803).

3. The interaction between cognitive styles and storytelling styles with digital storytelling activities affecting the critical thinking of undergraduate student teachers were singnificantly different at the .05 level (F= 8.470, p=.004).

The results of the study were summarized as follows:

1. The results of the analysis of mean ($\overline{X}$) and standard deviation (SD) score of critical thinking after learning with digital storytelling activities by different thinking styles with different storytelling styles are shown in Table 2.

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Table 2

Mean and standard deviation of the critical thinking scale score after study (24 points) all 4 group samples

Cognitive Styles	Storytelling					
	Narrative		Compare		Total	
	($\bar{X}$)	(S.D.)	($\bar{X}$)	(S.D.)	($\bar{X}$)	(S.D.)
Verbaliser Cognitive Style	19.31	1.62	20.18	1.44	19.76	1.58
Imager Cognitive Style	20.30	1.21	19.57	1.60	19.13	1.45
Total	19.84	1.49	19.86	1.54	19.85	1.51

From Table 2, it was found that the samples with the highest critical thinking score were those with imager cognitive style using narrative storytelling. The mean score was 20.30 and standard deviation was 1.21. The next group was the group with the verbaliser cognitive styles using compare storytelling. The mean score was 20.18, and standard deviation was 1.44. The group with the lowest score was the bilingual group using narrative storytelling. The mean score was 19.31 and standard deviation was 1.62.

2. The results of analysis of two-way ANOVA of the critical thinking scores of learners classified by cognitive styles andstorytelling patterns are shown in Table 3.

Table 3

Results of analysis of two-way ANOVA of the critical thinking scores of learners classified by cognitive styles andstorytellingpattern

Source of variance	SS	df	MS	F	p
Cognitive Style	1.027	1	1.027	.476	.492
Storytelling	.134	1	.134	.062	.803
Cognitive Style &Storytelling	18.272	1	18.272	8.470	.004*
Error Sum of Square	237.312	110	2.157		
Total	445179.000	114			

*p. <.05

From Table 3, it was found that:

1. The cognitive styles with digital storytelling activities affecting the critical thinking of undergraduate student teachers were not singnificantly different at the .05 level (F = .476, p = .492).

2. The narrative patterns affecting the judgment of undergraduate student teachers were not singnificantly different at the .05 level (F= .062, p=.803).

3. The interaction between cognitive styles and storytelling styles with digital storytelling activities affecting the critical thinking of undergraduate student teachers were singnificantly different at the .05 level (F= 8.470, p=.004). It was shown in Figure 1.

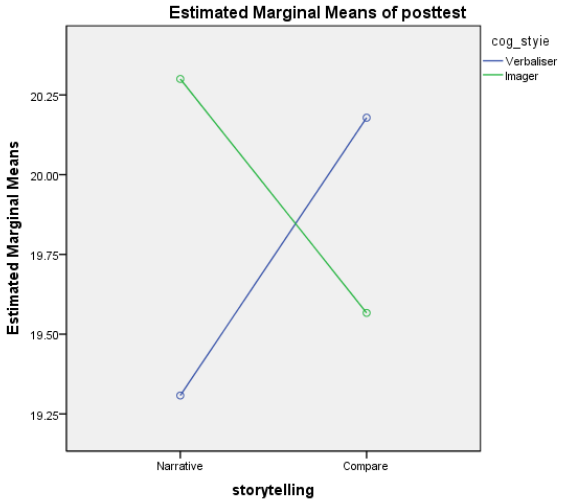

Figure 1: Graph of the interaction between cognitive styles and storytelling styles with digital storytelling activities affecting the critical thinking of undergraduate student teachers

Discussion

From the research results on effects of cognitive styles and storytelling patterns by digital storytelling activities on critical thinking of undergraduate student teachers, the research results showed that:

1. The cognitive styles with digital storytelling activities affecting the critical thinking of undergraduate student teachers were not singnificantly different at the .05 level (F = .476, p = .492). The results of the study found that the mean of post-study critical thinking scores of students with a verbaliser cognitive styles and students with a imager cognitive styles found that there was no statistically

significant difference in the critical thinking score at the .05 level, with the learners who studied with a verbaliser cognitive styles with the average critical thinking scores of 19.76, while the learners with imager cognitive style had an average critical thinking scores of 19.13,and students with a cognitive styles of a imager cognitive styles was inconsistent with Thepprasit (2002: Abstract) who found that there were no differences in thinking patterns affecting gaming comprehension at 0.05, consistent with Riding(1991) who proposed the concept of separates the types of people with tendencies to represent what was received as a picture with wording (Imager-Verbaliser) and people with visual thinking tend to understand more visual presentations than language. A person with a linguistic thinking was more likely to understand a linguistic presentation than a picture.

2. The narrative patterns affecting the judgment of undergraduate student teachers were not singnificantly different at the .05 level (F= .062, p=.803).The results of the study showed that the mean of post-study critical thinking scores of learners with a narrative storytelling and the students with a compare storytelling, it was found that there was no statistically significant difference in the critical sing score at the .05 level, with the learners with a narrative storytelling model having an average critical thinking scores of 19.84. While the learners with the compare storytelling model had an average critical thinking scores of 19.86, the students' data were analyzed by observing and analyzing the data of the learners with the narrative storytelling and students with compare storytelling style were consistent with the Kaewpanuk (2017: abstract) who found that a legacy development model with critical investigative digital storytelling processes on web 3.0 to promote developed digital literacy consisted of 5 elements: 1) information resources, 2) content, 3) teachers, 4) digital heritage system, and 5) assessment, and there are ten learning

processes in accordance with the learning style: 1) set the concept, 2) set the storyline, 3) research the story, 4) tell stories, 5) analyze the elements, 6) compile media, 7) create stories 8) improve Story, 9) share story, and 10) reflect the story. The results of the experiments using the digital heritage development model were found that the digital literacy test after graduation was statistically significant at the .05 level, and the evaluation of the digital heritage storyteller found that the students had a better ability to produce digital heritage stories. This is consistent with Miller (2009) who studied digital storytelling and found that it was the development of research capabilities to improve the writing process and integrate technology to deliver content in everyday learning activities. This research used the storytelling patterns for learners to tell their life story, promote and encourage meaningful learning through the digital storytelling process, and to allow learners to share their experiences and express their feelings using digital media as a storytelling element. The results showed that as a step towards developing digital storytelling, the students had developed skills in the ability to manage information and concepts more systematically and meaningfully. In particular, it was a self-narrative that learners understand and know the stories the best. They could present the story and convey the feelings of the story as well. Learners could also improve their technological skills and solve problems. They learn how to plan to work, practice collaboration, and exchange experiences and receive advice from others.

3. The interaction between cognitive styles and storytelling styles with digital storytelling activities affecting the critical thinking of undergraduate student teachers were singnificantly different at the .05 level ($F= 8.470$, $p=.004$). The results showed that undergraduate students learned with storytelling activities affecting the critical thinking of undergraduate student teachers found that there was a correlation

between cognitive styles and narrative storytelling affecting critical thinking was statistically significant at .05 levels. The findings suggested that online teaching in innovative and educational information technology course, the classroom system and the online teaching system have important factors: cognitive styles and narrative storytelling and compare storytelling with digital storytelling activities. It was the presentation of content, lessons, knowledge sheets, activity sheets, which both factors interacted with each other and affected the critical thinking of undergraduate teachers. The results were consistent with Sims (2004: 152-166) who proposed a process of digital storytelling. It consisted of the key elements as follows: Storytellers must use a method of critical thinking, either deducting or explaining from the big picture down to detail and interpretation in order to catch the attention of the audience. It also used a process to decide what to present through a critical thinking and reflection process to complete the digital storytelling. In accordance with Premsrirat (2008: 1), the communications narrative from the research showed that telling news on the radio was a news story to create enjoyment, provide facts and thoughts using informal language. Storytelling in print media is based exclusively on storytelling elements, storylines, themes and characters, as well as the policies of the publication emphasizing the use of verbaliser cognitive style and erotic meaning. Storytelling in movies and television series is mainly based on storytelling elements; especially the story and conflict. Film media also emphasizes visual elements. The drama is also based on the narrative of the production objectives. To tell stories in Thai songs and country songs used storytelling in a story. It uses language that is easy to understand. The theme song tells the story according to the theme of the story. Most of the cross-media storytelling is cross-media from comics to animation and movies. It remains the same as the main narrative elements, such as the storyline,

and the theme of the conflict. It has been modified only in sub-details such as the secondary theme, conflicting parties and scenes, etc.

Recommendation

1. Implications

1. Teaching with digital storytelling activities in higher education should be used to develop learners to think, realize, and choose information

2. If the instructor or the relevant persons will apply this format, the instructor should understand the teaching stage, focus on, and choose the teaching instrument used in the experiment

3. Instructor or the relevant persons should choose the tool that is more suitable for the learners, so that it is convenient to communicate during the experiment. They will have an interaction between the learner and the instructor, learners and learners, and learners with online lessons.

2. Further Studies

1. In the next research, there should be an experiment with the cognitive styles and storytelling styles with digital storytelling activities to develop other forms of competence such as self-direction ability, creativity, motivation, digital knowledge, problem solving, and finding achievements.

2. To guide Rajabhat University to apply a learning management model with digital storytelling activities affecting the critical thinking of the undergraduate student teachers to the teaching and learning activities according to the condition and context of the educational institution by using cognitive styles and narrative styles in the educational innovation and information technology courses of undergraduate teacher students or related fields for students to have higher critical thinking.

References

Ennis, R. H. & Millman, J. (1985). *Cornell critical thinking test level X and level Z-manual, 3ed ed*. CA: Midwest Publication.

Kaeophanuek, S. (2017). *Digital heritage development model using critical inquiry digital storytelling on web3.0 to enhance digital literacy of undergraduate information science students*. Doctoral Thesis. Education Technology and Communication, Department of Educational Technology And Communication, Faculty of Education Chulalongkorn University. [in Thai]

Miller, E. A. (2009). *Digital storytelling.* (Master of Arts), University of Northern Iowa, USA.

Phetmark, S. (2017). *Interaction of communication formats and personality in teaching problems solve in virtual reality flipped classroom upon abilities in problems solve of undergraduate students*. Doctoral Thesis in Information and Communication Technology, Faculty of Education, Surindra Rajabhat University. [in Thai]

Philuek, W. (2001). *Charecteristics of links upon hoosing links in educational web of elementary school students with different cognitive styles*. Master's Thesis. Department of Audiovisual Studies, Faculty of Education, Chulalongkorn University. [in Thai]

Prangsorn, S. (2012). Thinking patterns and teaching and learning. *Journal of Vocational and Technical Studies*, (2nd Year). Issue 4 July–December. Page 4. [in Thai]

Premsriratana, U. (2015). Storytelling in communication arts: Study from research. *Journal of Communication Arts and NIDA*. 2nd Year. Issue No. 1 (Jan.-Jun. 2015). Page 31. [in Thai]

Robin, B. R. (2016).The Power of digital storytelling to support teaching and learning. *Digital Education Review*, (30). 17-29

Robin, B. R. & McNeil, S. G. (2012). *What educators should know about teaching digital storytelling.* Digital Education Review (22), 37-51. Riding, R.J. & Sadler-Smith, E. (1997). Cognitive styles and learning strategies: Some applications for training design. *International Journal of Training and Development, 1*, pp.199-208.

Srimuang, K. (2016). *A comparison of a small group discussion on Facebook Towards the critical thinking ability of undergraduate students*. Surin Rajabhat University. Master's Thesis. Information and Communication Technology Education Program. Faculty of Education. Surindra Rajabhat University. [in Thai]

SukwonLee. (2017). *Investigation of visualization literacy: A visualization sense making model, a visualization literacy assessment test, and the effects of cognitive characteristics*. Degree of doctor of Philosophy. Purdue University West Lafayette, Indiana.

Thabthiang, B. (2003). *Using the critical thinking skill set population matters with local environment of Mathayomsuksa 3 students Ban Pong Noi school mueang Chiang Mai district*. Master's Thesis. Department of Social Studies Teaching, Faculty of Education. Chiang Mai University. [in Thai]

Thepprasit, W. (2002). *Effects of tangible levels on folk computers game Teaching presentations on an understanding of the game play of 1st Grade students with different thinking patterns.* Master of Science Program in Audiovisual Science, Department of Audiovisual Studies, Faculty of Education, Chulalongkorn University. [in Thai]

Yang, Y.-T. C. & Wu, W.-C. I. (2012). Digital storytelling for enhancing student academic achievement, critical thinking, and learning motivation: A year-long experimental study. *Computers& Education*, *59*(2), 339-352.

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