

The Effect of Animation–Based Performance Testing on Undergraduate Students’ Thinking Skills and Motivation

Linatda Kuncharin

School of Technical Education, Rajamangala University of Technology Thanyaburi, Thailand

Corresponding Author, E-mail: klinatda@gmail.com

Received December 13, 2023; **Revised** March 30, 2024; **Accepted** March 31, 2024

Abstract

The aim of this study was to explore the effect of Animation–based performance testing on undergraduate students’ thinking skills and motivation and to examine whether on how students increase their thinking skill and motivation by using Animation–based performance testing in Psychology courses. In this study, the researcher used sequential mixed method study to conduct the effect of using Animation–based performance testing on students’ thinking skills and motivation in Psychology courses. A total of 123 undergraduate students participated for quantitative study and two of them were implemented reporting individual experiences for the interview. The quantitative study was evaluated by using descriptive statistics such as mean, standard deviation, while, correlation, and regression were used to find out the research question 1; hypothesis 1, and hypothesis 2. Meanwhile, a qualitative study was applying thematic analysis to conduct and interpret the data to answer this research question. The regression analysis showed that Animation–based performance testing on students’ thinking skills has a positive and significant effective ($R\text{-square} = 0.368$; $F = 20.752$; $\text{Beta } (\beta) = 0.565$; $T\text{-value} = 5.344$; and $P\text{-value} = 0.000$). Therefore, the regression analysis result showed that Animation–based performance testing on students’ motivation has a positive and significant effective ($R\text{-square} = 0.057$; $F = 7.693$; $\text{Beta } (\beta) = 0.618$; $T\text{-value} = 3.472$; and $P\text{-value} = 0.000$). Therefore, two respondents were selected to interview, students revealed that Animation–based learning and teaching in Psychology subject was effective and useful for themselves to enhance thinking skill such as critical thinking skills and increase their motivation.

Keywords: Animation; Performance; Undergraduate Students; Thinking Skills; Motivation

Introduction

Higher education institution worldwide has strived to collaborate with undergraduate students to improve their teaching (Nederhand et al., 2023). To increase students' academic and cognitive performance in the classroom and knowledge of the prevailing methods could help students' distribution in different and appropriate academic disciplines which reduced students' academic stumbling (Abdullah, 2022). In addition, students' performance on animation-based performance testing affected their performance testing scores by using animation such as cartoon characters (Demir & Oksuz, 2022). Meanwhile, critical thinking skills helped students to deal with the problems and improved students' academic performance by mediating the link between 21st century skills such as learning motivation, cooperativity, and interaction with peers, engagement with peers, and smart classroom environment (Almulla, 2023). Moreover, The Wall Street Journal also noted that stakeholders said too many academic places were not teaching students the skills they needed and did not teach basic critical thinking skills (Howard & Sarbaum, 2022).

Undergraduate students challenged facing various academic performance problems, this study aimed to explore the effect of Animation-based performance testing (Demir & Oksuz, 2022; Alessa; 2018) on students' thinking skills (Barak et al., 2010; Alessa, 2018) and motivation (Barak et al., 2010) supporting students to learn Psychology course and to identify on how undergraduate students effect of using Animation-based performance testing to evaluate the thinking skill and measure students' levels of motivation. In consequence, this study also evaluated the effect of implementing Animation-based performance testing on students' thinking skills and supporting students' motivation during Psychology course and researching undergraduate students' using of Animation-based performance testing can be learnt through multimedia learning skill, supported students' thinking skills, and increased students' level of motivation.

The researcher is designed the theoretical framework which related to the theories including to the effect of Animation-based performance testing on undergraduate students' thinking and motivation. There are including with Cognitive Theory of Multimedia Learning; Motivation: The Self-Determination Theory; and Sternberg's Theory and Critical Thinking Skills.

Cognitive Theory of Multimedia Learning

Multimedia learning is a cognitive theory of learning which builds upon mental representations from words and pictures, the theory has defined by Mayer's cognitive theory of multimedia learning. This theory is expanded in to exciting new areas that allowed it to continue to be evolved. Learner-centered and cognitive-constructivist orientation made it possible relevant in current educational applications. The facts of this theory focused on finding effective instructional methods rather than a specific technology, these have made it a dynamic theory that is going to allow it to expand well beyond the life cycle of an particular technology (Sorden, 2012).

Motivation: The Self-Determination Theory

Self-determination theory (SDT) is a theory of human motivation and well-being (Nguyen et al., 2023). Self-Determination Theory is suggested that people were moved, especially, according to three basic psychological need such as autonomy, competence, and relatedness (Ratinho & Martins, 2023).

Sternberg's Theory and Critical Thinking Skills

The styles of learning and thinking were ability based and personality based. The maximum-performance tests and typical-performance tests, these kinds of styles matter for instruction and assessment in school. The awareness in shaping lesson in the classroom let students to learn and think in different ways, it improved instructional outcomes. Sternberg et al (2008) describes one ability-based theory and one personality-based theory supporting data from multiple studies relevant to each (Sternberg et al., 2008). The formation of thinking is a specialization role due to the nature of academic specialization, specific curricula, and materials, these implemented have implications for individual behavior of the learners and their thinking skills (Sternberg & Wanger, 1991; Abdullah, 2022). The way of thinking of teachers and students were maintain a complex if they did not delicate the relationship. The arrangement in class should be had a strong influence on the development of a subject that proposed by Sternberg and Wagner (Sternberg & Wagner, 2018), its influenced on selecting the variables such as scores, gender, choice of small group for class tasks.

Research Objectives

1. To determine the difference effect in using Animation-based performance testing on undergraduate students' thinking skills and motivation.
2. To define whether on how students expect on the effect on Animation-based performance testing on undergraduate students' thinking skills and motivation.

Research Questions

1. Is there a difference effect in using Animation-based performance testing on undergraduate students' thinking skills and motivation?
2. How do undergraduate students expect on the effect on Animation-based performance testing on undergraduate students' thinking skills and motivation?

Research Methodology

The researcher used sequential explanatory design mixed method to conduct a study. Quantitative data such as scores on instruments, yield specific numbers that could be statistically analyzed. In addition, qualitative data such as open-end interviews which provide actual words of the respondents in the study (Cresswell & Guetterman, 2021). The explaining the quantitative results were more dept, then it made sense to select the qualitative samples from individuals who participated in the quantitative sample (Cresswell & Cresswell, 2018). The researcher collected quantitative data to explore Animation-based performance testing effect on undergraduate students' thinking skills and motivation. To collect the qualitative data, the research applied thematic analysis to investigate whether the effect of Animate-based testing performance on undergraduate students' thinking skills and motivation.

Population/ Sample

The population of this study were undergraduate students who were studying at Rajamangala University of Technology Thanyaburi, Pathum Thani Province, Thailand, there is 12 schools with 24,182 students (Office of Academic Promotion and Registration, 2023). According to purposive sampling (Cresswell and Guetterman, 2021), the researcher selected the 46 (37.40%) respondents who were second-year students and studied psychology for teachers' course and selected 77 (62.60%) respondents who were first year students and studied psychology for professional teacher's course.

Then the samples for this study, there were 123 students from two schools, 42 (34.15%) of them studied at school of Fine and Applied and 81 (65.85%) of them studied school of Technical Education (Table 1).

Undergraduate students participated in this study were 77(62.60%) first year students and 46 (37.40%) were second year students. Fourth two (34.15%) students have got grade point average between 2.51–3.00, followed by 38 (30.89%) students have got grade point average between 2.00–2.50, 38 (30.89%) students have got grade point average between 3.01–3.50, and five (4.07%) students have got grade point average between 3.51–4.00 respectively (Table 1).

Table 1 Demographic Information of the Respondents.

Demographic Information	n	%
Gender		
Male	71	57.72
Female	52	42.28
Level of the study		
Undergraduate	123	100.00
School		
Fine and Applied Arts	42	34.15
Technical Education	81	65.85
Year of the Study		
First Year	77	62.60
Second Year	46	37.40
Grade Point Average (GPA)		
2.00–2.50	38	30.89
2.51–3.00	42	34.15
3.01–3.50	38	30.89
3.51–4.00	5	4.07

The Instruments

This study used the Animation-based performance testing (Demir & Oksuz, 2022), the Psychology thinking skill Questionnaire (Barak et al., 2010), and Motivation to learn Psychology (Barak et al., 2010; Alessa, 2018) were used in this study.

Quantitative Study

Animation-Based Performance Testing

Animation-based performance testing (Demir & Oksuz, 2022; Alessa; 2018), there was four items consisted of open-ended (OE), animation-based open-ended (AOE), multiple-choice (MC), and animation-based multiple-choice (AMC) The students were responded a 5-point scale designing to measure on how effective of using Animation-based performance testing. The scale ranged from 1 (ineffective) to 5 (crucially effective). Animation-based performance resting (Barak et al., 2010) were validity by a lecturer in education and two school counsellors. The reliability was determined by internal consistency (Cronbach's alpha). Cronbach Alpha was 0.97 (Table 2).

Thinking Skills

The thinking skill was three items, this study applied the questionnaire by using the Psychology thinking skill (Barak et al., 2010; Alessa, 2018). The students who participated in this study, they were responded to answer each item by applying a 5-point scale, it ranged from 1 (never) to 5 (always). The Psychology thinking skill (Barak et al., 2010) were validity by a lecturer in education and two school counsellors. The reliability was determined by internal consistency (Cronbach's alpha). Cronbach's alpha was 0.98 (Table 2).

Motivation

The questionnaire of motivation (Barak et al., 2010) has five items. Respondents were asked to rate each item by scoring a 5-point scale, the scale was ranging from 1 (Strongly Disagree) to 5 (Strongly Agree). Cronbach's alpha of the five items of Academic problems was 0.86 (Table 2).

Table 2 Cronbach's alpha of the variable in the study

Variable	Cronbach's Alpha	No of Items
Animation-Based Performance Testing (Demir & Oksuz, 2022; Alessa; 2018)	0.97	4
Thinking Skill (Barak et al., 2010)	0.98	3
Motivation (Barak et al., 2010)	0.86	5

Qualitative Study

This study used thematic analysis (Wickramasinghe & Wickramasinghe, 2021; Wickramasinghe & Wickramasinghe, 2021) and observed the respondents (Wickramasinghe & Wickramasinghe, 2021) by

using Animation-based performance testing (Demir & Oksuz, 2022; Alessa; 2018), Thinking Skill (Barak et al., 2010), and Motivation (Barak et al., 2010). Throughout, the purposive sampling procedure (Bakele & Ago, 2022), the researcher selected the respondent for interview by focusing on two individuals students who have completed the questionnaire and then gathering data through reporting individual experiences for the interview in two persons (Cresswell & Cresswell, 2018; Bakele & Ago, 2022).

Research Result

RQ 1: Is there a difference effect in using Animation-based performance testing on undergraduate students' thinking skills and motivation?

H₀₁: Animation-based performance testing has a positive and significant effect on students' thinking skills.

To answer this research question, the researcher used descriptive statistics such as means, standard deviations. Then, Pearson's correlation and regression were used to analyze and test the hypotheses of this study.

To answer this research question, the researcher used descriptive statistics such as means, standard deviations. Then, Pearson's correlation and regression were used to analyze and test the hypotheses of this study.

The correlation indicated that the Pearson correlation between Animated-based performance testing and thinking skill have a positive ($r = 0.148$) (Table 3). Regression analysis results predicted that Animated-based performance testing have a positive and significant effective ($R\text{-square} = 0.368$; $F = 20.752$; $\text{Beta } (\beta) = 0.565$; $T\text{-value} = 5.344$; and $P\text{-value} = 0.000$). The results of Beta (β) identified that Animate-based performance testing and thinking skill have a positive effective. The finding results of $R\text{-square}$ indicated that the Animation-based performance testing among undergraduate students increased 36.8% due to thinking skill (Table 3).

Table 3 Correlation, Descriptive Statistics Analysis (n = 123)

Variables	Mean	S.D.	1	2	3
Animation-Based Performance Testing (Demir & Oksuz, 2022; Alessa; 2018)	4.20	0.44	1		
Thinking Skill (Barak et al., 2010)	4.23	0.73	0.148	1	
Motivation (Barak et al., 2010)	4.13	0.38	0.788**	0.357**	1

H_{02} : Animation-based performance testing has a positive and significant effect on students' motivation.

To answer this research question, the researcher used descriptive statistics such as means, standard deviations. Then, Pearson's correlation and regression were used to analyze and test the hypotheses of this study. Moreover, the correlation indicated that the Pearson correlation between Animation-based performance testing and motivation was positive ($r = 0.788$) (Table 3). In addition, regression analysis supported that Animation-based performance testing and motivation among undergraduate students had negative and significant effective ($R\text{-square} = 0.057$; $F = 7.693$; Beta (β) = 0.618; $T\text{-value} = 3.472$; and $P\text{-value} = 0.000$). The results of Beta (β) value confirmed that Animation-based performance testing and motivation had a positive effective. The results of $R\text{-square}$ indicated that the Animated-based performance testing among undergraduate students have changed 5.7% due to motivation (Table 4).

Table 4 Regression and Descriptive Statistics Analysis ($n = 123$)

Animation-Based Performance Testing (Demir & Oksuz, 2022; Alessa; 2018)					
	Beta (β)	T-Statistic	F-Statistic	Sig (p-value)	R-Square
Thinking Skill (Barak et al., 2010)	0.565	5.344	20.752	0.000	0.368
Motivation (Barak et al., 2010)	0.618	3.472	7.693	0.000	0.057

RQ 2: How do undergraduate students expect on the effect on Animation-based performance testing on undergraduate students' thinking skills and motivation?

This study, two students who were participated to be respondents. As found by a female undergraduate student, she was a first year student. Another one is a male student; he was a second year student. The followings were their experienced on the effect of Animation-based performance, animated movies improved student's thinking skill and motivation.

"A female student who has experience the use of Animation-base performance testing, she said that she was better understood and developed thinking skill when she studies Psychology subject. Animated helped her to motivate in her studying and animated movies can be useful explained her thinking skill" (Respondent 1, P 1-2).

Moreover, another student is a male, he said that *"animation is evoked his misconception in learning Psychology. Animation movies (Alessa, 2018) is very helpful for me to learn Psychology via Animation movies. When I watched Animated movies, I understood the character of the main actors and*

actress, these improved my critical thinking skills, creativity, and problem solving affecting academic performance and I could motivate in the concepts of Psychology by watching the Animate movies” (Respondent 2, P. 3–4).

Discussion and Conclusion

As shown by the previous study, Animation-based performance testing (Demir & Oksuz, 2022; Alessa; 2018) helped the Psychology classes to learn more interesting, because it improved students' thinking skills (Barak et al., 2010; Alessa, 2018) and supported students' motivation (Barak et al., 2010). According to the results of this study, thinking skills and motivation were positive effective to undergraduate students' academic Animation-based performance testing ($r = 0.357$) (Table 3). The samples for this study were selected from two schools, these students have taken to study Psychology courses. There were 123 undergraduate students, students who agreed to participate in the study, they were completed the questionnaires and then four of them have been interviewed. Out of 123 undergraduate students, 71 (57.72%) were male students and 52 (42.28%) were female students (Table 1). In addition, the results showed that thinking skill is the highest mean scores (Mean = 4.23), followed by Animation-based performance testing (Mean = 4.20), and Motivation (Mean = 4.13) respectively (Table 3).

Moreover, the researcher answered Research Question 2 by using thematic analysis to interpret the finding from interviewees. The interview results with two students, they agreed on the effect of Animation-based performance testing improving their thinking skills such as critical thinking skills. Moreover, Animation had a positive effect on students' thinking skills and motivation.

New Knowledge from this Study

For further study, the recommendations were sum up as follows:

To be best supported undergraduate to increase their thinking skills and motivation, Animation-based performance testing from this study could be effective on students' thinking skills and motivation.

The explanatory sequential mixed method study was conducted in this study, the interviews results could help lecturer to use Animation-base performance testing in teaching students in the classroom, these techniques had a positive effective on students' thinking skills and motivation.

Suggestions

Implications

This study is provided the benefits suggestions to the Government, university, lecturers, and undergraduate students. There are following:

The Government should improve into the modern age of education by enhancing the learners' learning experience, including increased engagement and interest, improved understanding, and greater flexibility in self-directed learning. In addition, governor must understand the pedagogical advantages of animated instructional video and offer valuable guidance to enable further educators to harness the power of animation technologies in producing the effective teaching resources (Liu & Elms, 2019).

University should consider that the instructional material and technology increased students' and motivation in the classroom. University has to support students, lectures, and staffs for using innovative, attractive, and entertaining learning environment with Augment Reality in Education (AR) (Cevahir, Ozdemir, & Baturay, 2022).

Lecturers were developed positive characteristics and behavior, these could be enhanced students' participation in Psychology course by using movies-based teaching (Smithikrai, 2016). Moreover, lecturers who were teaching undergraduate students, they had to add more value to the role of a lecturer when delivered students through online platforms and used innovative teaching techniques such as developing to use animation in a classroom environment (Wickramasinghe & Wickramasinghe, 2021).

Undergraduate students needed productive performance goal to help them initiate and sustain their learning in a multimedia environment. The motivation factor such as performance goal is also related to productive learning behavior Productive motivations were positive to learning within a multimedia environment and on a unit exam (Kuhlmann et al., 2023).

References

- Abdullah, I. S. (2022). The Study of Thinking Methods in Light of the Sternberg's Theory among Students of the Faculty of Basic Education. *Journal of Positive School Psychology*, 6(4), 4791–4806.
- Alessa (2018, July 25). *Everyday learning: teaching Psychology with animated movies*. <https://everyday-learning.org/teaching-psychology-with-animated-movies/>

- Almulla, A. M. (2023). Constructivism Learning Theory: A Paradigm for Students' Critical Thinking, Creativity, and Problem Solving to Affect Academic Performance in Higher Education. *Cogent Education*, 10(2172929), 1–25.
- Barak, M., Ashkar, T., & Dori, J. Y. (2010). Teaching Science via Animated Movies: Its Effects on Students' Learning Outcomes and Motivation. *The Open University of Israel: Conferences*, 1–6.
- Bekele, B. W., & Ago, Y. F. (2022). Sample Size for Interview in Qualitative Research in Social Sciences: A Guide to Novice Researchers. *Research in Educational Policy and Management*, 4(1), 42–50. <http://doi.org/10.46303/repam.2022.3>
- Cevahir, H., Ozdemir, M., & Baturay, H. M. (2022). The Effect of Animation–Based Worked Examples Supported with Augmented Reality on the Academic Achievement, Attitude and Motivation of Students towards Learning Programming. *Participatory Educational Research (PER)*, 9(3), 226–247. <http://dx.doi.org/10.17275/per.22.63.9.3>
- Cresswell, W. J., & Cresswell, D. J. (2018). *Research Design: Qualitative Quantitative & Mixed Methods Approach* (5th ed.). Los Angeles: Sage.
- Demir, G. E., & Oksuz, Y. (2022). Investigating Animation–Based Achievement Tests according to Various Variables. *Participatory Educational Research (PER)*, 9(4), 33–52. <https://dx.doi.org/10.17275/per.22.78.9.4>
- Howard, E., & Sarbaum, J. (2022). Addressing Study Skills, Learning Theory and Critical Thinking Skills in Principles of Economics Courses. *Front. Educ.*, 7(770464), 1–8. <http://doi:10.3389/feduc.2022.770464>
- Kuhlmann, L. S., Bernacki, L. M., Greene, A. J., Hogan, A. K., Evans, M., Plimley, R., Gates, K., & Panter, A. (2023). How do Students' Achievement Goals Relate to Learning from Well–Designed Instructional Video and Subsequent Exam Performance? *Competency Educational Psychology*, 73(102162), 1–12. <http://doi.org/10.1016/j.cedpsych.2023.102162>
- Liu, C., & Elms, P. (2019). Animating Student Engagement: The Impacts of Cartoon Instructional Video on Learning Experience. *Research in Learning Technology*, 27(2124), 1–31. <http://dx.doi.org/10.25304/rlt.v27.2124>
- Martinez–Romera, D.D. (2018). Sternberg–Wagner Thinking Styles: A research Tool in Social Science Didactics. *Journal of Technology and Science Education*, 8(4), 398–407. <https://doi.org/10.3926/jotse.422>

- Nederhand, M., Giesbers, B., Auer, J., & Scheepers, A. (2023). Animated Process–Transparency in Student Evaluation of Teaching: Effects on the Quality and Quantity of Student Feedback. *Assessment & Evaluation in Higher Education*, 1–14. <http://doi.org.10.1080/02602938.2023.2225813>
- Ratinho, E., & Martins, C. (2023). The Role of Gamified Learning Strategies in Students’ Motivation in High School and Higher Education: A systematic Review. *Heliyon*, 9(e19033), 1–16. <http://doi.org/10.1016/j.heliyon.2023.e19033>
- Smithikrai, C. (2016). Effectiveness of Teaching with Movies to Promote Positive Characteristics and Behaviors. *Procedia–Social and Behavioral Sciences: Conferences*, 217, 522–530.
- Sorden, D. S. (2012). *Cognitive Theory of Multimedia Learning*. http://sorden.com/portfolio/sorden_draft_multimedia2012.pdf
- Sternberg, R. J., Grigorenko, E. L., & Zhang, L. (2008). Styles of Learning and Thinking Matter in Instruction and Assessment. *Perspectives on Psychological Science*, 3(6), 486–506. <http://www.jstor.org/stable/40212269>
- Sternberg, R. J. & Wagner, R. K. (1991). *MSG Thinking Styles Inventory Manual*. Unpublished Manuscript
- Wickramasinghe, M. H. M., & Wickramasinghe, M. M. T. (2021). Impact of Using 2D Animation as a Pedagogical Tool. *Psychological and Education* 58(1), 3435–3439.