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A WhatsApp-based Flipped Classroom Model: Effect on Students' Higher Order Thinking Skill

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ABSTRACT

This study casts the light on the effect of WhatsApp-based flipped learning on students' higher order thinking skills (HOTS). This study was experimental research involving 68 university students majoring in Islamic education at UIN Raden Mas Said Surakarta Indonesia who were divided into experimental group (N=34) and control group (N=34). A set of pre- and post-tests were used to measure the students' HOTS. The data were analyzed through an independent sample t-test using SPSS version 24. The results showed that the students of experimental group successfully outperformed their counterparts in the post-test (p-value 0.000 < 0.05). Also, the result of independent t-test revealed a significant difference between the scores of pre- and post-test of the experimental students. WhatsApp-based flipped learning is a promising model for enhancing the students' HOTS, as well as improving the efficacy of teaching-learning process. These results provide fruitful insights for higher educational stakeholders (teachers, students, and policymakers) to begin acknowledging flipped classroom model as an alternative approach for teaching in university level.

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INTRODUCTION

Decades ago, we still remembered the situation of our teaching and learning process, where students were sitting passively in the class receiving their teacher's instruction of learning materials. Students were seen as 'an empty glass' that must be fully fulfilled with knowledge and materials. Such a traditional teaching emphasizes on the crucial role of teacher as a delivery, instead of being a facilitator for students. In this situation, students were fully under the control of their teacher and could not optimize their talents and interests toward the learning process (Hwang et al., 2019). In the twenty-first century nowadays, teaching-learning paradigm has shifted from a teacher-centered instruction to a more student-centered activity emphasizing on collaborative activities in which students play a vital role in the process of learning (Davidson & Major, 2014). With the concept of

Communicative Teaching approach, teaching-learning process promotes collaborative tasks among teachers and students to achieve learning goals in a more student-centered exposure (Vergonia & Mombas, 2022).

With the affordance of Information Communication and Technology (ICT) system, collaborative learning has gone to an informal activity beyond classroom. The teaching and learning paradigm, particularly in higher education, has grown up toward more varied activities by combining traditional and contemporary teaching approach (Khan & Mansoor, 2020). In a digital environment, learning process is not only limited in class hours, but it is potentially conducted in an informal setting beyond the class hours with the assistance of technological devices (Lundie et al., 2022). Under the concept of technology-based collaborative learning, a new model called flipped learning was come up as a promising approach for teaching in the recent decade (Bergmann & Sams, 2012). Flipped learning is emerged based on the idea of technology integration in learning process, where classroom is flipped from inside to outside classrooms by creating digital learning environment (Öztürk & Çakıroğlu, 2021; Rezaei Fard et al., 2021). The key success of flipped learning instruction is the use of technological devices to assist pre-class activities (Makruf et al., 2021), since it offers ample opportunities for students to obtain a lot of learning exposure through activities prior to and inside the class (Al Mamun et al., 2021).

The idea of flipped learning environment seems appropriate to enhance university students' higher order thinking skills. The result of yearly survey by Faculty of Tarbiyah and Education UIN Raden Mas Said Surakarta in the beginning of 2022 shows that the level of higher order thinking skills of students majoring in Islamic education enrolled in the aforementioned year remains low. The survey was the part of placement test for assigning the students in academic or professional class, which requires examining affective, cognitive, and psychological knowledge of the students. The students' higher order thinking skills were measured using a set of interview questions asking for their opinion on particular issues related to their field of study (e.g. how will you evaluate Islamic education curriculum for elementary school in Indonesia?). The yearly survey on Islamic education students' higher order thinking skills resulted in 65% (approximately 75 students) were classified in low level of higher order thinking. This result becomes the urgent reason of conducting this research.

Precedent studies have been resulted in a consensus that flipped learning could enhance the effectiveness of teaching and learning activities in higher education. Sevillano-Monje et al. (2022), through experimental research, examined the role of flipped learning to improve a group of physics students' knowledge and understanding of particular materials. The results show that the application of flipped learning had a significant impact on students' competence levels. Similarly, Lee and Eun (2016) and Makruf et al. (2021) proved the significant role of flipped classroom to develop the level of university students' communicative competence. Moreover, Polat and Karabatak (2022) and Wright and Park (2022) revealed the empirical contribution of flipped learning on students' academic achievement and learning satisfaction. In line with the previous studies, Algarni and Lortie-Forgues (2022), Gonzalez-Gomez et al. (2022), Sun and Lin (2022) further reported that flipped learning successfully promote affective variables such as self-efficacy, attitudes, and motivation among university students with different background of study. More recently, Lee et al. (2022) came up to a conclusion that flipped learning is a promising approach to enhance teaching-learning efficacy across different backgrounds and materials.

From the previous studies, we know that flipped learning is an effective approach to assist teaching and learning process. Drawing on this fact, this study is based on the

assumption that flipped learning seems to be a promising alternative method to promote higher order thinking skills (henceforth HOTS) and learning engagement of a group of undergraduate students majoring in Islamic education. HOTS is a concept of education reform based on the development idea of critical thinking skills (Ahmad et al., 2017; Tanujaya et al., 2017). HOTS comprises the ability of performing critical analysis, evaluation, creation, and synthesis toward particular issues, and it is considered as a crucial twenty-first century skill that should be acquired by university students (Bredow et al., 2021). In addition, HOTS includes the acquisition of complex judgmental skills such as problem solving and critical thinking (Margana & Widyantoro, 2017). From this perspective, students majoring in Islamic education program are at a center of strategic discourse with flourish and sophisticated religious issues in Indonesia. Hence, fostering the HOTS of Islamic education students is a must and becomes a worth inquiry.

Previous literature has shown efforts of developing students' HOTS in various backgrounds. Singh et al. (2020) identified teaching strategies to promote students' HOTS in an English class. The results depicted questioning and giving challenge were effective strategies to develop the students' HOTS. Yurniwati and Utomo (2020) designed a learning model to enhance mathematic students' HOTS. The finding showed that Problem Based Learning (PBL) could successfully promote the students' HOTS, and is an appropriate teaching approach amidst the COVID-19 pandemic. Closely related to this study, Liu and Zhang (2022) made use of WeChat based flipped classrooms to enhance students' HOTS such as problem solving and critical thinking. It was found that the students' levels of HOTS could be improved using the implementation of WeChat based flipped learning instruction. These previous studies empirically proved that HOTS is teachable and it can be improved through various models of teaching and learning approaches, and this study proposes WhatsApp based flipped classroom to foster a group of students' majoring in Islamic education higher order thinking skills.

Having explored the results of previous literature, several research gaps are observable. First, previous studies have been directed to examine the effect of flipped learning on higher order thinking of students' majoring in general sciences such as mathematics, English, and physics. The empirical evidence from Islamic education still requires more paucity of evidence. Second, research on technology-based flipped learning model using WhatsApp application is still scare and unexplored. WhatsApp, as the most frequently-used digital messaging platform among Indonesian, offers great opportunity for educational purpose, including assisting flipped learning practice to enhance students' HOTS and learning engagement. Previous studies have shown that WhatsApp is an effective digital platform to facilitate teaching and learning activities, such as to improve students' writing ability (Handayani & Aminatun, 2020), to develop transmedia skills and informal learning strategies (Costa-Sánchez & Guerrero-Pico, 2020), to reinforce online learning (Ramdhani & Nandiyanto, 2021), and to facilitate learning collaboration among students (Vogiatzis et al., 2022). Therefore, utilizing WhatsApp in flipped learning practices is a worth trying.

To address the research gaps, this study aims to examine the effect of WhatsApp-based flipped classroom on Islamic education students' higher order thinking skills. To reach the objective, experimental research design using pre- and post-tests in flipped and non-flipped groups is employed to depict the students' level of HOTS. The results of this study are expected to contribute to providing fruitful insights for higher education stakeholders (teachers, policymakers, students, etc.) to begin acknowledging the promising role flipped learning approach for enhancing the efficacy of teaching and learning process. Last but not

least, the results could also be used as literature enhancement on the field of technology-based flipped learning model and higher order thinking skills.

LITERATURE REVIEW

A WhatsApp-based Flipped Learning

The idea of flipped learning came up as an alternative teaching method to foster students' active engagement outside the class hours (Zarinfard et al., 2021). Flipped classroom instruction combines in-class and out-of-class learning activities (Turan & Akdag-Cimen, 2020). Students are encouraged to engage in pre-class tasks, while the class hours are devoted to foster the students' communicative and critical skills by doing collaborative projects, role-plays, peer-discussion, etc. With enormous time allocation for students' interaction, flipped learning environment offers ample exposures for students to perform collaborative tasks so as to achieve a better learning performance (Bredow et al., 2021). The success practice of flipped learning highly depends on the digital platform used to facilitate the out-of-class learning facilities. It has a vital role as a sharing platform of materials, discussion, and communication among teachers and students. Therefore, determining an appropriate digital platform is crucial for the success implementation of flipped learning.

As the system of information and technology is more advanced, the use of social media for educational purposes has become more popular (Wong et al., 2022). Among the existing social media, WhatsApp is considered as a promising digital platform to facilitate learning activities (Yeboah & Nyagorme, 2022). Previous studies have shown the effectiveness of WhatsApp as a learning platform to enhance students' performance, such as to improve communication skill (García-Gómez, 2022), foster mathematics learning achievement (Durgungoz & Durgungoz, 2022), facilitate the online learning (Sumadi et al., 2022), and boost students' motivation, engagement, and satisfaction toward learning process (Alamer & Al Khateeb, 2021; Martinez-Comeche & Ruthven, 2021). By referring to the previous literature, this study considers WhatsApp application as a promising digital platform that can assist flipped learning practice to enhance students' higher order thinking skills. Hence, the idea of WhatsApp-based flipped classroom model emerges as an immense effort of this study to examine the significant effect of flipped learning model through WhatsApp application in fostering students' higher order thinking skills.

Higher Order Thinking Skill

According to Collins (2014)**,** there have been two levels of thinking skills (e.g. higher order thinking skills [HOTS] and lower order thinking skills [LOTS]). In general the two levels of thinking differ in terms of thinking efforts and level of difficulty performed by a person (Ahmad et al., 2017). LOTS is a low level of thinking which comprises memorizing, retrieving, and understanding knowledge, while HOTS requires the ability to analyze, criticize, evaluate, and create something through the process of thinking and creativity (Alhassora et al., 2017). HOTS is a concept of education reform based on learning taxonomies (Smith & Darvas, 2017). The indicators of measuring HOTS are Bloom's taxonomy including analyzing, evaluating, and creating. In Indonesian education context, HOTS has been introduced along with the establishment of *Kurikulum 2013 (K-13)*, in which students are required to enhance critical and creative thinking through learning activities inside and outside classroom. HOTS is believed as the way of thinking that makes a person

more innovative and creative to create invention and solve problem (Annan et al., 2019). Since, HOTS becomes more popular and is considered as a twenty-first century skill; hence, fostering the students' HOTS through WhatsApp-based flipped learning is a worth inquiry.

METHOD

This study employed experimental research design using pre- and post-tests to determine the students' significant improvement in HOTS. This study is based on Islamic education program at UIN Raden Mas Said Surakarta Central Java province Indonesia. 68 (sixty-eight) undergraduate students majoring in Islamic education program enrolled in strategic management course were recruited as participants for this study. Strategic management course was chosen because this course emphasizes on critical review on current issues in Islamic education management; hence, the ability of higher order thinking is highly required. Therefore, this research hypothesizes the effect of flipped learning on higher order thinking development of Islamic education students at UIN Raden Mas Said Surakarta. This study was conducted during the even semester of the 2021/2022 academic year in the compulsory subject of the study program. The participants were randomly divided into experimental group (N=34) and control group (N=34). The experimental group was taught using WhatsApp-based flipped learning model while the control group was taught by using traditional teaching method. Before the treatment, students of both groups were given pre-test administration on higher order thinking skills. Orientation about the application of flipped learning activities were also given only for the experimental group. The treatment lasted for eight meetings, with approximately 100 minutes for a meeting. The content of course materials were in the form of short videos, websites, reading materials, and other related materials to the lesson. The course materials were posted two days before class using the WhatsApp group, and the students were required to perform pre-class activities such as discussing, summarizing, and problem solving. The class hours were then devoted to have collaborative tasks such as presentation, debate, group projects, etc. Furthermore, post-tests were given to both groups after the students finished the eight-meeting treatment.

Since this study aims to scrutinize the effect of WhatsApp-based flipped learning on students' HOTS, an instrument namely higher order thinking skill test was designed. The test is directed to measure students' thinking skills in the ability of analyzing, evaluating, and creating. The test was adopted from Annan et al. (2019) and was developed based on Bloom's taxonomy (only questions for higher order thinking were used). The test consisted of 25 questions divided into three categories: analyzing (9 items), evaluating (8 items) and creating (8 items). The ensure its validity, the test was checked by two experts in material design. The test was revised based on the modifications provided by the experts, and the final test comprises 30 questions (analyzing [10], evaluating [10], and creating [10]). Multiple choice model was chosen for this test due to its practicality. Each question had four options, and only one of them was correct. One point was given for the correct answer and zero point for the false one, so the maximum score was 30. To ensure the reliability, the test was piloted to a group of students (N=26), also majoring in Islamic education. The result showed that the test was reliable (Cronbach's Alpha = 0.81).

After the process of data collection was completed, the further step was data analysis. First, the descriptive statistics on the pre- and post-tests of experimental and control groups were analyzed statistically using SPSS version 24 in the form of mean and standard

deviation. Second, paired sample t-test was administered to examine the significant improvement from pre- to post tests for both experimental and control groups. Third, an independent sample t-test was run to look into the significant difference between the students' mean scores of the post-tests in both experimental and control groups. In other words, this process was conducted to see if WhatsApp-based flipped learning instruction had a significant role in improving the students' higher order thinking skills. Furthermore, a conclusion drawing was made to provide the empirical result of this study.

FINDINGS

First of all, the descriptive statistics presenting the students' mean scores on pre-tests and post-tests for both experimental and control groups were administered (see Table 1). As presented in Table 1, the main scores of post-tests were higher than the pre-tests in both experimental and control groups. In more detailed information, both students in experimental and control groups performed better and experienced improvement in the post-tests (experimental: from 16.73 to 26.82; control: from 17.05 to 23.96). Moreover, when we take an in-depth look to Table 1, the mean scores of the students in the experimental group (M=26.82) was higher than the control group (M=23.96).

Table 1. Descriptive statistics of pre- and post-tests of experimental and control groups

	Group	N	Mean	SD	Std. Error Mean
Pre-test	Experimental	34	16.73	4.16	0.63
	Control	34	17.05	3.64	0.71
Post-test	Experimental	34	26.82	4.62	0.78
	Control	34	23.96	5.83	0.762

Moreover, paired sample t-test was conducted to investigate the significant difference between the mean scores of pre- and post-tests for both experimental and control groups. Table 2 presents the result of the paired sample t-test which portrays that the students' mean scores in post-tests were statistically significantly higher than the mean scores of the pre-tests ($p<0.05$). The differences of the mean scores between pre- and post-tests for both experimental and control groups were 10.09 and 6.91 respectively. This finding suggests that the students in both experimental (taught in flipped learning environment) and control (taught in traditional mode) groups achieved better performance on higher order thinking skill test in the post-tests.

Table 2. Result of paired sample t-test

	Paired differences			95% Confidence interval of the difference				
	Mean	SD	Std. Error Mean	Lower	Upper	*t*	df	Sig. (2-tailed)
Post-test – Pre-test	10.09	3.245	.575	14.923	19.272	21.652	28	.000
Post-test – Pre-test	6.91	3.632	.597	6.862	9.352	12.873	28	.000

Furthermore, to explore the significant difference between the students' mean scores on HOTS of post-tests in experimental and control groups, an independent sample t-test was conducted. Table 3 demonstrates that the mean score of post-test of the students in experimental group was significantly higher than their counterparts in the control group

($p<0.05$). This result depicts that although the students of experimental and control groups have statistically been proven effective to foster students' HOTS, flipped learning instruction contributes to the better learning outcome. In conclusion, the WhatsApp-based flipped learning instruction could be an effective model of teaching to promote university students' higher order thinking skills.

Table 3. Result of independent sample t-test

Mode	N	M	SD	*t*-test for equality of means		
				t	df	Sig.
Experimental	34	26.82	4.74	4.86	30	.000
Control	34	23.96	5.93			

DISCUSSION

The result of this study shows that WhatsApp-based flipped classroom instruction successfully contributes to the development of Islamic education students' higher order thinking skills. So, what does this result imply? This result is similar with the findings of Hwang et al. (2019) and Liu and Zhang (2022) that technology-based flipped learning model can facilitate students to foster their critical thinking and problem solving skills. According to Bergmann and Sams (2012), the key success of flipped learning instruction is the effective pre-class activities that can promote students' motivation and active engagement toward the learning activities. This statement is proven by the result of this study in which learning activities prior to the class hours play a crucial role to activate the students' background knowledge about the lesson being discussed. This evidence is widely agreed by the previous studies' results on flipped learning (Ekici, 2021; Moreno-Guerrero et al., 2020; Nerantzi, 2020). Flipping the classroom offers students ample opportunity to obtain learning exposure and to experience more collaborative learning tasks (Fatemeh et al., 2020).

The success of flipped learning to enhance the students' HOTS as proven by this study is highly supported by the nature of today's university students who are well-known as digital natives. In other words, they are fond of and very adaptive to technology, even when it is integrated in the process of education. Hence, the use of flipped learning approach which combines pre-class and in-class learning activities by the assistance of WhatsApp application seems to be appropriate for the students. In addition, the use of WhatsApp as the digital platform to assist flipped learning instruction in this study is the best choice since the students are already familiar with this frequently-used messaging platform in Indonesia. The researchers do not need to provide extensive orientation about how to operate WhatsApp application. In a nutshell, WhatsApp is a recommended digital platform to assist the implementation of flipped learning instruction. This evidence is relevant to the statements of Lo and Hew (2020) and Nerantzi (2020) that the integration of technological platforms in the pre-class activities is the key success of flipped learning instruction.

The result of this study also support the previous studies' findings that flipped learning enables students to gain vigorous correspondences with their teachers and classmates (Brewer & Movahedazarhouligh, 2018; Makruf et al., 2021). In addition, previous studies also depict that flipped learning could reduce the students' learning stress, so that the learning engagement and participation will be improved (Chun, 2014; Yilmaz, 2017). It happens because flipped learning enables more collaborative activities in both pre- and in-

class activities, such as practicing conversation, peer projects, role-plays, etc. This evidence is similar to previous results that flipped learning is an effective method to enhance active engagement and foster the students' motivation toward learning activities (Chen Hsieh et al., 2017; Heo & Chun, 2018; Huang et al., 2022; Lo, 2022).

The results of this study provide several implications for educational activities in higher education level. First, this study provides fruitful insights for educational stakeholders including teachers, students, and policymakers to begin integrating flipped learning approach in the design of learning curriculum, particularly to teach higher order thinking skills. In this twenty-first century era, higher order thinking skill and digital literacy play a vital role in developing students' future performance. Hence, teaching higher order thinking skills using flipped learning approach is one of the best ways. Second, the result of this study offers literature enhancement in the field of flipped learning approach particularly in Islamic education program in Indonesian context. Therefore, the result of this study can be taken as direction for future research on the similar issues.

CONCLUSION

To sum up, this study results in an empirical finding that WhatsApp-based flipped learning model successfully contributes to the development of the students' higher order thinking skills. The result of statistical analysis shows that students who taught in the flipped learning environment outperformed their counterparts in the control group in the post-test. Therefore, it is concluded that flipped learning is a promising teaching model to foster students' higher order thinking skills. This study provides an alternative teaching approach for teachers and other stakeholders particularly in improving the problem solving and critical thinking skills. This study will be more comprehensive if qualitative data is available to explain the positive relationship between flipped learning and students' higher order thinking skills. Thus, future research is suggested to conduct similar inquiry by involving qualitative data to depict an in-depth understanding about the implementation of flipped learning to enhance higher order thinking skills.

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