IMPROVING CHILDREN'S PROBLEM-SOLVING SKILLS THROUGH JAVANESE TRADITIONAL GAMES

Iswinarti[1*], Dewi Retno Suminar[2]
[1]Faculty of Psychology, Universitas Muhammadiyah Malang
[2]Faculty of Psychology, Airlangga University
*e-mail: iswinarti@umm.ac.id

Abstract: Nowadays, most children play digital games. Digital games, despite their advantages, have gradually eroded the existence of traditional games. Although both digital and traditional games comprise the values of problem-solving learning for children, traditional games offer more benefits in terms of the embodiment of local wisdom. This study aimed at encompassing the influence of Javanese traditional games such as *bekelan, congklak lidi,* and *selentikan* on the improvement of children's problem-solving skills. This research was done employing quasi-experimental design involving 72 school-age children ranging from 9 to 11 years old, who studied at primary schools. The subjects of this study consisted of four experimental groups. Three groups played *bekelan*, *congklak lidi*, *selentikan* games respectively and the other group was assigned as the control group. The treatment was done for three weeks divided into six sessions. The findings showed that there was a significant improvement between the result of the pre-test and that of the post-test for these three games. The analysis results using One Way ANOVA showed that there was a difference in the improvement of problem-solving skills among groups ($F(17) = 5.032$, $p < .01$). Due to its superiority, Javanese traditional games is potential to be an alternative media in improving children's problem-solving skills.

Keywords: *problem-solving skills, children, Javanese traditional games*

PENINGKATAN KEMAMPUAN PROBLEM SOLVING ANAK MELALUI PERMAINAN TRADISIONAL JAWA

Abstrak: Saat ini, sebagian besar anak-anak bermain game digital. Game digital, terlepas dari kelebihannya, secara bertahap telah mengikis keberadaan game tradisional. Meskipun permainan digital dan tradisional sama-sama mengandung nilai-nilai pembelajaran pemecahan masalah untuk anak-anak, permainan tradisional menawarkan lebih banyak manfaat dalam hal perwujudan kearifan lokal. Penelitian ini bertujuan mengetahui pengaruh permainan tradisional Jawa *bekelan, congklak lidi,* dan *selentikan* pada peningkatan keterampilan *problem solving* pada anak. Penelitian ini dilakukan dengan menggunakan desain eksperimen semu yang melibatkan 72 anak usia sekolah mulai dari usia 9 hingga 11 tahun yang duduk di bangku sekolah dasar. Subjek penelitian ini terdiri dari empat kelompok eksperimen. Tiga kelompok memainkan bekelan, congklak lidi, selentikan permainan masing-masing dan kelompok keempat sebagai kelompok kontrol. Treatment dilakukan selama tiga minggu yang terbagi dalam enam sesi. Temuan menunjukkan bahwa ada peningkatan yang signifikan antara hasil pre-test dan post-test untuk tiga kelompok permainan tradisional. Hasil analisis menggunakan *One Way Anova* menunjukkan bahwa ada perbedaan dalam peningkatan keterampilan problem-solving antara kelompok ($F(17) = 5.032, p < .01$). Dengan kelebihan yang dimiliki, permainan tradisional Jawa berpotensi menjadi media alternatif dalam meningkatkan keterampilan pemecahan masalah pada anak.

Kata Kunci: *keterampilan problem-solving, permainan traditional Jawa*

INTRODUCTION

Problem-solving is one of the important skills for school-age children. This skill is meaningful for their success in making any friendship. Children who could develop their friendship will likely be more avoided from either emotional or mental difficulties (Ferrer & Fugate, 2014). Problem-solving skills, especially social problem-solving, are necessarily essential for children to cope with varied issues relating to both academic and social problems (Gok & Silay, 2010; Kostelnik, Soderman, Whiren,

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Rupiper, & Gregory, 2018).

In the professional context, problem-solving is an essential cognitive activity in daily life (Jonassen, 2000). A study shows that problem-solving skills could predict job performance (Cianciolo, Matthew, Sternberg, & Wagner, 2006; Sternberg, 2000). The result of a study conducted by Ismail, Ismail, & Aun (2015) asserts that problem-solving skills are essential for children to cope with numerous daily life issues. Children with low problem-solving skills will be aggressive upon others and thus likely have many social problems, tend to get involved in any criminal actions and have various mental problems in their adulthood.

The problem-solving experience emerges as prospective chances for children to sharpen their problem-solving skills. Commonly, children could barely solve their problems independently; through practice, learning, and meaningful supports, however, they could significantly develop their problem-solving skills (Pawlina & Stanford, 2011). Through experiences and learning process, children shape their rough ideas that generally yield contradicted decisions into more complex ideas. In their daily life, children's natural skills in solving problems could appear from their involvement in various problem-solving attempts through numerous cognitive experiences that help them to discover any possibilities to address their issues. Further, through education and experience, any dilemmas they encounter with will be more likely to be solved quickly (Dereli-Iman, 2013). Potter (2013) identifies such experiences and offers valuable insights and understanding to cope with daily-life problems. McDonald (2017) reveals that problem-solving games are able to improve one's critical thinking.

The improvement of problem-solving skills through assorted games has been proven significant (Pata, Sarapuu, & Lehtinen, 2005; Hong & Liu, 2003; Fiore, Cuevas, Scielzo, & Salas, 2002). Playing games could become one of the attractive strategies for both teacher and educator to improve problem-solving skills (Moursund, 2016). Researchers weigh up that students could improve their problem-solving skills through game-design (Robertson, 2012) to enhance their perception (Hwang, Hung, & Chen, 2014). Game creation could be used as one of the instructional strategies to assist students in improving their problem-solving skills and critical thinking (Treadwell, Smith, & Pratt,

2014). Games are tools to stimulate a cognitive development which constitutes problem-solving skills (Bhagat, Haque, & Jaalam, 2018).

Kind of games that have been proved increasing problem-solving skills is video games. Video games could become learning media for school children (Buckingham & Burn, 2007; Johnson, 2005; Schmidt & Vandewater, 2008). Learning through analog video could improve children's problem-solving skills. They could follow the illustration and strategies provided in the video (Chen & Siegler, 2013). Schmidt & Vandewater (2008) explained that video games could improve problem-solving skills through strategies and rules consisted of the games so that children could cope with problems they encounter.

A game is a game with rules and competitive atmosphere played by more than one player (Frost, Wortham, & Reifel, 2008; Schaefer & Reid, 2001). A game with rules is a game that is appropriate for school-age children due to its function that could trigger them to think logically (Drewes & Schaefer, 2014; Frost, et. al., 2008). Playing a game could stimulate children's thinking and learning skills including problem-solving skills (Whitebread, Basilio, Kuvalja, & Verma, 2012).

Long before the existence of modern games, has long been developed and played various kinds of traditional games. Traditional games are games inherited over generations incorporating various salient learning values for child development (Akbari, Abdoli, Shafizadeh, Khalaji, Hajihosseini, & Ziaee, 2010; Bishop, Curtis, & Opie, 2001; Parlebas, 2005). A study conducted by Iswinarti, Ekowarni, Adiyanti, & Hidayat (2016) points out that traditional game of "*gembatan*" could become learning media to improve social competencies comprising problem-solving, teamwork, self-control, and empathy.

From numerous literature on games that have been developed for the improvement of children's problem - solving skills, very little research has been conducted to address traditional games; most of the studies are based on digital games. Traditional games are games that come from local wisdom. In Java, Indonesia, there are plenty of traditional games that have existed for a long time.. When compared to digital games, traditional games represent the richness of local culture and do not require a large amount of money. Traditional games can also foster children's social values as children play them

in groups. Padmaningsih, Suwanto, & Sujono (2018) found various values of local wisdom in various traditional Javanese games such as social values, physical-motor development, and various problem-solving abilities such as strategy formulation and creativity.

Bekelan, *congklak lidi*, and *selentikan* are traditional Javanese games which according to the analysis of their playing procedure, constitute problem-solving learning values. In these games, children are required to concentrate, make decisions, set strategies, and complete tasks starting from easy mode to hard mode. Therefore, these games need to be tested for their effectiveness in improving children's problem-solving skills. All of these are supported by Hunt & Ellis's notion (2004) about the logical thinking that is necessarily required in problem-solving.

Play is a means for children to learn problem solving skills that will be transferred in real life (Sutton-Smith, 2008). In the traditional game of *bekelan*, *congklak lidi,* and *selentikan*, the child will learn to set strategies, make decisions, identify problems and solve problems. Learning in problem solving encountered in games will be reflected by the facilitator so that children will better understand how to do problem solving in games. These various problem solving skills will also be reflected again by the facilitator so that the child can apply them in their daily lives. Thus it is necessary to conduct research to prove this hypothesis.

It is the purpose of this study to examine the influence of traditional games of *bekelan, selentikan,* and *congklak lidi* on the improvement of children's problem-solving skills. This study contributes in providing alternative treatments to improve the development of children's problem-solving skills through traditional games.

METHODS

This study was done by means of experimental design with *multiple treatments under a pre-test post-test control group*. The measurement of problem-solving performance was done before and after the treatment upon three groups: group of *bekelan, congklak lidi,* and *selentikan*. The description of each group can be seen in Table 1.

Table 1. The Description of Experimental Groups

Group	Pre-Test	Treatment	Post-Test
Game of *Bekelan*	X1	T1	X2
Game of *Congklak Lidi*	X1	T2	X2
Game of *Selentikan*	X1	T3	X2
Control Group	X1	-	X2

Note:
X1: Pre-test
X2: Post-test
T1: Game treatment of *Bekelan*
T2: Game treatment of *Congklak Lidi*
T3: Game treatment of *Selentikan*

Participants in this study were primary-school students in Malang Regency. Subjects consisted of 72 children divided into four groups: experimental group 1 consisting of those playing *bekelan*; experimental group 2 consisting of those playing *congklak lidi*; group 3 consisting of those playing *selentikan*; and last, group 4 as the control group. Each experimental group included nine children divided into three teams in which each team consisted of three children. Informed consent was obtained from all individual participants included in the study. Parents and teachers gave approvals for the involvement of research participants. The average age of the participant was 10.4 years. Table 2 present the description of gender and age of participants.

Table 2. The Description of Participants

Group	Gender		Total	Average Age	Sd
	M	F			
Bekelan	7	11	18	10.5	.33
Congklak Lidi	9	9	18	10.4	.44
Selentikan	10	8	18	10.3	.42
Control Group	10	8	18	10.4	.33
Total	36	36	72	10.4	.38

The instrument used to measure pre-test and post-test score in this study was the problem-solving scale comprising 16 items. This scale was specially designed for this study. It was designed in form of word problems with multiple choices on how a child solve the daily-life problems. The multiple choices consisted of three alternatives. Three-point was given to the favorable option supporting problem-solving skills. Two points were given to the favorable option with lower grade and one score was given to unfavorable choice which did not support problem-solving skills. Before distributing the scale, the trial and reliability test was done to measure this scale. According to the result of these tests, it was gained the *Cronbach's Alpha* score of .831.

Research procedure include preparation and treatment. This study started with preparing the required instruments that is the problem-solving scale. In this preparation stage, the scale was designed, compiled, and tested its reliability. The game module, furthermore, was designed, trialled, and evaluated to see its properness. The subjects were also selected in this stage by considering the pre-test score from four primary schools. From each school, there were nine five-grade students selected to be subjected by considering their low-to-intermediate scores in the problem-solving scale. Each school represented four groups consisting of three experimental groups: the group of *bekelan*, the group of *congklak lidi*, and the group of *selentikan*, and one control group. The description about how to play the games is attached in this script. The treatment was done for three weeks divided into six sessions. In each session, a subject played with the other two subjects that had been set. In the first session, two subjects learned to play the game. Further, in the succeeding session, after playing the game children discussed with facilitators to gain feedbacks about the learning process. The measurement of problem-solving skills was done after all six sessions ended.

Games used in this study are described as follows:

(a) *Bekelan* is a traditional game that uses *bekel ball* and *bekel stones* played by two or more players. This game is started by throwing up the ball followed by scattering *bekel stones* on the ground while catching up again the ball before bouncing the floor. Then the ball should be thrown again. While the ball is in the air, the player must collect *bekel stones* according to its stages. The stages are divided into (1) single-take. In this stage, the player must collect the stones one by one and the ball must be thrown again while the collected stones are scattered again on the floor. Afterward, the player must collect two stones at once until they all are collected, for instance, if there are six stones, the player must collect these six stones until the end of the turn; (2) *Phet* (the *bekel stones* must be flipped upside down on its hole). In this stage, players must flip the stones upside down on its hole, followed by collecting all the stones according to the first stage (one by one, two by two, and so forth); (3) *Rha/rhe* (the *bekel* stones must be flipped upside down on its back). In this stage, all stones must be flipped into *rha/rhe*, followed by collecting all the stones according to the first stage (one by one, two by two, and so forth); (4) *Klat* one to five (*bekel* stones are flipped flat on its soft side); (5) *Es* one to five (*bekel* stones are flipped flat on its triangle shape); (6) Flipping all stones from stage 1 to stage 5. After this stage, the player must collect all stones in once while pointing forefinger on the floor. If the player could not do this, he/she must restart from the beginning. Any player who could pass these all stages will get one point.

(b) *Congklak lidi* is a traditional game that uses 50 sticks played by two or more players. This game is started by throwing all the sticks on the floor and starts collecting them one by one. The first player holds the stick on the floor and then opens them slowly. The sticks will be scattered and he/she must collect them one by one. However, the player must collect the sticks without touching other sticks; otherwise, he will fail the game and another player must play it. The objective of this game is collecting all the sticks without touching other sticks. Any player who could collect all the sticks will earn one point in each turn. In this game, the values of problem-solving skills exist in the way how players carefully collect the sticks one by one without touching other sticks and the way how players decide the best strategy to be used to win the game.
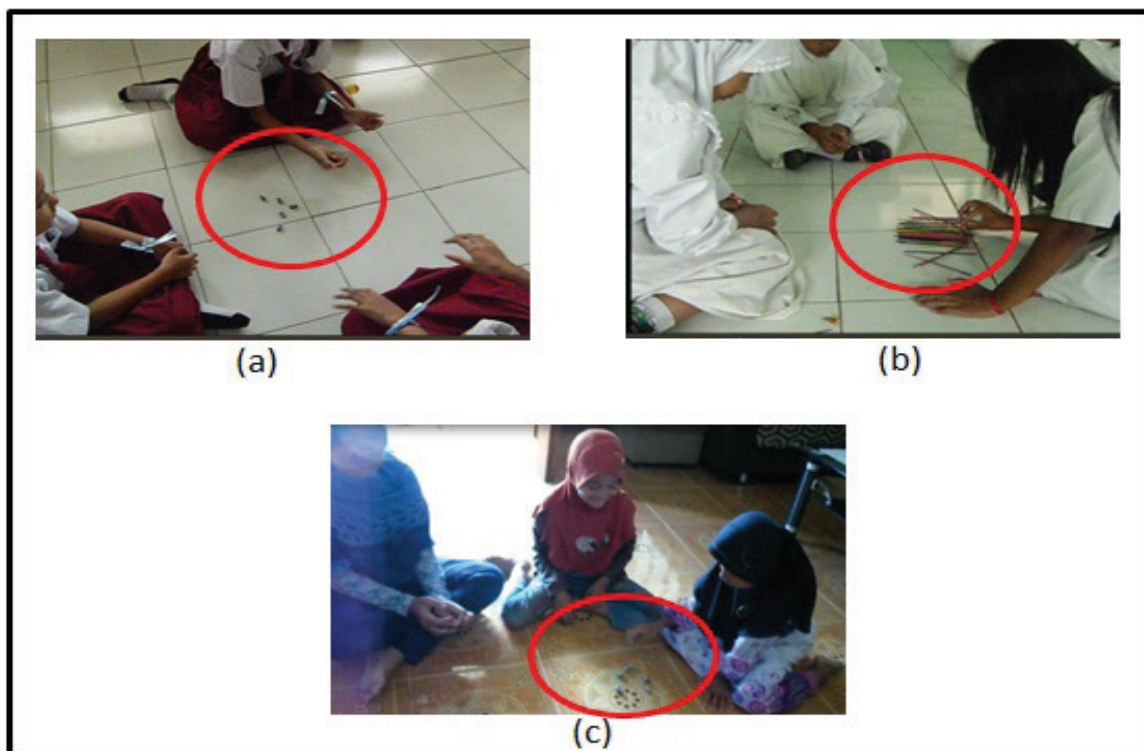
Figure 1. The games

(c) *Selentikan* is a traditional game that uses five stones. This game is started by scattering all these five stones. The player must use the furthest stone by which he/she must throw other stones. This game requires full concentration and good strategies. In this game, the values of problem-solving skills exist in the way how players decide which stones to throw.

The data of pre-test and post-test in each group were analyzed by using *paired sample t-test*. This test was used to figure out the different score of *problem-solving skills* before and after the treatment. *One-way anova* test was done to figure out the improvement of problem-solving skills among groups.

RESULTS AND DISCUSSION
Result

Table 3 presents the overview of the mean scores in the pre-test and post-test of each group. It also describes the results of *paired sample t-test* which measures whether or not there is a difference of problem-solving skills between the pre-test and post-test in four groups. The scores on p indicate the significance of differences, in which scores less or equal to .05 mean that differences between groups are significant.

Based on the description in Table 3, it can be seen that there were increasing scores of problem-solving skills between pre-test and post-test in all experimental groups yet there was no score difference between pre-test and post-test in the control group. This indicates that *bekelan, congklak lidi*, and *selentikan* games could

Table 3. The Overview of the Mean Difference of Problem-Solving Skills between Pre-Test and Post-Test in the Groups

Group	Mean Score of *Pre-test*	Mean Score of *Post-Test*	$t(17)$	P
Bekelan	28.3	32.6	4.221	.001
Congklak lidi	29.2	31.1	2.200	.042
Selentikan	29.1	33.5	8.791	.000
Control Group	31.1	31.3	.719	.719

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become effective learning media to improve the problem-solving skills on school-age children.

The overview of problem-solving skills before and after the treatment of three traditional games of *bekelan, congklak lidi,* and *selentikan* can be seen in the Figure 1.

The succeeding data analysis was done by using *one-way anova test* to figure out the influence of each game on the improvement of problem-solving skills. The analysis results showed that there was a difference in the improvement of problem-solving skills among groups ($F(17) = 5.032$, $p < .01$). The analysis result of multiple comparisons can be fully seen in Table 4.

Based on the results of multiple comparison analysis as described in Table 4, it can be concluded that there was no difference in terms of the influence of *bekelan, congklak lidi,* and *selentikan* on the increase of problem-solving skills. *Bekelan* and *congklak lidi* games were not significantly different in improving problem-solving skills ($t(3) = 1.590$, and $p = .073$). Similarly with *bekelan* and *selentikan* ($t(3) = -2.631$, and $p = .057$) also *congklak lidi* and *selentikan* ($t(3) = -.068$, and $p = .945$).

When compared to the changes of the pretest-posttest in the control group, it can be seen that the increase in problem-solving skills in the group playing traditional
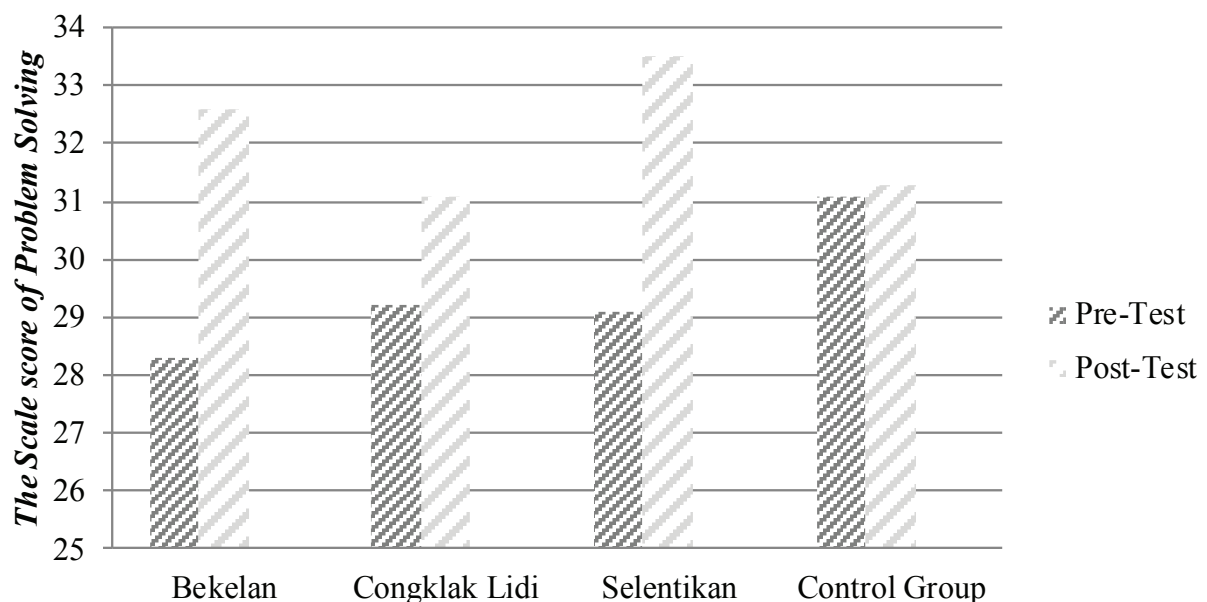

Figure 2 The Diagram of Overall Scores

Table 4. The Comparison of the Improvement of Problem-Solving Skills among Groups

Group	Mean Difference	*t*(3)	*P*
Bekelan – Congklak lidi	1.944	1.590	.073
Bekelan – Selentikan	-2.017	-2.631	.057
Congklak lidi – Selentikan	-.072	-.068	.945
Bekelan – Control Group	1.583	1.468	.155
Congklak lidi – Control Group	3.528	3.113	.002
Selentikan – Control Group	3.600	4.044	.001

bekelan game was not significantly different (t(3) = 1.468, p = .155). Meanwhile, the group that played *congklak lidi* experienced an increase in problem-solving skills as compared to the control group (t(3) = 3.113, p = .002); and the group playing *selentikan* also experienced an increase in problem-solving skills as compared to the control group (t(3) = 4.044, p = .001). Based on the overall analysis results above, it can be seen that both *selentikan* and *congklak lidi* could significantly develop problem-solving skills on school-age children as compared to *bekelan*.

Discussion

This study aimed at investigating the influence of traditional Javanese games of *bekelan, congklak lidi,* and *selentikan* on the improvement of children's problem-solving skills. Findings of this study showed that there was an improvement in children's problem-solving skills after the game treatments. This supported experts' notion that playing is one of the effective learning media to improve varied skills in children.

Playing has a central role in developing cognitive skills. Piaget and Vygotsky, two experts of cognitive development, assert that playing could provide chances for children to directly interact with surrounding materials and subsequently construct their knowledge upon this world. This becomes one of the most salient elements in cognitive development, including problem-solving skills (Zigler & Bishop-Josef, 2004). As reflected by Elkind (2007), playing is one of human's necessities to adjust to the world and create a new learning experience.

The results of this study also attest to the previous studies that learning could become of meaningful media to improve problem-solving skills (Moursund, 2016; Obikwelu, Read, & Sim, 2013; Spires, Rowe, Mott, & Lester, 2011). A study conducted by Iswinarti, et. al. (2016) also figures out that the traditional game of *gembatan* could improve children's social competencies, including problem-solving skills. This study also supports previous research in Indonesia conducted by Kawuryan, Hastuti, & Supartinah (2018) who found that traditional games can be a medium for thematic learning to improve students' creative abilities. In the study of Widiana, Jampel, & Prawini (2018) also found that traditional games are effective for improving cognitive processes in achievement.

In this study, game treatments could provide several relevant experiences that are meaningful for their daily life. These games tend to be competitive for children and thus improve their cognitive skills through concentration and strategies. The cognitive process in these games was adjusted in accordance with their respective skills and could offer feedbacks in each session of the games as a learning process. It also assesses children's understanding of any advantages they would get. Smiley, Thelin, Lance, & Muenchen (2002) also state that problem-solving skills depend on either information or basic knowledge of children by which they could easily cope with particular problems

From third to fifth sessions, children were to discuss their experiences during the games. Through such discussion, children, therefore, were expected to gain valuable experiences that could be applied to solve any issues. During the experimental process, subjects were also trained to discover any values in the games based on their schemata.

An individual will easily value or argue every phenomenon once it involves their experiences. Children's problem-solving skills will improve if they frequently face the same problems so that they could enable their experiences to help them to cope with the problems (Novotná, Eisenmann, Přibyl, Ondrušová, & Břehovský, 2014). Meanwhile, according to Coker, Heiser, Taylor, & Book (2016), once such experiences could create a meaningful change within an individual, it evidently proves that the learning process has taken place. In this context, the learning process could be earned by children through the given feedbacks.

Subjects used in this study were categorized into school-age children ranging from 9 to 11 years old, did not have any physical or mental disorders, and varied from male to female. According to Piaget (Santrock, 2011) from 7 to 11 years old, children are undergoing the development stage of concrete operational. In this stage, a child will be capable of undergoing a concrete and logical thinking as well as considering any concrete and real characteristics of particular objects. Therefore, in this stage, children could also classify or differentiate any

objects based on their groups as well as regard the mutual relationship between these two.

The traditional game of *congklak lidi* is a traditional game that uses 50 sticks played by two or more players. This game is started by throwing all the sticks on the floor and starts collecting them one by one. The first player holds the stick on the floor and then opens them slowly. The sticks will be scattered and he/she must collect them one by one. However, the player must collect the sticks without touching other sticks; otherwise, he will fail the game and another player must play it. The objective of this game is collecting all the sticks without touching other sticks. Any player who could collect all the sticks will earn one point in each turn.

The stages in the traditional game of *selentikan* were also proven effective to improve children's problem-solving skills. In the first stage, children were to decide the best strategy to throw the scattered stones. After the enemy took one of the stones and point outed which stone that must be thrown in the first turn, other children must decide which best strategy to use to throw the pointed stone. Children must also concentrate to avoid falling; otherwise, they would fail this turn. Besides, all subjects must also set strategies to get the point; one of which was the strategy to keep the stones in hands to get more points. For the enemy role, children must decide the strategy to select and take the stone. They must also decide which stone that must be thrown by other players so that they would never win the game. These all develop children's cognitive to concentrate, set strategies, and make a decision to win the game.

Both *selentikan* and *congklak lidi* have different rules and stages. Hence, subjects were asked to follow the rules to win the games. As mentioned by Santrock (2011), there are three problem-solving aspects that assist them to play the games, namely: (1) figuring out and understanding the problems. In this context, subjects were to follow the rules and learned to cope with any encountered problems during the game; (2) setting strategies to solve the problems. In this context, subjects were to decide strategies to determine which stones or sticks that must be thrown or taken without touching one another; (3) exploring any solutions in which an individual will use alternative ways that have been decided before.

The traditional game of *bekelan* has numerous stages. In the first stage, subjects must concentrate to collect *bekel stone* from one to six. The problem-solving process happened in this game can be seen while subjects must determine how high the ball must be thrown while collecting all *bekel stones* according to the stages. After collecting the stones one-by-one, they must proceed the further step, that is collecting the stones two-by-two, and so forth.

The traditional games of *bekelan* and *selentikan* have also different rules and stages. Thus, it enables subjects to understand what they have to do to follow the rules. According to Santrock (2011), there are three stages of problem-solving that can be found in these games: (1) figuring out and understanding the problems; (2) setting problem-solving strategies to cope with, solve the problems, and subsequently win the game; (3) exploring any possible solutions comprising decision-making process. These games stimulate subjects to make the right decision to win the game by selecting the best strategy to select the stones and to measure how high the ball must be thrown. As stated by Dharmamulya (2004), games involving cognitive processes fully require concentration, serenity, intelligence, and effective strategy.

During the stages in both *congklak lidi* and *selentikan,* it can be analyzed that there were various cognitive processes inside the player's brain involving *cerebellum* to coordinate both movement and muscle balance that triggers *cerebrum* in frontal lobe area to think rigorously. According to MacLin, MacLin, & Solso (2007), these all might help an individual to undergo the problem-solving process.

In this study, *bekelan* had rather slight influence on the improvement of children's problem-solving skills compared to *congklak lidi* and *selentikan* due to its rather-high difficulty level. Based on the observation results, subjects experienced many difficulties in *bekelan*. Considering the equal duration of these three games, apparently *bekelan* supposedly requires a longer duration to be played by children. This, thus, becomes the limitation in this study that necessarily requires further consideration for succeeding studies.

This study concludes that the Javanese traditional games of *bekelan, congklak lidi,* and *selentikan* may become effective media in

problem-solving learning. There were several improvements in problem-solving skills on school-age children who played these three games. Further, both *congklak lidi* and *selentikan* were better in improving problem-solving skills on school-age children as compared to *bekelan*. Through these games, children learn problem-solving skills starting from the simple procedure to the more complex one as the games proceed; such procedures may train children with various skills in solving problems such as setting strategies, thinking critically, making decisions, and choosing solutions.

The limitation of this study is that there is not any follow-up provided in the problem solving skills after the posttest was done. Further research can be done by combining one game with another in improving the problem-solving skills so that it may provide-more insights of how problem solving skills can be developed in children.

CONCLUSION

This study concluded that the Javanese traditional games of *bekelan, congklak lidi,* and *selentikan* could become effective media in problem-solving learning. There were several improvements of problem-solving skills on school-age children who played these three games. By playing Javanese traditional game children learn to find problems, make decisions, strategize, and find the best problem solving, Further, both *congklak lidi* and *selentikan* were better in improving problem-solving skills on school-age children compared to *bekelan.* Based on the result, Javanese traditional games is potential to be an alternative media in improving children's problem-solving skills.

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