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The effectiveness of quartet card game in increasing career knowledge in lower grade elementary school students

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Abstract

A variety of previous research findings have shown that educational games can improve students' knowledge, proving that the joyful learning experience improves the learning process. However, it is not easy to make educative or learning activities interesting enough to stimulate the acquisition of career knowledge in lower grade elementary school students. This research was conducted to examine the effectiveness of quartet card game in increasing career knowledge in lower grade elementary school students (grades 1, 2, and 3). A quantitative approach and an experimental method were employed. The data were collected with career knowledge pretest and posttest with 254 lower grade elementary school students and were analyzed with a statistical t-test of the gain scores and variance analysis of the posttest gain scores from the three different methods. The results showed that of the three quartet card game methods examined, only two were significantly found effective ($p < .05$) in increasing the career knowledge in lower grade elementary school students; namely, the chain message method and the conventional method. The memory game method failed to increase the students' career knowledge.

Keywords Career knowledge · Experiment · Game-based learning · Lower grade elementary school students

Working is the center of activities in life (Blustein 2013) which relates to the critical role of deciding for a career path that constructs psychological success—a sense of pride (Mirvis and Hall 1994)—and personal fulfillment (Lochab and Mor 2013). Watson and Stead (2017) argued that a career is a continuous lifelong process that does not stop in adulthood, but carries on over a person's life as hinted by their increasingly established career (Kosine and Lewis 2008). Watson and McMahon (2019) argued that most experts emphasize the importance of giving consent to career development in the early stage of life. Although these scholars have indicated the critical life stage for career development, Porfeli et al. (2013) and Watson et al. (2015) suggested that research on children's career development is understudied, particularly on the practice of career education for children.

Watson and McMahon (2019) argued that children's career development constitutes the foundation for further career development over the developmental stages. Trice and Rush (1995) suggested that children's career development starts at 4 when they begin to be aware of career stereotypes. When children go to elementary schools during the age of 6 to 11, they have better career awareness and interest; therefore, they begin to explore careers (Lapan et al. 2017). These insights show the necessity for schools to provide career education to facilitate the growth of children's career knowledge as indicated by Carvalho et al. (2018). Carvalho et al. (2018) suggested that the environment of children such as school plays a role in providing experiences that allow them to develop the capacity to do self-exploration and make a decision out of the available career alternatives for their future.

Lapan et al. (2017) suggested that career interventions have a significant influence on children's career development during elementary school. Children's interest in career increases during this phase; therefore, providing career information in

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this phase may potentially prevent a premature foreclosure on a career decision making that does not fit with their traits (Skorikov and Vondracek 2007). However, Porfeli et al. (2013) argued that the study on children's career intervention is limited. Research encompassing evidence-based practice on career intervention is critical (Watson et al. 2015) to reduce the challenge in providing career education and to stimulate young children for career knowledge development.

Children's Career Development

Children's career development is the foundation for their further career development (Watson and McMahon 2019) which is believed to start at the age of 4 when children come up with ideas and conduct assessments of various careers for themselves, but still have a career outlook based on gender stereotypes (Trice and Rush 1995). At the age of 6 to 11 when children go to elementary school, their career awareness and interest increase and they begin to explore careers (Lapan et al. 2017). Thus, a variety of efforts are deemed necessary for giving career education to children during elementary school to expand their career knowledge.

The parties around the children including the school have roles in the development of students on the whole, and this includes giving them the experience of career awareness and exploration. The children should be given a relevant experience that enables them to develop the capacity to put the future into perspective and to explore themselves and the world of work which in turn will enable them to consider alternatives, make future decisions, and shape their careers (Carvalho et al. 2018).

Joyful Learning: Game-Based Learning

Game-based methods to improve children's career knowledge are intended for the students to have fun while learning. As stated by Jagtap and Tilak (2017), joyful learning is a sort of learning process or experience involving participation, which allows students to take pleasure throughout the process. The joyful atmosphere referred to in joyful learning has no relevance with noise or clamor, because it is the joy that stimulates the students' learning interest and abilities and enables them to gain understanding (mastery of the materials) (Ismanto 2018).

Joyful learning is found to be a strategy that has a positive impact on students (Anggoro et al. 2017), bringing joy to the learning which indirectly contributes to the happiness, intelligence, competence, and success of a human as a whole (Ismanto 2018). Moreover, joyful learning can improve students' knowledge (Jagtap and Tilak 2017) since it provides relaxing and entertaining circumstances that enable them to acquire new information and turn it into a new scheme of knowledge with less effort to effectively achieve the goals of learning (Brotherson 2009). It can be concluded that the more joyful the game-based learning circumstances are, the easier the information is absorbed by the learners, thereby facilitating them to achieve the learning goals effectively.

Previous research findings have shown that educational games can improve students' knowledge (Jagtap and Tilak 2017) as they allow students to enjoy the learning process with the freedom to try new things and without fear of making mistakes (Young 2018). Jagtap and Tilak (2017) argued that joyful learning is a sort of learning process or experience involving participation, which allows students to feel pleasure. The pleasant atmosphere may stimulate students' learning interests and abilities and may enable them to master the subject learned (Ismanto 2018). In the learning process, the selection of proper media becomes an essential key because the learning media would mediate the delivery of the materials for better learning goal acquisitions of the students (Maulidiana and Saragi 2017).

One renowned game-based learning media is the quartet card game, which is a game introduced by Dauviller and Hillerich as a teaching-learning media (Mardini 2018). This game was initially designed for vocabulary learning but has now been developed with numerous modifications for many educational purposes. Using a particular set of cards with a variety of pictures, words, and categories, this game is entertaining for children to play (Elviza and Ratmanida 2019). Primary research related to the quartet card game in learning has involved lower grade elementary school students for subject-based learning activities (Elviza and Ratmanida 2019). The variety of methods in playing the quartet card game allows differing degrees of effectiveness in improving the career knowledge of lower grade elementary school students. This study assumed that the most exciting playing method is the most effective method in improving the students' career knowledge. Therefore, the selection and utilization of the right playing method become necessary to enable students to quickly capture the educational messages in such a game (Khobir 2009).

According to these insights, this research was aimed to examine the effectiveness of the quartet card game as a media for career education for lower grade elementary school students. This research was the third-year research of a multi-year study on developing the quartet card game. In the first year, the research identified the children's need for assistance in career exploration to learn about various occupations, and in the second year, the researchers developed a quartet card game media to help children explore career knowledge (Ayriza et al. 2017, 2020). In the third year, the researchers examined the effectiveness of the game in increasing elementary school students' career knowledge.

This study had two objectives: first, to examine the effectiveness of the quartet card game in improving career knowledge of lower grade elementary school students (grades 1, 2, and 3). Second, to examine the effectiveness of the

conventional method, the memory game method, and the chain message method of the quartet card game. In line with these two objectives, two hypotheses were formulated as follows:

H1: The quartet card game is effective in increasing the career knowledge of lower grade elementary school students.
H2: There are differences in effectiveness between the conventional method, the memory game method, and the chain message method of the quartet card game.

Examining the effectiveness of the quartet card game on career knowledge development constitutes an effort to provide the evidence-based practice of career education for children addressed in Tracey and Sodano (2017) and Watson and McMahon (2007). This research will be a source of practical reference for educators and the school administration to provide career guidance intervention for children. Moreover, this research may reveal how utilizing the quartet card game in career education may work best for early elementary school students.

Method

Sample

This research involved 254 elementary school students of grades 1, 2, and 3 in the Special Region of Yogyakarta, Indonesia. These participants were 133 males and 121 females aged between 5.6 and 10 years old. A multi-stage random sampling was employed in obtaining the intended target sample of lower grade elementary school students in the Special Region of Yogyakarta. The sample was randomly selected in two or more stages, often taking into account the hierarchical structure of the population (Battaglia 2008). This technique of sampling was used because it is more cost-effective compared to one-stage sampling that leads to high costs for data collection.

In obtaining the sample of elementary school students in the Special Region of Yogyakarta, the researchers divided the target population of students into elementary schools in the Special Region of Yogyakarta as the first stage of sampling. Since the Special Region of Yogyakarta consists of four regencies and one municipality, the researchers in the second stage randomly selected three regencies. In the third stage of sampling, the researchers randomly selected two districts and then proceeded to randomly select elementary schools from these districts in the fourth stage. Finally, a sample of students was selected from each selected school.

For treatment purposes, the participants were randomly divided into three quartet card game method-based groups. There were 86 students in the conventional method group, 78 students in the memory game method group, and 90 students in the chain message method group. The participants had given their consent to participate in this research and could cancel their participation whenever they felt uncomfortable. In this study, the research subjects were given a set of stationery as a token of gratitude for their participation.

Design

The main purpose of this study was to examine the effectiveness of the quartet card game in improving the career knowledge of lower grade elementary school students. Further, it also examined the effectiveness of the three methods being implemented in playing the quartet card game which are the conventional method, the memory game method, and the chain message method. The researchers used a three-group pretest-posttest experimental design involving three randomized groups. Participants were randomly assigned to the three experimental control groups and the effect of the treatment was measured by giving a test to the participants before and after the treatment (Cino 2017). This design was a further development of an experimental design with another manipulated control group where the researchers added a different manipulation for a control group that was not originally manipulated (Nahartyo 2012).

The researchers applied a three-group pretest-posttest design with one experimental group and two manipulated control groups because when the research was carried out, it was found out that there was a difference of effectiveness between the three methods. This led to the need to further analyze which method was more effective in improving the students' career knowledge. The three-group pretest-posttest experimental design with two manipulated control groups can be represented as follows:

$R\ O_1 \rightarrow X_A \rightarrow O_2$ (Conventional Method).
$R\ O_1 \rightarrow X_B \rightarrow O_2$ (Memory Game Method).
$R\ O_1 \rightarrow X_C \rightarrow O_2$ (Chain Message Method).

*R = Random; O_1 = Pretest; X_A = Treatment A (Experimental Group); X_B = Treatment B (Manipulated Control Group 1); X_C = Treatment C (Manipulated Control Group 2); O_2 = Posttest.

Group A was the group that played the quartet cards according to the conventional method and was the experimental group. Group B was the memory game group and group C was the chain message group, and both were manipulated control groups. The group A that was given treatment (the conventional method) was called the experimental group because the quartet cards are usually played in that method. Meanwhile, both group B (the memory game method) and group C (the chain message method) were deemed as the manipulated control groups because those methods were modified from the conventional method. The participants were put

into groups randomly so that all groups were practically equal, and each participant only received one type of treatment.

This three-group pretest-posttest research design allowed the researchers to investigate whether there were changes in test results between observation 1 and observation 2 following the treatment. Further, the researchers through this design could conclude whether there were differences of effects between the groups (Nahartyo 2012).

Instrument

The pretest and posttest instruments to assess students' knowledge of career—career knowledge test—were checklists based on Holland's theory of career classification (Holland 1997), i.e., Realistic, Investigative, Artistic, Social, Enterprising, and Conventional (RIASEC). There are five indicators of the careers covered in the test, namely work activities, place, wear, time, and device. The researchers developed the career knowledge test and examined the validity of the test with a Confirmatory Factor Analysis (CFA) in the first-year research (Ayriza et al. 2020), and the results indicated that the instrument fitted Holland's theory. The results of the reliability analysis using Alpha Cronbach showed that the reliability coefficient was .891 indicating that the instrument was reliable to measure the students' career knowledge as expected.

Procedures

In this section, we provide the information related to the quartet card game design and the experiment stages.

Quartet Card Game Design

The experiment in this research was playing the quartet card game where the researchers had developed three volumes of quartet cards that were grouped based on three levels of difficulty. The first group was supposed to be easy, the second was moderate, and the third was the hardest volume of all. Every quartet card represented a profession and it had four variations containing the following professional indicators: (1) activities or tasks, (2) equipment, (3) workplace, product, or service, and (4) attributes, uniform, or clothing. For example, a card series of a professional doctor (see Fig. 1) consisted of four pictures: (1) activities of a doctor treating sick people, (2) a stethoscope as a doctor's equipment, (3) a hospital as a doctor's workplace, and (4) a white coat usually worn by a doctor.

According to Holland's theory of career classification (Holland 1997), there are six career categories: Realistic, Investigative, Artistic, Social, Enterprising, and Conventional (RIASEC). Each volume of the quartet cards contained all the six RIASEC career categories. Each category encompassed two occupations and each occupation consisted of four career characteristics, and so there were 144 cards in total for all three volumes (6 career categories × 2 occupations × 4 career characteristics × 3 volumes = 144 cards).

Experiment Stages

Before the experiment was conducted, the researchers randomly divided the 254 participants into three treatment groups, namely the conventional method group, the memory game method group, and the chain message method group. As many as 86 students were put into the conventional group which was the group that played the career quartet cards as they are usually played, whereas 78 students were put into the memory game group and 90 students into the chain message group. The latter two groups (the memory game and the chain message groups) played the career quartet cards in the mode that had been modified from the conventional method.

After being grouped, the participants completed a pretest to measure their career knowledge level by answering questions about the types of careers or jobs they knew. The researchers would read the questions and the participants would cross one of the two option boxes consisting of "have already known" or "have not yet known" answers. After completing the pretest, the researchers gave treatment to the participants with the quartet card game for each of the three groups.

Each group played the game differently from the others but everyone had the same goal to collect four cards from each profession (occupation) (see Fig. 1) and the procedures were different. The conventional method (method 1) involved 2–4 players who took turns in reading and asking for a quartet card to the other players based on their need to collect the complete four cards of the same category to win the game (see Fig. 1).

The memory game (method 2) was a modified form of method 1 which required memory to play. Two players facing one another had to compete in guessing the right categories by randomly picking the upside-down cards spread on the table. If a player guessed an upside-down card correctly, they might take the card. If they made a wrong guess, however, they had to put the card down again in its original position and kept in mind the name of the card so that they could name and take it later when they needed it. Correct guesses would lead either one of the players to win the game because they could collect as many desired cards as possible.

The chain message method (method 3) was an upgraded version of method 2 involving a relay between two groups of students standing in two different lines. Each player at one end of the line would whisper a card category to the next player in the same group. The last player at the other end of each group would run to retrieve the required card from a pool of cards spread on the table several meters away from where they were lining. The group that was able to collect the card series faster than the other group would win the game. After the experiment, the participants would complete the same instrument, i.e., the career knowledge test, once again as the posttest.

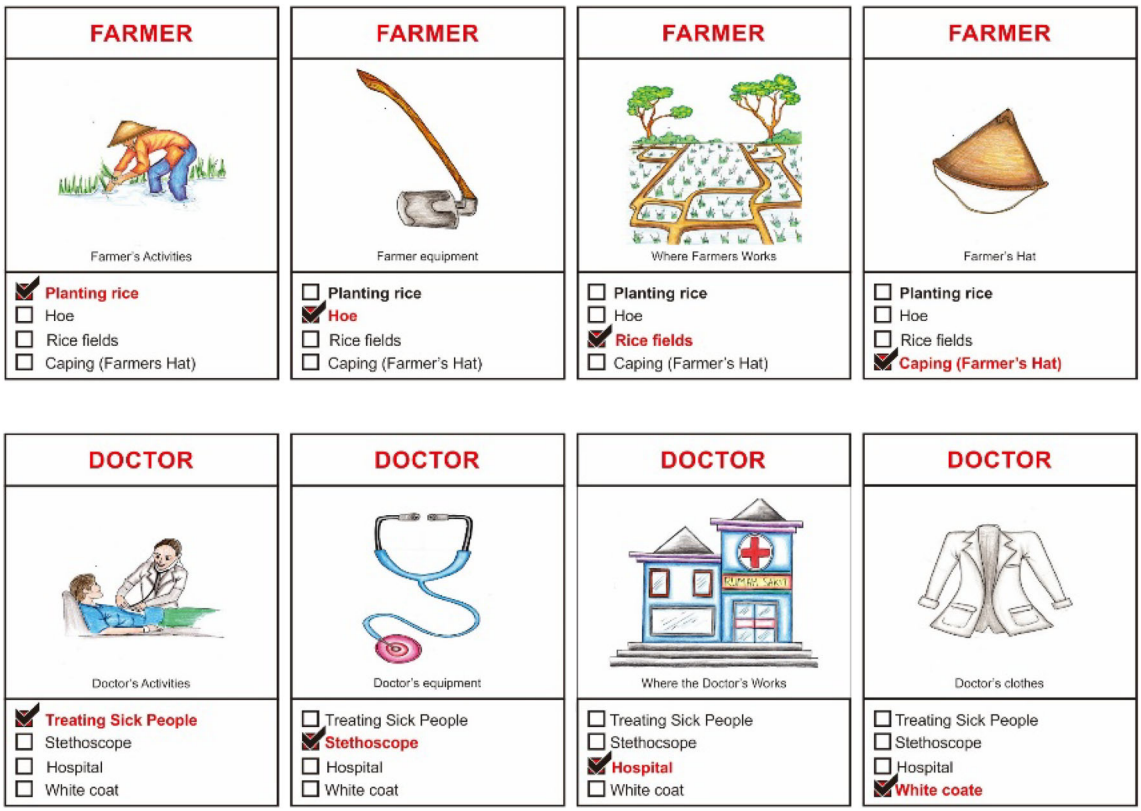

Fig. 1 Examples of quartet cards containing career characteristics

Regarding the research procedures, the ethics committee of Universitas Negeri Yogyakarta, revealing the authors' institution/affiliation has given their approval for involving the groups of participants. Moreover, the Education and Culture Agency of the Special Region of Yogyakarta and the principals of the involved schools have also approved the procedures of this research.

Data Analysis

The researchers used a descriptive analysis of the levels of career knowledge among participants. After the descriptive analysis, the researchers employed two inferential statistical analyses to answer the hypotheses, a paired sample t-test, and a one-way ANOVA. The researchers used SPSS version 25 to run a paired sample t-test with the obtained pretest and posttest data. This analysis was to examine the first hypothesis regarding the effectiveness of the quartet card game to increase the participants' career knowledge. The researchers conducted a one-way analysis of variance (One-way ANOVA) on the posttest scores of the three experimental groups to examine the second hypothesis about the differences of effectiveness between the conventional, memory game, and chain message methods.

Results

The results of the descriptive analysis and inferential statistical analysis are presented in this section.

Results of the Descriptive Analysis

The detailed analysis results showed remarkable changes in participants' career knowledge after the experiment intervention. Figure 2 shows the distribution of career knowledge among participants before and after each method of treatment. The graph (Fig. 2) illustrates the career knowledge scores with each method of the quartet card game. In the conventional method (method 1), most participants had a very high career knowledge (46.51%) in the pretest. The posttest also indicated a very high percentage of 63.95%, meaning that there was an increase of 17.44% in career knowledge among the participants of the very high category in the conventional method.

As to the memory game method, most participants (30.77%) in the pretest stage had high career knowledge, but in the posttest, most participants (28.21%) had moderate career knowledge. Meanwhile, with the chain message method, most participants (47.78%) had very high career knowledge in the pretest and also very high career knowledge in the posttest (87.78%). Thus, there was an increase of 40% in career

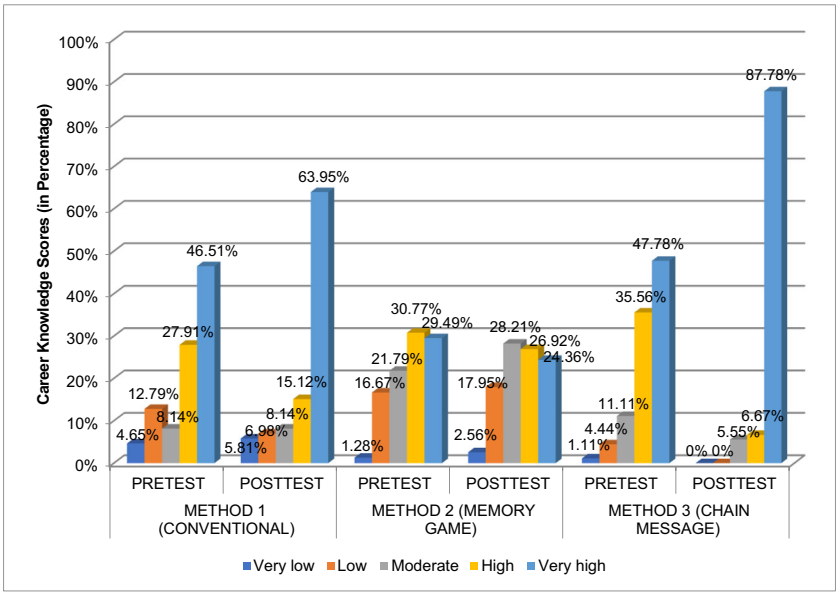

Fig. 2 Distribution of career knowledge before and after treatment by each method

knowledge among the participants of the very high category with the chain message method. According to this descriptive data, the graph shows that the chain message method was the method with the highest level of improvement in participants' career knowledge. The memory game method, in contrast, lowered the participants' career knowledge as it was proven by the findings that the higher categories dominated the pretest stage while the moderate category dominated the posttest stage.

This comparison between the three methods showed that in the implementation of method 2, the portions of participants with very low, low, and moderate career knowledge increased while the portions of participants with high and very high career knowledge decreased. This trend did not happen in the other two methods (methods 1 and 3) in which the portions of participants with low career knowledge decreased while the portions of participants with very high career knowledge increased. The number of participants with increased knowledge was higher in the implementation of method 3 (the chain message method) than in the implementation of method 1 (the conventional method) while the method 2 (the memory game method) showed a decreasing trend instead.

Inferential Statistical Analysis

The Effectiveness of the Three Quartet Card Game Methods in Increasing Career Knowledge

The findings of the paired samples t-test in Table 1 showed the following results:

1) The career knowledge score in the conventional method after the intervention increased by 1.33721 with $t(85) = -2.764$ and $p = .007$ ($p < .05$). These statistical results indicated that playing the quartet card game with the conventional method significantly improved the participants' career knowledge.
2) The career knowledge score in the memory game method after the intervention decreased by .98718 with $t(77) = 77$ and $p = .000$ ($p < .05$). These statistical results showed that playing the quartet card game with the memory game method significantly lowered the participants' career knowledge instead.
3) The career knowledge score in the chain message method after the intervention increased by 2.91111 with $t(89) = -7.923$ and $p = .000$ ($p < .05$). These statistical results revealed that playing the quartet card game with the chain message method significantly improved the children's career knowledge.

Comparison of the Effectiveness of the Three Quartet Card Game Methods in Increasing Career Knowledge

The differences in effectiveness among the quartet card game methods were analyzed using a one-way analysis of variance and the results are displayed in Table 2.

Based on the results presented in Table 2, the three quartet card game methods generated significantly different results with $F = 51.4$ and $p = .000$ ($p < .05$). Thus, it can be concluded that the conventional method, the memory game method, and the chain message method of the quartet card game have significantly different posttest scores in lower grade elementary school students. This finding means that the three playing methods have different degrees of effectiveness in improving the students' career knowledge. Therefore, it is necessary to perform a further test (Post-Hoc test) to see the differences in

Table 1 Results of Paired Samples T-Test of the Three Quartet Card Game Methods

		Paired Differences					
		Mean	SD	Std. Error Mean	t	df	Sig. (2-tailed)
Pair 1	pre-post	−1.33721	4.48687	.48383	−2.764	85	.007*
Pair 2	pre-post	.98718	.11323	.01282	77.000	77	.000*
Pair 3	pre-post	−2.91111	3.48559	.36741	−7.923	89	.000*

Note. *Correlation is significant at the .05 level (2-tailed). Pair 1: pretest & posttest t-test scores in the conventional method; Pair 2: pretest & posttest t-test scores in the memory game method; Pair 3: pretest & posttest t-test scores in the chain message method

effectiveness between the quartet card game methods. The results of the Post-Hoc test are presented in Table 3.

The findings of the three playing methods, as presented above, suggest the following results:

1) Between the conventional method ($M = 14.52$) and the memory game method ($M = 10.99$), there was a significant difference in increasing the career knowledge of lower grade elementary school students with $p = .000$ ($p < .005$). Based on the means, it can be concluded that the conventional method was more effective in increasing the participants' career knowledge than the memory game method that lowered the participants' career knowledge instead (see Table 1).
2) Between the conventional method ($M = 14.52$) and the chain message method ($M = 16.84$), there was a significant difference in increasing the career knowledge of lower grade elementary school students with $p = .000$ ($p < .005$). Based on the means, it can be concluded that the chain message method was more effective in increasing the children's career knowledge than the conventional method (see Table 1).
3) Between the memory game method ($M = 10.99$) and the chain message method ($M = 16.84$), there was a significant difference in increasing the career knowledge of lower grade elementary school students with $p = .000$ ($p < .005$). This statistical result means that the chain message method was more effective in increasing the children's career knowledge than the memory game method that lowered the children's career knowledge instead (see Table 1).

Based on Tables 2 and 3, it can be concluded that the conventional method, the memory game method, and the chain message method had significantly different degrees of effectiveness in increasing career knowledge in lower grade elementary school students as shown by the posttest scores. The chain message method showed the highest effectiveness with $M = 16.84$, followed by the conventional method in the second place with $M = 14.52$ and lastly the memory game method with $M = 10.99$. Despite the difference in effectiveness in generating changes in the scores of lower grade elementary school students, only the conventional method and the chain message method were effective in increasing the participants' career knowledge as proven by higher posttest scores than the pretest scores in the results of the paired samples t-test as presented in Table 3. Meanwhile, the memory game method was ineffective in increasing the students' career knowledge as the method resulted in lowering scores after the intervention.

Discussion

The purpose of this study was to examine the effectiveness of the quartet card game in improving the career knowledge of lower grade elementary school students (grades 1, 2, and 3) and to examine the effectiveness of the conventional method, the memory game method, and the chain message method of the quartet card game. There were two hypotheses to be discussed in this section. The first hypothesis claimed that the quartet card game effectively increases the career

Table 2 Results of ANOVA Test for Comparison of the Effectiveness of the Three Quartet Card Game Methods

		Sum of Squares	df	Mean Square	F	Sig.
Post	Between Groups	1442.588	2	721.294	51.400	.000**
	Within Groups	3522.263	251	14.033		
	Total	4964.850	253			

Note. **$p < .05$

Table 3 Results of Post-Hoc Test of the Three Methods

Dependent Variable	(I) Method	(J) Method	Mean Difference (I-J)*	Std. Error	Sig.
Post	Conventional (M=14.52)	Memory Game	3.53608	.58573	.000
		Chain Message	−2.32119	.56488	.000
	Memory Game (M=10.99)	Conventional	−3.53608	.58573	.000
		Chain Message	−5.85726	.57951	.000
	Chain Message (M=16.84)	Conventional	2.32119	.56488	.000
		Memory Game	5.85726	.57951	.000

Note. * The mean difference was significant at the .05 level

knowledge of lower grade elementary school students in the Special Region of Yogyakarta.

Based on the results of the tests on the first hypothesis as presented in Table 1, the pretest and posttest results demonstrated that only the conventional method and the chain message method were significantly effective ($p < .05$) in improving the career knowledge of lower grade elementary school students in Special Region of Yogyakarta. Although only two of the three methods were found effective in increasing the students' knowledge, these results corroborate those of previous studies on the effectiveness of the quartet card game in improving students' knowledge in various subjects, such as English speaking (Elviza and Ratmanida 2019) and physics (Lestari et al. 2020).

The quartet card game as an educational media for lower grade elementary school students was found statistically effective in improving their career knowledge. This reveals that game-based learning is effective for knowledge acquisition and can be applied to specific targets, in this case lower grade elementary school students (grades 1, 2, and 3). Nevertheless, the contents presented in the quartet cards used in this research are unlike the academic materials in general. The use of game-based activities offers a fun experience, relaxation, 'joyful' features (Gee 2003), and a level of challenges (Csikszentmihalyi 1990) that stimulate the internal learning motivation of children (Gee 2003) which implies that children participate with a more engaging atmosphere in playing the game. Moreover, the relaxing and entertaining atmosphere in learning through games enable children to acquire new informations and transform them into a new scheme of knowledge with less effort. An expert, Brotherson (2009), suggested that utilizing a game may lead children to achieve the goals of learning effectively. It can be concluded that learning through game activities offer joyful ease in attaining the learning goals.

Through the quartet card game, students unconsciously go through a teaching and learning process and have their career knowledge improved during the experiment intervention. Game-based learning enables students to be actively involved in the learning experience and to have a real interest in participating in the learning activity. Papastergiou (2009) proposed that such an experience allows the educational contents to impress learners more than that of conventional learning would do. A study by Kamnardsiri et al. (2017) showed that students who applied a game-based approach to learning American Sign Language (ASL) were better than those who applied the traditional face-to-face learning approach. Thus, the quartet card game for career knowledge improvement has similar benefits as game-based learning that offers students the opportunity to absorb the learning materials more intensively than conventional learning processes.

This game-based learning with the quartet card media supports the statement of Ismail (2009) that playing activities would develop three primary abilities in children: physical and motor skills (psychomotor aspect), social and emotional abilities (affective aspect), and intellectual abilities (cognitive aspect). The quartet card game, especially with the chain message method as a learning media for career knowledge, involves the psychomotor aspect (as children need to move physically), affective aspect (as it stimulates positive emotions such as joy), and cognitive aspect (as the children need to focus their attention and memory in playing (see Procedures, Experiment stages). Thus, as a practical learning media, the quartet card helps students to understand the learning materials by involving their senses to touch, see, and perceive.

Using the quartet cards in classrooms and adapting them as a learning media make the teaching and learning process more vibrant and offer pleasure to the students (Garris et al. 2002). There is an attachment of love and affection between teachers and students and between students themselves, meaning the learning process can make each party try to give their best to please others (Anggoro et al. 2017). The students' information processing involving a joyful learning activity may flow effectively through the amygdale as it carries a minimum level of stress, allowing them to reach more significant degrees of cognitive processing and gain more "aha" moments (Jagtap and Tilak 2017) which are the moments when students realize the connection between one point and another in what they are learning. This process also happens when students play the career quartet cards, where career knowledge materials are associated with pleasure through game-based learning. This

experience may reach the cognitive processing domain involving a higher degree of functions and may enable students to acquire a new learning scheme effectively as a form of learning attainment.

The second hypothesis predicted that there were differences in effectiveness between the conventional method, the memory game method, and the chain message method of the quartet card game in increasing children's career knowledge and the hypothesis was accepted. The findings indicated that the intervention with the three playing methods generated significant posttest scores ($p < .05$) on the students' career knowledge (see Table 2). Based on the results of further tests (see Table 3), the chain message method of the career quartet card game was found as the most effective method in increasing lower grade elementary school students' scores after the intervention, with a pretest-posttest mean difference = −2.91111 (see Table 1), followed by the conventional method in the second place, with a pretest-posttest mean difference = −1.33721. In opposite, the memory game method lowered the students' career knowledge significantly with a pretest-posttest mean difference = .98718 (see Table 1).

The superiority of the chain message method over the conventional method and the memory game method in generating higher posttest career knowledge scores may be due to the involvement of movements and physical activities in the chain message method, allowing students to have more entertaining interactions. Using physical and sensory organs while being actively involved in games with the chain message method allow participants to achieve the 'flow' state (Csikszentmihalyi 1990). This state is reached when individuals immerse into the activity of deep and effortless involvement that potentially optimizes the learning process. This is in line with Syväoja et al. (2014)' view, claiming that the increase in physical activity has positive effects on children's academic performance, such as test results, particularly for tasks requiring executive functions and memory.

Additionally, the practice of playing games which resembles cooperative learning in the chain message method may also be the reason why this method demonstrated the most significant effect in increasing lower grade elementary school students' career knowledge. Gillies (2016) suggested five essential elements for higher productivity that cooperative learning has over individualistic learning: positive interdependence, promotive interaction, individual accountability, the interpersonal skill within the small group, and group processing. With a meta-analysis of 148 studies, Roseth et al. (2008) also found that cooperative learning brings about better achievements and a more positive relationship among peers than individual learning. There were interdependence, high interactivity, positive emotion, and career knowledge test results, which were also higher in the students that were given the intervention of the chain message method of the quartet card game.

Many previous studies have successfully provided evidence that cooperative learning positively contributes to academic achievement (Gull and Shehzad 2015) since the students become more active cognitively. Thus, it becomes clear why the implementation of the chain message method is more significant in improving career knowledge than the two other methods since the chain message method offers an involvement of movements and physical activities and cooperative learning among participants which make students feel more fun and gain knowledge efficiently with increased learning motivation.

Compared to the chain message method, the conventional method and the memory game method had more individualized game features (see Procedure, Experiment stages), because there was no intensive interaction between players, and the students' achievements were based solely on their own abilities (Swab 2014). According to Kejani and Raeisi (2020), the game of relaying a sentence to another individual or identifying a peer with eyes closed and guessing the change arising in the class allows students to intentionally and composedly engage themselves in the working memory practicing activity. It came to a little surprise that the chain message method gained the most significant positive effect on career knowledge, but it might be because of the dynamics involving the working memory function. The students playing with this method may feel more engaged with their groups which allows them to get involved and motivated in performing their task. Kejani and Raeisi (2020) added that non-competitive games would let children play free of the fear of being lost. Although the three quartet card game methods are competitive, the fear of loss is minimal in the chain message method because of the collective risk as opposed to the individual risk in other methods.

Although both conventional and memory game methods have the element of individualism, only the latter failed to show effectiveness in improving children's knowledge. The results of the descriptive statistical analysis showed that during the implementation of the memory game method's pretest stage, most of the participants had already high career knowledge (30.77%). However, after the intervention with this game method, most participants showed lowered posttest scores and fell in the moderate category (28.21%). Consistent with these results, the paired samples t-test results indicated that the memory game method implementation decreased the students' career knowledge as shown by the difference between the pretest and posttest means (see Table 1). This means that the memory game method gained a higher score in the pretest stage than in the posttest stage. In other words, the method was ineffective in improving the career knowledge of lower grade elementary school students.

Additionally, the memory game method also produced lower posttest scores compared to other methods. During the experiment process, some participants expressed that playing

the quartet card game with the memory game method was difficult. Participants did trial-and-errors for multiple times and rarely succeeded in finding the cards they saw and remembered. In the Behaviorism theory, Thorndike mentioned that the children's lack of success results in their failure to get the reinforcement for the Stimulus-Response relationship (Schunk 2012). A high frequency of failures leads to the phenomenon of confusion and stress which eventually decreases the knowledge initially mastered. Qin et al. (2009) echoed the notion above, saying that under the stressful condition, a higher level of cortisol would be produced, and thus a disruption would be introduced in the work system of the prefrontal cortex, inhibiting the working memory function. Therefore, a challenging learning material that exceeds the learner's capacity would become a stressful learning resource and hinders learning goal attainment.

Since the effectiveness of career interventions particularly in lower grade elementary school students is rarely investigated, the findings of this study would contribute to the development of the career counseling literature. Evidence of the effectiveness of game-based career interventions is getting stronger and educational game-based interventions are once again proven to be able to facilitate students in knowledge attainment, including children.

In conclusion, these research findings indicated that of the three career quartet card game methods examined, only two were proven significantly effective in increasing the career knowledge of lower grade elementary school students, namely the chain message method and the conventional method. The chain message method to a great extent involved children's sensations as well as social interactions in learning and allowed the students to take much pleasure in the activity, generating the highest effectiveness as per learning goal. On the other hand, the memory game method was too complicated and causing too much stress to the students, inhibiting the flow of information in their working memory instead, hence ineffective.

Practical Implications

These research findings have a practical implication on career education, particularly for lower grade elementary school students. In line with the findings, education practitioners may implement quartet card games for career knowledge improvement. This quartet card game serves as a media for education practitioners such as teachers, school counselors, and school psychologists to introduce the types of occupations based on Holland's theory of career classification (Holland 1997) or to develop students' understanding of career characteristics for further explorations. Practitioners may utilize the conventional and the chain message models for students to play the quartet card game for effectiveness reasons so that students could attain a higher level of career knowledge with the entertaining learning process that is appropriate for accommodating their developmental characteristics.

Limitations and Future Research

This research attempted to fill the gap in the career education practice that lacks studies on effective media for practitioners. The findings of this research have proved the effectiveness of the quartet card game for career knowledge improvement in lower grade elementary school students. Despite the novelty of this research, there are at least three limitations that need to be acknowledged.

The first limitation lies in the pretest-posttest experimental design that did not involve a control group without manipulation (O_1-O_2). Future research needs to involve a control group without manipulation (O_1-O_2) for better accuracy in explaining the causal effects of the quartet card game implementations. The second limitation concerns the lack of analysis regarding differential impacts of the game according to the demographic characteristics of the students (i.e., age or grade and gender). It is still not clear which groups of children based on demographic characteristics gained more benefits from this game. Future studies may consider these possible moderating factors for the treatment effectiveness towards the outcomes.

Third, future research needs to embrace more extensive contemporary types of careers following the growth of the new fields in business and changing features of jobs, especially the advancement of technology and its impact on the required digital skills.

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Data Availability All data generated or analysed during this study are included in this published article and its supplementary information files.

Declarations

Informed Consent The participants have stated their agreement to participate in this research.

Animal Studies This article does not contain any studies with animals performed by any of the authors.

Ethics Approval All procedures performed in studies involving human participants have followed the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards. The University Ethics Committee and also the Education and Culture Agency of the Special Region of Yogyakarta have approved the research procedures involving the participants.

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