The Effect of Quiz Case Game in Kemp's Model on Creative Thinking and Learning Motivation

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ARTICLE INFO	ABSTRACT
	This study examines the effect of the Quiz Case game in the Kemp model on students' creative thinking and learning motivation. Using a Quasi-Experimental Design with Nonequivalent (Pretest-Posttest) Control Group Design, 66 students were divided into experimental and control groups (33 each) through purposive sampling. The experimental class used the Quiz Case game, while the control class used Matching Pairs. Data were collected via tests and questionnaires, analyzed with N-gain, Mann-Whitney U, effect size, and Spearman correlation. The experimental class showed higher creative thinking improvement (N-gain 0.68; 68.97%) than the control (0.30; 30.61%). Learning motivation improvement was similar in both classes (0.62 vs. 0.59). Mann-Whitney U indicated significant differences in creative thinking (sig. = 0.000) but not motivation (sig. = 0.346). Spearman correlation showed a strong relationship (r = 0.756). Thus, the Quiz Case game effectively enhances creative thinking and learning motivation.
	Penelitian ini mengkaji pengaruh permainan Quiz Case dalam model pembelajaran Kemp terhadap kemampuan berpikir kreatif dan motivasi belajar siswa. Dengan menggunakan Quasi-Experimental Design jenis Nonequivalent (Pretest-Posttest) Control Group Design, sebanyak 66 siswa dibagi ke dalam kelas eksperimen dan kontrol (masing-masing 33 siswa) melalui teknik purposive sampling. Kelas eksperimen menggunakan permainan Quiz Case, sementara kelas kontrol menggunakan Matching Pairs. Data dikumpulkan melalui tes dan angket, kemudian dianalisis menggunakan uji N-gain, Mann-Whitney U, effect size, dan korelasi Spearman. Kelas eksperimen menunjukkan peningkatan berpikir kreatif lebih tinggi (N-gain 0,68; 68,97%) dibanding kelas kontrol (0,30; 30,61%). Peningkatan motivasi belajar hampir sama di kedua kelas (0,62 vs. 0,59). Uji Mann-Whitney menunjukkan perbedaan signifikan pada berpikir kreatif (sig. = 0,000) tetapi tidak pada motivasi belajar (sig. = 0,346). Korelasi Spearman menunjukkan hubungan kuat (r = 0,756). Dengan demikian, permainan Quiz Case efektif meningkatkan berpikir kreatif dan motivasi belajar siswa.

INTRODUCTION

Mathematics is a subject that is closely associated with daily activities and plays an crucial role in equipping students with the capacity for logical, analytical, critical, creative thinking, and cooperatively (Epstein & Uehara, 2014; Hong et al., 2000: Isro'il & Supriyanto, 2020). NCTM (2000) asserts that mathematical skills, such as problem solving, communication, reasoning, conceptual

understanding, and critical and creative thinking, are needed to face challenges in mathematics and everyday life. This is consistent with Permendiknas Number 22 of 2006 related to Content Standards for Mathematics, which emphasizes values such as hard work, honesty, discipline, creativity, independence, communication, and responsibility in shaping student character. However, the mathematical expertise of Indonesian students is still low. Based on the PISA results for 2000-2022, Indonesia's mathematics scores only ranged from 300-390 out of a standard 500. Thus, only about 28% of Indonesian students reached level 2 with a score range of 358-431, which is considered a basic level of mathematical competence to function in everyday life (OECD, 2019).

One of the mathematical abilities needed in these problems is the expertise to think creatively. By thinking creatively, students are able to see various approaches to solving problems, find alternative solutions, and apply mathematical concepts to new situations (Handaya dkk., 2023; Silver, 1997). PISA measures the level of students' ability to solve simple problems to problems that require higher-level thinking skills, so the characteristics of PISA questions lead students to be able to have creative thinking skills (Zaiturrahmah et al., 2024; OECD, 2019). Indirectly, this conveys that the condition of students in creative thinking skills is insufficient.

Developing and fostering creative thinking skills is important, especially through mathematics education (Freiman & Tassell, 2018; Chamberlin & Mann, 2021; Irbah et al., 2018; Sari et al., 2022; Suroyaningsih, et al., 2023). Through creative thinking skills, students can comprehend, master, and solve the problems they face, and in learning mathematics will encourage students to dare to solve mathematical problems in diverse ways (Liljedahl et al., 2016; Suroyaningsih, et al., 2023). Therefore, Innovative thinking is essential in education to effectively address mathematical learning challenges (Kaiser et al., 2018; Wanelly & Fauzan, 2020). According to Eftafiyana et al. (2018), in addition to creative thinking abilities, learning motivation is also crucial t in learning mathematics. Sardiman (2005) asserts that learning motivation functions to encourage action, determine direction, and select behavior, so it becomes an important element for students and teachers. Good motivation can improve student learning achievement (Bureau et al., 2023; Alderman, 2007; Emda, 2018; Siagian, 2015; Heriyati, 2017; Hernama & Maharani, 2023). To achieve learning objectives, providing maximum and diverse motivation is one of the effective solutions.

Story problems can be used as problem solving problems in upgrade students' creative thinking skills. Story problems trigger students to develop answers and analyze them, so that their creative hernamathematics material is the matrix. The study of matrices is very broad, one of which is the solution of a system of linear equations in matrices using the inverse and determinant of the matrix. Story problems are open-ended so that they can develop students' creative cognition.

Retrieved from the findings of pre-research at SMAN 8 Pontianak, the creative thinking ability test in class XII showed an average of only 36.97%, far below the creative standard of $> 61\%$. Direct observation also revealed several problems: 1) only a few students were active, 2) monotonous and traditional learning without a variety of strategies and media, 3) student cooperation is low because they tend to learn individually, 4) some students are not focused and some even fall asleep, and 5) learning is centered on textbooks so that students memorize more than understand. These results indicate low innovative reasoning abilities and student academic drive. Therefore, a more innovative and interesting learning approach is needed so that students can understand the material better and more effectively.

Effective mathematics teaching must pay regard to the needs and characteristics of students (McKenney & Reeves, 2018). Kemp's learning design model, as a constructivist approach, places the teacher as a facilitator who designs learning according to student characteristics and clear goals. The Kemp model includes problem identification, analysis of student characteristics, task analysis, goal formulation, content preparation, strategy development, media use, and learning evaluation (Bajracharya, 2019). This model effectively improves students' creative thinking skills through a systematic problem-based approach (Rauf et al., 2022). In addition, the apply of educational games in the Kemp model can enhance student motivation and learning outcomes, as games have been shown to be more effective than traditional methods (Park & Kim, 2022; Kembau et al., 2016).

The game that is suitable for integration in the Kemp model learning design is the Quiz Case game. Study conducted by Wicaksono et al. (2024) that the execution of the Kemp model learning design using the Quiz Case game on matrix material for class XI Accounting and Financial Institutions at SMK Budhi Warman I discovered that the Kemp model is appropriate for learning mathematics and teamed up with consultation or team activities. The Quiz Case game is a game inspired by a combination of

team quiz and criminal case games. In this game students will be given a creative thinking test question with various ways of solving it that has been hidden and must be sought and solved by each group in various ways or methods of completion.

Research shows the effectiveness of Kemp's learning design model in various contexts. Subedi et al. (2015) found that the Kemp model based on Think-Pair-Square (TPS) was more effective in improving communication and self-concept than conventional learning. Fatmawarni & Chania (2020) showed the positive effect of Kemp's model on students' self-concept. financial management learning outcomes, with ($t\ hitung$= 2.34 >$ttabel$=2.06866) at a significant level of 0.05. Reksiana (2022) stated that this model is effective for general learning and development of teaching materials, although empirical testing is still limited. However, there is no research that explores the use of educational games such as Quiz Case to upgrade creative thinking and student learning motivation in grade XI matrix learning. Retrieved from the above description, this research was carried out to investigate the impact of using Quiz Case games in Kemp's learning design model on students' learning motivation and creative thinking, aiming to enhance students' learning motivation and creative thinking capabilities.

METHOD

This study uses the experimental approach. The experimental approach is a quantitative method that involves experiments to measures the influence of the independent variable on the dependent variable in a controlled situation (Jha, 2023; Sugiyono, 2019). Quast Experimental Design with a Nonequivalent (Pretest and Posttest) Control Group Design approach was applied in this study (Scharrer & Ramasubramanian, 2021; Privitera & Du, 2022). Sugiyono (2019) mentions that this approach is one of the most commonly used in quasi-experiments, he experimental and control teams were determined without using the randomization method. Both classes were given a pre-test and post-test and only the experimental team accepted treatment. The experimental group was treated by using Quiz Case game in Kemp's learning design model. While the control class was given Kemp model design learning with Matching Pairs game. In learning for both control and experimental classes, it was carried out for 2 x 45 minutes (2 meetings).

The data in this study were obtained through creative thinking capability test in the type of essay questions and motivation for learning survey. The creative thinking ability test includes indicators of fluency, flexibility, and originality (Silver, 1997; Siswono, 2008). The test questions are in the form of open-ended story problems that measure creativity through divergent thinking tests, where a person is asked to generate many ideas or solutions from one open problem (Guilford, 1967). The learning motivation questionnaire was modified from Muharrir's research (2022) consisting of 20 statements, with learning motivation indicators: (1) desires and wants to do activities, (2) patience and high fighting power, (3) self-confidence, (4) interesting tasks in learning, and (5) a supportive learning environment.

Before the instrument is given to students, validity and reliability tests are retrieved through expert opinion and classroom trials. The data from the validity test of the creative thinking capability test and the learning motivation questionnaires meet the validity and reliability standards. Based on the test using IBM SPSS Statistics 25 software, the validity coefficient for the creative thinking capability test is 0.953 and the reliability is 0.707. For the learning motivation questionnaire, the item validity coefficient ranged from 0.362 to 0.673 with a reliability of 0.840. The creative thinking ability test has 1 statement with a maximum score of 12, with each indicator having a score range of 0-4. The learning motivation questionnaire uses a Likert scale (1-4), the score for each answer provided is given as listed in Table 1 below:

Table 1. Score Scale Likert

Indicator	Score
Strongly Agree	4
Agree	3
Disagree	2
Strongly Disagree	1

In calculating the learning motivation points, before that it resolve be converted first from ordinal data into interval data with the Method of Succesive interval (MSI). The following is the actual score of the score that has been converted into a qualitative value with five categories referring to the conversion guidelines of Table 2:

Table 2. Student learning motivation conversion guidelines

Score Range	Average Score	Category
X > X_(i)+1,8 xsbi	4 X>88,4	Very High
X_(i)+0,6 xsbi<X ≤ X_(i)+ 1,8 xsbi	72,8 <X≤88,4	High
X_(i)-0,6 xsbi<X ≤ X_(i)+ 0,6 xsbi	57,2<X≤72,8	Medium
X_(i)-1,8 xsbi<X ≤ X_(i)- 0,6 xsbi	41,6 <X≤57,2	Low
X ≤ X_(i)-1,8 xsbi	X≤88,4	Very Low

After the pre-test and post-test data were obtained, normality, homogeneity, linearity, and N- gain analysis were tested using IBM SPSS Statistics 25. The normality test with the Shapiro-Wilk Test demonstrated that the creative thinking ability test data were not normally distributed (sig.< 0.05), while the learning motivation questionnaire data were normally distributed (sig.> 0.05). F test is used to test the homogeneity of data variance, obtained both data are homogeneous (sig. > 0.05), and linearity test to measure the relationship between variables, obtained linear relationship data (sig. > 0.05).

The N-gain test was used to see the increase in pre-test and post- test value in the control and experimental classes. This calculation will show the increase from the pretest to the posttest of the learning motivation questionnaire and the students' creative thinking ability test. The formula for calculating N-gain is as follows:

$$\langle g \rangle = \frac{S_{post} - S_{pre}}{S_{maks} - S_{pre}} \tag{1}$$

The category of the normalized gain (g) according to Hake (in Sundayana, 2016) as shown in Table 3 Below:

Table 3. Classification of N-gain interpretation

Normalized Gain Score	Interpretation
-1,00 ≤ g <0,00	drop
g =0,00	Fixed
0,00 ≤ g <0,30	Low
0,30 ≤ g <0,70	Medium
0,70 ≤ g <1,00	High

The category of the effectiveness of the application of the learning model in the calculation of N-Gain in percentage is as follows:

Table 4. N-Gain effectiveness category

Percentage (%)	Interpretation
<40	Not Effective
40-55	Less Effective
56-75	Moderately Effective
>76	Effective

The data analysis technique used was the Mann Whitney U test to test the difference in improvement between the control and experimental classes based on the N-gain score of the data. The Mann-Whitney U test criterion is H₀ accepted if the smallest U value is greater than U table at the 0.05 significance level. If the smallest U is smaller or equal to U table, then H₀ is rejected, which means there is a significant difference between the learning motivation and creative thinking ability of experimental and control class students.

Effect size calculation was used to measure the effect of Quiz Case game in Kemp's learning design model.

$$d = \frac{M_{post} - M_{pre}}{S_{pooled}} \tag{2}$$

The effect size criteria are presented in the following table:

Table 5. Effect size criteria

Interval	Criteria
ES ≤0,2	Low
0,2<ES ≤0,8	Medium
ES >0,8	High

Spearman rank test was applied to determine the relationship between learning motivation and students' creative thinking skills following instruction using the Kemp model framework supported by the Quiz Case game. Hypothesis testing employs a 0.05 level of significance. The interpretation of the size of the correlation coefficient is based on the provisions listed in Table 6. below.

Table 6. Classification of correlation coefficients

Interval	Relationship Level
0,000-0,199	Very Low
0,200-0,399	Low
0,400-0,599	Medium
0,600-0,799	Strong
0,800-1,000	Very Strong

RESULT AND DISCUSSION

The research was conducted at SMAN 8 Pontianak class XI. Class XI A as an experimental class was given learning treatment by using Quiz Case game in Kemp model design, where in this game students were divided into 6 groups. each group looked for hidden questions and solved in various ways. While class XI B as the control class was given the Matching Pairs game with the same design as the experimental class. In this game, students match cards that contain the steps of solving the problem.

The pre-test results between the two classes have initial abilities that are not significantly different, so the students of the two classes are suitable for comparison. While the pre-test findings between the two classes have significantly differently creative thinking abilities, but student learning motivation is not significantly distinct. While the posttest score on creative thinking ability between the two classes has a significant difference, while the learning motivation does not have a significant difference. This can be seen from the data on the average value of the student learning motivation questionnaire shown in the tables below.

Table 7. Descriptive statistics of student learning motivation data

Class	Test	Average
Control Class	Pre-test	42,42
	Post-test	59,89
Eksperimen Class	Pre-test	43,68
	Post-test	61,03

As presented in Table 7, the typical pre-test score of students' creative thinking skills in the control class was 42.42, while in the experimental class it was 43.68. This shows that the initial ability of the two classes is not significantly different. In the post-test, the typical value in the control class improved to 59.89, while in the experimental class it increased higher, namely 61.03. This shows that after being given the treatment the two classes are not significantly different as well as student learning motivation.

Regarding the findings of the mean value of the creative thinking abilities test observable in Table 8 below.

Table 8. Descriptive statistics of students' creative thinking ability data

Class	Test	Average
Control Class	Pre-test	19,32
	Post-test	42,07
Eksperimen Class	Pre-test	21,6
	Post-test	62,30

As presented above, the pre-test findings display that the average creative thinking capability of students in the control class is 19.32, while in the experimental class it is higher, namely 21.6. This shows that there is an initial difference that is not too significant between the two classes. In the post-test findings, the average creative thinking capability of students in the control class improved to 42.07, while in the experimental class it improved higher to 62.30. This indicates that the experimental class demonstrated a considerable difference and greater improvement than the control class after the

treatment is applied. N-gain calculation to see the rise in motivation and creative thinking ability of students between the control and experimental classes from the pre-test and post-test values.

The results of the N-Gain test in percent form from the pre-test and post-test data of the experimental class learning motivation are as follows.

Table 9. The results of the N-Gain test calculation of class learning motivation data experimental class

Student Code	N-Gain Score (%)	N-Gain Score	Category
DA	68.42	0.68	Medium
DF	46.57	0.47	Medium
MFA	100.00	1.00	High
AF	72.19	0.72	High
AAA	39.35	0.39	Medium
RAR	54.46	0.54	Medium
HKR	100.00	1.00	High
SRE	56.84	0.57	Medium
SR	43.24	0.43	Medium
DNF	69.40	0.69	Medium
SRH	35.74	0.36	Medium
AR	75.16	0.75	High
EPM	47.67	0.48	Medium
PR	61.63	0.62	Medium
MK	64.40	0.64	Medium
ASW	60.15	0.60	Medium
SA	47.62	0.48	Medium
SA1	54.18	0.54	Medium
KHA	42.51	0.43	Medium
AF	51.55	0.52	Medium
FNAZ	100.00	1.00	High
RO	72.86	0.73	High
KIH	56.88	0.57	Medium
MSK	35.83	0.36	Medium
KJD	52.12	0.52	Medium
RE	62.55	0.63	Medium
AM	48.50	0.49	Medium
NA	75.16	0.75	Medium
OR	72.86	0.73	Medium
RSS	70.93	0.71	Medium
AM1	59.29	0.59	Medium
AR1	100.00	1.00	High
FR	72.86	0.73	High
Rata-rata	62.7557	0.62	Medium
Minimum		35.74	
Maksimum		100	

Table 10. The results of the N-Gain test calculation of class learning motivation data control class

Student Code	N-Gain Score (%)	N-Gain Score	Category
AT	66.7	0.67	Medium
MF	57.27	0.57	Medium
AA	61.32	0.61	Medium
SA	36.3	0.36	Medium
M	62.35	0.62	Medium
FA	47.76	0.48	Medium
AR	100	1.00	High
PT	53.87	0.54	Medium
GD	48.03	0.48	Medium
FL	50.26	0.50	Medium
AS	100	1.00	High
FW	65.06	0.65	Medium
OM	67.58	0.68	Medium
MJ	42.65	0.43	Medium
MH	67.58	0.68	Medium
ED	48.38	0.48	Medium
AB	75.16	0.75	High
RC	70.33	0.70	High
CH	67.46	0.67	Medium
MFA	45.99	0.46	Medium
SN	41.8	0.42	Medium
BG	67.54	0.68	Medium
CK	51.48	0.51	Medium
FF	100	1.00	High
EP	39.63	0.40	Medium
OA	33.77	0.34	Medium
RH	32.7	0.33	Medium
DZ	71.42	0.71	High
JT	37.19	0.37	Medium
SD	50.54	0.51	Medium
FR	71.63	0.72	High
AF	52.54	0.53	Medium
KD	67.58	0.68	Medium
Rata-rata	59.1474	0,59	Medium
Minimum		32.70	
Maksimum		100	

Based on the table above, for the experimental class there were no students who scored in the low category, 8 students in the high category and 25 students in the medium category of improvement. In addition, the table shows that the average N-gain score of learning motivation for the experimental class using the Quiz Case game in the Kemp learning model is 62.75% or 0.62 which is included in the moderately effective category and the moderate improvement category. With a minimum score of 35.74% and a maximum score value of 100%. While the increase in learning motivation of control class students seen from the results of the N-gain calculation can be seen in table 10 above. Based on the table above, for the control class there were no students who scored in the low category, 7 students in the high category and 26 students in the medium category on the increase. In addition, the table shows that the average N-gain score of learning motivation for the experimental class using the Quiz Case game in the Kemp learning model is 59.14% or 0.59 which is included in the moderately effective category or the

improvement is classified as moderate. With a minimum score of 32.70% and a maximum score value of 100%. When compared to the experimental class, the learning motivation score in the control class is not significantly different.

The subsequent are the findings of the N-gain computation of students' creative thinking capability data, the results of the calculation of the increase in creative thinking skills of the two classes are as follows.

Table 11. The results of the N-Gain test calculation of class learning motivation data experimental class

Student Code	N-Gain Score (%)	N-Gain Score	Category
DA	54.67	0.55	Medium
DF	54.67	0.55	Medium
MFA	63.04	0.63	Medium
AF	45.65	0.46	Medium
AAA	54.67	0.55	Medium
RAR	66	0.66	Medium
HKR	54.67	0.55	Medium
SRE	45.47	0.45	Medium
SR	63.04	0.63	Medium
DNF	100	1.00	High
SRH	66	0.66	Medium
AR	77.33	0.77	High
EPM	63.04	0.63	Medium
PR	79.76	0.80	High
MK	100	1.00	High
ASW	50	0.50	Medium
SA	79.76	0.80	High
SA1	59.52	0.60	Medium
KHA	45.47	0.45	Medium
AF	100	1.00	High
FNAZ	100	1.00	High
RO	62.92	0.63	Medium
KIH	100	1.00	High
MSK	62.92	0.63	Medium
KJD	77.33	0.77	High
RE	74.63	0.75	High
AM	50	0.50	Medium
NA	77.33	0.77	High
OR	49.25	0.49	Medium
RSS	77.33	0.77	High
AM1	77.33	0.77	High
AR1	81.46	0.81	High
FR	62.92	0.63	High
Rata-rata	68.9764	0.68	Medium
Minimum			45.47
Maksimum			100

Table 12. The results of the N-Gain test calculation of class learning motivation data control class

Student Code	N-Gain Score (%)	N-Gain Score	Category
AT	77.33	0.77	High
MF	0	0.00	Low
AA	8.3	0.08	Low
SA	0	0.00	Low
M	26.94	0.27	Low
FA	44	0.44	Medium
AR	10.71	0.11	Low
PT	8.4	0.08	Low
GD	18.21	0.18	Low
FL	8.4	0.08	Low
AS	40.48	0.40	Medium
FW	21.33	0.21	Low
OM	54.67	0.55	Medium
MJ	49.25	0.49	Medium
MH	66	0.66	Medium
ED	45.47	0.45	Medium
AB	33.33	0.33	Medium
RC	0	0.00	Low
CH	0	0.00	Low
MFA	0	0.00	Low
SN	100	1.00	High
BG	49.25	0.49	Medium
CK	33	0.33	Medium
FF	54.67	0.55	Medium
EP	35.66	0.36	Medium
OA	20.24	0.20	Low
RH	35.66	0.36	Medium
DZ	8.4	0.08	Low
JT	29.76	0.30	Low
SD	32	0.32	Medium
FR	44	0.44	Medium
AF	33.33	0.33	Medium
KD	21.33	0.21	Low
Rata-rata	30.6100	0,30	Low
Minimum	0		
Maksimum	100		

Based on the table above, for the experimental class there were no students who got an increase in creative thinking test scores in the low category, 15 students in the high category and 18 students in the medium category on the increase. In addition, the table shows that the average N-gain of creative thinking test scores for the experimental class using the Quiz Case game in Kemp's learning model is 68.97% or 0.68 which is included in the moderately effective category or the improvement is classified as moderate. With a minimum score of 45.47% and a maximum score value of 100%. As for the control class, there were 14 students who got an increase in creative thinking test scores in the low category, 2 students in the high category and 16 students in the medium category in their improvement. In addition, the table shows that the average N-gain of creative thinking test scores for the control class using the Matching Pairs game in Kemp's learning model is 30.61% or 0.30 which is included in the less effective category or the improvement is low. With a minimum score of 0% and a maximum score value of 100%.

The Mann Whitney U test was used to determine the divergence in significant improvement in students' learning motivation and creative thinking capability between the two classes. This test was conducted on the N-gain value previously obtained. The outcomes of the Mann Whitney U test learning motivation data observable in Table 13 below.

Table 13. Mann Whitney U Test Results Learning Motivation Data

Test Statistics	Value
Mann-Whitney U	471,000
Z	-0,943
Asymp.Sig. (2-tailed)	0,346

From Table 13, the Mann-Whitney U test results demonstrate a significance value of 0.346 (> 0.05), so H_0 is approved. Thus, it can be inferred that there is no substantial disparity in learning motivation between experimental and control class students. The findings of the Mann Whitney U Test on creative thinking capability data observable in Table below.

Table 14. Mann Whitney U Test Results of Creative Thinking Ability Data

Test Statistics	Value
Mann-Whitney U	95,000
Z	-5,774
Asymp.Sig. (2-tailed)	0,000

From Table 14, the Mann-Whitney U test results demonstrate a significance value of 0.000 (<0.05), so H_0 is rejected. Thus, it can be concluded that there is a substantial disparity in the improvement of creative thinking aptitude between experimental and control class students. To measure the degree of influence of the use of Quiz Case games in Kemp's learning design model has on students' creative thinking capability and learning motivation, it could be seen from the value of Cohen's effect size value. For student learning motivation obtained Cohen's effect size value is 2.88 (very large category), indicating that the Quiz Case game in Kemp's learning model exerts a profound impact on student learning motivation. While in students' creative thinking ability, the Cohen's effect size value is 4.53 (very large category), indicating that the Quiz Case game in the Kemp learning model significantly enhances students' creative thinking ability.

Students' creative thinking ability and learning motivation improved better with the use of Quiz Case game than Matching Pairs game in Kemp's learning design model. Based on the Mann-Whitney U Test, no significant disparity was observed in the improvement of motivation to learn in the experimental and control classes. This is because both classes used interactive games in the Kemp model learning design, such as Quiz Case and Matching Pairs, which effectively encourage student engagement through group discussions and healthy competition. Dianto & Ramadhani's (2022) research showed that the Kemp model learning design can increase students' learning motivation gradually. Nisa & Susanto (2022) also found that educational games have a positive impact on learning motivation (Bilodeau et al., 2023), according to the perspective of Najuah et al. (2022), who mentioned that educational games encourage active interaction of students to encourage greater enthusiasm and openness to learning. Corresponds to Self-Determination theory (Deci & Ryan, 1985), intrinsic motivation increases through active engagement and a sense of competence. This is supported by Abidin et al. (2024), who mentions that competition can be a motivational tool, as well as Fauzi (2023) and Brophy (2010), who assert that group game activities create a positive learning environment. Thus, although Quiz Case has additional elements such as the challenge of finding hidden questions, its impact on learning motivation is not much different compared to Matching Pairs, because both classes are given a game that can encourage student learning motivation well.

Research by Wibowo & Apriyanti (2024) supports this finding, which shows that the apply of educational games increases learning motivation higher than traditional methods (Di Serio et al., 2013). This is steady with Brophy's (2010) perspective, which suggests that challenge and fun in learning can increase student motivation. Although the motivation category is at a moderate level, the large effect shown by the Quiz Case game indicates that the effect requires reinforcement, either through a longer duration of intervention or a variety of learning activities. This finding supports Silver's (1997) research,

which emphasizes that creative challenge-based approaches increase student engagement, resulting in significant impact in the long run. The Quiz Case game also has a very strong influence in enhancing students' creative thinking ability. Group-based activities that involve resolving hidden problems not only encourage collaboration, but also train students to think flexibly and innovatively. Fatmawarni & Chania's (2020) research supports these findings, showing that game-based study techniques can enhance learning conclusions and higher-order thinking ability. Research by Montag-Smit & Maertz (2017) also supports this, showing that a learning model involving collaboration in solving mathematical problems and strengthening creativity through the steps of problem clarification, expression of opinion, evaluation, and implementation can significantly improve students' creative thinking ability. Along with the application of Quiz Case game in Kemp Model learning, it enhances the overall development of students' creative thinking skills.

The Spearman Correlation Test is employed to examine the connection between students' learning motivation and their creative thinking skills after the Quiz Case game is applied in the Kemp model learning design. The Spearman correlation test results, as seen in Table 15 below.

Table 15. N-Gain Calculation Results of Creative Thinking Ability Data

Variables	Correlation Coefficient (Spearman's rho)	Sig. (2-tailed)	N
Learning motivation > Thinking ability	0,756	0,000	33

The Spearman correlation test results demonstrate a significance value of 0.000 (<0.05) with a correlation coefficient of 0.756, indicating a powerful relationship between motivation to learn and the capability to think creatively. The significant and strong category relationship between academic motivation and the ability to think creatively shows that students who are highly motivated to learn inclined to be more creative in solving problems. This finding is consistent with the investigation of Anditiasari, et al. (2021), which declares that motivation affects students' mathematical creative thinking ability. Students who do not have motivation will experience low interest in learning, that affects their capacity for creative thinking. Research by Rahmawati, et al. (2021) and Sari & Ristontowi (2020) also showed a very high interrelation between learning motivation and students' creative thinking in mathematics. This indicates a positive influence between the two. This finding is consistent with Vygotsky's theory (1978), which declares that a supportive learning environment can influence students' cognitive development and creativity. High motivation makes students more enthusiastic about exploring creative solutions, as stated by Livne (2008), who mentioned that intrinsic motivation plays an crucial role in the development of creative thinking skills. In the context of this study, motivated students tend to be more willing to take risks and try new approaches in solving math problems.

CONCLUSION

Students' creative thinking ability and learning motivation were better improved by using Quiz Case game than Matching Pairs game in Kemp's learning design. Although both games, Quiz Case and Matching Pairs, have a positive affects on students' learning motivation in Kemp's learning design, Quiz Case is more effective in improving students' creative thinking ability. The use of Quiz Case proved to have a huge influence on learning motivation, although the difference with Matching Pairs was not significant. In addition, the group-based activities in Quiz Case encouraged collaboration, flexible and innovative thinking, which strengthened students' creative thinking skills. The findings suggest that, although learning motivation was at a moderate level, the effect of the Quiz Case game on improving students' creativity was significant, and this was influenced by the challenge and exploration elements present in the game. In the future, reinforcement through a longer intervention duration and a variety of learning activities could further strengthen the positive impact.

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