Journal of Instructional and Development Researches
Homepage: https://www.journal.iel-educationorg/index.php/JIDeR
e-ISSN: 2807-5471; p-ISSN: 2807-548X

JIDeR, Vol. 6, No. 5, October 2026
© 2026 Journal of Instructional and Development Researches
Page: 851-858

The Effect of Interactive *E-Learning* on 2D Animated Video Production Skills Among 11th-Grade Visual Communication Design Students at SMKN 2 Magetan

* **Irfansyah Bayu Putra Pamungkas, Andi Kristanto, Nur Annisa Fitri, Linda Mutiarini**
Surabaya State University, Surabaya, Indonesia
*Email: 26010905004@mhs.unesa.ac.id (Corresponding Author)

DOI: https://doi.org/10.53621/wqrtsd26

Article Information

Article History:
Received: October 3, 2026
Final Revision: November 1, 2026
Approved: November 2, 2026
Published: November 4, 2026

Keywords:
2D Animation Video;
Creative Skills;
Interactive E-Learning;
True Experiment;
Visual Communication Design.

ABSTRACT

The disparity in vocational high school students' creative thinking abilities and their inadequate usage of interactive digital learning resources served as the impetus for this study. The purpose of the study is to examine how interactive e-learning affects the creative abilities needed to create 2D animated videos in 11th-grade Visual Communication Design (VCD) students at SMKN 2 Magetan. A true experiment with a posttest-only control group design was the study methodology employed. A total of 64 students made up the sample size, which was split into an experimental class of 32 students who received the interactive e-learning therapy and a control class of 32 students. Classes were chosen using cluster sampling. Additionally, the content and instructional design of the e-learning program were judged to be very acceptable. With a Cronbach's Alpha of 0.646 for the experimental class and 0.673 for the control class, the evaluation tool was deemed to be reliable and validated with a Sig. value < 0.05. The Shapiro-Wilk test (p-value > 0.05) and Levene's test (p-value = 0.973) both verified that the creativity skills data were homogeneous and regularly distributed. The independent samples t-test produced a mean difference of 5.625, a p-value < 0.05, and a t-value of 2.660 at df = 62. The implementation of interactive e-learning has a positive and significant impact on the 2D animated video production creativity skills of 11th-grade Visual Communication Design (VCD) students at SMKN 2 Magetan, according to these results, which show that H0 is rejected and Ha is accepted.

INTRODUCTION

Vocational high school graduates are expected to be able to create new and competitive products for the job market in addition to possessing knowledge in the twenty-first century. The 4Cs critical thinking, teamwork, creativity, and communication are a concept of 21st-century abilities that correspond with these requirements (Setyaedhi, 2023). Among these four skills, vocational high school students' inventiveness plays a crucial role in product production. The capacity to produce novel, inventive, and useful ideas, concepts, or solutions is known as creativity (Wardana, 2023). According to a study conducted at SMK Batik 2 Surakarta with 23 twelfth-grade students enrolled in the Office Automation and Management program, 82.61% of students received a final test score in the "highly creative" category, validating this criteria (Pratiwi et al., 2024). But according to a different study conducted at a vocational high school in Sumedang Regency with 36 twelfth-grade students, their mathematics creative thinking abilities remained at 62%, placing them in the "not yet optimal" category (Sontany et al., 2024). In a comparable instance, 68 tenth-grade students at SMKN 1 Sidayu were able to raise their creative thinking abilities to 84.25% with the use of the Project-Based Learning (PjBL) model with the Science, Environment, Technology, and Society (SETS) approach (Hamdiyah et al., 2024). But according to a another study done at SMKN 4 Luwu with 60 students in the tenth grade, 30 of them or 56.67% were categorized as less creative (Yenti & Suaedi, 2022). These results suggest

that there is still a disparity in vocational high school students' capacity for creative thought among these different institutions.

The results of a pre-study survey utilizing a Likert-scale questionnaire on the creation of two-dimensional (2D) animated videos, which involved 11th-grade students in the Visual Communication Design (VCD) classes A, B, and C at SMKN 2 Magetan, provide evidence of this percentage gap. By definition, 2D animated video is an audiovisual medium based on digital technology that combines a series of two-dimensional moving images with sound to convert abstract messages or educational content into moving visual displays that are more tangible and captivating for viewers (Riadi, 2024). The majority of students' grades in all three classes were still below the Minimum Competency Criteria (MCC) of 76, which is why this subject was chosen for the study. The pre-study survey findings for the three classes, which revealed that students in Class XI VCD A had an average score of 65.67, students in Class XI VCD B had an average score of 71.35, and students in Class XI VCD C had an average score of 90.55, further supported this. Students in Class XI VCD A and B scored lower than the MCC, according to the pre-research survey findings from these three classes. The lack of variety in learning strategies and the predominance of assessment tools that still emphasize rote memorization are blamed for this low level of creative thinking skills. As a result, students are less accustomed to developing divergent thinking, which keeps their capacity to come up with original ideas and find creative solutions to problems low (Rahmania et al., 2023). Additionally, because lecture-based and teacher-centered methods continued to dominate the learning process, students' capacity for creative thought was poor (Kristanti et al., 2024). The findings of a pre-research survey, which took the form of observations of the direct learning process using a Likert-scale questionnaire, support both of these claims. It showed that students had little opportunity to review the material at home in order to create 2D animated videos, and the instructor in charge of the 2D animation course lacked access to both printed and digital teaching materials to carry out learning activities.

Implementing learning media with sophisticated and useful instructional materials for use in the learning process is necessary given the phenomena and problems mentioned above. To solve these contemporary issues, e-learning acts as an interactive learning tool. Interactive e-learning is a learning system that makes use of information and communication technology as the main medium in the learning process (Sari et al., 2023). This allows for flexible and creative access to materials, interactions, and assessments without being constrained by time or location. All of the students in the 11th-grade Visual Communication Design (VCD) class at SMKN 2 Magetan have smartphones that can access interactive e-learning efficiently, according to the results of a pre-research survey conducted as a needs analysis of the infrastructure for face-to-face learning using a questionnaire; every classroom has WiFi with a highly stable connection; and the school has two computer labs. These factors make the implementation of interactive e-learning in this study urgent. The instructor used interactive e-learning to give students tutorial-based teaching on creating 2D animated videos during the in-person learning process. The students may then immediately apply the knowledge they had learned by creating 2D animated videos on their own. This claim is also in line with constructivism's definition, which maintains that knowledge is a continual process of action inside the subject with the goal of comprehending how a specific state is generated rather than a state (Piaget, 2003).

The study's title, "The Effect of Interactive E-Learning on 2D Animated Video Production Skills Among 11th-Grade Visual Communication Design Students at SMKN 2 Magetan," is based on the explanation given above. The purpose of this study is to ascertain whether interactive e-learning has a substantial impact on the creative abilities of 11th-grade VCD students at SMKN 2 Magetan in 2D animated video production..

RESEARCH METHODOLOGY

This study used a posttest-only control group design, making it a real experiment. A reliable and efficient scientific technique for determining the causal linkages between particular variables is the idea of a real experiment (Gusti, 2023). Because it fits with the chosen learning objective for

students to be able to create a 2D animated film by selecting one of two categories this study was created as a posttest-only control group study. This claim is validated by comparing the final measurement findings between the experiment and control groups, which were chosen at random to minimize the risk of pretest bias on student responses, in order to assess the impact of the treatment on the dependent variable (Amin & Sumendap, 2022). Here is an illustration of the research design:

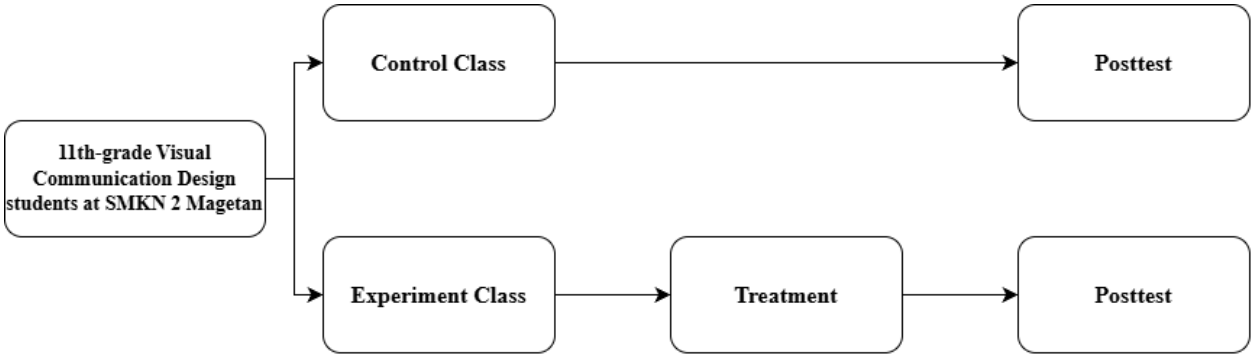


Figure 1. Posttest-Only Control Group Design

At SMKN 2 Magetan, 32 students from Class XI VCD A were assigned to the experimental group and 32 students from Class XI VCD B to the control group, as shown in Figure 1. The average pre-study survey ratings from both classes were homogeneous, and the class selection method included cluster sampling. A method for choosing a probability sample at random from an existing population that has been split up into distinct groups is known as cluster sampling (Subhaktiyasa, 2024). Additionally, two subject matter experts and one instructional design expert had to approve the interactive e-learning before it could be incorporated into the learning process. The interactive e-learning might be used in the experimental class if it was approved by all of these specialists. The final output project for this study required students in both classes to create a 2D animated video. The teacher evaluated these products using an assessment questionnaire, which also functioned as a method of gathering data for the study. A questionnaire is a data collecting tool that consists of a series of written questions or statements that are presented to respondents in order to gather information in line with the goals of the study (Rachmad et al., 2024). In order to get precise and impartial data, this study also included observation as a data collection method, which involved methodically seeing objects, phenomena, or behaviours in the field directly without intervention and then documenting them (Soesana et al., 2023).

IBM SPSS Statistics 22 software was then used to evaluate the gathered data. The following are the phases of data testing in this study:

1. Descriptive Analysis
   The data were divided into the following score categories for the descriptive analysis in this quantitative study (Akbar et al., 2024):

Table 1. Feasibility Percentage Categories

Score	Feasibility Category	Percentage
5	Highly Feasible	81%–100%
4	Worth It	61%–80%
3	Fairly Acceptable	41%–60%
2	Less Acceptable	21%–40%
1	Very Unsuitable	≤ 20%

2. Validity and Reliability Testing

This helps to assess the consistency of respondents' responses and make sure that every statement is in line with the measured indicators (Fitria & Wulndari, 2025). In terms of validity, the test is considered valid if Sig. < 0.05; in terms of reliability, the test is considered reliable if Sig. ≥ 0.60 (Alwa et al., 2026).

3. Normality Test
   Before doing a hypothesis test, this test seeks to ascertain whether the study data are normally distributed (Fajri et al., 2024). This test comes under the Shapiro-Wilk test group if there are fewer than fifty respondents, and the Kolmogorov-Smirnov test category if there are more than fifty (Ningsih & Fadillah, 2019). If the Sig. value is greater than 0.05, the data are deemed normally distributed; if the Sig. value is less than 0.05, they are deemed non-normally distributed (Edelmann, 2026).
4. Homogeneity Test
   The purpose of this test is to ascertain whether or not two or more sample data groups originate from populations with equal variances (Astini & Pasek, 2022). The homogeneity test's requirements are as follows: if the Sig. value is greater than 0.05, the data are deemed homogenous; if it is less than 0.05, the data are deemed non-homogeneous (Handayani et al., 2021).
5. Independent Samples t-Test
   The means of two independent or unpaired groups are compared using a parametric statistical test (Buchori et al., 2023). According to the independent samples t-test, Ha is accepted and H0 is denied if the Sig. value is less than 0.05 (Arisandi & Sukmana, 2024)..

RESULTS AND DISCUSSION

Results

1. **Descriptive Analysis**
   Subject matter experts and instructional designers must first authenticate interactive e-learning for the descriptive analysis of this study in the following ways:

Table 2. Subject Matter Expert Validation Results

Validator	Score	Total Score	Percentage	Category
Subject Matter Expert I	50	100	100%	Highly Qualified
Subject Matter Expert II	50			

Table 3. Results of Instructional Design Expert Validation

Validator	Score	Total Score	Percentage	Category
Instructional Design Expert	100	100	100%	Highly Feasible

The interactive e-learning tool is very appropriate for use in the experimental class's learning process, according to the findings in tables 2 and 3.

2. **Validity and Reliability Testing**
   Before the 2D animated video evaluation tool was utilized in the learning process in this study, its validity and reliability had to be examined. The findings were as follows:

Table 4. Results of the Validity Test for the 2D Animated Video Assessment Instrument in the Experimental Class

Question	Sig. (2-tailed)	Criteria	Remarks
Q1	0.021	Sig. < 0.05	Valid
Q2	0.001		
Q3	0.002		
Q4	0.004		
Q5	0.003		

Table 5. Results of the Validity Test for the 2D Animated Video Assessment Instrument in the Control Class

Question	Sig. (2-tailed)	Condition	Remarks
Q1	0.006	Sig. < 0.05	Valid
Q2	0.001		
Q3	0.006		
Q4	0.001		
Q5	0.008		

Table 6. Results of the Reliability Test for the 2D Animated Video Assessment Instrument in the Experimental and Control Classes

Class	Cronbach's Alpha	Requirements	Description
Experiment	0.646	Sig. > 0.60	Reliable
Control	0.673		

The 2D animated video evaluation tools for the experimental and control classes were determined to be valid and reliable based on the findings in Tables 4, 5, and 6.

3. **Normality Test**

The purpose of this test is to ascertain whether or not the replies from the 2D animated video assessment tools for the experimental and control classes are normally distributed. The test's findings are shown as follows:

Table 7. Results of the Normality Test for the Experimental and Control Classes

	Kolmogorov-Smirnov			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Posttest for the Experimental Class	0.157	32	0.043	0.936	32	0.056
Control Class Posttest	0.135	32	0.149	0.936	32	0.058

The Shapiro-Wilk test was used since each class has 32 students, and the posttest results from both courses indicated a normal distribution with a significance level (Sig.) > 0.05.

4. **Homogeneity Test**

Before doing a t-test, this test seeks to confirm that the variances of two or more groups are equal. The test's findings are displayed as follows:

Table 8. Homogeneity Test Results

Levene's Statistic	df1	df2	Sig.
0.001	1	62	0.973

According to Table 8's results, the data are deemed homogeneous and can move on to the t-test because Sig. > 0.05.

5. **Independent Samples t-Test**

The purpose of this last test is to compare the experimental and control groups' means, as indicated below:

Table 9. Results of the Independent Samples t-Test

	Levene's Test for Equality of Variances		t-Test for Equality of Means				
	F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Standard Error of the Difference

Equal variances assumed	0.001	0.973	2.660	62	0.010	5.625	2.115
Equal variances not assumed			2.660	61.996	0.010	5.625	2.115

Table 9's Sig. < 0.05 indicates that Ha is accepted and H0 is rejected. Thus, among 11th-grade Visual Communication Design students at SMKN 2 Magetan, interactive e-learning can significantly impact their creative abilities in creating 2D animated videos.

Discussion

The descriptive analysis's findings demonstrate that subject matter experts and instructional design specialists validated the interactive e-learning program before it was put into use. According to the evaluations of the experts, which included two Subject Matter Experts and one Instructional Design Expert, each gave it a total score of 100 with a success rate of 100%, indicating that it was very appropriate. These validation results attest to the interactive e-learning medium's great suitability for use in the experimental class's educational process.

The validity and reliability of the 2D animated video assessment tool were examined in both the experimental and control groups prior to its usage in the study. According to the validity test results, every item in the instrument from Q1 to Q5 was validated with a Sig in both the experimental and control groups. Value < 0.05 (2-tailed). Additionally, the experimental class's Cronbach's Alpha coefficient was 0.646, whereas the control class's was 0.673, according to the reliability test. The assessment tool was considered reliable since both values were higher than the 0.60 cutoff.

Normality and homogeneity tests were used as prerequisites for statistical analysis. The Shapiro-Wilk test was employed to determine normalcy because each class included thirty-two students. According to the test results, the experimental class's posttest data had a significance value of 0.056, whereas the control class's was 0.058. The student learning outcome data were determined to be normally distributed because both Sig. values were greater than 0.05. With df1 = 1, df2 = 62, and a Sig. value of 0.973, the homogeneity test produced a Levene's Statistic value of 0.001. The data variances were considered homogeneous because the Sig. value was more than 0.05, which satisfied the criteria for hypothesis testing.

An independent samples t-test was used in the analysis's last phase to compare the experimental and control classes' mean accomplishment scores. The test findings revealed a mean difference of 5.625, a significance level (two-tailed) of 0.010, and a t-value of 2.660 at df = 62. The hypothesis judgment is to reject H0 and accept Ha because the Sig. (2-tailed) value is less than 0.05. Therefore, it has been demonstrated that the use of interactive e-learning significantly enhances the creative abilities of 11th-grade Visual Communication Design (VCD) students at SMKN 2 Magetan in 2D animated video production.

CONCLUSION

After gaining a 100% validation rate from subject matter experts and instructional designers, interactive e-learning was judged to be highly suited for application in the learning process. With a Cronbach's Alpha coefficient of 0.646 in the experimental class and 0.673 in the control class, the assessment tool for 2D animated videos utilized in the study was determined to be valid (Sig. < 0.05) and reliable. Furthermore, all requirements for statistical analysis were satisfied, including homogeneous variances based on Levene's test and normally distributed data based on the Shapiro-Wilk test. A t-value of 2.660 with a significance level (Sig., two-tailed) < 0.05 and a mean difference of 5.625 were found based on the final analysis utilizing the independent samples t-test. It can be concluded that the use of interactive e-learning has a positive and

significant impact on enhancing the creativity skills in 2D animated video production among 11th-grade Visual Communication Design (VCD) students at SMKN 2 Magetan because the significance level is less than 0.05, rejecting H0 and accepting Ha.

REFERENCES

Akbar A., Buchori S, & Umar N. (2024). Penerapan Konseling Kelompok Melalui Teknik Bermain Peran untuk Menurunkan Perilaku Agresif Verbal Siswa di MAN Pinrang.

Alwa, S., Ismail, A., & Gumilar, S. (2026). Efektivitas Model Pembelajaran Problem Solving Berbantuan Simulasi Interaktif PhET dalam Meningkatkan Pemahaman Konsep Siswa pada Materi Gelombang Transversal. PENDIKDAS: Jurnal Pendidikan Sekolah Dasar, 7(1), 238–246. https://jurnal.habi.ac.id/index.php/Pendikdas/article/view/1452

Amin, S. P. M. S., & Sumendap, L. Y. S. (2022). Model Pembelajaran Kontemporer. Pusat Penerbitan LPPM. https://books.google.co.id/books?id=rBtyEAAAQBAJ

Arisandi, N. P. E., & Sukmana, I. W. I. Y. (2024). Media Pembelajaran Video Animasi IPAS Materi Mengenal Bumi Kita Terhadap Hasil Belajar Kognitif Siwa Kelas V Sekolah Dasar. Journal of Education Action Research, 8(3), 398-407.

Astini, K. P. A., & Pasek, G. W. (2022). Pengaruh literasi keuangan terhadap keputusan investasi (Studi eksperimen di Gugus V Mandara Giri Kec. Kubutambahan). JIMAT (Jurnal Ilmiah Mahasiswa Akuntansi) Undiksha, 13(03), 991-1002.

Buchori, A., & Nugroho, A. A. (2023). Efektivitas Model Problem Based Learning Berbantu Media M-Math Untuk Meningkatkan Kemampuan Berpikir Kritis Dan Kreatif Peserta Didik Sekolah Dasar. Didaktik: Jurnal Ilmiah PGSD STKIP Subang, 9(04), 1441-1456.

Edelmann, D. (2026). The Optimal Standardization Factor for the Variance of the Normal Distribution : A Historical Perspective and Recommendations for Practice. 123, 1–13.

Fajri, J. F., Anggraini, P., & Faizin, F. (2024). Peningkatan hasil belajar siswa melalui penerapan metode PQ4R pada materi teks diskusi bahasa Indonesia. 10(1), 235–242.

Fitria, S., & Wulndari, M. N. (2025). Analisis Statistik : Uji Validitas Reliabilitas Instrumen Indeks Efektivitas Tujuh Standar Pendidikan Akademi Kepolisian (IEPA). 2, 1–13.

Gusti, G. P. (2023). Metode Penelitian Eksperimen untuk Pemula: Edisi Pertama. wawasan Ilmu.

Hamdiyah, H., Bachri, B. S., & Arianto, F. (2024). Pengaruh Project Based Learning dengan Pendekatan Science, Enviroment, Technology and Society (SETS) Terhadap Keterampilan Berpikir Kreatif Siswa SMK. Jurnal Studi Guru dan Pembelajaran, 7(3), 1166–1177. https://e-journal.my.id/jsgp/article/view/4784

Handayani, E., Fatirul, AN, & Rusmawati, RD (2021). Pengaruh metode praktik langsung dengan variasi permainan terhadap motivasi dan prestrasi belajar teknologi perumahan. Jurnal Inovasi Teknologi Pendidikan , 7 (2), 188–195. https://doi.org/10.21831/jitp.v7i2.35816

Kristanti, E., Hakim, L., Kasmiruddin., Irwandi., & Wahyudi, A. (2024). Strategi Pembelajaran Inovatif untuk Pendidikan Abad 21. CV. Angkasa Media Literasi. https://books.google.com/books/about/STRATEGI_PEMBELAJARAN_INOVATIF_UNTUK_PEN.html?id=lj39EQAAQBAJ

Ningsih, D. A., & Fadillah, L. (2019). Efektivitas pembelajaran di luar kelas dalam pembentukan sikap percaya diri peserta didik pada mata pelajaran IPA di kelas V SDN 190 Cenning. Jurnal Pendidikan Dasar Dan Keguruan, 4(2), 1-12.

Piaget, J. (2003). The Principles of Genetic Epistemology. Routledge. https://books.google.com/books/about/The_Principles_of_Genetic_Epistemology.html?id=rr-avb4T8ksC

Pratiwi, D. S., Murtini, W., & Susantiningrum. (2024). Peningkatan kemampuan berpikir kreatif melalui implementasi model pembelajaran two stay two stray siswa SMK Batik 2 Surakarta. JIKAP (Jurnal Informasi dan Komunikasi Administrasi Perkantoran), 8(3), 329–338. https://jurnal.uns.ac.id/JIKAP/article/view/77598

Rachmad, YE, Rahman, A., Judijanto, L., Wulandari, D., Rahmawati, FA, Mukhlis, IR, Purba, AE, Nopiah, R., & Fanani, AF (2024). Integrasi metode kuantitatif dan kualitatif: Panduan praktis penelitian campuran. Pustaka Hijau Indonesia.

Rahmaniah, N., Oktaviani, A. M., Arifin, F., Maulana, G., Triana, H., Serepinah, M., Misyanto., Abustang, P. B., Manurung, A. S., Wafiqni, N., Waluyo., Wijaya, S., Widiawati., & Patras, Y. E. (2023). Berpikir Kritis dan Kreatif: Teori dan Implementasi Praktis dalam Pembelajaran. Publica Indonesia Utama. https://books.google.co.id/books?id=klvoEAAAQBAJ

Riadi, B. (2024). Media Animasi Berbasis Artificial Intelegence: Teori & Praktik. Google Books. https://books.google.com/books/about/Media_Animasi_Berbasis_Artificial_Intele.html?hl=id&id=k7gfEQAAQBAJ

Sari, N. Y., Gusliana, E., Puspitasari, T., & Muslihudin, M. (2023). E-LEARNING SEBAGAI MEDIA PEMBELAJARAN INOVATIF. Google Books. https://books.google.co.id/books?id=AIHJEAAAQBAJ

Setyaedhi, H. S. (2023b). Gamification of 2D and 3D Animation Subjects to Improve Learning Outcomes. Journal of Education Technology, 7(3), 532–542. https://doi.org/10.23887/jet.v7i3.672

Soesana, A., Subakti, H., Karwanto, K., Fitri, A., Kuswandi, S., Sastri, L., ... & Lestari, H. (2023). Metodologi penelitian kuantitatif.

Sontany, T., Yuliawati, L., & Ratnasari, S. A. (2024). Analisis Kemampuan Berpikir Kreatif Matematis Siswa SMK Pada Soal Statistika. J-KIP (Jurnal Keguruan dan Ilmu Pendidikan), 5(3), 826–835. https://jurnal.unigal.ac.id/J-KIP/article/view/16359

Subhaktiyasa, P. G. (2024). Menentukan Populasi dan Sampel: Pendekatan Metodologi Penelitian Kuantitatif dan Kualitatif. Jurnal Ilmiah Profesi Pendidikan, 9(4), 2721–2731.

Wardana, M. A. (2023). Kreativitas Desain Inovasi. Intelektual Manifes Media. https://books.google.co.id/books?id=99zmEAAAQBAJ

Yenti, Y., & Suaedi, S. (2022). Pengaruh kemampuan pemecahan masalah dan kecerdasan emosional terhadap kemampuan berpikir kreatif siswa. Proximal: Jurnal Penelitian Matematika Dan Pendidikan Matematika, 5(1), 91-97.