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Creative Physics Problem Solving based on Local Culture to Improve Creative Thinking and Problem-Solving Skills

Febrina Siska Widyaningtyas* [1], **Mundilarto**[2], **Heru Kuswanto**[3], **Arif Rahman Aththibby**[4], **Ricka Tesi Muskania**[5], **Friska Octavia Rosa**[6], **Puardmi Damayanti**[7], **Bagus Endri Yanto**[8]

[1-3]Yogyakarta State University, Indonesia.

[2]Yogyakarta State University, Indonesia.

[3]Yogyakarta State University, Indonesia

[4, 6-8]Universitas Muhammadiyah Metro, Lampung, Indonesia

[5]Institut Agama Islam Negeri Pontianak, Indonesia

Abstract

Integrating local culture in physics lessons may encourage the development of creative thinking and problem-solving skills. This research aims at examining the effectiveness of the implementation of the creative physics problem solving model based on the local culture of Yaaqowiyu (Cripics-Qu) to improve student's creative thinking and problem-solving skills. This research employed a quasi experimental non-equivalent control group design. The experimental class was given treatment using the Cripics-Qu model, while the control class utilized the conventional learning model. The research samples were 120 students of grade X. The sampling technique employed was a cluster sampling technique. The data were collected using tests instrument. The instrument validity was determined based on the Aiken index while instrument reliability was measured based on Cronbach's alpha coefficient. The data were analyzed by using manova and quantitative descriptive. The results of this research indicate that there is a significant difference on the average value of the creative thinking and problem-solving skills between the experimental class and the control class (sig = .00 < α). The conclusion of this research shows that the use of the Cripics-Qu model in physics learning is very effective in improving students' creative thinking and problem-solving skills.

Keywords: Achievement,creative physics problem-solving model, creative thinking , problem-solving, yaaqowiyu local culture

Introduction

Conceptual and Theoretical Framework

The advancement of science and technology that keeps increasing in the era of the industrial revolution 4.0 has encouraged the educational sectors to innovate in order to be able face the rapid technological developments. The educational process must utilize technological advances in learning to improve learning outcomes (Hermino & Arifin, 2020). e 21st century learning require students to have skills, ability and competitiveness in order to realize an education system that is appropriate and in line with global demands.

e 21st century education has a paradigm in emphasizing the ability of students to think creatively, connect science to reality, master technology, communicate and collaborate. (Dakhi, Jama, & Irfan, 2020). is is in line with Daker et al., (2019) who state that the ability to think creatively is very important to be developed to encourage advances. In addition, Ernaeni and Gunawan, (2019) states that students' ability to think creatively is still low since learning activities are dominated by teachers.

e teachers deliver the subject matter without encouraging student's interaction and enhance active participation to express their ideas and o er less opportunities for the students to analyze the topics. Sugiyanto, Masykuri, & Muzzazinah, (2018) explain that the average creative thinking skill of high school students in Klaten Regency which belong to the hi [redacted] category reach 28.66% and the low category reach 13.71%. ese data indicate that the creative thinking skills of high school students in Klaten regency are still low.

In order to create sophisticated learning in today's era, teachers must be able to act as facilitators who provide great opportunity for students to express themselves in the learning process (Kim, et al., 2015; Eom, Youn, & Kim, 2016). e development of students' creative thinking becomes a challenge for teachers (Bich, et al., 2017).

e ability to solve problems is badly needed by students in facing the 21st century. Creative thinking is required as a [redacted]

Corresponding Author e-mail: ebrinasiska.2017@student.uny.ac.id

https://orcid.org/ 0000-0002-5296-6777

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basis for enhancing the progress of educational achievement that can provide solutions to overcome the complex problems (Mumford, Medeiros, & Partlow, 2013). Problem solving should be based on the ability of scientific reasoning to formulate conclusions appropriately (Yanto, Subali, & Suyanto, 2019). Thus, students must be able to apply 21st century skills actively, have initiative and able to collaborate effectively (Ahmad, et al., 2016).

The learning process of physics is expected to form a scientific conception so that the mastery of physics concepts encourages deep thinking, problem solving and critical thinking. The learning process which is based on local culture and local wisdom can help students acquire the targeted learning competencies. Through physics learning, students will acquire problem-solving skills that are relevant to their daily lives (Ardan, 2016).

Related Research

The results of research conducted by Sasmitatias and Kuswanto (2018) state that learning kits such as materials, lesson plans, and learning media which accommodate local culture are considered effective in improving students' analytical skills. This means that local culture-based learning kits affects students' cognitive analysis skills.

Culture is rarely used in learning except in arts and culture subjects. This becomes the duty of teachers to make learning innovations by utilizing local culture especially in physics learning (Harahap & Abidin, 2019). Promoting local culture in learning is expected to create a contextual and meaningful physics learning process for students (Viana, Wilujeng, & Kuswanto, 2019).

Work and energy is one of the topics for physics learning in Senior High School which can be found in everyday life. is topic should be utilized by teachers to motivate students to preserve and develop local culture so that they are able to apply their understanding on the concept of work and energy in the real life, especially the local culture of "*Yaaqowiyu*" ceremony in Klaten regency, Central Java, Indonesia.

The previous research on "*Yaaqowiyu*" culture highlighted the meaning of the *Yaaqowiyu* ritual (Mona & Ikhsanudin, 2014). Also, the research investigated the relation between religion and local culture of *Yaaqowiyu* (Eva, 2015). There are many things that can be developed from the local culture of Yaaqowiyu both for the learning process and values of *Yaaqowiyu*. However, there has been no research that integrates the local culture of *Yaaqowiyu* in the classroom learning especially in physics lessons. Yaaqowiyu as a unique traditional ceremony still exists in Jatinom village, Klaten Regency, Central Java, Indonesia.

Physics learning based on local culture can foster student involvement in the classroom. rough local culture-based physics learning, it is hoped that learning environment becomes joyful since the students can learn physics from the local culture they nd in the everyday life therefore they will be enthusiastic in learning physics. Physics learning based on local culture is a learning model that integrates culture in the learning process. Culture is used as a learning medium to encourage students to create meaning, promote understanding, and grasp the implied meaning from the information they receive.

Based on the preliminary study, the student's low achievement in physics learning was due to inappropriate learning models (Istiyono, Mardapi, & Suparno, 2014). is is in accordance with the view of Mariati et al., (2017) stating that physics learning in general faces a problem, namely physics learning activities still employ traditional methods or learning is not contextual.

According to Sagita and Sani (2019), an increase in student learning outcomes which re ects an increase in the quality of education can be realized by implementing the appropriate learning model. One of the learning models that is relevant with the scienti c approach and encourages the student's ability to think creatively and solve problems is *Creative Problem Solving* (CPS) learning model.

According to Jankowska, Gajda, & Karwowski (2019), the development of creative thinking skills is influenced by many factors. As an educator, teachers must be able to develop students' thinking skills by facilitating students to become good thinkers and problem solvers. erefore, physics learning at schools should be oriented towards problem solving activities. e importance of problem-solving ability to be examined is admitted by several researchers (Afriansyah, 2016; Yusri, 2013; Dewi & Minarti, 2018).

Future life requires innovative problem solutions. e ability to solve problems is very important in science learning especially in physics (Docktor, Strand, Mestre, & Ross, 2015; Mason & Singh, 2016). In fact, the ability of high school students to solve physics problems is still low (Azizah, Yuliati, & Latifah, 2015). Sagita, Medriati, & Purwanto, (2018) states that the application of the CPS model can improve students' physics learning activities and problem-solving abilities. In addition, the CPS learning model can improve students' creative thinking skills (Sari, Ikhsan, & Abidin, 2018). is research focuses on the application of the CPS model which intends to increase creative thinking skills and physics problem solving.

ere are several studies on CPS that have been conducted by previous researchers. e CPS learning model focuses on the learning process improvement and problems solving skill development, and student creativity reinforcement (Dewi, Sunarno, & Supriyanto, 2019). In addition, CPS is able to encourage students to solve a problem using systematic techniques in organizing creative ideas (Dongoran Said, & Detriani, 2019).

Based on the previous studies, this research intends to fill the gap or overcome the shortcomings of previous research by developing local culture-based CPS learning model in physics learning since the nature of physics learning contents, basically derive from the natural environment found in everyday life because physics studies natural phenomena. Therefore, in this research, the local culture-based CPS learning model is developed to improve students' creative thinking skills and physics problem solving ability.

In this research, the developed learning model contains practicum activities. However, because of the Covid-19 pandemic, they cannot be implemented in schools because students do not meet face to face at schools. Due to this pandemic restriction, this research employs a combination of face-to-face learning in the classroom and online learning which is carried out using WhatsApp Group (WAG) application. application with The WhatsApp group starts with the teacher first first make a plan daily lessons arranged in

home study sheet form,after that the teacher will communicate to parents that learning carried out online then the teacher will send the file students. This study sheet from home contains worksheets that arewill work for 1 week where is the implementation of online learning done 2 times in 1 week.

The WhatsApp application was chosen because learning instruction can be realized up-to-date and real-time. Moreover, communication can be performed smoothly. Although teachers and students do not meet face-to-face, learning and discussion can be done online to improve the quality of communication and learning between teachers and students (Tikno, 2017). Thus, physics learning is not limited by place and time (offering time and place flexibility). The use of WhatsApp features in learning activities can increase the effectiveness of learning (Lillian, 2012), information can be accessed at any time and is flexible (Bower, Dalgarno, Kennedy, Lee, & Kenney, 2015).

Research questions of the study

Based on the background and problems described above, this research focuses on the implementation of creative physics problem solving bsed on local culture of *"yaaqowiyu" (cripics-qu)* to improve creative thinking and problem-solving skills. Through the implementation of a creative physics problem solving model based on the local culture of "Yaaqowiyu", teachers must understand science content and know how to provide an understanding of these various concepts by applying technology. Thus, the research question is how the effectiveness of the implementation of the creative physics problem solving model based on the local culture of *Yaaqowiyu* to improve creative thinking and problems solving ability.

Method of Research

Research model

This research aims at investigating the effectiveness of the implementation of the creative physics problem solving model based on the local culture of Yaaqowiyu to improve the creative thinking and problem-solving ability. This research utilizes a quasi experimental non-equivalent control group design to compare the increase in creative thinking and problem- solving skills between the experimental class and the control class. The experimental class was given a treatment using a creative physics problem solving model based on the local culture of Yaaqowiyu, while the control class was given treatment by applying the conventional learning model. This research was conducted for two months, from November to December 2021. The use of the Cripics-Qu model has some stages of teaching and learning, the syntax is presented in table 1.

Participants

Population in this research consisted of all high school students in Klaten Regency, Indonesia. The research samples were 120 students of grade X of Public Senior High Schools in Klaten Regency, Indonesia. The sampling employed a cluster sampling technique. Because the samples were large in number, the sampling was based on the determined groups (Sugiyono, 2015). The experimental group consisted of 2 classes with 30 students for each in the X1 and X2 classes at SMA 1, and the control group consisting of 2 classes with 30 students respectively in the X3 and X4 classes at State Senior High School 2.

Data collection tools

Data collection in this study consisted of Data were collected by using tests for measuring creative thinking and problem solving skills. The tests are in the form of essay tests. The questions in the tests for measuring creative thinking skills are arranged based on the indicators for each component with a rating scale of 0-5. The criteria for determining the rating scale include 0 (if there is no correct answer), 1 (if there is 1 correct answer), 2 (if there are 2 correct answers), 3 (if there are 3 correct answers), 4 (if there are 4 the correct answers), and 5 (if all answers are correct). Meanwhile, the test questions for assessing problem solving abilities are arranged based on the indicators for each component with a rating scale of 0-5.

The categories for the rating scale include 0 (if there is no correct answer), 1 (if students can only identify the given quantities correctly), 2 (if students can formulate the problems correctly), 3 (if students can choose an appropriate and correct formula), 4 (if students can put the given quantities into the formula correctly), and 5 (if students can calculate and conclude correctly). These two tests will be given to students

Table 1. Syntax of Creative Physics Problem Solving Model Based on the Local Culture

Teaching and Learning Stages	*Activities*	*Interaction*
Orientation	Formulating the learning visions or objectives to be achieved. Collaboration between teachers and students are carried out to find a common vision or goal.	Face to face
Collaboration	The teachers guide the students to make What's Up Group (WAG) together. Furthermore, students access the learning materials presented in the handouts available on the WAG.	Online
Eksploration of the real problems	Finding facts by allowing students to gather information. Then, students identify the most appropriate or relevant facts. The teacher provides a source of information in the form of a video links about Yaaqowiyu culture sent to the WAG that can be accessed by students to find as many facts as possible.	Online
Experiment	The teacher gives assignments to students presented in the worksheets which can be accessed through the WAG. The student's worksheets contain student activities to find problems, formulate hypotheses	Online
Communication	The teachers guide students to present the results of the experiments that have been carried out at the experimental	Online
Reflection	The teacher guides students to jointly conduct classical discussions to accept each other's best final conclusions.	Face to face

Table 2. Creative Thinking Ability Test Grids

Aspects	*Sub-Aspects*	*Indicators*	*Cognitive Domain*
Fluency	Formulating answers	Having a plenty of ideas for solving problems	C5
	Expressing ideas	Expressing ideas fluently	C6
	Completing many assignments	Being able to complete many assignments well	C5
Flexibility	Interpreting	Producing many different ideas to solve problems	C5
	Finding alternative solutions	Solving problems using various alternative solutions	C6
Originality	Planning new things	Solving new and different problems from other people	C6
Elaboration	Solving problems using detailed procedures	Looking for a thorough meaning to a problem with detailed procedures	C6
Doing experiment and testing ideas	Testing ideas	Conducting experiments to test ideas	C6
Being sensitive to problems	Being sensitive to what is happening on the surroundings	Showing empathy for the existing problems	C6

before learning (pretest) and after learning (posttest). The table 2 below presents the test grid that will be used to obtain data on the student's creative thinking ability while table 3 presents the test grid for measuring the problem solving skills.

These research instruments have been valid since they have been validated by three educational experts. The validity analysis is used to determine whether the instrument items are valid or not. To prove the validity of the instrument, the researchers assess the expert agreement index based on the Aiken index (V). The results of this assessment are presented in Table 4.

Instrument reliability is determined based on Cronbach's alpha coefficient. The reliability of the problem solving test instrument was .87, while the reliability of the creative thinking skill test instrument is .83. Thus, reliability value of the instrument was in a high category (Taber, 2018).

Data analysis

The results of this research were analyzed using quantitative descriptive method to determine the effectiveness of the Cripics-Qu model in improving creative thinking and problem solving skills. The test used was the Manova test at

Table 3. Problem Solving Ability Test Grid

Aspects	*Indicators*
Defining Problems	Determining the types of problem
	Mentioning all the information provided
	Completing the problem sketch
	Stating the final goals that must be met from the existing problems
Exploring Problems	Describing the condition of the objects
	Describing free diagrams
	Making assumptions that must be met
Solving Problems using a well-planned procedure	Describing given information
	Specifying the information to be determined
	Constructing the structure of equations from theories, principles, and the appropriate physics laws
	Producing the right solutions
Evaluating and Reflecting on Problem Solving	Making conclusions based on solutions completed with appropriate theories
	Evaluating statements based on the theories, principles, and laws of physics

Table 4. The results of the Aiken Index Coefficient of Instrument Validity

Instruments	*V*	*Validity*
Creative thinking skills	.82	Valid
Problem solving skills	.77	Valid

a significance level of .05. If the probability < the specified level of significance, there will be an effect of the application of the Cripics-Qu model in improving creative thinking and problem solving skills. Several prerequisites for Manova testing which include normality test, homogeneity test, and covariance matrix test have been met.

Results and Discussion

The effectiveness of the implementation of the Cripics-Qu model

The effectiveness of the implementation of the Cripics-Qu model is determined based on the impact of applying the model on increasing creative thinking and problem-solving skills. The description of students' creative thinking and problem-solving skills before and after treatment is presented in the following Table 5. The difference in the average score between the experimental and the control class presented on table 6 shows that the average creative thinking ability in the experimental class is 88.93 while the problem-solving skill is 87.93. Both are higher than the average value in the control class.

The Cripics-Qu model is declared to be effective if it can improve the students' creative thinking and physics problem-solving skills. This is carried out by performing a Manove statistical analysis. The initial analysis step as a prerequisite for the Manova analysis is normality and homogeneity tests. Data on creative thinking and problem-solving abilities are normally distributed if the value of sig. > .05. The results of the normality test can be seen in Table 6. While the homogeneity test can be carried out using the Box's M of equality of covariance test with the SPSS program where the output can be seen in Table 7 and the Lavene test in Table 8.

Based on Table 6, the variables of creative thinking and problem-solving skills obtained sig. > .05. It indicates that the data on students' creative thinking and problem-solving abilities are normally distributed.

Based on Table 7, the significance value is > .05. This means that the covariance matrices of the dependent variable are the same so that the population has a homogeneous variance matrix.

The results of the Lavene test in Table 8 show that the significant value of creative thinking skills and problem-solving abilities is > .05. This means that the variance of each pair of groups is homogeneous. This stage of the analysis test utilizes the Manova test which can be viewed from the output value of Hotelling's Trace in the value column and its significance value. The results of this test obtained a value of 6.682 with a significance level of .000.

This shows that there is a significant difference in creative thinking skills and problem-solving abilities between students who take lessons employing the Cripics-Qu model and students who take lessons utilizing the question-answer practising model. This output is presented in Table 9:

The contribution of the Cripics-Qu model to creative thinking and problem-solving skills (see Table 9) can be seen from the value of partial eta squared. The contribution of the Cripics-Qu model to creative thinking and problem-solving skills is .870 or 87%. The next step is to test the analysis of the effect of applying the Cripics-Qu model and the question-answer practising on each creative thinking and problem-solving ability.

The results of this test show that judging from the mean value, the Cripics-Qu model offers a better influence on creative thinking ability and problem-solving skills than the question-answer practising model. Thus, it can be said that the Cripics-Qu model is more effective than the question-answer practising model. The output of this test is presented in Table 10.

Based on the findings of this research, the implementation of the Cripics-Qu model in the experimental class is more effective for improving creative thinking and problem solving abilities than the conventional model in the control class. Based on the research data, it shows that sig = .00 < .05, so there are significant differences in student learning outcomes who get the implementation of the creative physics problem solving model based on the local culture of Yaaqowiyu at each level of creative thinking skills and problem solving abilities. The results of the research reveal the effectiveness of the Cripics-Qu model.

Table 5. The comparison of Average Value of Creative Thinking and Problem Solving Skills

	Group	*Mean*	*Std. Deviation*	*N*
Creative thinking	control	67.7333	5.79496	60
	experimental	88.9333	2.44855	60
Problem solving	control	66.3000	4.84341	60
	experimental	87.9333	2.19613	60

Table 6. Normality Test Results

Tests of normality

		Kolmogorov-Smirnova			*Shapiro-Wilk*		
	Class	*Statistic*	*df*	*Sig.*	*Statistic*	*df*	*Sig.*
Pretest	Experiment	.193	60	.235	.918	60	.243
	Control	.217	60	.115	.916	60	.172
Posttest	Experiment	.138	60	.434	.949	60	.129
	Control	.184	60	.312	.944	60	.217

a. Lilliefors Significance Correction

Table 7. Homogenity Test Results

Pretest		*Posttest*	
Box's test of equality of covariance matricesa			
Box's M	.952	Box's M	.493
F	.313	F	.162
df1	3	df1	3
df2	5703120.000	df2	5703120.000
Sig.	.816	Sig.	.922

Table 8. Levene test results

Pretest					*Posttest*			
Levene's test of equality of error variancesa								
	F	*df1*	*df2*	*Sig.*	*F*	*df1*	*df2*	*Sig.*
Creative Thinking Skill	1.658	1	178	.200	2.212	1	178	.139
Problem solving skill	.500	1	178	.480	.387	1	178	.534
Tests the null hypothesis								

a. Design: Intercept + Class

Table 9. Hotelling's Trace Test Output

Multivariate testsa					
Effects		*Value*	*F*	*Sig.*	*Partial Eta Squared*
Intercept	Pillai's Trace	.999	88431	.000	.999
	Wilks' Lambda	.001	88431.448b	.000	.999
	Hotelling's Trace	999.225	88431.448b	.000	.999
	Roy's Largest Root	999.225	88431.448b	.000	.999
Class	Pillai's Trace	.870	591.321b	.000	.870
	Wilks' Lambda	.130	591.321b	.000	.870
	Hotelling's Trace	6.682	591.321b	.000	.870
	Roy's Largest Root	6.682	591.321b	.000	.870

a. Design: Intercept + Class

b. Exact statistic

c. Computed using alpha = .05

Table 10. Output of Inter-Subject Effect Test

Class					
				95% Confidence Interval	
Dependent Variables	*Class*	*Mean*	*Std. Error*	*Lower Bound*	*Upper Bound*
Creative Thinking Skill	Experiment	88.778	.314	88.159	89.397
	Control	75.311	.314	74.692	75.930
Problem solving skill	Experiment	88.533	.323	87.896	89.170
	Control	75.200	.323	74.563	75.837

This is because teachers are able to apply the principles of the creative problem solving model as a method for solving problems creatively (Setyarini, Supardi, & Sudibyo, 2021). In line with Sagita et al., (2018), the Creative Problem Solving model is centered on creative problem solving and is expected to enable students to develop their ability to solve physics-related problems in everyday life.

Implementing CPS as a means to improve students' thinking skills may include creative and critical thinking (Tseng, Chang, Lou, & Hsu, 2013). Dongoran et al., (2019) state that systematic techniques in organizing creative ideas can be used to solve a problem. The learning strategy may focus on the learning process improvement and problem solving skill development, and student creativity reinforcement which is oriented towards developing student's HOTS (Dewi et al., 2019).

The implementation of the Cripics-Qu model utilizes the WhatsApp Group (WAG) media also affects the learning effectiveness. Communication can be carried out easily although it cannot be done face-to-face. In addition, learning discussion forums can be facilitated via online to improve the quality of communication and learning between teachers and students (Tikno, 2017).

The use of WhatsApp in learning activities can increase the effectiveness of learning (Lillian, 2012); enables students to access information at any time and offers flexibility (Bower et al., 2015). The use of WAG is enjoyed by adolescents and students (Chung, Subramaniam, & Dass, 2020) and is considered capable of improving critical thinking skills in problem solving (Kartikawati & Pratama, 2017).

This is also supported by research conducted by Chang & Chen, (2015) stating that the use of WhatsApp application can increase the student's motivation in physics learning, and accelerate the formation of study groups in building and developing science. Moreover, research conducted by Pustikayasa (2019) shows that WhatsApp Group can be used to support learning activities in the classroom. When teachers cannot attend the class, teachers can deliver the materials or assignments and discuss them without reducing the quality of learning outcomes. It can also be used during the current Covid-19 pandemic situation (Napratilora, Lisa, & Bangsawan, 2020; Azzahra 2020; Vlachopoulos, 2020).

Based on the research results, the implementation of the Cripics-Qu model can improve the students' creative thinking and problem solving skills. The activities performed by teachers and students are carried out in accordance with the procedures for implementing the learning (Widiana, Tegeh, & Artanayasa, 2020).

According to Hu (2017), learning procedures that focus on the creative learning process as integrated learning promotes collaboration between students and teachers where students and teachers are actively involved in planning, implementing, and evaluating learning. The teacher is able to facilitate students in developing their creative thinking skills through active participation of students in problem solving activities.

The success of the learning outcomes attainment using the Cripics-Qu model is supported by several research results that integrating local culture in learning offers benefits to students, teachers and the community. Based on the existing research, the integration of local culture in learning is useful to increase the students' understanding on the local culture.

In addition, students will gain understanding on the subject matter being taught and local cultural values. Also, it improves their interests and understanding on the taught concepts (Kusdianto, 2019). The concept of local culture-based learning can be implemented in the classroom by integrating a critical pedagogical model that is in accordance with the principles of multicultural education (Wintergerst & McVeigh, 2011). Local culture-based learning is considered to have a positive impact, which include developing understanding and character values of students and increase the student's motivation.

Integrating the local culture of Yaaqowiyu is an effort to realize meaningful learning (Suja, 2010). The meaningful learning can be carried out by promoting student's active participation and relating the materials to the surrounding environment or local culture. The initial step of integrating Yaaqowiyu's local culture in learning is identifying the relevant local cultures to be used as learning resources.

The relevant local culture is included in the lesson planning and implemented during the learning process and learning evaluation. As a learning model, the basic conception of the Cripics-Qu model can be viewed from the learning approaches and strategies which are used as reference. The Cripics-Qu model refers to the views of Joyce, Weil, & Calhoun, (2015) that a learning model has five main components which include syntax, social systems, reaction principles, support systems, and instructional impacts and side impacts.

Based on the research findings, the Cripics-Qu model in the experimental class is more effective for improving creative thinking and problem-solving skills than the conventional model in the control class. This is because the use Creative Physics Problem Solving model offers some advantages such as training the students to design an invention, and stimulate the development of student's critical thinking in solving the problems. Meanwhile, the Creative Physics Problem Solving learning model has some weaknesses where some topics are very difficult to taught using the Creative Physics Problem Solving learning model and it requires a longer time allocation than other learning models.

Conclusion

Based on the research findings, the Cripics-Qu model becomes an effective and efficient tool in learning so that there is a significant difference in the average value of the creative thinking and problem solving ability based on the differences between the two learning models used. The application of the Cripics-Qu learning model in the experimental class is more effective for improving creative thinking and problem solving skills than the conventional model in the control class. The Cripics-Qu model teaches students to solve problems by thinking critically and creatively. Also, it can increase understanding in the integration of science, technology, pedagogy, and knowledge. The research findings can be used as a reference for teachers in developing contextual physics learning based on local culture which can improve teachers' professional abilities. Also, the findings may reveal the aspects that need to be improved in terms of targeted competencies in physics learning

Recomendation

The recommendation of this research is that physics teachers can apply the Cripics-Qu learning model to improve creative thinking and problem solving skills. In addition, it can increase understanding in the integration of science, technology, pedagogy, and knowledge. The results of this study can be used as a reference for teachers in developing contextual physics learning based on local culture that can improve the professional abilities of teachers.

References

Afriansyah, E. A. (2016). Investigasi kemampuan problem solving dan problem posing matematis mahasiswa via pendekatan realistic [Investigating students' problem solving ability and problem posing students via realistic approach]. Journal of Mathematics Education /Jurnal Pendidikan Matematika, 5(3), 269–280.

Ahmad, M., Badusah, J., Mansor, Z.A., Karim, A. A., Khalid, F., Daud, M. Y., Din, R., & Zulkefle, F. D. (2016). The application of 21st century ict literacy model among teacher trainees. Turkish Online Journal of Educational Technology, 15(3), 151-161.

Ardan, A. S. (2016). The development of biology teaching material based on the local wisdom of timorese to improve students knowledge and attitude of environment in caring the preservation of environment. International Journal of Higher Education, 5(3), 190-200.

Azizah, R., Yuliati, L., & Latifah, E. (2015). Kesulitan pemecahan masalah fisika pada siswa sma[Difficulty solving physics problems in high school students]. Journal of Physics Research and Applications/Jurnal Penelitian fisika dan Aplikasinya, 5(2), 44-50. http://doi.org/10.26740/jpfa.v5n2.p44-50

Azzahra, N. F. (2020). Policy brief addressing distance learning barriers in indonesia amid the covid-19 pandemic. CIPS Indonesia.

Bich, T., Tran, L., Nhat, T., Mackenzie, S. V., & Kim, L. (2017). Developing assessment criteria of a lesson for creativity to promote teaching for creativity. Thinking Skills and Creativity. 25, 10-26. https://doi.org/10.1016/j.tsc.2017.05.006

Bower, M., Dalgarno, B., Kennedy, G. E., Lee, M. J., & Kenney, J. (2015). Design and implementation factors in blended synchronous learning environments: Outcomes from a cross-case analysis. Computers and Education, 86, 1-17.

Chang, N. C., & Chen, H. H. (2015). A motivational analysis of the ARCS model for information literacy courses in a blended learning environment. Libri, 65(2), 129-142. https://doi.org/10.1515/libri-2015-0010

Daker, R. J., Cortes, R. A., Lyons, I. M., & Green, A. E. (2019). Creativity anxiety: Evidence for anxiety that is specific to creative thinking, from stem to the arts. Journal of Experimental Psychology: General, 149(1), 42–57. https://doi.org/10.1037/xge0000630

Dakhi, O., Jama, J., & Irfan, D. (2020). Blended Learning: A 21st Century learning model at college. International Journal of Multi Science, 1(08), 50-65.

Dewi, S. N., & Minarti, E. D. (2018). Hubungan antara self-confidence terhadap matematika dengan kemampuan pemecahan masalah matematik siswa pada materi lingkaran[The relationship between self-confidence in mathematics with students' mathematical problem-solving abilities in circle material]. Journal of Mathematics Education /Jurnal Pendidikan Matematika, 7(2), 189–198.

Dewi, G. A. C., Sunarno, W., & Supriyanto, A. (2019). The needs analysis on module development based on creative problem solving method to improve students' problem solving ability. Journal of Physics: Conference Series, 1153,(1),012-129. https: //doi.org/10.1088/1742-6596/1153/1/012129

Docktor, J.L., Strand, N.E., Mestre, J.P., & Ross, B. H. (2015). Conceptual problem solving in high school physics. Physical Review Special Topics-Physics Education Research 2(11),1-14.

Dongoran, S., Said, H. B., & Defitriani, E. (2019). Perbedaan kemampuan pemahaman konsep matematis siswa yang memperoleh model pembelajaran creative problem solving dan model pembelajaran problem based learning di kelas vii SMP Negeri 14 Kota Jambi[Differences in the ability to understand mathematical concepts of students who obtain creative problem solving (cps) learning models and problem based learning (pbl) learning models in class vii SMP 14 Jambi City]. Journal of Mathematics Education /Jurnal Pendidikan Matematika, 4(1), 326-330.

Eom S., Youn J., & Kim H. (2016). A study on image selection for the development of educational contents enhancing undergraduates' creativity and personality. Indian Journal of Science and Technology, 9(26),1-6. https://doi.org/10.17485/ijst/2016/v9i26/97316

Ernaeni, L., & Gunawan, I. (2019). Model advanced organizer: Pengaruhnya terhadap kemampuan berpikir kreatif[The advanced organizer model: Its effect on the ability to think creatively]. Indonesian Journal of Science and Mathematics Education, 2(1), 79-83. https://doi.org/10.24042/ijsme.v2i1.3974

Eva, I. A. (2015). Relasi agama dan budaya lokal: Upacara yaqowiyyu masyarakat Jatinom Klaten[The relation between religion and local culture: The yaqowiyyu ceremony for the Jatinom Klaten community]. Journal of Aqidah Science and Religious Studies /Jurnal Ilmu Aqidah dan Studi Keagamaan,3,(1).1-9.

Harahap, R. S. I., Nst, D., & Abidin, Z. (2019). Development of physics learning device with Batak culture based cooperative learning models. Journal of Physics Education /Jurnal Pendidikan Fisika, 8(1), 47-56.

Hermino, A., & Arifin, I. (2020). Contextual character education for students in the senior high school. European Journal of Educational Research, 9(3),1009-1023. doi: 10.12973/eu-jer.9.3.1009

Hu, R. (2017). A study on the application of creative problem solving teaching to statistic teaching. Journal of Mathematics Science and Technology Education, 13,(17). 3139-3149.

Istiyono, E., Mardapi, D., & Suparno, S. (2014). Pengembangan tes kemampuan berpikir tingkat tinggi fisika (pysthots) peserta didik sma[Development of high-level physics thinking ability test (pysthots) for high school students]. Journal of Educational Research and Evaluation/Jurnal Penelitian dan Evaluasi Pendidikan, 18(1), 1-12.

Jankowska, D. M., Gajda, A., & Karwowski, M. (2019). How children's creative visual imagination and creative thinking relate to their representation of space. International Journal of Science Education, 41(8),1096-1117. https://doi.org/10.1080/09500693.2019.1594441

Joyce, B., Weil, M. & Calhoun, E. (2016). Models of Teaching. Pustaka Pelajar.

Kartikawati, S., & Pratama, H. (2017). Pengaruh penggunaan whatsapp messenger sebagai mobile learning terintegrasi metode group investigation terhadap kemampuan berpikir kritis[The effect of using whatsapp messenger as a mobile learning integrated group investigation method on critical thinking ability.]. Journal of Electrical Engineering Education/ Jurnal Pendidikan Teknik Elektro, 2(2), 33-38. http://doi.org/10.25273/jupiter.v2i2.1797

Khusaini. (2014). Optimalisasi penggunaan whatsapp dalam perkuliahan penilaian pendidikan fisika[Optimizing the use of WhatsApp in physics education assessment lectures]. Journal of Research and Studies in Physics Education/Jurnal Riset dan Kajian Pendidikan Fisika, 1(2).

Kim, H., Lee ,H., Youn, J., Eom, S., & Lee, J. (2015). A study on college students' demands for creativity and personality education as part of the general education curriculum. Indian Journal of Science and Technology. 8(8),29-36. https://doi.org/10.17485/ijst/2015/v8iS8/64715

Kusdianto. (2019). Pengembangan model pembelajaran IPA SD pendekatan analogi budaya lokal Papua (MBI-ABLP) untuk meningkatkan minat dan pemahaman konsep[Development of a natural science learning model for the local Papuan cultural analogy approach (MBI-ABLP) to increase interest and understanding of concepts]. [Unpublished doctoral dissertation]. State University of Yogyakarta.

Lillian, B. (2012). Scaffolding teachers integrate social media into a problem-based learning approach. The Electronic Journal of e-Learning, 10(1), 13-22.

Mariati, P.S., Betty, & Sehat. (2017). The problem solving learning model by using video recording on experiments of kinematics and dynamics to improve the students cognition and metacognition. Indonesian Journal of Physics Education/ Jurnal Pendidikan Fisika Indonesia, 13 (1) (2017) 25-32. https://doi.org/10.15294/jpfi.v13i1.10154

Mason, A & Singh, C. (2016). Helping students learn effective problem solving strategies by reflecting with peers. Department of Physics and Astronomy University of Pittsburgh, Pittsburgh, PA, 15260.

Mona, E. N. I. & Ikhsanudin, M. (2014). Simbol dan makna ritual yaqowiyu di Jatinom Klaten[Symbols and Meanings of the Yaqowiyu Ritual in Jatinom Klaten]. Travel Media Journal/ Jurnal Media Wisata, 12,(2)

Muhammad, G. M., Septian, A., & Sofa, M. I. (2018). Penggunaan model pembelajaran creative problem solving untuk meningkatkan kemampuan pemecahan masalah matematis siswa[The use of creative problem solving learning models to improve students' mathematical problem solving abilities]. Journal of Mathematics Education /Jurnal Pendidikan Matematika,7(3). http://journal.institutpendidikan.ac.id/index.php/mosharafa

Mumford, M. D., Medeiros, K. E., & Partlow, P. J. (2013). Creative thinking: Processes, strategies, and knowledge. Journal of Creative Behavior. 46(1).30–47. https://doi.org/10.4337/9780857939814.00029

Napratilora, M., Lisa, H., & Bangsawan, I. (2020). Using whatsapp as a learning media in teaching reading. Educational Journal /Jurnal Kependidikan, 6(2), 116-125.

Pustikayasa, I. M. (2019). Grup whatsapp sebagai media pembelajaran[Whatsapp group as a learning medium]. Scientific Journal of Hindu Education, Religion and Culture/Jurnal Ilmiah Pendidikan, Agama dan Kebudayaan Hindu, 10(2), 53-62.

Sagita, N., & Sani, R. A. (2019). Pengaruh model pembelajaran inquiry training terhadap hasil belajar pada materi pokok momentum dan impuls[The influence of inquiry training learning model on learning outcomes on momentum and impulse main material]. Physics Learning Innovation/Inovasi Pembelajaran Fisika), 7(2). https://doi.org/10.24114/inpafi.v7i2.13969

Sagita, I., Medriati, R., & Purwanto, A. (2018). Penerapan creative problem solving model untuk meningkatkan kemampuan pemecahan masalah fisika[Application of creative problem solving models to improve physics problem solving abilities]. Physics Coil Journal/Jurnal Kumparan Fisika, 1(3), 1-6.

Sari, D. M., Ikhsan, M., & Abidin, Z. (2018). The development of learning instruments using the creative problem-solving learning model to improve students' creative thinking skills in mathematics. Journal of Physics: Conference Series,1088(1)012-018. https://doi.org/10.1088/1742-6596/1088/1/012018

Sasmitatias, F., & Kuswanto, H. (2018). The development of science learning device based on serukam local culture to improve students' analytical skill. International Journal of Educational Research Review, 3(3), 59-68. https://doi.org/10.24331/ijere.441348

Sugiyanto, F. N., Masykuri, M., & Muzzazinah. (2018). Analysis of senior high school students' creative thinking skills profile in klaten regency. Journal of Physics: Conf. Series, 1006, 012-038. http://doi.org/10.1088/1742- 6596/1006/1/012038

Sugiyono. (2015). Metode Penelitian Pendidikan[Educational Research Methods]. Alfabeta.

Suja, I W. (2010). Kearifan Lokal Sains Asli Bali[Original Balinese Science Local Wisdom]. The Ministry of National Education/ Kementerian Pendidikan Nasional.

Taber, K. S. (2018). The use of cronbach's alpha when developing and reporting research instruments in science education. Research in Science Education,48(6),1273-1296.

Tikno, T. (2017). Measuring performance of Facebook advertising based on media used: a case study on online shops in Indonesia. Procedia Computer Science, 111, 105–112.

Tseng, K. H., Chang, C. C., Lou, S. J., & Hsu, P. S. (2013). Using creative problem solving to promote students' performance of concept mapping. International Journal of Technologi and Design Education, 23 (4), 1093-1109.

Viana, R. V., Wilujeng, I., & Kuswanto, H. (2019, June). The influence of project based learning based on process skills approach to student's creative thinking skill. Journal of Physics: Conference Series, 1233(1), 012-033.https://doi.org/10.1088/1742-6596/1233/1/012033

Vlachopoulos, D. (2020). COVID-19: Threat or opportunity for online education?". Higher Learning Research Communications, 10(1). https://doi.org/10.18870/hlrc.v10i1.1179.

Wintergerst & McVeigh. (2011). Tips for teaching culture practical approaches to intercultural communication. Pearson Education.

Yanto, B. E., Subali, B., & Suyanto, S. (2019). Improving students' scientific reasoning skills through the three levels of inquiry. International Journal of Instruction, 12(4). 689-704

Yusri, A. Y. (2013). Penerapan pendekatan keterampilan proses dalam pembelajaran matematika terhadap kemampuan pemecahan masalah pada peserta didik kelas viii smp di sibatua pangkajene[The application of the process skills approach in learning mathematics to the problem solving ability of students in class viii junior high school in Pangkajene]. Journal of Mathematics Education /Jurnal Pendidikan Matematika, 6(3), 407–418.