Research Article

Creative Thinking Ability and Collaborating in Classroom with ASICC Learning Model

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Abstract.
Twenty-first century education demands the birth of a generation that thinks at a higher level, including creative thinking. Apart from that it also requires the ability to collaborate. These abilities prepare students to face future challenges. Therefore, this research examines efforts to improve these two abilities in learning through quasi-experimental research using a non-equivalent pre-post test control group design by comparing two classes that program genetics courses with a total of 82 students. The experimental class was taught using the ASICC model, while the control class did not use the ASICC model. The research instrument used was an integrated essay test instrument for creative thinking abilities, while the collaboration instrument used a collaboration questionnaire. The instruments used have been validated and declared valid and reliable. The data obtained was then analyzed using the t-test, which previously began with homogeneity and normality tests. The research results showed that there were differences between the experimental class and the control class for creative thinking abilities and collaborative skills. The average collaboration value of the ASICC model class was higher than the control class. This research indicates that the ASICC learning model can be used as an alternative learning model that can improve students' creative thinking and collaboration skills.

Keywords: twenty-first century education, ASICC model, creative thinking, collaborative

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1. INTRODUCTION

Twenty-first century education demands the birth of a generation that is critical, creative and able to collaborate. These abilities prepare students to face future challenges. This was emphasized by [1] that a student's success depends on 21st century skills. [2] also added that 21st century skills include high order thinking skills, communication and collaboration. Skills that are demands of the 21st century can be developed through

creating a learning environment, one of which is through implementing a student-centered learning model. This is reinforced by [3 that an appropriate learning environment improves students' thinking abilities and students' skills. One student-centered learning model is the ASICC learning model.

The ASICC model is a learning model with steps consisting of stages: 1) Adapting, a stage where students are required to critically analyze the stimulus provided and carry out self-reflection to continue learning activities, 2) Searching, looking for information from various sources, 3) Interpreting, students do sharing tasks (individually) and jumping tasks (collaboratively), 4) Create and Communicating, students produce various forms of products collaboratively and then share them to get feedback [4]. Referring to these steps, it can be seen that the ASICC model creates a learning situation that is based on high order thinking skills, in this case the ability to think critically, creatively, and solve problems. On the other hand, it also brings up collaboration and communication skills between students.

Critical thinking and collaboration skills in relation to the implementation of the ASICC model have been reported by [4] for secondary school students, where the ASICC model can be used as a model that can improve students' critical thinking and collaboration skills. Meanwhile, creative thinking abilities have not been reported.

Creative thinking can produce creativity. Creativity can be defined as the ability to use imagination to produce something new, which no one else has ever thought of [5], [6]. Creative thinking produces innovative ideas and solutions that have not existed before [7], creative thinking is a problem-based learning ability [8], creative thinking requires complete, accurate and objective [9]. The ability to think creatively is very necessary in the era of globalization so that we don't just follow the flow, but must own and make our own personal decisions. Research on creative thinking in relation to the use of student-centered learning models has been reported by [10]. However, whether the same thing applies to the ASICC model, this research was carried out.

On the other hand, collaboration is needed so that someone can solve problems more effectively and efficiently. Collaborative skills are also needed so that someone also has tolerance, responsibility, respect and wisdom in dealing with the complexity of problems [11]. Collaboration means working to come together or work as a team to achieve several common goals [12 , collaboration always provides different opportunities for students to interact and foster curiosity and keen interest, and can inspire and encourage many other students [13], Collaboration abilities can also be used to predict student learning outcomes [14]. Although collaborative thinking skills using the ASICC model have been carried out, they have been carried out at the secondary school level, whereas at

the tertiary level it has not been studied. Therefore, in this research the creative and collaborative thinking abilities of students using the ASICC learning model have been studied .

The ASICC model in relation to students' creative thinking and collaboration skills is implemented in genetics lectures. The genetics course is one of the courses in the biology education study program at FKIP Nusa Cendana University, Kupang. Genetics is considered a difficult subject by students because it is abstract, covers a wide range of material, is complex and complicated. The inherent complexity of genetics related to genes, DNA, chromosomes, cell division, and inheritance makes it difficult for students to understand [15], [16]. Genetic phenomena are complex because they consist of several interrelated levels of organization (genes, proteins, cells, tissues, organs, etc.) that contain a myriad of heterogeneous elements [17]. Many problems in genetics learning and efforts to resolve them have been made, including using a series of learning models and learning [18], [19] learning media, as well as learning approaches [20], [21]. This effort is carried out to obtain effective information in improving understanding of concepts, learning outcomes and higher-level thinking skills (thinking creatively, critically and problem solving) which can be empowered in students

2. METHOD

2.1. Research Design

This quasi-experimental research uses a pre-test-post-test research design (adapted from [22] in two sample classes. The sample class used is a class that programs genetics courses. The two classes have the same equality based on the results of the equality test on their initial abilities regarding genetic material. Each class consists of 41 students so the total number of students is 82 people. The two classes were given different teaching in the use of learning models. The first class was taught using the ASICC model which uses the syntax from [4] while the second class was taught without using the ASICC model.

2.2. Populasi and Sample

The population and sample in this study were fifth semester students who were taking genetics courses consisting of two classes with a total of 82 samples. Determination of experimental and control classes was carried out randomly.

2.3. Research Instrument

The instruments used in this research are learning instruments and assessment instruments. The learning instruments used are teaching modules, student worksheets, teaching materials, learning media, while the assessment instruments include collaboration questionnaires and essay tests that integrate creative thinking abilities. The collaboration questionnaire refers to [23] which contains 13 items covering three dimensions, namely Team Engagement, Contribution and Attitude. The collaborative instrument uses a Likert scale with a score of 1 - 4, where score is 4 (always), score 3 (often), score 2 (rarely) and score 1 (never). Meanwhile, the creative thinking instrument refers to the indicators proposed by [24] namely fluency, originality, elaboration, flexibility, and metaphorical thinking. Each indicator is given a score of 1 - 4 based on a predetermined rubric. The creative thinking instrument is measured by an essay test consisting of ten items. The instruments used have been previously validated by experts regarding the construct validity of the instrument. The reliability of the instrument was also analyzed with the results of the instrument reliability being 0.72 and the instrument being included in the valid category.

2.4. Research Procedure

Before the research was carried out, the two sample classes were given a pretest to see their initial abilities. The pre-test includes a creative thinking ability test and a collaboration questionnaire. The learning was carried out in two sample classes where one class was taught using the ASICC model and the other class without using the ASICC model. The genetics material taught consists of the concept of mendelism which includes monohybrid, dihybrid, semidominance and codominance crosses. After delivering the material, a pretest was carried out again to see the results of using the applied model. The research data was then analyzed using the SPSS program.

2.5. Data analysis technique

Research data was analyzed using an independent t-test. Before carrying out the t test, a prerequisite test was first carried out (Kolmogrov-Smirnov normality test and Levene homogeneity test). The normality test results on the pretest and posttest data for creative thinking abilities are classified as normal with values respectively 0.08 and 0.06, as well as for collaborative data of 0.07 and 0.62. The homogeneity test results for the pretest

and posttest values for creative thinking abilities are 0.83 and 0.07, while the values for collaborative skills are 0.06 and 0.07. All these values are >0.05. All data testing was carried out using the SPSS version 25.0 for Windows program.

3. RESULTS

The results of descriptive data analysis for students' creative thinking abilities and collaborative skills can be seen in Table 1.

TABLE 1: Averages and Standards for the Use of Creative Thinking Abilities and Collaboration Skills in Each Class.

Variable	Class	Mean	Standard Deviation
Creative Thinking	Control	2.03	0.50
	ASICC Models	2.50	0.39
Collaborative	Control	3.13	0.68
	ASICC Models	3.17	0.42

The data in Table 1 shows that the average score for the creative thinking ability and collaboration skills variables is higher in classes taught using the ASICC model. The difference in average scores is 0.47 for creative thinking abilities and 0.04 for collaborative abilities. And if we look at the standard deviation value, it shows a lower score compared to classes that are not taught using the ASICC model. A smaller standard deviation value indicates that the distribution of values obtained is close to the average value, meaning that the research performance results are also better.

Furthermore, the results of the analysis using the t-test for these two variables (creative thinking skills and collaboration) are presented in Table 2.

TABLE 2: T-test results on the variables Creative Thinking Ability and Collaboration Skills.

		Levent test for equality variances		t-test for Equality of Means		
		F	Sig.	t	df	Sig.(2 Tailed)
Creative Thinking	Equal variances assumed	1.88	.174	-4.77	80.00	.000
	Equal variances not assumed			-4.77	75.47	.000
Collaborative	Equal variances assumed	4.02	.048	-.266	80.00	.791
	Equal variances not assumed			-.266	66.99	.791

The t-test results in Table 2 show that the sig. creative thinking ability 0.000 < 0.05. This value indicates that there is a difference in score points between the control and treatment groups. And based on the descriptive value (in Table 1), it is proven that the treatment group using the ASICC model received a higher score. Meanwhile, for collaborative ability, a sig value was obtained. 0.791 > 0.05. This value indicates that there is no difference in score points between the control and treatment groups, although based on the descriptive value it can be seen that the treatment group using the ASICC model received a higher score.

4. DISCUSSION

Overall, it can be seen that treatment with the ASICC model in learning can improve students' creative and collaborative thinking abilities. This is possible because at each stage in the model the cultivation of these two capabilities has been integrated. For example, in the Searching stage (looking for information from various sources), this stage trains students to try to find various alternative reading materials related to the problems studied in learning. Searching for various alternative reading materials is necessary so that students can provide various alternative answers (flexibility), on the other hand, it can also provoke the emergence of new ideas (originality), and even allow students to combine answers (metaphorical thinking). If this happens, it is also possible for the ability to detail answers (elaboration) and fluency in presenting answers to emerge. According to Wakefield (1994), students' freedom to choose and collect information provides greater opportunities for creativity to emerge. The presence of various indicators of creative thinking in students in the ASICC model allows creative thinking abilities to be developed. This is in accordance with what was stated by [24] and [25] that someone is said to have the ability to think creatively if there are indicators of creative thinking in him, namely the ability to carry out elaboration, fluency, flexibility, originality and metaphorical thinking.

Next is the Create stage, a stage where students are stimulated to produce various forms of products. The diverse products produced by students certainly come from various alternative ideas that they have discovered from the previous stage (namely the Search stage). The variety of products indicates the creativity that is awakened in students. According to [26], creativity is based on ordinary thinking processes, but what differentiates it from other thinking processes is the result of deliberate action or action. A similar thing was also stated by [27] that creativity can occur when someone uses their mind to ask questions that are different from others. [25] added that creative thinking

is needed for problem solving. According to [28] creativity does not only require ideas, but also knowledge, skills and experience. Creative people need to utilize knowledge to create things.

Indicators of creative thinking will not necessarily grow and improve if the learning situation is not supportive. Therefore, for creativity to take place, group interaction involving the mobility of ideas is also needed. The ASICC model facilitates this in the Collaborating stage (although statistically the t-test does not show a significant difference, but descriptively it shows a higher average value). According to [29] collaborative (group work) gives students the opportunity to develop their conceptual knowledge as well as procedural knowledge, and makes their thinking explicit and will improve problem solving and design. Another advantage that can arise in a collaborative work atmosphere is revealed by [25] that group interaction will encourage creative thinking, looking for the strengths and weaknesses of an idea in a group can trigger more ideas helping perseverance, generating ideas, and clarification in cases which is difficult to solve. [30] also expressed the same thing that collaborative learning will provide positive energy that can be brought into the class, collaborative provides space to share and discuss ideas and analyze challenges as a group. According to [31], collaboration can reduce anxiety and relieve tension that occurs during learning and facilitate students to be involved intensively in teams.

The various advantages presented in the ASICC learning model make this model an alternative for empowering students' creative thinking and collaborative skills. The ability to think is very important because creative thinking is something that is actually inherent in every individual, it's just that teachers need to be aware of how to encourage and foster creativity in the classroom. Through the right learning process, students will be trained from convergent thinkers (only one correct answer) to divergent thinkers (answers that lead to alternative solutions). A sense of individual competence and a sense of pride in their own thinking needs to be fostered in learning by applying various learning models.

5. CONCLUSIONS AND RECOMMENDATIONS

Based on the results of the data analysis carried out, it can be concluded that the ASICC model of learning can improve students' creative and collaborative thinking abilities. The increase can be seen from the average value for the variable creative thinking ability and collaboration skills which is higher in classes taught using the ASICC model. The difference in average scores is 0.47 for creative thinking abilities and 0.04

for collaborative abilities. The t-test results show that the sig. creative thinking ability 0.000 < 0.05. This value indicates that there is a difference in score points between the control and treatment groups. Meanwhile, for collaborative ability, a sig value was obtained. 0.791 > 0.05. This value indicates that there is no difference in score points between the control and treatment groups. The ASICC learning model can be used as an alternative to empower students' creative thinking abilities and collaborative skills.

From the results of this research, it is recommended to expand the study of the ASICC learning model to other courses so that comprehensive information can be obtained. Apart from that, it is also necessary to study other thinking skills that can possibly be utilized according to the demands of 21st century education

References

[1] Rotherham, A. J. and D. Willingham. 21st Century Skills: The Challenges Ahead. Teaching for the 21st Century. 2009. 67 (1): 16 - 21.

[2] Greenstein, L. Assesing Skill 21st Century. A Guide to Evaluating Mastery and Authentic Learning. U.S.A: Crowin A SAGE Company. 2021

[3] Damavandi AJ. Mahyuddin, H. Elias, S.M. Daud, J. Shabani. Academic Achievement of Students with Different Learning Styles. Int J Psychol Stud. 2011;3(2):186–92. Available from: www.ccsenet.org/ijps

[4] Santoso, A. M., P. R. Primandiri., S. Zubaidah., dan M. Amin. (2021). Improving Student Collaboration and Critical Thinking Skills through ASICC Model Learning. Journal of Physics: Conference Series. 1806 (2021) 012174 https://doi.org/10.1088/1742-6596/1806/1/012174.

[5] Papaleontiou-Louca E, Varnava-Marouchou D, Mihai S, Konis E. Teaching for creativity inuniversities. Journal of Education and Human Development. 2014;3(4):131–54.

[6] Ray-Gehani R. (2011. Individual creativity and the influence of mindful leaders on enterprise innovation. J Technol Manag Innov. 2011;6(3):82–92.

[7] Halizah A, Ramly I. Cerative Thinking Skill Approach Through Problem-Based Learning: Pedagogy and Practice in the Engineering Classroom. Int J Humanit Soc Sci. 2008;2(4):334–9.

[8] Awan AA, Shah NH, Bashir S. M. A. B. Iqbal., N. P. Thalho., and J.F. Mutupha. Critical Thinking and Creative Thinking: Students' Reading Comprehension. Webology. (2021). 18 (6): 4186-4190. http://www.webology.org

[9] Beyer BK. Critical Thinking: what is it? Soc Educ. 1985;49(4):270–6. Available from: https://eric.ed.gov/?id=EJ316045

[10] Yusnaeni AD. Corebima, H. Susilo, and S. Zubaidah. Creative Thinking of Low Academic Student Undergoing Search Solve Create and Share Learning Integrated with Metacognitive Strategy. Int J Instr. 2017;10(2):245–62. Available from: www.e-iji.net

[11] Firman., S. Nur., dan M.A. S.L. Taim. Analisis Keterampilan Kolaborasi Siswa SMA pada Pembelajaran Biologi. Diklabio: Jurnal Pendidikan dan Pembelajaran Biologi, (2023). 7 (1), 82-89. https://ejournal.unib.ac.id/index.php/jppb

[12] Musarrat Riaz; Dr. Marium Din. Riaz, Musarrat., and M. Din. Collaboration as 21st Century Learning Skill at Undergraduate Level. Sir Syed Journal of Education & Social Research. 2023;6(1):93–9.

[13] Turner J, Paris SG. How literacy tasks influence children's motivation for Literacy. The Rreading Teacher. (1995).48(8): 662-673. https://www.jstor.org/stable/20201530

[14] Leasa M, Wuarlela ME; Marthina Eralisa Wuarlela. Cooperative Abilities and Cognitive Learning Outcomes: Study Group Investigation on Life Cycle Topic. International Of Elementary Education. 2023;7(1):162–8.

[15] Cimer A. What makes biology learning difficult and effective: students views. Educ Res Rev. 2012;7(3):61–71. Available from: http://www.academicjournals.org/ERR

[16] Kibuka-Sebitosi E. Understanding genetics and inheritance in rural schools. J Biol Educ. 2007;41(2):56–61.

[17] Duncan RG, Tseng KA. Designing project-based instruction to foster generative and mechanistic understandings in genetics. Sci Educ. 2011;95(1):21–56.

[18] Angarini E, Zubaidah S. H. Sisanto., N. Omar. Enhancing Creativity in Genetics Using Three Teaching Strategies-based TPACK Model. EURASIA Journal of Mathematics, Science and Technology Education, (2022). 18(12), em2196ISSN:1305-8223 (online). https://doi.org/10.29333/ejmste/12697.

[19] Yilmaz D, Tekkaya C, Sungur S. The comparative effects of prediction/discussion-based learning cycle, conceptual change text, and traditional instructions on student understanding of genetics. Int J Sci Educ. 2011;33(5):607–28.

[20] Atun H, Usta E. The effects of programming education planned with TPACK framework on learning outcomes. Participatory Educational Research. 2019;6(2):26–36.

[21] Irdalisa I, Paidi P, Djukri D. Irdalisa, Paidi, & Djukri. Implementation of technology-based guided inquiry to improve TPACK among prospective biology teachers. Int J Instr. 2020;13(2):33–44.

[22] Cohen L, Manion L, Morrison K. Research methods in education. Routledge; 2018. https://doi.org/10.4324/9781315456539.

[23] Santoso AM and P. R. Primandiri. Pengembangan Model Pembelajaran ASICC untuk Mendukung Kecakapan Abad 21 Siswa SMA. Laporan Penelitian Hibah Kompetitif Nasional. (2019).Tidak Dipublikasikan. Universitas Nusantara PGRI Kediri

[24] Treffinger DJ, Young GC, Selby EC, Shepardson C. Assessing creativity: A guide for educator. Center for creative learning. Sarasota: Florda; 2002.

[25] Vandeleur S, Ankiewicz PJ. A.E. de Swardt., and E.J. Gross. Indicators of Creativity in a Technology Class: a case study. S Afr J Educ. 2001;21(4):268–73.

[26] Brandt RS. On creativity and thinking skills: A conversation with David Perkins. Educ Leadersh. 1986;:12–8.

[27] Couger JD. Creative Problem Solving and Opportunity Finding. Danvers: Boyd & Fraser; 1995.

[28] Petty G. 1997. How to be Better at Creativity. London: Kogan Page Rotherham, A. J., & Willingham, D. 21st Century Skills: the challenges a head. Educ Leadersh. 2009;67(1):16–21.

[29] Mc Cormick R. Instructional Methodology. In: Williams J, Williams A, editors. Technology Education for teachers. Melbourne: MacMillan; 1996.

[30] Sidgi LF. (2022). The Benefits of using Collaborative Learning Strategy in Higher Education. International Journal of English Literature and Social Sciences. 7 (6): 217 - 224. ISSN: 2456-7620) https://dx.doi.org/https://doi.org/10.22161/ijels.76.31.

[31] Angelo TA, Cross KP. Classroom Assessment Techniques. A Handbook for College Teachers. 2nd ed. San Francisco: Jossey-Bass Publishers; 1993.