



Evaluation of Creative Thinking Skills in the Development of Elementary Science Learning in Elementary Schools: A Mix Method Study

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ABSTRAK

Kemampuan berpikir kreatif mahasiswa masih terbatas pada perkuliahan pengembangan pembelajaran IPA. Siswa hanya mampu menjawab pertanyaan pada level penerapan konsep (C1-C3 atau keterampilan berpikir tingkat rendah). Hal ini disebabkan karena metode pembelajaran kurang bervariasi, materi perkuliahan belum dikaitkan dengan permasalahan kontekstual. Penelitian ini bertujuan untuk menganalisis kemampuan berpikir kreatif mahasiswa pendidikan guru SD pada mata kuliah pengembangan pembelajaran IPA SD. Penelitian ini menggunakan metode campuran. Pengambilan sampel dilakukan dengan menggunakan random sampling yang melibatkan 233 mahasiswa dari 8 kampus berbeda. Instrumen penelitian terdiri dari tes yang memuat 12 soal terkait indikator kemampuan berpikir kreatif (kefasihan, fleksibilitas, orisinalitas, dan kolaborasi), wawancara semi terstruktur terhadap 10 responden untuk menggali pemahaman di balik jawaban yang diberikan, dan dokumentasi. Teknik analisis data dilakukan melalui analisis data kuantitatif dan kualitatif yang meliputi reduksi data, penyajian data, serta penarikan kesimpulan dan verifikasi. Hasil penelitian menunjukkan bahwa dari keempat indikator berpikir kreatif siswa dikategorikan cukup pada aspek kelancaran. Namun tiga indikator lainnya yaitu fleksibilitas, orisinalitas, dan elaborasi berada pada kategori buruk. Hasil wawancara juga mengungkapkan bahwa sebagian besar responden tidak mampu memberikan jawaban yang sesuai dengan indikator pencapaian berpikir kreatif. Kesimpulan penelitian ini adalah tiga indikator berpikir kreatif yaitu fleksibilitas, orisinalitas dan elaborasi perlu ditingkatkan karena dikategorikan kurang.

ABSTRACT

Students' creative thinking abilities are still limited in science learning development lectures. Students are only able to answer questions at the concept application level (C1-C3 or lower order thinking skill). This is due to the lack of variety in learning methods, lecture material has not been linked to contextual problems. This research aim is to analyze the creative thinking abilities of elementary teacher education students in elementary science learning development courses. This study uses mixed method. Sampling was carried out using random sampling involving 233 students from 8 different campuses. The research instrument consists of a test that includes 12 questions related to indicators of creative thinking skills (fluency, flexibility, originality, and collaboration), semi-structured interviews with 10 respondents to explore the understanding behind the answers given, and documentation. Data analysis techniques are carried out through quantitative and qualitative data analysis which includes data reduction, data presentation, as well as drawing conclusions and verification. The research results show that of the four indicators of creative thinking, students are categorized as sufficient in the fluency aspect. However, the other three indicators, namely flexibility, originality, and elaboration are in the poor category. The interview results also revealed that the majority of respondents were unable to provide answers that were in accordance with the indicators of creative thinking achievement. The conclusion of this research is that three indicators of creative thinking, namely flexibility, originality and elaboration, need to be improved because they are categorized as lacking.

1. INTRODUCTION

Education has an important role in forming a dignified and knowledgeable society. In the 21st century, the skills to think creatively is required due to rapid and complex changes in various sectors. The quality of a person can be reflected in the skills to think creatively in overcoming various problems (Mutohhari et al., 2021; Papadakis, 2020). Individuals who have creative traits tend to see problems as opportunities to show solutive actions in dealing with problems in various ways. Students as part of education are important assets that must be fostered and directed to become useful human beings. This effort clearly cannot be carried out by relying solely on a procedural capacity building process, but rather

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emphasizing on providing challenges in the form of problems accompanied by questions (Gupta et al., 2022; Vargo et al., 2003).

Creative thinking is the skills to generate new, original and innovative ideas that have never been considered before. Through creative thinking, one can innovate and formulate new ideas and solutions that have never been thought of before. Creative thinking skills have four indicators, namely fluency, flexibility, originality, and elaboration (Ghaedi et al., 2014; Saptanno et al., 2019). These indicators can be used to measure or identify a person's creative thinking skills in context certain. The level of proficiency in creative thinking in students can be analyzed from their initial abilities. Students who show high initial abilities do not necessarily have the skills to think fluently and flexibly, but they show newness of thinking so that they can be classified as individuals who are quite capable of creative thinking. Meanwhile, students who have initial capacity are demonstrating the skills to think fluently, but still do not have flexibility and novelty in thinking which can be considered less creative (Tanujaya et al., 2017; Yamin et al., 2020). However, students who have low initial abilities do not yet have the skills to think fluently, flexibly, and come up with new ideas so that they can be categorized as having no creativity.

In science learning development courses at Unikama, students' creative thinking skills are still limited. Students can only answer questions at the concept application level (C1-C3 or in lower order thinking skill). This problem is caused by learning methods that are less attractive, lack of higher order thinking skills, and had lack of connectivity between the material taught by lecturers and everyday life situations in a comprehensive manner. Creating problems that stimulate the development of student creativity is not simple, but it requires commitment from lecturers to involve themselves in the process and train themselves to think creatively when designing lesson plans (Almroth, 2015; Rahmawati et al., 2021). The skills to think creatively is important in elementary science learning development courses to determine solutions to problems. However, in the practice of elementary science learning lectures, assessments are often more focused on traditional approaches that prioritize the correct answers. This resulted in students focusing more on finding the right single answer.

Several previous studies that are relevant to this research. The four indicators of the skills to think creatively in mathematics, students who have a cognitive style that tends to be reflective are able to fulfill the elements of fluency and depth. This is reflected in his skills to answer questions more fluently, explain cause-and-effect relationships between the concepts used, and provide more detailed and structured answers in writing (Marianti & Rahayuningsih, 2022; Miller, 2018). On the other hand, students with a more impulsive cognitive style have not been able to achieve the same thing. Even so, the aspects of flexibility and innovation in answering questions are still not fully fulfilled, both by students with reflective and impulsive cognitive styles, because both are still limited to one approach and have not utilized new strategies (Dhayanti et al., 2018; Tanujaya et al., 2017). In addition, other research also revealed that 21st century skills, such as critical thinking, communication, collaboration, and creativity, possessed by students of the Elementary School Teacher Education at Unirow University, showed low achievement (Dishon & Gilead, 2020). This fact is reflected in the average score of students' critical thinking skills which are less than 30%, communication skills which are less than 50%, and the skills to collaborate and think creatively which are below 45%.

Other relevant research conducted by it was found that within the scope of mathematical creative thinking abilities related to the topic of geometric shapes, several students of the elementary teacher education at STKIP Melawi showed the following 48.5% of students had the skills to answer questions according to Fluency criteria belonging to low category, 45% of students are able to answer questions with low Flexibility suitability, 44.5% of students are able to answer questions according to the originality standard and are also rated in the low category, and as many as 46.5% of students have the skills to answer questions with Elaboration suitability which is also undervalued (Fitrianawati et al., 2020). The results of research conducted by describes the level of creative thinking skills of a number of PGSD students at Surabaya State University in the basic science concepts course. This study shows that the understanding of creative thinking skills is still at a low level, namely fluency of 32%, flexibility of 29%, and originality of 31%.

Based on the review of several previous studies conducted there is no research that examines creative thinking skills in elementary science learning development courses. Research is important to do because as elementary school teachers' who will later become prospective teachers students, having the skills to think creatively is necessary in planning and developing learning tools. It is intended that the learning process can become more creative and innovative, so as to achieve the desired learning objectives. Therefore, understanding the level of students' creative thinking skills is a must for lecturers to be able to design learning according to their characteristics. Based on the description above, this study aims to analyzed the creative thinking abilities of elementary teacher education students in the elementary school science learning development course. This research is expected to provide an overview of students' creative

thinking skills from the aspects of fluency, flexibility, originality, and elaboration so that it can help lecturers identify which aspects of students' creative thinking skills need to be improved.

2. METHODS

Mixed methods research is a research approach that combines elements of qualitative and quantitative research methods. The goal is to understand the research phenomenon more comprehensively, allowing researchers to explore different dimensions of a research topic. These mixed methods can provide deeper insights and more data than using qualitative or quantitative methods alone (Camilli Trujillo et al., 2022; Kärner, 2017). In this study, the first step of the research procedure was to collect data using quantitative methods through giving tests to students to evaluate their creative thinking ability. Furthermore, a qualitative approach was used in collecting data through interviews to support the research results. Documentation of the interview results was done to ensure the accuracy of the research data. The research sample was chosen with the aim of generalizing the results of observations from a population. The population of this study were PGSD students in Indonesia, particularly in the East and Central Java regions. There are 23 campuses that have PGSD study programs in East Java and Central Java, so the researchers selected the sample. The sampling process was carried out by drawing lots on the campuses that would become the object of research, and finally 8 campuses were selected (5 campuses in East Java and 3 campuses in Central Java) as research samples. The total number of participants in this study were 233 students.

In this study, there are several types of instruments used, namely tests, interviews, and documentation. Quantitative data came from test results, while qualitative data was obtained through documented interviews. The test consists of 12 questions designed to measure creative thinking skills, which include fluency, flexibility, originality, and collaboration which are listed in Table 1. Each question is rated on a scale of 0 to 4. The score 4 indicates a very high level of creativity, 3 indicates a level of creativity, 2 indicates a sufficient level of creativity, and score 1 indicates a low level of creativity. This assessment refers to the scoring rubric which has been modified based on the guidelines, while the formula for calculating the percentage score of students' creative thinking is taken from. The formula calculates the percentage of student scores by dividing the score obtained by the student by the maximum test score, then the result is multiplied by one hundred percent. The results of this percentage are then used to classify the level of students' creative thinking competence as shown in Table 2.

Table 1. Creative Thinking Indicator

Indicator	Attribute
Fluency	Generate lots of relevant ideas/answers Smooth flow of thoughts
Flexibility	Generate a variety of ideas Able to change the way or approach A different direction of thought
Originality	Give unconventional answers Give different answers than others Give answers that most people rarely give
Elaboration	Develop, add, enrich an idea Detailing details Expand an idea

Table 2. Creative Thinking Skills Category

Total Score Range (%)	Creative Thinking Category
76-100	High creativity
51-75	Creative
26-50	Pretty creative
0-25	Less creative

After completing the written test, the research subjects also took part in a semi-structured interview to explore the reasons behind the answers given. Information obtained from interviews was recorded in the form of documentation. Data analysis techniques are carried out through data reduction, followed by data presentation, as well as drawing conclusions and verification. To ensure the validity of the

data, the triangulation method was used, namely by comparing the results of tests, interview instruments, and documentation.

3. RESULT AND DISCUSSION

Results

The skills to think creatively has a very important role in various aspects of life. By thinking creatively, we can generate new ideas, create innovative solutions, and face challenges in a variety of ways. Assessment of creative thinking skills refers to fluency, flexibility, originality and elaboration. The skills to think creatively is needed in elementary science learning development courses, where students are expected to be able to deal with problems that often arise in the learning process and find solutions to problems by creating innovative and creative learning tools. The results of research on students' creative thinking abilities in elementary science learning can be found in [Table 3](#).

Table 3. Achievement of Each Creative Thinking Indicator

Indicator	Percentage (%)	Category
Fluency	39	Enough
Flexibility	25	Not enough
Originality	17	Not enough
Elaboration	19	Not enough

Based on [Table 3](#) the fluency indicator gets the highest score, namely 39% in the sufficient category. This indicates that students can generate relevant ideas or answers to overcome problems in learning. In addition, students can also smoothly or quickly determine solutions to given problems. Meanwhile, the flexibility indicator obtained a value of 25% in the less category. This indicates that students do not yet have more than two concepts or ideas that can be used as solutions in dealing with a problem. In addition, students are also less able to find various approaches that are suitable for solving problems.

On the elaboration indicator, obtaining a score of 19% is categorized as lacking. The results of the research show that students' ideas when solving problems are not yet broad and ideas have not been explained in detail and detail in solving a problem. Therefore, the answers given by students are often short and do not explain the problem in detail. The quality of learning that is less interactive and does not provide opportunities for students to actively participate in learning also has an impact on the low level of elaboration. The originality level gets the lowest score, namely 17% in the less category. This is shown from the answers produced by students are almost the same as the others. Thus, the resulting answer is no different from most people. This shows that the originality of students still needs to be improved. Originality in creative thinking is an ongoing process, so it is necessary to practice and be open to new experiences and perspectives to develop creative thinking skills. After analyzing the results of the PGSD students' creative thinking skills test in elementary science learning based on the achievement of each indicator score, the next step is to calculate the test scores to estimate the extent of students' creative thinking abilities. Students' creative thinking skills are shown in [Figure 1](#).

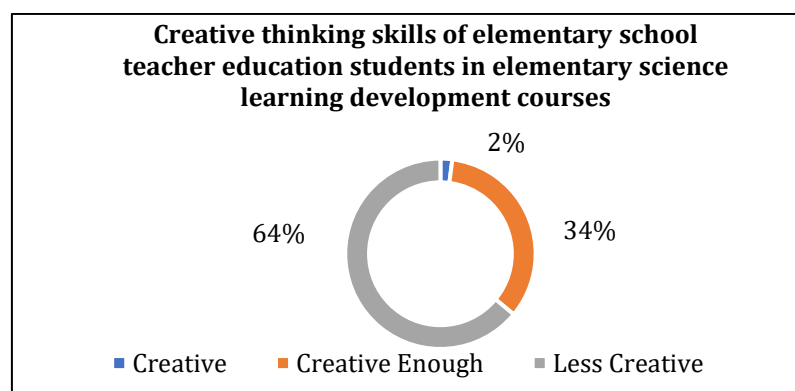


Figure 1. Creative Thinking Skills of Elementary Teacher Education Students

Based on the data shown in [Figure 1](#), it can be concluded that there are four students (about 2%) who fall into the category of creative thinking. This indicates that these students have met the indicators of

fluency, flexibility, and originality. As many as 79 students (about 34%) fall into the quite creative category, which shows that they have met the indicators of fluency and flexibility. Meanwhile, 150 students (about 64%) fall into the less creative category, indicating that they only meet the fluency indicator. This finding is in line with the view which illustrates that creative thinking level 4 (very creative) involves four indicators, namely (fluency, flexibility, originality and elaboration). Meanwhile, creative thinking level 3 (creative) involves three indicators, namely fluency, flexibility, and originality. Creative thinking level 2 (quite creative) includes two indicators, namely fluency and flexibility and creative thinking level 1 (less creative) only involves one indicator, namely fluency.

Semi-structured questions were used to verify quantitative data by giving four questions to ten students. The results of student answers related to questions about creative thinking skills are recorded using codes R-01 to R-10. Then, student responses were divided into two categories, namely "confirmed" and "unconfirmed," as shown in Table 4.

Table 4. Item Criteria Responses after Interview

Participant Code	Item Criteria Responses after Interview	
	Confirmed	Unconfirmed
R-01	1,3	2,4
R-02	1,2	3,4
R-03	1,2	3,4
R-04	1,2	1,3,4
R-05	1,2	3,4
R-06	1	2,3,4
R-07	3	1,2,4
R-08	1,2	3,4
R-09	1	2,3,4
R-10	1,3	2,3,4

Base on Table 4 showed that the students' fluency level was in the sufficient category. This is evidenced by the assessment of respondents R-02, R-04 who obtained an average score of 2.33 and 3.16 in the sufficient category. This is because in completing the tasks R-02 and R-04 provide answers that are relevant to the problems given. This finding is in line with the responses from R-02 and R-04.

Table 5. Question 1

Interviewer	Confirmed
What learning model is appropriate for the following problem: when Mrs. Rina teaches the concept of the water cycle, she introduces problems to students related to the difficulty of obtaining clean water in an area due to polluted water sources. Therefore, Mrs. Rina asked her students to find a solution so that the polluted water could be removed can be used by people for daily needs?	The learning model that can be used by Mrs. Rina is the PBL learning model. This model is effective to use because students can solve contextual problems that exist around students (R-02). At the time of learning the teacher can use the PjBL model. Through this model the teacher can provide orientation problem to students. Teachers can dig up detailed information to students so they can determine solution to a problem by creating a product (R-04).

Based on Table 5 show the answers given by R-02 and R-04, it shows that the answers they gave are quite relevant to the case studies given. R-02 suggests that the most suitable model for this case is the PBL model because this model focuses on solving contextual problems, so that it can be used in these situations and helps students find solutions to existing problems. On the other hand, R-04 states that the appropriate model is PjBL. This model is oriented to authentic problems. The PBL and PjBL models are learning models that focus on contextual situations that can enhance student creativity, provide practical experience, and develop teamwork skills. In addition, R-02 and R-04 can think fluently and fast enough to answer questions. This shows that the fluency levels of R-02 and R-04 are categorized as sufficient. The results of the flexibility assessment were categorized as lacking because students in answering questions only used one concept or idea, besides that students were less able to find various variations that were suitable for solving problems. This is shown from respondents R-01 and R-06 who obtained an average score of 1.25 and 1.50 in the less category. This finding is in line with the responses of R-01 and R-06.

Table 6. Question 2

Interviewer	Unconfirmed
What is done by the teacher in order to increase student enthusiasm when learning style material using media PowerPoint, even though there are students who seem sleepy during the learning process?	Teachers can display learning videos and invite students to be active in learning in a way following the movements in the video (R-01). Teachers can use a variety of teaching methods such as discussion, question and answer, problem solving, groupwork by considering the needs and learning styles of different students. It can make learning more interesting and relevant to all students in the class (R-06).

Base on [Table 6](#) show respondents R-01 and R-06 indicated that the answers given only used one idea. R-01 explained that increasing student motivation can be done by showing a video in which students are then asked to imitate the movements in the video. While R-06, motivates students by using a variety of learning methods. Supposedly, they can provide answers to more than one idea, such as the use of various media, methods, models, or games that can make students active in the learning process so students don't get bored. The use of various strategies, approaches, methods, media, and models has been proven to increase student motivation. Based on the answers from R-01 and R-06, it seems that their level of flexibility still needs to be improved. Based on the results of the assessment, originality is a creative thinking skillless category. This is shown from the answers produced by R-04 and R-09 which have not resulted in ideas, concepts or solutions that are new and different from those that already exist. Respondents R-04 and R-09 who obtained an average score of 1.25 were in the less category. This finding is in line with the responses of R-04 and R-09.

Table 7. Question 3

Interviewer	Unconfirmed
Give a brief description of how you plan lesson study cycles of the digestive system material food so that the learning you do can achieve the goals set!	In the initial planning, identify KD, determine learning objectives, methods, materials, learning resources and make lesson plan. While at the stage of implementing learning, observing and recording data, conduct discussion and analysis. In the final stage of reflection and improvement (R-04). Make a lesson study cycle design with five stages namely planning, implementation, observation, reflection and revision (R-06).

Based on [Table 7](#) show the responses from R-04 and R-09, it shows that their answers are almost identical and have not produced new ideas that can bring innovation in various fields, including science, technology and society. There is no visible student effort to develop original ideas that are different from those that already exist. In the context of reflection, learning improvements can be linked to advances in science and technology so that new ideas can emerge that are truly unique. Planning lessons with lesson study cycles can be charted with plan, do and see cycles which will make it easier to understand the lesson plan. Responses from R-04 and R-09 show that the level of originality of students still needs to be improved. The answer is show in [Figure 2](#), and [Figure 3](#).

Rating result elaboration is in the less category. This is shown from the answers generated by R-07 and R-08 that have not been explained in detail and detail to solve a problem. This is shown from respondents R-07 and R-08 who obtained an average score of 1.00 and 1.25 in the less category. This finding is in line with the responses of R-07 and R-08. The results of the elaboration assessment were categorized as poor. This is shown from the answers produced by R-07 and R-08.

From [Table 8](#) show the responses of R-07 and R-08, it can be seen that the answers given were not yet in-depth and detailed. Answers should include developing a rubric or scoring criteria covering aspects such as assessment design, research implementation, observation or measurement, data analysis, and conclusions. In addition, they should detail the process for developing psychomotor assessment instruments and scoring guides for these psychomotor assessments. It is important to describe the assessment criteria in detail so that the evaluation or measurement carried out is effective and accurate. R-07 and R-08 only provide answers regarding the assessment criteria, so their answers are not detailed enough. This shows that the elaboration capabilities of the R-07 and R-08 need to be improved.

Rancangan Siklus Lesson Study: Materi "Sistem Pencernaan Makanan" untuk Siswa Kelas 4

<p>Perencanaan Awal</p> <p>Tahap 1: Perencanaan Bersama</p> <ol style="list-style-type: none"> Identifikasi Kompetensi Dasar: Menjelaskan sistem pencernaan makanan pada manusia. Menentukan Tujuan Pembelajaran: Memahami fungsi dan proses sistem pencernaan makanan. Memilih Metode Pembelajaran: Ceramah, diskusi kelompok kecil, dan eksperimen sederhana. Menentukan Materi dan Sumber Belajar: Buku teks, video animasi, gambar, model plastik sistem pencernaan. Membuat Rencana Pembelajaran: Rangkaian aktivitas, alokasi waktu, materi, dan metode pembelajaran. <p>Pelaksanaan Pembelajaran</p> <p>Tahap 2: Pengamatan dan Perckaman Data</p> <ol style="list-style-type: none"> Guru A melaksanakan pembelajaran dengan mengikuti rencana pembelajaran yang telah disusun. Guru B dan guru lainnya mengamati proses pembelajaran yang dilakukan oleh Guru A. Guru B dan guru lainnya merekam data tentang respons siswa, kesulitan yang dihadapi, dan strategi pengajaran yang efektif. <p>Tahap 3: Diskusi dan Analisis</p> <ol style="list-style-type: none"> Guru B dan guru lainnya mengadakan pertemuan untuk membahas pengamatan dan data yang telah dikumpulkan. Menganalisis respons siswa, kesulitan yang dihadapi, dan strategi pengajaran yang efektif. Mengidentifikasi area perbaikan dan pengembangan pembelajaran untuk siklus berikutnya. <p>Refleksi dan Perbaikan</p> <p>Tahap 4: Perbaikan Bersama</p> <ol style="list-style-type: none"> Guru A dan guru lainnya mengadakan pertemuan untuk merenungkan hasil pengamatan dan analisis dari siklus sebelumnya. Membuat perubahan dan perbaikan dalam rencana pembelajaran berdasarkan temuan dan rekomendasi. Menyesuaikan strategi pengajaran, materi, atau pendekatan yang akan digunakan pada siklus berikutnya. <p>Pelaksanaan Pembelajaran Selanjutnya</p> <p>Tahap 5: Implementasi Rencana Pembelajaran yang Diperbaiki</p>

Figure 2. Answer R-0

Rancangan siklus Lesson Study untuk materi "Sistem Pencernaan Makanan" dalam pembelajaran kelas 4 sebagai berikut:

- Tahap Perencanaan (Planning)
 - Identifikasi tujuan pembelajaran:
 - Siswa memahami struktur dan fungsi organ-organ dalam sistem pencernaan manusia.
 - Siswa memahami proses pencernaan makanan dari mulai mulut hingga keluarnya sisa-sisa makanan.
 - Bentuk kelompok kerja: Guru sebagai tim perencana, koordinator, dan pengamat, serta siswa sebagai subjek pembelajaran.
 - Penetapan metode pengumpulan data: Observasi, wawancara, dan catatan reflektif.
 - Identifikasi bahan ajar yang akan digunakan: Buku teks, gambar organ pencernaan, dan video pembelajaran.
- Tahap Pelaksanaan (Lesson Implementation)
 - Guru mempersiapkan bahan ajar dan sumber daya yang dibutuhkan, seperti gambar organ pencernaan dan video pembelajaran.
 - Guru menyampaikan pembelajaran tentang sistem pencernaan makanan dengan menggunakan metode yang interaktif dan partisipatif, seperti cerita, diskusi, dan demonstrasi.
 - Selama pelaksanaan pembelajaran, guru mencatat respon dan interaksi siswa serta mengamati kesulitan atau kebingungan yang mungkin timbul.
- Tahap Observasi (Observation)
 - Guru dan anggota tim mengamati interaksi antara guru dan siswa, serta antar siswa selama pembelajaran berlangsung.
 - Tim mencatat hal-hal yang berjalan baik dan kendala yang muncul selama pembelajaran, termasuk tingkat pemahaman siswa terhadap materi.
- Tahap Refleksi (Reflection)
 - Tim perencana dan pengamat melakukan diskusi reflektif terhadap hasil observasi dan pencapaian tujuan pembelajaran.
 - Menganalisis data yang telah dikumpulkan dan mengidentifikasi kelemahan atau kekuatan dalam pendekatan pembelajaran yang dilakukan.
 - Merumuskan rekomendasi perbaikan untuk siklus pembelajaran berikutnya.
- Tahap Revisi (Revision)
 - Berdasarkan hasil refleksi dan rekomendasi perbaikan, tim perencana memperbarui rencana pembelajaran dan mempersiapkan perbaikan untuk siklus selanjutnya.
 - Memilih metode pembelajaran yang lebih efektif dan sesuai dengan karakteristik siswa kelas 4.
 - Mengidentifikasi bahan ajar tambahan atau sumber daya pendukung yang diperlukan.

Figure 3. Answer R-10

Table 8. Question 4

Interviewer	Unconfirmed
<p>During the learning activities of photosynthesis material. Mrs. Siska asked her students to do it experiment related to photosynthesis, but Ms. Siska was confused in preparing the assessment form the experiment. Help Mrs. Siska to design the assessment and explain it briefly related to how to make the assessment instrument!</p>	<p>Mrs. Siska needs to design a product assessment instrument first, then process assessment, psychomotor, character education and social skills (R-07). Make an assessment of experimental activities by assessing understanding of the concept of photosynthesis, experiment planning, experiment implementation, data analysis, communication and presentation (R-08).</p>

Discussion

The world of education continues to experience rapid development, thus demanding creative thinking skills for a teacher, especially elementary school teachers. The reason behind this is that children at the primary level tend to achieve better learning outcomes when teaching is presented in an interesting and creative way. Teachers who have the skills to think creatively adapt more easily to changes in curriculum and new educational technologies (Asrial et al., 2019; Divjak & Tomić, 2011). They are also more open to innovation in education. Moreover, teachers who have the skills to think creatively are able to design innovative lessons, create educational games, and visual media that attract students' attention. Elementary teachers who are able to think creatively play an important role in helping students develop critical, analytical and creative thinking skills.

In the science learning development course, prospective elementary school teacher students need to have the skills to think creatively in order to be able to create innovative learning tools. The skills to think creatively is assessed through four aspects, namely fluency, flexibility, originality, and elaboration (Senevirathne et al., 2022; Williams et al., 2009). The results of the study show that of the four indicators of creative thinking, students get the sufficient category on the fluency aspect. However, the other three indicators, namely flexibility, originality, and elaboration are in the less category. In terms of fluency, students are able to provide relevant responses to the case studies presented. In addition, when answering questions, students are able to think fluently and quickly. This can be seen in the results of the interviews, where students were able to determine learning models based on problem orientation, such as PBL (Problem-Based Learning) and PjBL (Project-Based Learning), which are in accordance with the case studies given (Affandi & Sukyadi, 2016; Fiana et al., 2019). Students who have experienced more intense training in developing fluency in creative thinking skills tend to be able to produce better ideas.

In terms of flexibility, most students tend to give answers based on only one concept or idea when answering questions. They are also limited in their skills to find a variety of suitable solutions to a problem.

This indicates that in terms of flexibility, students tend to be in the less category. These results are consistent with findings that have been disclosed in previous studies which defines flexibility as a person's skills to generate a variety of different ideas when faced with a problem (Hill, 2021). In addition, the results of the interviews also showed that each respondent only provided one idea or way to motivate students, namely by showing learning videos or using certain learning methods. In fact, increasing student motivation can be achieved with a variety of strategies, media, methods, and models (Hamidah & Putra, E., 2021; Safitri et al., 2021). Creative thinking skills often need to be developed and honed through practice and experience. If students do not have the opportunity to practice regularly, their level of flexibility may not reach the expected standard.

In the aspect of originality, the respondents' answers have not been able to produce a new concept. The response they gave was almost identical. When students are asked questions about making lesson study-based learning designs, most of them are based on five stages, namely planning, implementing, observing, reflecting, and revising (Aurum & Surjono, 2021; Musdi et al., 2020; Yolanda et al., 2022). In addition, the description of the learning design cycle has not been prepared in the form of a concept map that describes the steps "plan, do, see," which can help readers to understand the learning design more easily. All of this indicates that the level of originality of students is still lacking and needs to be improved. The skills to think creatively is a skill that can be improved and improved over time. Through practice and openness to new experiences and perspectives, we can generate more original and innovative ideas.

In terms of elaboration, it can be seen that the answers given by the respondents have not been explained in detail and detail. When asked about how to arrange experimental instruments, respondents only explained the criteria for evaluating the experiment and did not provide an in-depth explanation regarding the assessment of research implementation, observations or measurements, data analysis, and conclusions (Pebriana & Disman, 2017; Saptенno et al., 2019). In addition, respondents also did not provide an explanation regarding the procedure for making assessment guidelines for psychomotor assessment. This indicates that elaboration skills is categorized as lacking. Elaboration in creative thinking can be increased through the use of mind mapping techniques because this technique helps describe ideas in a more structured way by connecting the main idea with other sub-ideas. In addition, increasing student elaboration can be done by making steps to think through generating initial ideas, detailing the framework, and identifying the concrete steps needed to develop the idea (Auliandari et al., 2019; Priawasana et al., 2020). The results showed that the level of students' creative thinking skills in the SD Science learning development course was in the low category. This can be seen from the results of the responses when 233 students answered the questions, in which around 64%, or 150 students to be precise, belonged to the less creative category. Based on the results of the interviews, most of the respondents answered that they did not match the indicators of achieving creative thinking. This study makes an important contribution to improving students' creative thinking skills in the course by combining quantitative and qualitative data, thus providing a more comprehensive picture than previous studies. The findings on the low creative thinking ability of students prompted recommendations to adopt learning strategies that focus more on the development of creative thinking and more accurate assessment.

4. CONCLUSION

The creative thinking skills of elementary teacher education students in the Science learning development course was assessed using four indicators of creative thinking, namely fluency, flexibility, originality, and elaboration. In terms of fluency, students are categorized as sufficient because they are able to provide appropriate responses to the given case studies. However, in terms of flexibility, most students tend to give answers based on only one concept or idea when answering questions, and variations in answers to address problems are also limited. Regarding the originality aspect, students have not been able to produce new concepts so that their answers are almost identical to the others. In the elaboration aspect, the answers given by the respondents have not been explained in detail and detail. This indicates that the majority of students have a low level of creative thinking skills. Therefore, it is necessary to increase the three indicators of creative thinking, namely flexibility, originality and elaboration, because they are in the less category. It is important to improve students' creative thinking skills because as elementary school teacher candidates, they need to create innovative and creative learning to increase student learning motivation. Students' creative thinking skills can be improved through practice, the use of mind mapping techniques to develop ideas, and openness to new experiences. Suggestions for further research are to conduct research on factors that influence or moderate creative thinking skills, such as environment, education, learning experience, or teaching methods. In addition, research can investigate the relationship between creative thinking skills and student learning outcomes.

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