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The Effect of Assessment Strategy on Students' Character and Creative Thinking Ability in Designing Learning Media

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Abstract: The Effect of Assessment Strategy on Students' Character and Creative Thinking Ability in Designing Learning Media. **Objective:** assessment strategy its effect on creative thinking ability and academic character of students in making learning media. **Methods:** research quasi-experimental method one-group pretest-posttest design. The research was carried out in the Biology Education Study Program of UMM in the odd semester of 2021/2022. The research population is students in the Media and Learning course. Saturated sampling technique and sample of 25 students. The research instrument consisted 6 creative thinking essay questions and an academic character assessment form. Data were analyzed statistically using ANOVA. **Findings:** the application of the assessment strategy has a significant effect on students' creative thinking skills in making learning media for biological diversity, fungi and inheritance. The assessment strategy used has an influence on the academic character of students. **Conclusion:** good assessment strategy will encourage educators to determine good teaching strategies and motivate students to learn better so that learning becomes meaningful.

Keywords: elaboration, flexibility, fluency, metaphorical thinking, academic character.

Abstrak: Pengaruh Strategi Asesmen terhadap Karakter dan Kemampuan Berfikir Kreatif Siswa dalam Mendesain Media Pembelajaran. Tujuan: strategi asesmen pengaruhnya terhadap kemampuan berpikir kreatif dan karakter akademik mahasiswa dalam membuat media pembelajaran. Metode: penelitian eksperimen semu one-group pretest-posttest design. Penelitian dilaksanakan di Prodi Pendidikan Biologi UMM semester ganjil 2021/2022. Populasi penelitian mahasiswa mata kuliah Media dan Pembelajaran. Teknik sampling jenuh dan sampel 25 mahasiswa. Instrumen penelitian terdiri 6 soal essay berfikir kreatif dan form penilaian karakter akademik. Data dianalisis secara statistik menggunakan ANOVA. Temuan: penerapan strategi asesmen memberikan pengaruh secara signifikan pada kemampuan berpikir kreatif mahasiswa dalam membuat media pembelajaran materi keankergaman hayati, jamur dan pewarisan sifat. Strategi asesmen yang digunakan memberikan pengaruh terhadap karakter akademik mahasiswa. Kesimpulan: strategi asesmen yang baik akan mendorong tenaga pendidik untuk menentukan strategi mengajar yang baik dan memotivasi siswa untuk belajar yang lebih baik sehingga pembelajaran menjadi bermakna

Kata kunci: elaborasi, fleksibilitas, fluency, berpikir metafor, karakter akademik.

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■ **INTRODUCTION**

Learning media is a tool in the learning process that can be used to stimulate the thoughts, feelings, attention, and abilities or skills of students (Widodo & Wahyudin, 2018). In general, the forms of learning media are varied. It can be visual, audio, and motion. The use of media in learning must be adapted to the condition of place and the characteristics of the students (Ahamdi & Rokhman, 2017). As prospective professional educators, students must understand that determining media or learning resources must be in accordance with students' learning styles, and the media chosen must be familiar with student characteristics (Sumiharsono & Hasanah, 2017).

In planning learning media based on student needs, it needs creativity skills because learning media is one of the determinants of learning success (Nurhayati & Rahardi, 2021). A learning media is considered good if the message in the media can be conveyed in accordance with the essence of the message meant by the conveyer, and its use in learning feels practical as well as effective for students (Dwijiyani, 2019). The use of appropriate learning media can determine the teacher's perspective in utilizing media during learning activities both as a strategy and when delivering material (Pakpahan et al., 2020).

Creative thinking ability is one aspect of HOTS (Higher Order Thinking Skills) and 21st century skills that must be possessed by students (Akpur, 2020; Saputri, Sajidan, Rinanto, Afandi, & Prasetyanti, 2019). Likewise, the implementation of education in universities, which must be able to develop students' creative thinking skills, with the hope that each graduate will be able to analyze and solve problems faced in everyday life. (Sari & Wulanda, 2019). The development of creative thinking skills needs to be used to solve student problems in the learning they get (Patmawati, Puspitasari, Mutmainah, & Prayitno, 2019). Students' creative thinking skills are important to use in learning and dealing with life problems (Ndiung, Dantes, Ardana, & Marhaeni, 2019).

Creative thinking ability is the ability possessed by students in solving complex problems with different strategies, through the development of ideas that existed before that (Siburian, Corebima, Ibrohim, & Saptasari, 2019). Every student who has good creative thinking skills is expected to be able to solve problems from various different perspectives (Mahfi, Marzal, & Saharudin, 2020). The ability to think creatively is closely related to the creative thinking process, uniqueness, novelty, and originality, and is also related to the process of creating (Akpur, 2020; Nurhayati & Rahardi, 2021).

Education that affects individual development lies in two main aspects, namely intellectual and moral. Intellectual is the natural ability possessed by individuals to choose an orientation. While morals develop through experience and learning. In the perspective of education, these two aspects cannot be separated from the formation of individual character (Amri, 2016). The balance of character education and academic education must be instilled in students from an early age. This is a responsibility to cultivate noble character and knowledge (Wulandari Retnaningrum, 2020). Students must be devoted to God Almighty, must have noble character, be healthy, knowledgeable, capable, creative, independent, skilled, competent and cultured (Heryadi, 2017).

Creativity or creative thinking skill is one of the 21st century skills that can be applied universally to improve the way of thinking, learning, working, and living in the world. Students are required to be able to think creatively because creativity becomes a character that must be owned by students. Through a strong character, students can develop better thinking patterns. According to Mansir, Parinduri, & Abas

(2020:431) character is a personality, temperament, distinctive basic nature, a trait, or quality that remains continuous and everlasting so that it can be used as a characteristic to identify a person. Students as someone who is learning, then the formation of a strong character can be formed through nurturing and education in a series of learning processes, training, and imitation.

The implementation of effective character education is carried out through courses (Kapatan et al., 2022). Research conducted by Rifai, Fahrudin Ghozali, & Nurhakim (2021:117) found that character building can be done by spiritual improvement, including by strengthening the intention before taking an action. So that in improving the ability to think creatively, it needs to be preceded by the intention to do so, then proceed in learning. The superior values of academic cultural characters that are developed are not only creativity but there are many more that can be developed. In general, academic characters that must be grown include the character of thoroughness, critical thinking, responsibility, and logical, systematic, and innovative thinking (Heryadi, 2017).

Many efforts can be made to improve creative thinking skills and academic character. One of them is through the assessment strategy used. Assessment is an important component in the implementation of education. Efforts to improve the quality of education can be pursued through improving the quality of learning and quality of assessment. A good assessment will encourage teachers to determine good teaching strategies and motivate students to learn better (Habiby, Rudibyani, & Efkar, 2015). When designing a lesson, it is necessary to think about the assessment used (Pantiwati, 2015).

The effective assesment strategies are *portfolios, self-asesments, peer evaluations*, and weekly assignments using quick *feedback*. The role of *meaningful feedback* does not need

to be overemphasized (Gaytan & Mcewen, 2007). Collecting information about creative abilities can be done with behavioral or performance data, self-reported data, rating scales, and tests (Bolden, DeLuca, Kukkonen, Roy, & Wearing, 2020). Thus, there are various types of assessments that can be used as assessment strategies and these types of assessments are expected to influence learning outcomes. This type of assessment has a fairly positive impact on academic achievement, and students' attitudes towards this type of assessment are very positive. What was particularly interesting was the students' belief that this type of assessment had helped them to cope with anxiety and tension (Pengiran Omar, Shahrill, & Zuraifah Sajali, 2019).

The use of media in learning is very important because, through learning media, an active, effective, creative and fun learning process can be created. In making learning media, it takes creativity from every student. Mastery of creative thinking skills is an important thing related to problem solving abilities and creating new ideas (Ulger, 2018). In addition to the ability to think creatively, academic character in learning activities also needs to be done. This is because character is an integral part of education (Kurniawansyah & Sumitro, 2020). An appropriate strategy is needed in conducting an assessment or assessment, so an assessment strategy is needed in media learning and learning. The strategy meant is an assessment strategy for creative thinking skills and academic character in making a learning media. So the purpose of this study is to determine the effect of the assessment strategy on the creative thinking ability and academic character of students in making learning media.

■ **METHODS**
Participants

The population in this study was the Biology Education Study Program Odd Semester 2021/

2022 students who took the Learning Media course in class 3B. Non-probability sampling uses a saturated sampling technique, namely determining a sample of all members of the population with a total of 25 students

Research Design and Procedures

This type of quantitative research with a quasi-experimental method with a One-Group Pretest-Posttest Design was conducted on one group without a control group (Figure 1). This research is adapted to the objectives to be achieved, namely testing assessment strategies in learning to see creative thinking skills and academic character. The research was carried out in the odd semester of the 2021/2022 academic year in the Learning Media course. Learning for one semester by applying assessment strategies. The assessment strategy consists of portfolio, written test, oral test, performance assessment, project and product, and self-assessment. The portfolio is a collection of student work for one semester in the form of a portfolio of documents and displays. The written test is carried out 2 times, namely the mid-semester exam (UTS) and the final semester exam (UAS), while the oral test is during the lecture process. Performance assessment is carried out through discussion activities and learning media creation activities in project assignments that produce products in the form of IT-based and non-IT-based learning media. Self-assessment is carried out after the activity is completed such as after discussion, after doing assignments. The independent variable is online and offline assessment strategy. The dependent variable of creative thinking ability includes fluency, originality, elaboration, flexibility and metaphorical thinking and academic character.

Group	Pretest	Treatment	Posttest
Experiment	O	X	O
Control	O		O

Figure 1. Research design

Information :
O : pretest = posttest
X : treatment of assessment strategy
Pretest : initial measurement of creative thinking skills and academic character of biodiversity material
Posttest : measurement of the middle (mushroom material) - end (material inheritance) creative thinking skills and academic character after the treatment of the assessment strategy.

Instruments

The instrument used in this research is an instrument to measure students' creative thinking ability in making learning media based on creative thinking indicators and assessment of academic character. The creative thinking instrument was developed by the researcher, which consisted of 6 essay questions for 1 Basic Competence (KD) and the research used 3 KD (Table 1.) The creative thinking indicators used in developing the

Table 1 Basic competencies for creative thinking

Materi	Kompetensi Dasar
Biodiversity	3.2 In the form of analyzing various levels of biodiversity in Indonesia and their threats and conservation, and
	4.2 In the form of presenting the results of observations of various levels of biodiversity in Indonesia and proposed conservation efforts. The second task is material for grade 10, fungi, basic competence
Fungi	3.7 In the form of grouping fungi based on characteristics, reproduction methods, and linking their roles in life, and
	4.7 In the form of presenting reports on the results of investigations on the diversity of fungi and their roles in life. The third task is hereditary material for grade 12, basic competencies
Inheritance Material	3.3 Analyzing the structure and function of genes, DNA, chromosomes in the application of the principles of hereditary in living things and
	4.3 Formulating the sequence of protein synthesis processes in relation to the delivery of the genetic code (DNA-RNA-Protein).

Table 2 Indicators of creative thinking

Creative Thinking Indicator	Creative Thinking Question Instrument
Originality	1. Mention ideas, suggestions or other alternative types of media and learning resources that will be used in the basic competence used!
Fluency	2. Mention interesting unique ideas logically, relatively new and relevant to the problem in the basic competence!
Elaboration	3. Explain some logical details on the idea that you have mentioned so that the formulation of the idea becomes easier to apply and clear!
Flexibility	4. Write down several alternative answers that are logical and relevant to the problem given from several different points of view!
Metaphorical Thinking	5. Combine several ideas, modify, and explain the formulation of ideas with logical and coherent analogies (related or related!
	6. Why do you give ideas, suggestions, choose the media and learning resources mentioned above. Give reasons, explain the concept clearly and specifically! Provide answers, explanations, and descriptions systematically, clear arguments, and interrelated so as to provide an integrated answer.

questions consisted of fluency, originality, elaboration, flexibility and metaphorical thinking (Table 2).

Each instrument about creative thinking goes through the validity and reliability test stages. Test the validity of the items using the Pearson Prodact Moment Correlation formula with the help of SPSS 27 software. The basis for decision making in the validity of items if the value of r count > r table is declared valid item and the value of r count < r table is declared invalid. The item validity test uses r table with the formula df=N-2 with a significance level of 5%. The sample used in the test questions amounted to 16, so the value of df = 16-2 = 14 or the value of r table 14 of 0.425. The question of creative thinking on the material of biodiversity consists of 6 questions. Of the 6 questions developed, each item will be tested for item validity with the results of 6 questions being declared valid. Furthermore, the

question of creative thinking on mushroom material is 6 questions. Of the 6 questions developed, 6 questions were declared valid. Finally, the question of creative thinking on the inheritance of traits consists of 6 questions and 6 questions that were developed were declared valid. Questions that are declared valid are followed by a test of the reliability of the questions.

The reliability test of the creative thinking instrument was carried out using the Cronbach alpha test with the help of SPSS 27 software. The results of the reliability test will later be interpreted to determine the reliability criteria of the question, Fraenkel, Wallen, & Hyun in 2012

explained that an instrument is said to be reliable if the reliability coefficient value is more than 0.70 (Yusup, 2018). The question instrument on the material of biodiversity has a high degree of reliability, namely 0.791. Furthermore, on the question of creative thinking, mushroom material has a very high degree of reliability, namely 0.884. Finally, the inheritance material has a very high degree of reliability, namely 0.882.

Academic character data obtained refers to the Character Education Terms of Reference Muhammad Nuh (2010:35-36) through observations, anecdotal notes, assignments, reports, and other learning activities. The character building process is as follows:

Table 3 Character building records

Character	Description
BT: Not Seen (2)	When students have not shown the initial signs of behavior stated in the indicators because they do not understand the meaning of the value (*Anomy* Step)
MT: Started to be Seen (3)	When students have started to show early signs of behavior stated in the indicators but have not been consistent because there is already an understanding and reinforcement of the immediate environment (*Heteronomy* Step)
MB: Started to Develop (4	When students have shown various signs of behavior stated in the indicators and are starting to be consistent, because apart from understanding and awareness, they also get a strengthening of the immediate environment and the wider environment (*Socionomy* Step*)*
MK: Started to be Entrenched (5)	When students continue to show the behavior stated in the indicators consistently, because apart from having understanding and awareness and getting strengthening the immediate environment and the wider environment, moral maturity has grown. (*Autonomy* Step).

Data Analysis

Creative thinking and academic character data were analyzed using the repeated measure ANOVA test with the help of SPSS 27 software. The repeated measure ANOVA test was a test used to test the difference between two or more variables. The main requirement in the repeated measure ANOVA test is that the data must be normally distributed. The sample used in the study

was below 50 so that for the normality test, the Shappirowilk test was used. If the value of sig > 0.05 the data is normally distributed and the value of sig < 0.05 the data is not normally distributed. Normal distributed data can be continued for the ANOVA test. Furthermore, to meet the assumption of the similarity of sphericity variance seen through the output of Mauchly's test of sphericity, the value of sig > 0.05, the research

data fulfills the assumption of the similarity of sphericity variance. Research data that meet the assumption of similarity of variance will be followed by hypothesis testing using output tests of within-subjects effects. If the significance value is <0.05, it can be concluded that H0 is rejected and Ha is accepted. While the significance value > 0.05 H0 is accepted and Ha is rejected. To find out the increase in data on creative thinking and academic character, look at the output of pairwise comparisons. If the significance value < 0.05, it is stated that there is an increase in the value of creative thinking or student academic character significantly and the significance value > 0.05 there is an insignificant increase. The increase is seen from each material, namely the value of the biological diversity material on the fungal material, the value of the biological diversity material on the inheritance material and the value of the fungal material on the hereditary material.

■ RESULTS AND DISCUSSION

Creative thinking skills and academic character in making learning media are carried out on three materials. The first task is the material for biodiversity grade 10, basic competence 3.2, in the form of analyzing various levels of biodiversity in Indonesia and their threats and conservation, and 4.2 in the form of presenting the results of observations of various levels of biodiversity in Indonesia and proposed conservation efforts. The second task is material for grade 10, fungi, basic competence 3.7, in the form of grouping fungi based on characteristics, reproduction methods, and linking their roles in life, and 4.7 in the form of presenting reports on the results of investigations on the diversity of fungi and their roles in life. The third task is hereditary material for grade 12, basic competencies 3.3 Analyzing the structure and function of genes, DNA, chromosomes in the application of the principles of hereditary in living things and 4.3

Formulating the sequence of protein synthesis processes in relation to the delivery of the genetic code (DNA-RNA-Protein). Students are given six questions in each question leading to indicators of creative thinking ability. Each aspect of the creative thinking indicator has a maximum score of four and every score of 1-4 contains criteria for that aspect.

Creative ability is generally understood as creativity (Puspitasari, In'am, & Syaifuddin, 2018). Creative thinking skills are new ideas and generate ideas about students' ability to generate a number of ideas (*fluency*), ability to generate new ideas in different and varied ways (*flexibility*), ability to generate new and unusual ideas (*originality*), ability to enrich ideas to make them more interesting and more complex (*elaboration*), and ability to use comparisons or analogies to make new connections (*metaphorical thinking*). The benefits of creative thinking skills include building the ability to take risks, developing the ability to deal with unstructured and ambiguous problems, helping students appreciate multiple perspectives, promoting innovation and encouraging independent learning (Kasirer & Mashal, 2018; Supratman, Zubaidah, Corebima, & Ibrohim, 2020)

Students' creative thinking ability in making learning media can be known by providing an assessment that has been designed in such a way according to the characteristics contained in the classification of students' creative thinking abilities. (Kristiani, Mayasari, & Kurniadi, 2017). Assessment is closely related to the learning activities that will be designed (Sewell, Frith, & Colvin, 2010). Assessment is a process of gathering information and making decisions for student learning progress (Pantiwati, 2015). Assessment can be used to measure a person's creativity (Bolden et al., 2020). Assessment should be authentic so that it is able to provide

holistic and valid information on students' abilities in the three aspects measured. Assessment can also be seen as a controller in the quality of learning activities (Habiby et al., 2015).

The purpose of assessment in learning is to determine the level of achievement of learning objectives and determine the effectiveness of the teaching and learning process (Widiana,2016). Assessment in learning activities will provide feedback to students to monitor self-development in learning activities (Kristiani et al., 2017) This is because assessment includes all student activities during learning (Basera, 2019). The type and model of assessment to use can vary depending on the type of competence, indicators of learning outcomes to be achieved, learning materials, and the objectives of the assessment itself (Widiana, 2016).

Table 4. Output mauchly's test of sphericity creative thinking

Within Subjects Effect	Mauchly's W	Approx. Chi-Square	df	Sig.	Epsilon[b]		
					Greenhouse-Geisser	Huynh-Feldt	Lower-bound
Strategy_Assessment	.674	5.521	2	.063	.754	.820	.500

The results of the research on the effect of the assessment strategy on students' creative thinking were analyzed using the repeated measure ANOVA test. The use of this test is to compare three or more mean data from the same study. There are three data on students' creative thinking, namely creative thinking on the material of biodiversity, fungi, and hereditary. Based on the output of Mauchly's test of sphericity creative thinking, a significance value of 0.063 > 0.05 means that the creative thinking ability data meets the assumption of the similarity of sphericity variance (Table 4). Based on the output tests of within-subjects effects sphericity assumed creative thinking students have a significance value of 0.00 < 0.05, this indicates that there are differences in students' creative thinking abilities in the material of biodiversity, creative thinking of students on mushroom material and creative thinking skills on the material of inheritance in application assessment strategy (Table 5).

Table 5 Tests of within-subjects effects creative thinking

Source		Type III Sum of Squares	df	Mean Square	F	Sig.
Strategy_Assessment	Sphericity Assumed	3303.125	2	1651.562	19.844	.000
	Greenhouse-Geisser	3303.125	1.508	2189.805	19.844	.000
	Huynh-Feldt	3303.125	1.641	2013.340	19.844	.000
	Lower-bound	3303.125	1.000	3303.125	19.844	.000
Error(Strategy_Assessment)	Sphericity Assumed	2496.875	30	83.229		
	Greenhouse-Geisser	2496.875	22.626	110.353		
	Huynh-Feldt	2496.875	24.609	101.461		
	Lower-bound	2496.875	15.000	166.458		

This shows that there are significant differences in students' creative thinking on the material of biodiversity, fungi and hereditary in the application of the assessment strategy or there is an influence of the assessment strategy on creative thinking skills. A research conducted by Naser & Almutairi (2015) found that there is a significant difference in the use of brainstorming strategies in the treatment group. This shows that the brainstorming strategy as a collective discussion strategy encourages to generate as many varied and creative ideas as possible that are spontaneous, and are free to make creative ideas. The creative thinking process allows students to find a connection, face new challenges and seek a resolution that is unusual, original and new. Thus, creative thinking is related to one's knowledge and experience (Gafour, 2021).

Table 6. Output pairwase comparisons of creative thinking

(I) Strategy_Ass essment	(J) Strategy_Ass essment	Mean Difference (I-J)	Std. Erro r	Sig.[b]	95% Confidence Interval for Difference[b]	
					Lower Bound	Upper Bound
1	2	-10.625[*]	3.61 9	.031	-20.374	-.876
	3	-20.312[*]	3.69 3	.000	-30.261	-10.364
2	1	10.625[*]	3.61 9	.031	.876	20.374
	3	-9.687[*]	2.11 5	.001	-15.384	-3.991
3	1	20.313[*]	3.69 3	.000	10.364	30.261
	2	9.688[*]	2.11 5	.001	3.991	15.384

Description: 1 (creative thinking on biodiversity material), 2 (creative thinking on mushroom material) and 3 (creative thinking on trait inheritance)

Furthermore, based on the output of pairwise comparisons, it shows the magnitude of the increase in students' creative thinking skills after the implementation of the assessment strategy. The increase in creative thinking skills in making learning media for biological diversity material to creative thinking on mushroom material shows that an increase of 10,625 and an increase in creative thinking skills is real because of the sig value. $0.031 < 0.05$. Increased creative thinking skills in making learning media for biological diversity material on creative thinking skills for inheritance material by 20,312 and increasing creative thinking skills because of the sig value. $0.000 < 0.05$. Furthermore, the average increase in students' creative thinking skills on mushroom material to inheritance is 9,687 and the increase in creative thinking skills is real because of the sig. $0.001 < 0.05$ (Table 6). The assessment strategy used must be authentic. Through authentic assessment, knowledge, understanding, problem solving skills, social skills and behavior are used or practiced in life. This is because authentic assessment is realistic which refers to actual situations in life. Through authentic assessment, students are given the opportunity to justify and defend their answers or products (Mohamed & Lebar, 2017).
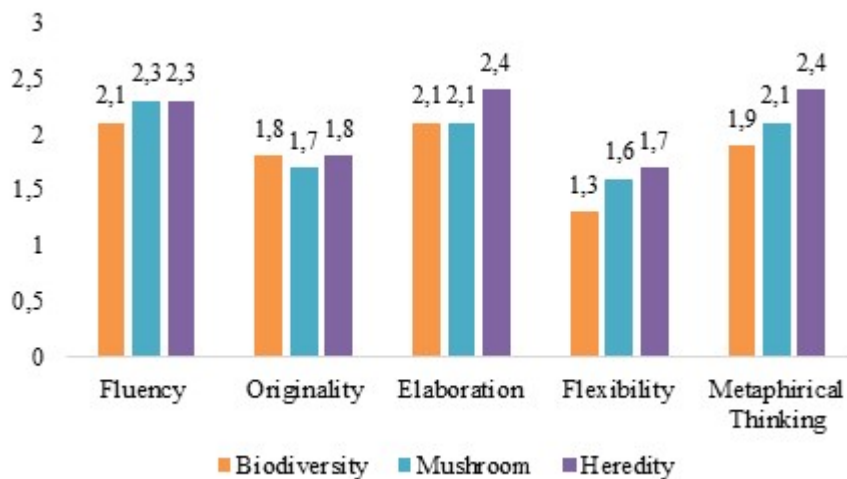
Figure 2. Average of student creative thinking indicator

Fluency is the ability of students to generate thoughts, questions or creative ideas in large numbers (Sugiyanto, Masykuri, & Muzzazinah, 2018). The indicator of fluency in making learning media in this study can be seen in the average score of the material on biodiversity of 2.1 (Figure 2). In this indicator, every idea written on biodiversity materials, suggestions or alternatives is written in almost the same way as using pictures, audio-visual media, and power points. Furthermore, the results of research on fluency as an indicator of creative thinking in Fungi material show that the average score on the fluency aspect of Fungi material is 2.3 or an increase compared to the previous material (Figure 2). The ideas written down varied although there were still some similarities in ideas and implementations written by students. One example of an idea that is often proposed by students in solving problems with creative thinking skills, such as the use of fungus as a medium of learning. Although both use fungus as a medium, each student has a different way of using fungus as a medium. Some students use fungus to observe the morphology directly, but there are students who give the idea to visit a fungus cultivation place. The average score on the hereditary material is 2.3 (Figure 2).

The results in Table 7. show that the aspects of creative thinking fluency from 4 scores, the most students get a score of 2 both on tasks 1,2 and 3. While those who get a score of 4 are the least (Table 7). This shows that most students tend to give an idea or suggestion that tends to be similar. For example, in making media with problems given the basic competencies provided, they tend to write down ideas such as the use of PPT, pictures, and videos. The ideas mentioned are general in nature, but there are some students who mention different ideas but not too many. This shows that the ideas written are still in the same category (Kinati, 2012). Each idea that is written shows that students are able to understand the problems given, but the ideas, suggestions, or alternative answers are still general or almost the same (Dwi Herdani & Ratu, 2018).

Each student has their own ideas in making learning media for the three materials (Table 7). Students on the fluent indicator tend to give ideas, suggestions or alternative answers that are general in nature but have different implementation methods. The fluency aspect in making learning media includes fluency in thinking, combining learning ideas or ideas and the ability to produce

an idea in a fairly short time. Someone who has good fluency ability can produce an idea that is constant in a problem (Hu, Wu, & Shieh, 2016). In addition, someone who has fluency is able to generate many ideas, suggestions, and is also able to provide an alternative answer other than the main answer (Handayani, Rahayu, & Agustini, 2021).

Table 7. Result of fluency in creative thinking

Aspect	Description	Score	Number of Students		
			Task 1	Task 2	Task 3
Fluency	Mentioning more than 5 different ideas, suggestions, or alternative answers	4	1	1	0
	Mentioning more than 3 different ideas, suggestions, or alternative answers	3	2	3	7
	Mentioning some ideas, suggestions, or alternative answers that are tend to be similar	2	10	11	7
	Mentioning an idea, a suggestion, or an alternative answer	1	3	1	2

Description: Task 1: Biodiversity material, Task 2: Fungi material, and Task 3: Hereditary material

Originality is the ability to think in new or unique ways to solve a problem (Habibi et al., 2020). The average score of the authenticity aspect of biodiversity material is 1.8 (Figure 2). This shows that the ideas conveyed by students are still general in nature and the ideas used are common because the ideas written are still general in nature. Students pay less attention to whether the ideas written down have a correlation with the problems in the basic competencies provided. The average score of Fungi material is 1.7, which means a decrease from the previous score (Figure 2). This is based on the finding that the ideas written are still general in nature and do not yet have a correlation with the existing problems. Some ideas that are often used by students about media include PPT-based media, pictures, or videos. Furthermore, the average score of hereditary material is 1.8 (Figure 2). The ideas written by students on this material are still general in nature but there are some students who have written down ideas that are still rarely used (Table 8). Some of the different ideas listed include using conventional teaching aids for inheritance material or creating application-based media.

The results of Table 8 show that, based on the aspect of authenticity in creative thinking which consists of 4 scores, the most students get a score of 1, both on assignments 1, 2, and 3. While students who get a score of 4 are the least (Table 8). These results indicate that, in general, students are still writing ideas about making learning media using ideas that are commonly used, such as the use of image-based media, video, and PPT. However, there are some students who write down ideas about making learning media that are unique and logical so that they get a score of 3 and 4 (Table 8). In this case, students are required to be able to create a new idea that is unique, logical, and unusual, to express the arguments they have (Lince, 2016).

Originilaty aspect in thinking critically includes the ability to write down a new idea, suggestion, or alternative answer, as well as write down ideas that have never been done by other

individuals (M.N Anwar, Muhammad Aness, Asma Khizar, Muhammad Naseer, & Gulam Muhammad, 2012). In creative thinking, this aspect is also related to students' thinking patterns in solving problems with their own ideas. Thus, the ideas that are written down are not general ideas because they come from their own unique thoughts (Rahman, 2012).

Table 8. Results of the authenticity of creative thinking

Aspect	Description	Score	Number of Students		
			Task 1	Task 2	Task 3
Originality	Mentioning some interesting unique ideas logically, relatively new, and relevant to the given problem	4	1	1	0
	Mentioning some interesting unique ideas logically, relatively new but less relevant to the given problem	3	3	2	3
	Mentioning some ideas that are quite unique, logically interesting, relatively new and relevant to the given problem	2	3	4	7
	Mentioning some ideas that are common, logical, and relevant to the given problem	1	9	9	6

Elaboration is an ability to add or specify the details of a problem, object, idea, or situation (Nufus, Duskri, & Bahrun, 2018). The average score of the detailed thinking aspect on the material on biodiversity is 2.1 (Figure 2). The ideas conveyed by students are still not clearly defined. One example of a student writing media pictures, videos, audio-visuals, or utilizing surrounding materials, but students did not clarify what things would be used. This includes the role of video in solving problems or what materials are used so that they can solve existing problems. The average score of the detailed thinking aspect on the Fungi material is 2.1 or the same as the previous material (Figure 2). The ideas presented by students on Fungi material are quite varied, but it is still not clear about the role or implementation of the media used. Finally, the average score on the hereditary material is 2.4 or has increased compared to the previous material (Figure 2). The ideas written have begun to be clarified regarding the implementation of the media used, although there are some ideas that have been clarified but are less relevant.

Students begin to be able to convey ideas that are not just initial ideas (Table 9).

Table 9. shows that, the detailed thinking aspect in creative thinking out of 4 scores, the most students get a score of 2, both on tasks 1, 2, and 3. For example, in making media on tasks 1, 2, and 3 when students write media in the form of pictures or videos. Students tend to write that the material on biodiversity, fungi, and inheritance will be displayed with pictures or videos in front of the class. In the ability to think in detail, students should be able to detail the role of the media that will be used. Meanwhile, students who get a score of 4 are the least (Table 9). The result of a score of 2 shows that most of the students have clarified the ideas written, but there are some explanations that are less relevant to the ideas written down. In addition, a score of 4 indicates that there are several students who add logical details to the ideas presented. This shows that students' ability to think in detail is related to their ability to develop creative ideas they own (Haq, 2012).

Aspects of detailed thinking in creative thinking relate to the ability of students to explain

their ideas in detail, so that the written ideas can be realized properly, enrich and develop an idea or product, and detail the situation to be more

interesting (Lince, 2016). Participants' ability to add details or refinements beyond the basic response (Lin & Wu, 2016).

Table 9. Result of elaboration aspects of creative thinking

Aspect	Description	Score	Number of Students		
			Task 1	Task 2	Task 3
Elaboration	Explaining some logical details on existing ideas so that the formulation of ideas becomes easier to apply and clear	4	1	1	3
	Providing a logical detail on an existing idea so that the formulation of the idea becomes easier to apply and clear	3	3	3	4
	Providing some logical details on an existing idea but it is not in accordance with the main idea concept so it cannot be used to clarify the idea	2	9	8	6
	Does not add any detail to existing ideas so that the formulation of ideas is less applicable	1	3	4	3

Flexibility is the ability to generate many thoughts or alternatives in solving problems from various points of view (Batlolona, Diantoro, Wartono, & Latifah, 2019; Simanjuntak, Hutahaean, Marpaung, & Ramadhani, 2021). The average score of the flexibility aspect of the ability to think creatively on biodiversity is 1.3 (Figure 2). In writing alternative ideas, students have not been able to distinguish between the alternative ideas presented and the main idea, whether they have a different role or not. The average score of Fungi material is 1.6 (Figure 2). The alternative ideas used by students to solve the problems provided still use the same method. The average score of the inheritance material is 1.8 or different from the previous material, although it is quite small (Figure 2). The alternative ideas presented were still the same as the main idea, but some students began to provide other alternative ideas with different methods (Table 10). One example of student ideas in making learning media that is often written down in solving problems in tasks 1, 2, and 3 is the use of PPT, videos, and pictures. The flexibility aspect has the lowest score compared to the others.

The results of the study showed that the score for flexibility in creative thinking for making media media had the lowest score compared to the others. The results of table 7. show that the aspect of flexibility in creative thinking out of 4 scores, the most students get a score of 1 both on tasks 1, 2, and 3. While students who get a score of 4 are the least (Table 10). This shows that students are still lacking in solving problems using more than one method (Apriliani & Suyitno, 2016). Students are still lacking in analyzing or solving a problem based on their creative ideas (Amtiningsih et al., 2016).

The ability to think flexibly relates to the ability to determine an approach to address a given problem (Sharma, Nagar, & Pathak, 2012). The flexibility aspect in creative thinking ability makes the media included in the ability of students to categorize a problem according to daily life and the ability to create different ideas (Amtiningsih et al., 2016; Haq, 2012). This is in accordance to the opinion of Lince (2016:208) that flexible thinking skills include the ability to generate ideas, provide varied answers, use various solving strategies, provide examples

Table 10. Result of flexibility aspect of creative thinking

Aspect	Description	Score	Number of Students		
			Task 1	Task 2	Task 3
Flexibility	Writing down several alternative answers that are logical and relevant to the problem given from several different points of view.	4	0	0	0
	Writing down several alternative answers that are quite logical and relevant to the problem given from several different points of view.	3	0	2	2
	Writing down several alternative answers that are quite logical but less relevant to the problem given from several different points of view.	2	5	6	7
	Writing an answer that is quite logical and relevant to the problem given only from one point of view	1	11	8	7

related to concepts, and look for different alternative solutions.

Metaphorical thinking is the ability to use comparisons to make new relationships (Maghfiroh, Susilo, & Gofur, 2016). The ability to think metaphorically relates to the ability to explore ideas, so that creative ideas are quite varied (Im, Hokanson, & Johnson, 2015). The average score of the metaphorical thinking aspect on the material on biodiversity is 1.9 (Figure 2). Students do not make it clear so that the ideas become a single unit, so that what is written is still impressed as separate points or there is no relationship. Furthermore, the average score on the Fungi material is 2.1. This shows that the student's ability to combine written ideas has progressed slightly from the previous material. Students begin to clarify in combining the ideas that are written down so that they become a single unit. There are some students who are lacking in combining the ideas that have been written down. Finally, the average score on the inheritance material is 2.4. This shows that there are some students who are able to combine ideas well and become a complex unit. However, there are some students who are still lacking in combining the ideas written down (Table 11). A person's creativity is relative (Shaughnessy, 2021).

Table 11. Results of metaphorical thinking aspect of creative thinking

Aspect	Description	Score	Number of Students		
			Task 1	Task 2	Task 3
Metaphorical thinking	Combining several ideas, modifying, and explaining the formulation of ideas using logical and coherent analogies	4	1	0	2
	Combining and modifying several ideas, but not explaining the formulation of ideas using logical and coherent analogies	3	4	5	7
	Combining several relevant ideas but not explaining the formulation of ideas with logical analogies.	2	4	8	2
	Being less able to combine relevant ideas so that they become a coherent whole	1	7	3	5

Building student character includes building student academic culture. Academic culture is a universal culture that is owned by everyone who involves himself in academic activities (Manurung & Rahmadi, 2017). The optimal academic culture for students is if they are able to achieve the highest academic achievement (Supriyanto, 2021) The development of academic culture becomes meeting point between character building efforts and quality improvement as a result of the higher education process (Masruroh & Mudzakkir, 2013). Character formation according to the learning perspective cannot be separated from the choice of strategies in the classroom. The more precise the strategy chosen, the more it will strengthen and accelerate the transformation of values into individuals and society (Manurung & Rahmadi,

2017).

Character is an integral part of academic culture, considering that character is needed and has the potential to be developed from every academic activity (Kurniawansyah & Sumitro, 2020). Strengthening character for students needs to be done from an early age. In practice, the cultivation of character education can be carried out in every life, both in the family, school, and life in society (Bustami, Syafruddin, & Afriani, 2018). Character education begins to develop when students have shown various signs of behavior stated in the indicators and are starting to be consistent. Character education begins to become entrenched and empowering if students continuously demonstrate the behavior stated in the indicators consistently for assessment (Table 3) (Muhammad Nuh, 2010).

Table 12. Output mauchly's tes of sphericity academic character

Within Subjects Effect	Mauchly's W	Approx. Chi-Square	df	Sig.	Epsilon[b]		
					Green house -Geisser	Huynh-Feldt	Lower-bound
Strategy_Assessment	.673	5.537	2	.063	.754	.820	.500

The results of the research on the effect of the assessment strategy on the student's academic character values were analyzed using the *repeated measure ANOVA* test. There are three data on the value of academic character, namely the value of academic character on the material of biodiversity, fungi, and inheritance. Based on the output of Mauchly's test of academic character sphericity, a significance value of $0.063 > 0.05$, it can be concluded that the academic character research data meets the assumption of the similarity of sphericity variance (Table 12). Based on the output tests of within-subjects effects sphericity assumed the academic character of

students has a significance value of $0.00 < 0.05$, this indicates that there are differences in the value of the initial academic character (biodiversity material), the value of the middle academic character (mushroom material) and the character value. final academic (inheritance material) students in implementing the assessment strategy (Table 13). This shows that there are differences in the value of the initial academic character, the value of the middle academic character and the value of the final academic character of students in the application of the. The assessment strategy has a significant influence on the academic character of students in making learning media.

Table 13. Tests of within-subjects effects academic character

Source		Type III Sum of Squares	df	Mean Square	F	Sig.
Strategy_Assessment	Sphericity Assumed	2613.500	2	1306.750	318.288	.000
	Greenhouse-Geisser	2613.500	1.508	1733.606	318.288	.000
	Huynh-Feldt	2613.500	1,639	1594,087	318.288	.000
	Lower-bound	2613.500	1,000	2613.500	318.288	.000
Error(Strategy_ Assessment)	Sphericity Assumed	123.167	30	4.106		
	Greenhouse-Geisser	123.167	22.613	5.447		
	Huynh-Feldt	123.167	24.592	5.008		
	Lower-bound	123.167	15.000	8.211		

Students' academic character can be grown using the assessment strategy used. Research result Marhaeni & Artini (2015) shows that through authentic assessment, students are guided to identify their learning strengths and weaknesses through self-assessment or peer assessment. Through this, students develop an attitude to always want to know their own abilities and push themselves and work hard for them. Assessment activities are carried out during the learning process, both when preparing teaching materials to summative assessments (Inna Latifa Rahmawati , Hartono, 2015).

The increase in the academic character of students based on the pairwise comparison output shows that the value of the initial academic character to the value of the middle academic character has an average increase of 0.837 and the increase in the value of academic character is real because of the sig. 0.000 < 0.05. Furthermore, from the initial academic character value (before the application of the assessment strategy) to the final academic character value (after the implementation of the assessment strategy), the average increase in student academic character scores was 0.785 and the increase in student academic character scores was significantly due to the sig. 0.000 < 0.05. The last is the average increase in the value of the middle academic character value to the final academic character value. The average increase in the value of student academic character is 0.473 and the increase in the value of student academic character is real because of the sig. 0.000 < 0.05 (Table 14). Character assessment on students can use appropriate assessment strategies, such as observations, anecdotal notes, assignments, and reports (Muhammad N, 2010).

Table 14. Pairwise comparision academic character

(I) Strategy_ Assessment	(J) Strategy _Assessment	Mean Difference (I-J)	Std. Error	Sig.[b]	95% Confidence Interval for Difference[b]	
					Lower Bound	Upper Bound
1	2	-13.000[*]	.837	.000	-15.254	-10.746
	3	-17.375[*]	.785	.000	-19.489	-15.261
2	1	13.000[*]	.837	.000	10.746	15.254
	3	-4.375[*]	.473	.000	-5.650	-3.100

| 3 | 1 | 17.375* | .785 | .000 | 15.261 | 19.489 |
| | 2 | 4.375* | .473 | .000 | 3.100 | 5.650 |

Description: 1 (academic character on biodiversity material), 2 (academic character on mushroom material) and 3 (academic character trait inheritance)

Characters can be integrated in assessment activities. The application of authentic assessments which include performance assessments, laboratory assessments, portfolio assessments, and project assessments has a great opportunity to grow students' character. Characters that can be developed through an authentic assessment model include honesty, responsibility, thoroughness, hard work, creativity, discipline, cooperation, self-confidence, independence, and openness. (Sadia, 2013). Research results of Rizkiwati & Farid (2018) shows that the use of authentic assessment in learning activities is able to measure the consistency of student character development. Authentic assessment is one of the efforts to improve the quality of learning that can be taken through improving the assessment system.

The result of the research conducted by Darmiyanti (2019) showed that assessment has a close relationship with the formation of student character. An example of an assessment strategy related to character building is portfolio assessment. Portfolio assessment is closely related to character building in shaping students to be intelligent and have noble character, love Allah as well as the whole universe, be responsible, disciplined, independent, confident, creative, hard working, never give up, tolerate and appreciate the work of others. This assessment is able to have an influence on the character of students because the assessment does not only focus on assessing cognitive abilities but focuses on affective and psychomotor as well as assessments that emphasize the learning process in addition to the final results. (Fazilla & Marisa, 2016)

Furthermore, the project assessment also has an influence on the formation of students' character. The character of students will also develop by themselves and develop in the learning process. Learning by implementing project assessments is able to meet what students need as long as educators always strive to design meaningful learning in order to improve students' character abilities (Baihaqi Rifqi, 2021). In learning activities, project assessments can be used to determine students' understanding, ability to apply, inquiry ability and ability to clearly inform certain subjects (Widiana, 2016).

■ **CONCLUSIONS**

Every student in making learning media must possess creative thinking ability and academic character. Through the ability to think creatively using assessment strategies, students are able to solve the problems given through essay questions. Students are expected to be able to fulfill the 5 indicators of creative thinking that have been described, namely fluency, flexibility, originality, elaboration and metaphorical thinking. The assessment strategy is able to improve the ability to think creatively in making learning media. In addition to creativity, there are characters that students must have. Remembering that through strong character students can develop better thinking patterns. The assessment strategy used is also able to improve the academic character of students. The academic character of students includes the character of thoroughness, critical thinking, responsibility. logical, systematic, and innovative thinking.

The results showed that planning a good assessment strategy in learning had a significant

influence on the ability to think creatively in making learning media and on the academic character of students. Furthermore, in learning activities, an educator must determine an assessment strategy that is in accordance with the needs of students, so that learning activities can be meaningful. In addition to meaningful learning, the application of a good assessment strategy also has an impact on achieving learning objectives. A good assessment will encourage teachers to determine good teaching strategies and motivate students to learn better. Apart from the results of the study which showed that the assessment strategy had a significant effect on the research variables, there were limitations to the study. The research was conducted on a group of 25 students, so for further research it can be applied to a group with a large enough number.

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