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Building Pupils' Creativity at Lower Secondary School: Science Teachers' Perspectives in Urban and Rural Areas

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Abstract. This study aims to investigate lower secondary science teachers' perspectives of teaching strategies for developing pupils' creativity as one of the 21st-century skills in rural and urban areas. This descriptive research consisted of 110 participants who are lower secondary school science teachers in rural and urban areas from 22 provinces in Indonesia. A survey technique was employed as the method. The instruments used in this study were questionnaires, unstructured interviews, and lesson plan analyses that were validated by two experts in science education. The results showed that 33.30% of teachers prioritize the acquisition of creativity in learning. They mention science skills as the basis for gaining knowledge of concepts from learning experiences. Furthermore, lesson plans of teachers in rural and urban areas show that there is no significant difference between the number of divergent questions and the number of convergent questions in order to develop pupils' creativity. The numbers of divergent and convergent questions are 50.90% and 49.10%, respectively. Only 2.80% of Indonesian lower secondary science teachers have the initiative to implement teaching strategies that are suitable for the circumstances of their pupils so that learning is more progressive. In conclusion, most

teachers from rural and urban areas apply teaching methods from abroad without adapting these to the pupils' circumstances. This study indicates the importance of developing a new teaching strategy that is able to raise pupils' levels of creativity based on their conditions and the Indonesian curriculum.

Keywords: creativity; lower secondary school; urban and rural area

1. Introduction

In science education, creativity can be understood as the skill to produce new ideas or products that have correlation to the context and have scientific uses (Prahani, 2021). The interest in developing pupils' creativity in the world of education has continued to grow, increasing exponentially in the past decade (Huang et al., 2019; Snyder et al., 2019). The trend in this research domain is also predicted to grow faster in the future. Hernández-Torrano and Ibrayeva (2020) and Davies et al. (2013) who analysed research reports published in various journals stated that in the period of 1975-2019, the practice of pupils' creativity in classroom instruction became an urgent issue since it was proven to have a positive impact on pupils' cognitive development. Moreover, creativity is a key to facing the diverse and complex global problems (Karwowski. et al., 2020). The skills framework published by the Partnership for 21st Century Skills (P21), the Assessment and Teaching of 21st Century Skills (ATCS), and guidelines developed by the Organization for Economic Co-operation and Development (OECD) also indicates that amongst the capabilities that pupils must have in the 21st century are creativity and innovation (Chu et al., 2017). Within the framework of Global Citizenship Education (GCE) and Sustainable Development Goals (SDGs), creativity is a skill that pupils need to foster awareness of global problems (Marshall, 2019). One of the visions of education with the principle of ESD (Education for Sustainable Development) is to shape pupils who are able to think creatively, critically, and analytically. Even the MEXT (Minister of Education, Culture, Sports, Science, and Technology) in Japan launched a programme called SGH (Super Global High School) where pupils are directed towards achieving one of the goals, i.e. solving problems that implicitly require creative problem-solving (Fredriksson et al., 2020). In addition, there is general agreement in the international ESD discourse that strategic competence is important in developing and implementing innovative actions that advance sustainability at various levels (Jegstad et al., 2017; Rieckmann, 2018). Research on the instruction of pupils' creativity was first published in 1967 in the Journal of Creativity Behavior (Pope, 2005; Treffinger, 2007). The previous information revealed that developing pupils' creativity was very important. However, the bibliometric data presented by Hernández-Torrano and Ibrayeva (2020) show that research studies on instruction of pupils' creativity in Indonesia published in several reputable creativity journals number fewer than twenty.

Zubaidah et al. (2017) revealed that the creativity of elementary and middle school pupils in Indonesia must be improved because the emphasis in science teaching is still on the process of remembering facts. Onwu and Kyle (2011) also revealed that one of the failures of the science curriculum is that the subject is

taught as an activity to memorize complex facts and meaningless abstract data that does not interact directly with pupils' learning environments. It does not train the pupils' specific skills, such as creativity or critical thinking. Some OECD countries such as South Korea, Finland, and Canada explicitly state that creativity must be taught to elementary and secondary school pupils where ICT (information and communication technology) is a supplement (Ananiadou & Claro, 2009; Schauss & Sprenger, 2019; Zubaidah et al., 2017). Bialik and Fadel (2015) clearly map the meeting point between creativity and technology-based science subjects. Creativity is also a key factor of the digital revolution and innovation where life is global, diverse, borderless, and complex (Qian et al., 2019). It is also believed that creativity has a vital role in education (Benedek et al., 2016; Cropley et al., 2019). Owing to this important value, various researchers have implemented various innovative teaching models to enhance pupils' creativity. It is not surprising that creativity has become one of the main goals in education for several countries today as mentioned by Craft et al. (Gralewski & Karwowski, 2019a) and Piaget (Wang & Kokotsaki, 2018). Even Vygotsky (Hernández-Torrano & Ibrayeva, 2020) argues that if the main goal of education is to prepare pupils for a bright future, then cultivating pupils' creativity must be one of the main strategies employed to achieve this goal. Unfortunately, some researchers (Jankowska et al., 2019; Lucchiari et al., 2019; RA, 2007; Soh, 2000) reported that there were teachers who had an understanding that teaching creativity was an enrichment and not a main goal in education.

Some research studies emphasize that the concept of teaching creativity needs to be adapted to a country's cultural conditions that have many differences (Gupta & Sharma, 2019; Kim et al., 2019; So & Hu, 2019). The differences are in terms of curriculum content and pupils' conditions. Moreover, teachers in elementary school, middle school, and high school have different perceptions about the development of creativity (Kaçan, 2015; Trnova & Trna, 2014). Moreover, they do not have strong beliefs related to the coherence of creative concepts and innovation (Erdem & Adiguzel, 2019; Mullet et al., 2016). The key to teaching creativity that applies the principles of ESD is inquiry learning (Jegstad et al., 2017). However, based on the findings of Zubaidah et al. (2017), the creativity of inquiry teaching strategies for pupils in Indonesia needs to be adjusted because pupils in Indonesia have different speeds of learning so that inquiry learning needs to be adapted to different levels is needed. This implies that the teacher needs to make adjustments in the teaching steps so that pupils' creativity can be developed.

Indonesian teachers agree that creativity is a compulsory skill for pupils because it is one of 21st century skills. Various studies have also been conducted to increase pupils' creativity. However, the implementation of these strategies is difficult for teachers to apply in the classroom. When teachers choose a teaching strategy, they do not consider anything except the innovative learning models from abroad. They sometimes do not consider the pupils' learning styles or curriculum demands. Moreover, researchers offer solutions without considering the teachers' point of view regarding creativity development. As a front man who has taught in the classroom for more than a decade, the researcher

understands and is aware of the learning patterns that pupils need to build their creativity. This is because the teacher's perspective on teaching that stimulates pupil creativity plays an important role in classroom implementation (Glăveanu, 2018; Gralewski & Karwowski, 2019b).

Mullet et al. (2016) reported that there were some research studies on teachers' perspectives about creativity. However, there has not been much research on how to investigate the perceptions of science teachers in Indonesia related to the strategies for developing lower secondary pupils' creativity and the assessment based on pupils' location.

Their perspectives influence the planning, implementation, and evaluation of teaching. Those perspectives might be different because their schools are situated in different areas. Pupils in rural and urban areas have different support systems. Teachers in rural areas might be the single source of knowledge because of limited access to information. On the other hand, they may be more creative than teachers in urban areas where they are spoiled by instant solutions. Both teachers in rural and urban areas should have the same perspectives in developing pupils' creativity in their science classes. Those perspectives are going to influence their classroom instructions.

Based on this explanation and recent literature, research on students' creativity does not address teachers' perspective in the implementation of the strategy. Moreover, the teaching location may also impact on teachers' decisions on developing certain strategies. To address this matter, this study aims to determine the perspective of science teachers in both the rural and urban areas as well as the strategies and assessment used by the teachers to develop and practise pupils' creativity in 21st century. To the end, this study reveals the criteria of effective and creative teaching strategies that should be implemented in Indonesian secondary schools in both urban and rural areas.

The purpose of this study is to investigate lower secondary science teachers' perspectives regarding teaching strategies that develop pupils' creativity as one of the 21st century skills in rural and urban areas. Some specific research aims are mentioned as follows:

1) Describe how teaching pupils' mastery of concepts was prioritized over teaching them creativity in both urban and rural areas, and
2) Analyse lesson plans and learning scripts.

2. Methods

This research was a survey study that investigated the perceptions of science teachers in Indonesia related to the strategies of developing lower secondary school pupils' creativity. Data collection was carried out on the subject twice at different times. The first data collection was carried out on a group of teachers who had already completed the programme to increase teaching competency. Meanwhile, the second data collection was carried out on a group of teachers who had completed one of the training sessions and workshops at the Centre for the Development and Empowerment of Educators and Education Personnel.

Participants of Research

This research involved 110 lower secondary school science teachers from 22 of the 34 provinces in Indonesia as participants. The proportion is 19.40% of teachers who have teaching experience of less than five years, 16.70% of teachers who have 5-10 years of teaching experience, 26.90% of teachers with 10-15 years of teaching experience, and 37% of teachers with more than 15 years of teaching experience. This research employed purposive sampling whereby the participants were chosen to provide information that might not have been obtained through other sampling techniques (Fraenkel et al., 2011). Teachers who were involved in the study had an understanding of how to develop and build pupils' creativity. Based on their teaching sites, they were further classified into rural and urban areas as shown in Table 1. The classification was based on the availability of adequate ICT facilities and the pupils' and parents' ICT literacy. Based on Table 1, almost all of the teachers are in urban areas.

Table 1: Subjects' information

No.	Teaching Locations	Area Types	Number of Teachers	SD
1	Sumatra Island, Bangka Belitung Archipelago, and Riau Archipelago	Rural	10	10.61
		Urban	25	
2	Java, Bali, and Nusa Tenggara Archipelago	Rural	11	21.21
		Urban	41	
3	Borneo Islands	Rural	5	5.66
		Urban	13	
4	Celebes Island and Molluca Archipelago	Rural	1	2.12

Instrument

The instruments used included a questionnaire, an interview guide, and a rubric. The content of the instrument were validated by two experts in science education and elementary education. The study started with the distribution of questionnaires, followed by interviews. To obtain clearer information, a rubric was used to investigate the steps followed in the teaching to develop pupil creativity.

This research could not be carried out completely in person because it was constrained by the rules of staying at home during the COVID-19 pandemic. Research that had originally been designed to observe classroom teaching directly was not able to be carried out. Instead, interviews were conducted with teachers by optimizing the WhatsApp application. The distribution of questionnaires was also done in two ways, i.e. directly and via Google Forms. The participants of this study were members of a WhatsApp chat group that consisted of science teachers who had once taken part in a workshop.

There were ten questions in the questionnaire. These questions had been validated by two experts in order to develop the right indicators. Readability tests were also carried out so that teachers were able to understand the message contained in those questions. The questions investigated several items of information e.g., teachers' priority in teaching, instructional strategy, and assessment. The open-ended questions were to gain detailed information on

teaching strategies such as the kinds of questions or probing questions. They provide better opportunities to acquire data in detail than questionnaires do. The data are presented through graphs (in the percentages) to show the priorities of teachers in teaching and the teaching strategies chosen to develop pupils' creativity. There were three open-ended questions. The data from the open-ended questions and lesson plan were transcripted, coded, and then presented in narrative form. They were then classified into rubric indicators (Al-Balushi & Al-Abdali, 2014). The findings from the questionnaire, open-ended interviews, and lesson plans were subsequently triangulated to obtain comprehensive results.

Besides questionnaires and open-ended questions, lesson plans were also analyzed. There were only 23 urban teachers out of 110 teachers who had collected a lesson plan or teaching scenario. Therefore, the analysis of lesson plan was used as complementary data in the triangulation process. The rubric was adopted and modified from the work of Al-Balushi and Al-Abdali (2014) that captured (1) teachers' questioning strategy, (2) teachers' reaction to the pupils' ideas, (3) teachers' performance in classroom activities to support creativity, and (4) teachers' performance on all the lesson methods that foster pupils' creativity.

Data Analysis

Generally, the data analysis comprised (1) data collected through various kinds of instruments, (2) analysis of qualitative and quantitative data, (3) data triangulation, and finally, (4) a conclusion of the findings.

3. Results and Analysis

What are the Priorities of Lower Secondary Teachers in Teaching Science?

The data in general show that teaching experience, teaching location, and area type do not distinguish teachers' choices in developing pupils' creativity. There are 66.70% of the teachers who reveal that they prioritize teaching that provides pupils with the knowledge of concepts. They argue that the conceptual knowledge is a prerequisite for the acquisition of skills in science, including pupils' creativity. In addition, teachers have pragmatic reasons why concepts must be taught in advance such as time constraints, pupil conditions, and evaluation demands such as mid-semester, final, and even national examinations which tend to measure pupils' mastery of concepts. Meanwhile, the 33.30% of teachers who prioritize the acquisition of creativity in learning briefly mention that science skills are the basis for gaining knowledge of concepts from learning experiences in the laboratory and nature so that the students are able to discover science concepts independently or by collaborating with their peers. An interesting finding through interviews is additional information that teaching steps which prioritize creativity are only possible if pupils have good literacy and reading comprehension skills. Thus, it is clear that this teaching strategy only applies in ideal conditions.

Lesson plans of teachers in rural and urban areas show that there is no significant difference between the number of divergent questions and the number of convergent questions in order to develop pupils' creativity. The numbers of divergent and convergent questions are 50.90% and 49.10%,

respectively. Table 2 presents several examples of divergent and convergent questions in the lesson plans on the topic of simple aircraft and conductor properties of materials. The teachers also have high levels of flexibility in asking questions. They adapt the types of questions appropriately according to pupils' circumstances. If pupils have mastered the basic concepts of an issue, the teachers can easily ask divergent questions that are expected to be able to explore pupils' creativity. However, if pupils do not understand the basic concept of an issue or phenomenon, the teachers tend to provide convergent questions as a stimulus for pupils' thinking abilities. These findings indicate that teachers in both rural and urban areas have to deal with high levels of flexibility.

Table 2: Sample questions in lesson plan

No.	Kinds of Question	Findings on Lesson Plan
1	Convergent	. What is the mechanical advantage of a fixed pulley? . What is the mechanical advantage of free pulley? . Which makes it most convenient for human work, fixed pulleys or free pulleys? . Which has the best transmission, iron or copper?
2	Divergent	. How do you increase the mechanical advantage of a pulley? . Why is the surface of the tire made jagged and uneven? . Can all types of metal be conductors contained in cables?

Teachers in the rural areas try to connect the pupils' learning experience such as observing natural phenomenon with a scientific concept in order to build scientific understanding. Nevertheless, teachers often become a single information source for pupils. They can trigger creativity but it takes time. They mention explicitly that they want to build the conceptual understanding before building creativity. Moreover, teachers in the urban areas often optimize the online sources of information from search engines. Pupils easily search for information or the answers for a test from Google. Teachers' role as the builder of creativity seems easy because pupils can enrich their conceptual understanding at home, but this is not the case in practice. Teachers must still ensure all of the pupils' conceptual understanding was constructed properly. Some pupils do not like reading if they are not given assignment. Teachers need to give a set of questions that contain constructive and guided conceptual questions to build their understanding. These findings indicate that both teachers in rural and urban areas need a set of questions as a guide for pupils to explore the fundamental concepts before learning can commence.

How Important was Creativity for Teachers in Rural and Urban Areas?

Creativity is one of four skills that are essential for pupils in the 21st century. However, the result of the questionnaire analysis shows that creativity is not the teachers' main priority to be taught to pupils among other 21st century skills, as they mainly choose to teach critical thinking skills, with a percentage of 64.80%. Creativity, collaboration, and communication were ranked 2nd, 3rd and 4th as shown in Figure 1. They believe that building critical thinking skills could be done by means of divergent and convergent questions posed to pupils before or

while teaching. Teachers in rural areas are able to introduce world-wide knowledge to pupils. They connect indigenous knowledge with the topic materials. In addition, they optimize the hands-on and mind-on activities seamlessly. Their challenge is connecting indigeneous knowledge with critical thinking questions and creativity. They claim the key is sets of questions that contain many convergent and divergent questions. Nevertheless, teachers in urban areas also need to ensure their pupils have mastered the critical thinking skills before creating a product. They argue that good ICT literacy helps pupils collect information, including the unintended knowledge. However, pupils need some sets of questions as a guide to stay focused on the relevant topic. These questions should contain critical thinking skills.

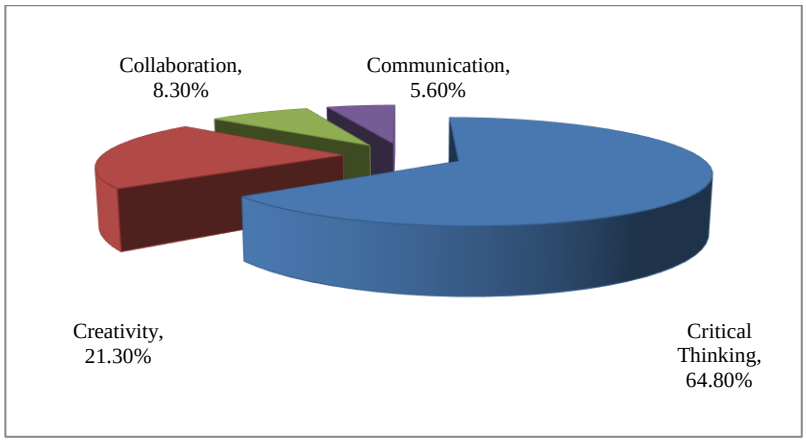

Figure 1: Teachers' choice of 21st century skills

The results of further interviews with the teachers show that although creativity is not the first choice among the four other skills, it is believed to be part of critical thinking in problem solving. Based on the opinions of teachers who teach pupils in rural areas, their pupils are more creative in using natural materials to make toys. However, when they are asked questions related to concepts, they often cannot answer. The innovation regarding making toys is obtained through imitating existing toy forms. This is called indigeneous knowledge. Meanwhile, teachers in urban areas revealed that their pupils are presented with modern toys all too often. They only become users of these toys without knowing the underlying basic scientific concepts. Suppose a boy plays with a car using a battery, but when asked why the battery drives the toy, he cannot answer. When a boy creates a toy car, his creative product will be unable to compete with existing products. The boy's creative product does not seem attractive any more. This indicates that one of the factors needed to develop creativity apart from mastering concepts is creative thinking. Science teachers in urban and rural areas also believe this.

What were Teachers' Chosen Learning Strategies in Rural and Urban Areas?

The results of further investigation show that teachers from both urban and rural schools have diverse strategies related to teaching that stimulate pupils' creativity as presented by Figure 2. The majority of the teaching strategies chosen by teachers both in rural and urban areas are foreign innovative learning models that in the course of their creation certainly do not take into

consideration the circumstances of pupils and requirements of curricula in Indonesia. The use of innovative strategies does not mean that they are not prone to obstacles in their implementation. The teaching steps that are written in the lesson plan often do not go as expected, therefore the teachers often adapt the teaching steps. This indicates that teachers need practical teaching strategies which are not theoretical but which help them to achieve the lesson objectives, one of which is stimulating pupils' creativity.

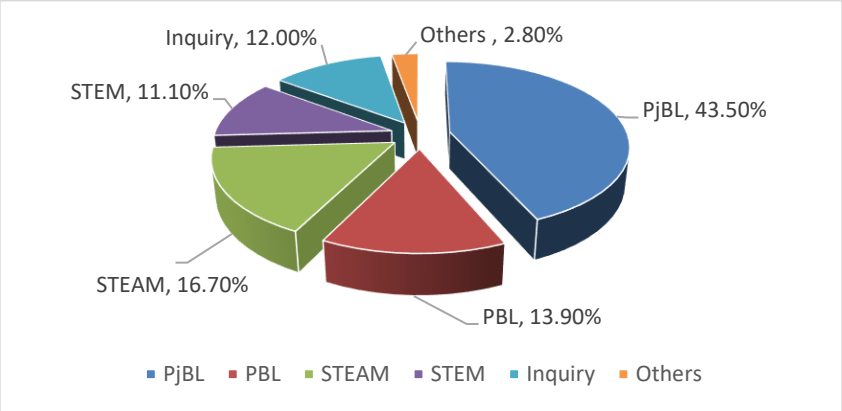

Figure 2: Teachers' choices on learning strategies in developing creativity

Figure 2 shows that only 2.80% of Indonesian lower secondary science teachers have the initiative to implement teaching strategies that are suitable for the circumstances of their pupils so that learning is more progressive. There are teachers in rural areas who face difficulties in teaching. They realize that they might be the single source of knowledge for their pupils, hence it will be difficult for pupils to find out about or learn fundamental concepts from the problems they encounter. Both teachers in rural and urban areas who choose project-based learning (PjBL) as a strategy to teach creativity argue that the creative product should be a reflection of creative thinking skills and fundamental concept mastery as the procedural or technical knowledge. Sometimes, they are worried that their pupils cannot produce a product because of the limited time or the difficulty of the concepts. They sometimes prefer giving problem-solving questions to introduce and explain a difficult concept. These findings indicate teachers in both urban and rural areas need a practical learning model that provides pupils with a fundamental concept of science before creating any products. Most importantly, the learning model should fit the allocated time in the curriculum.

How do Teachers in Rural and Urban Areas conduct Assessment?

Although creativity is often associated with products, it turns out that the majority of teachers both in rural and urban areas choose an essay as an assessment to measure pupils' creativity as presented in Figure 3 below. They argue that an essay could also show pupils' critical thinking skills. An essay is a universal assessment for teachers. Teachers in rural area prefer essays to product assessment because they need a scientific explanation from pupils who are accustomed to using indigenous knowledge in their lives. The interview with teachers from urban areas revealed that they prefer essay to product assessment

because they believe the product would be an imitation of existing sources on the Internet. They need to assess the critical thinking skills of pupils.

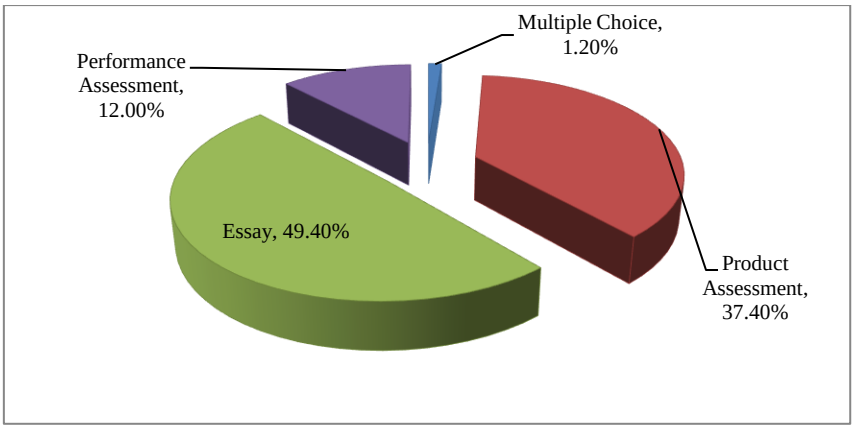

Figure 3: Teachers' choices of creativity assessment

Instructional Sequences in Developing Pupils' Creativity

The results of interview transcripts and analysis of lesson plans indicate that teachers do not mention all of the aspects in developing pupils' creativity. Only a few of them mentioned teaching for creativity based on Al-Balushi and Al-Abdali's (2014) rubric as shown in Table 3.

Table 3: The teaching for creativity observation form

No.	Aspect(s)	%
Questioning Strategy Category		
1	Asking divergent and open-ended questions	37.27
2	Using follow-up questions such as "Why?" "What if?" "What can you add to this idea?"	80.91
3	Encouraging pupils to think of all possible answers	20.92
4	Waiting after asking the question to allow pupils to think	-
5	Waiting after receiving a pupil's response to encourage more participation	-
6	Asking higher order questions that challenge pupils' thinking to generate novel solutions for real problems	10.00
Science Teachers' Performance on the Pupils' Ideas Category		
1	Praising unique ideas	-
2	Encouraging pupils to record their own ideas in their own idea notebook	11.82
3	Encouraging pupils to implement their ideas when possible	-
4	Avoiding expressions that discourage pupils' creative thinking such as "wrong answer" or "bad idea"	-
5	Encouraging sharing of ideas among pupils	35.45
6	Listening carefully to what pupils say, present, or ask	-
7	Accepting alternative techniques to solve problems or doing experiments	10.00
Teachers' Performance on the Classroom Activities to Support Creativity Category		
1	Asking pupils to suggest applications for the concepts, principles, or laws they study in the classroom	-
2	Asking pupils to design their own procedure to do experiments	17.27
3	Encouraging innovative methods for presenting their investigation data such as graphic organizers or sketches	-
4	Encouraging pupils to summarize the lesson in a creative form such as a story, comic, drama, or game	-

No.	Aspect(s)	%
5	Encouraging pupils to present their project reports in creative ways such as movies, concepts maps, or mind maps	17.27
6	Asking pupils to design 3D models for studied concepts using everyday materials	-
7	Designing homework assignments to foster creative thinking	17.27
Teachers' Performance on the Whole Lesson Methods that Foster Creativity Category		
1	Modelling teaching around idea-generation teaching methods such as brainstorming, problem solving, modelling, debating, inquiry-based leaning, or project-based learning that encourage different creative thinking skills	-
2	Using teaching methods that foster pupils' imagination such as analogies, guided imagery, or submicroscopic modelling of matter	-
3	Implementing metacognitive teaching strategies that encourage reflection on pupils' own ideas and the idea-generation processes	-

Table 3 reflects the data from the teachers in rural areas in Java, Borneo, and Bali. They believe in asking "Why?" and "How?"questions related to the topic to trigger pupils' creativity. However, only 10% of them ask pupils to produce solutions. The deeper interviews show that they fear the pupils could not produce novelty as creativity. They believe that pupils need sharing in small or classical groups to trigger their ideas. Although they initially proposed many innovative learning models, the analysis of the teaching scripts and lesson plans did not reveal those strategies. When they were asked about this, they mentioned that they should have flexibility in changing the learning steps because it was unpredictable. This reflects that creative strategies to foster pupils' creativity have not yet been developed.

4. Discussion

Generally, teachers in both rural and urban areas have the same perspectives on how to promote 21st century skills. This could be seen from their choices of learning strategies and assessments. The results show that the majority of teachers both in rural and urban areas choose to teach the mastery of a concept in the beginning because it is a prerequisite for developing science skills, including creativity. This is because creativity is a skill that is not concept free. Pupils need to recall conceptual knowledge that forms the basis of a solution in creative problem solving (Birgili, 2015; Hamza & Griffith, 2006; Kim et al., 2019; Todd et al., 2019; Usta & Akkanat, 2015). The same observation is made by some researchers, namely that creativity requires understanding of concepts (Conradty & Bogner, 2019; Thompson, 2017; Tran et al., 2017; Zubaidah et al., 2017). The story of one of the teachers in the interview revealed this. One pupil who forgot to bring a cable in an electrical circuit experiment finally replaced the cable with a string of needles and safety pins. The pupil thought that needles and pins could conduct electricity because they were made of metal. The pupil's action is considered as a creative act, which still requires knowledge of the concept of the conductivity relationship and electrical resistance in various types of conductors. Actually, this shows the anxiety and concern of the teacher regarding the pupil's mastery of concepts. Teachers are accustomed to explaining concepts explicitly in class (Anthony, 2019). They try to do their duty

to deliver an explanation of the concepts. This is reasonable because some pupils do not have good reading habits. Even in today's digital era, some of them rely on teachers as their sole source of information.

Another reason why teachers prefer teaching mastery of concepts to creativity is a matter of time effectiveness. Teachers need a relatively longer time to teach and develop creativity because they have to prepare pupils to be actively involved in learning activities (Dewi & Mashami, 2019; Tican, 2019; Zubaidah et al., 2017). For example, the teacher stimulates pupils to generate solutions for air pollution by pollutants produced by factories, while pupils have not yet understood fundamental concepts such as the nature of pollutants and air movement by convection. In the end, the teacher must explain the fundamental concepts of science initially (Dewi & Ibrahim, 2019). Meanwhile the allotted time is inadequate for discussing pupils' arguments so the teacher finishes off the lesson in class.

The choices of innovative teaching strategies chosen by teachers are also largely strategies developed by foreign education experts. The teachers do not adapt the teaching. Teachers should make adjustments to the teaching steps with consideration of pupils' circumstances, curriculum content, and Indonesian ethno-pedagogy (Nurmala et al., 2021). The teachers usually place pupils in ideal conditions, for example, pupils can find concepts from natural phenomena or socio-scientific problems, armed with problem-based learning steps or projects in class without conceptual explanation by the teacher. The facts show that not all pupils are able to generate creativity from these conditions because the abilities of pupils are not the same, according to Zubaidah et al.(2017).

The results of an investigation of 92 teachers from elementary and secondary schools in West Java also showed that teachers tend to experience difficulties in applying innovative learning models from abroad because of the syntax that is difficult to memorize and the circumstances of the pupils and curricula in Indonesia that are different from the creators of the syntax of the learning model (Sopandi et al., 2019). Innovative learning models implemented by teachers should be pupil-centred and constructive so that they are able to equip pupils with the mastery of concepts and special skills, including creativity. Consequently, teachers must develop or adapt teaching strategies that are appropriate to the needs and circumstances of education in Indonesia. Pupils who are able to make decisions and take risks in solving problems, both in learning and social contexts, are produced by teachers who always stimulate and develop their creativity with appropriate strategies (Czarniecki, 2009). Meanwhile, the information contained in Figure 2 shows that only 2.80% of teachers design teaching strategies independently. Moreover, the almost equal percentage between convergent and divergent questions implicitly shows that teachers do not fully understand how creativity is taught by using both types of questions because there are still many inconsistencies in the lesson plans. In some of the lesson plans analyzed, it can be seen that the teachers still mix questions to stimulate creativity and test the mastery of concepts.

Apart from the various teaching strategies, the evaluation methods chosen by the teachers are also very diverse. However, what is important to note is the

teachers' interpretation that creativity can be measured not only by product but also by essay, performance appraisal, even multiple choice. This indicates that the teachers' interpretations of creativity are also very diverse (Bereczki & Karpati, 2018). Teachers who choose essays and multiple choice options as an assessment tool think that the creativity that they develop is a thinking process so that what is produced are only ideas. However, teachers who choose performance and product assessments think that the intended creativity is the process of producing creative products. Moreover, they have not been able to determine the renewal of the products made by pupils in detail so that they adapt the assessment rubric from several sources. One teacher uses an assessment rubric from Bialik and Fadel (2015) which classifies pupil products based on their novelty into the categories of imitation, variation, combination, transformation, and original creation. However, most teachers judge pupils' creativity products based on their own rubrics which have not been empirically validated. The basis for making the rubric is the practical value of an instrument, not a comprehensive review (Briones et al., 2020). For performance appraisals, most teachers have not been able to explain the rubric they use in detail. The Catalina Foothills School District (Catalina Foothills School District, 2015) has developed a workshop to assess pupil performance in producing creative products by classifying pupils into novice, basic, professional, and advance categories. This rubric is good to use; however, it must be modified so that it is practical to use as conveyed by several teachers during the interview. Good instruments are practical, not just theoretical.

The results of Table 3 and the interview analysis with the teachers also revealed the fact that the teachers still view science as a knowledge that must be mastered by pupils with a variety of appropriate strategies. Meanwhile, only a few of the teachers understand that science is a scientific process in understanding natural phenomena. This has an impact on the priority of those teachers who always prioritize the mastery of concepts before developing other skills. Based on Table 3, it can be seen that there are only 10 out of 23 aspects of creativity teaching planned by the teachers. When examining these chosen aspects, there is a tendency for these steps to also be aimed at providing pupils with the mastery of concepts. There are high percentages of aspect No. 2 in the questioning strategy category, using follow-up questions such as "Why?", "What if…?", or "What can you add to this idea?" because they are similar to questions teachers use to develop pupils' conceptual knowledge. Moreover, only 17.27% of teachers ask and encourage pupils to design and present projects as shown in Table 3. None of the teachers implement metacognitive teaching strategies such as analogies, guided imagery, or submicroscopic modelling of matter as teaching methods. The various choices of teaching strategies shown in Figure 2 also do not affect the teaching steps planned by the teachers. It means teachers do not feel familiar with their chosen learning strategies. The learning strategies need to be adjusted initially before they are implemented in the class.

The most interesting finding from interviews with teachers is that lesson plans are never detailed because the steps that are carried out in the classroom are not always the same as the plan. These findings indicate at least two important factors. The first is that teachers have high levels of flexibility in teaching. The

second is that the teaching strategy chosen by the teacher is not always suitable for the circumstances of the students during classroom instruction. Therefore, the teachers replace the steps for their learners with practical steps. This is done by the teachers to overcome the gaps between planning and implementation (Gonzáles & Deal, 2019). One teacher even mentions that the learning model chosen should not be just an exhibition that is presented when there is a performance appraisal but must be based on a grounded learning culture.

5. Conclusion

In conclusion, science teachers in rural and urban areas mostly prioritize their instruction that builds mastery of concepts on creativity. They argue that mastery of concepts is the main key to developing pupils' creativity. This is because creativity is not a concept-free skill. Furthermore, the majority of innovative teaching strategies used by teachers from both rural and urban areas are those created by education experts abroad and these still need to be adapted to the circumstancess of Indonesian pupils and curricula. Only a few teachers have the initiative to develop and modify teaching strategies to stimulate their pupils' creativity. They are teachers from rural areas. Moreover, teachers from both rural and urban areas used a variety of assessment tools to assess pupils' creativity, such as essays, performance appraisals, product assessments, and multiple choices. However, most of them choose essays as the assessment.

Seeing the pattern of teaching pupils' creativity based on pupils' circumstances, curricula, and general Indonesian education goals, research needs to be conducted on developing learning models that are able to accommodate these needs. There is the potential for teachers to plan, implement, and develop a learning model that is not only theoretical but can also be practically implemented. Teachers need a learning strategy that can be implemented practically based on the needs of pupils and the curricula in Indonesia, in both the rural and urban areas. These implicit findings are found from Table 3 and teachers' interview results.

It is agreed that the process of developing pupils' creativity is urgent and important to be implemented. The core essence of teaching nowadays is preparing and shaping critical, creative, communicative, and collaborative pupils to develop careers and be able to compete globally. The findings of the research reflect that teaching strategies which facilitate the development of these skills must be based on the circumstances of the pupils as well as the curricula in Indonesia. This condition is an opportunity and a challenge to reconstruct an innovative Indonesian teaching model that is able to accommodate the needs of Indonesian pupils. The innovative teaching model must be constructed by Indonesians because only Indonesians care about the future of the nation. Moreover, only Indonesians understand what the young generation of Indonesia needs in facing the real competitive world.

That fact that innovative teaching models are implemented which are created by education experts from abroad does not mean that they are not suitable in Indonesia. However, their implementation must be adjusted to the conditions and needs of pupils as well as the curricula in Indonesia. These findings reflect

that the teaching model or strategy chosen and implemented by the teacher must be rational and practical, and must contribute positively to the development of pupils' conceptual knowledge and creativity. All science teachers in Indonesia need to be aware of this.

Owing to the Covid-19 pandemic, the data were collected online which becomes one of the limitations of the study since the data were not collected in natural settings. In addition, it is necessary to observe the teaching process directly in the classroom because analyzing questionnaires, interview transcripts, and lesson plans is not enough. Thus, future research can investigate the teaching practices directly in science classes in determining how teachers develop pupils' creativity. Another important point to note is that this study employed Al-Balushi and Al-Abdali's (2014) rubric's indicator; however, this indicator is used to analyze teaching progress, not learning lessons. Thus, future research can also endeavour to implement another methodology in examining the data of this research.

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