

# Exploring, Mind mapping, Collaborating, Simulating, and Evaluating (EMCOSE): A Learning Model Based on Lesson Study and Peer Teaching that Potentially Improves Student Teachers' Creativity and Communication Skills

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The purpose of this study is to develop a learning model that can be used to develop the professionalism of prospective educator students, which is based upon peer teaching and lesson study. The research conducted is development research. The development model used is the Plomp model. The effectiveness of the learning model was tested by using a quasi-experiment design. The main finding of this study was that the learning models developed met the criteria of being valid, practical, and effective. The effectiveness of the learning model is evident from a significant increase in the creativity and communication skills of prospective teacher students. Creativity and communication skills are essential skills that must be possessed by educators. Suggestions for the future research include testing the learning model to improve the other skills of prospective teachers. There have been several studies which found that the use of a lesson study is useful for training prospective teachers. However, there is no fixed model for this training. This study develops a new learning model that can train prospective teacher students.

**Keywords:** *Communication skills, Creativity, EMCOSE learning model, Lesson study, Prospective teacher students.*

## Introduction

Education in the twenty-first century is characterised by a comprehensive linkage to the world of science (Sudarisman, 2015). Globalisation and internationalisation have a significant influence upon twenty-first century education (Leon-abao et al., 2015). Students in the twenty-first century have grown up in a fast digital world (Boholano, 2017; Chiappe & Rodríguez, 2017), so future teachers must keep up with these developments. The current era, which is developing very fast, requires individuals to have 21<sup>st</sup> century capabilities. According to Baker and Sinkula (2005), capabilities are a collection of more specific skills, procedures, and processes that can leverage resources to a competitive advantage. Robeyns (2003) explains that capabilities can be used as an evaluation tool for existing weaknesses. The capabilities possessed by students can be seen from the skills possessed by students.

One of the essential skills twenty-first century, which teachers must possess, is creativity. When creativity is possessed by teachers, it positions teachers to continue to innovate in the learning processes that are being carried out. Pishghadam, Nejad, and Shayesteh (2012) argue that successful teachers are creative teachers. Besides, according to Narayanan (2017), teachers who have creativity will always innovate in their learning. For example, by developing, creating, and using innovative learning models. The use of innovative learning models will also improve learning outcomes and student motivation (Kolifah et al., 2017). In order to convey the results of creativity, excellent communication skills are needed, so that others can accept creativity.

Communication skills are necessary skills that every prospective student teacher should possess. These skills are essential, as a basis for interaction with students when they become teachers. Several studies show that the communication skills possessed by teachers affect the student learning outcomes. Research conducted by Khan, Khan, Zia-ul-Islam, and Khan (2017) at 14 universities in Pakistan shows that teachers' communication skills affect the learning outcomes and learning success achieved by students. Moreover, Zlati, Bjeki, and Bojovi (2014) state that teachers' communication skills can affect the effectiveness of the learning which is carried out.

The development of creativity and communication for prospective student teachers in Indonesia is not optimal. Based on the research conducted by Noviarni (2014) at the State Islamic University of Sulthan Syarif Kasim, the creativity of students in the Mathematics Education study program remains low, and this indicates that the development of creativity is not optimal. Other research at the University of Muhammadiyah Tapanuli Selatan shows that student creativity is also low, which is measured by less attractive student-made learning designs (Lubis & Lubis, 2017). Based on these research findings, creativity still needs to be developed in prospective teacher students. Based on the research conducted by Lukitasari et al. (2017) at PGRI Madiun University, the development of communication skills for prospective teacher students is also not optimal. Another study conducted by Anugrahana (2016), a student

of the Elementary School Teacher Education at Sanata Dharma University, also showed that student communication skills still need to be developed.

Based on the results of the observations made using the survey method upon 224 prospective teacher students, it was shown that 97 per cent of students stated that the lecturer in the learning process had developed creativity and communication skills. The survey results were supported by interviews with nine lecturers in the Biology Education study program, who stated that creativity and communication skills had been developed through lectures. The problem found was that the development and assessment of communication skills carried out by lecturers were not optimal because it was still being done in general, and the communication skills were developed and measured by the lecturers through the presentation activities carried out by students. Presentation is one indicator of communication skills (Greenstein, 2012). Based on this, the measurement or development carried out by lecturers is not optimal because it only develops one indicator of communication skills.

Twenty-first century skills, including creativity and communication skills, are acquired through theory and empirically through direct experience (Guo & Woulfin, 2016; Saavedra & Darleen Opfer, 2012). The direct experience triggers the growth of practical skills and competencies. Experience and functional roles are what become demands for prospective teachers in the twenty-first century. The development of twenty-first century skills for prospective teachers through practical experiences and roles requires an appropriate learning model. This learning model must provide students with experiences regarding twenty-first century skills.

Learning that can increase students' heterogeneous understanding and provide a direct experience can be achieved through peer teaching learning (Parr et al., 2004; Tang et al., 2004). Learning using the peer teaching method can also be utilised to develop twenty-first century skills. Research conducted by Wicaksono et al. (2019) shows that peer teaching using the Think Pair Share (TPS) model can improve students' literacy and communication skills. Peer teaching learning provides a practical experience for prospective student teachers to develop twenty-first century skills while also improving their skills as a teacher in the future. Peer teaching learning quality can be improved by using a learning approach, namely the lesson study approach (Myers, 2012; Yakar & Turgut, 2017).

A lesson study is a model for increasing teachers' knowledge of how to improve their learning through collaborative activities (Lundbäck & Egerhag, 2020). The lesson study has three main stages: plan, do, and, see (Hendayana et al., 2007). Based on the research conducted by Najah et al. (2019), it shows that the use of lesson study-based Problem Based Learning (PBL) models can improve students' oral communication skills. Also based on previous research results, lesson studies have the potential to develop the pedagogical abilities of prospective educator students (Chokshi & Fernandez, 2010). Additional research also shows that the lesson study is suitable for increasing the reflectivity of prospective educator students (Lamb & Ko, 2016; Myers, 2012), besides it can also increase the self-confidence of prospective educator students

(Yakar & Turgut, 2017). Lesson studies can also be used to form a professional community of teachers (Doig & Groves, 2011).

Improving teacher quality is generally carried out through in-service training (Haymore-Sandholtz, 2002). Several countries have made quality improvements in this regard. In Indonesia, in-service training is carried out through teacher community (MGMP) and training conducted by universities and government. Training is carried out across an average of seven to 15 days per year. The main obstacle to training through in-service training is the lack of teachers' commitment to apply the results of training in their learning. Besides, many teachers participate in in-service training only to obtain credit points, which are used for administrative purposes. Several of these factors result in the quality of teachers in Indonesia being questioned.

Another method to improve teacher competence and skills is optimal training, since the teacher is still a student (pre-service training). At the training stage, the facilitator can manipulate the situation, so that competency development is maximised. Besides, when teachers were still prospective teachers themselves, they did not have many dependents, so the development was maximised. There have been several studies that show that the use of a lesson study can develop the competence of prospective teacher students (Chokshi & Fernandez, 2010; Lamb & Ko, 2016; Myers, 2012; Yakar & Turgut, 2017). It is necessary to develop a standard lesson study-based training model that can be used to develop the competencies and skills of prospective teachers.

### **Skills for Teachers**

There have been many studies or opinions of experts who state that teacher skills affect the development of learning outcomes or other skills in students. Vong and Kaewurai (2017) state that the teacher's sensitivity to learning will be good if the teacher has excellent critical thinking skills. Moreover, teachers with good communication skills have been shown to improve student learning outcomes and success (Khan et al., 2017). Furthermore, Zlati et al. (2014) state that teachers' communication skills can affect the effectiveness of the learning carried out. Collaboration also has a positive effect upon student learning outcomes (Goddard et al., 2007). The development of the quality of learning can be achieved through collaboration between teachers (Sudrajat et al., 2020). Another important skill is creativity; teachers who have creativity will always innovate in their learning, namely by developing, creating, and using innovative learning models (Narayanan, 2017). Furthermore, Pishghadam et al. (2012) emphasise that successful teachers are creative teachers.

### **Lesson Study for Prospective Teacher**

A lesson study is essentially a model for teachers to improve their learning through collaborative activity (Khokhotva, 2018; Lundbäck & Egerhag, 2020; Saito et al., 2014; Saito

& Atencio, 2015; Seleznyov, 2019; Shepherd, 2019). Lesson studies has been widely used in Asian countries and around the world, and are considered the best way to improve the quality of the learning process (Bjuland & Mosvold, 2015; Djumingin, 2017; Dotger et al., 2009; Gutierrez, 2015; Kanauan & Inprasitha, 2014; Lenski et al., 2009; Roback et al., 2006; Rock & Wilson, 2005). So far, lesson studies are intended for teachers as a form of in-service training, but it would be better if lesson studies were also introduced and used to train prospective teachers. This will enable prospective teachers to become accustomed to performing a lesson study and being able to do it well.

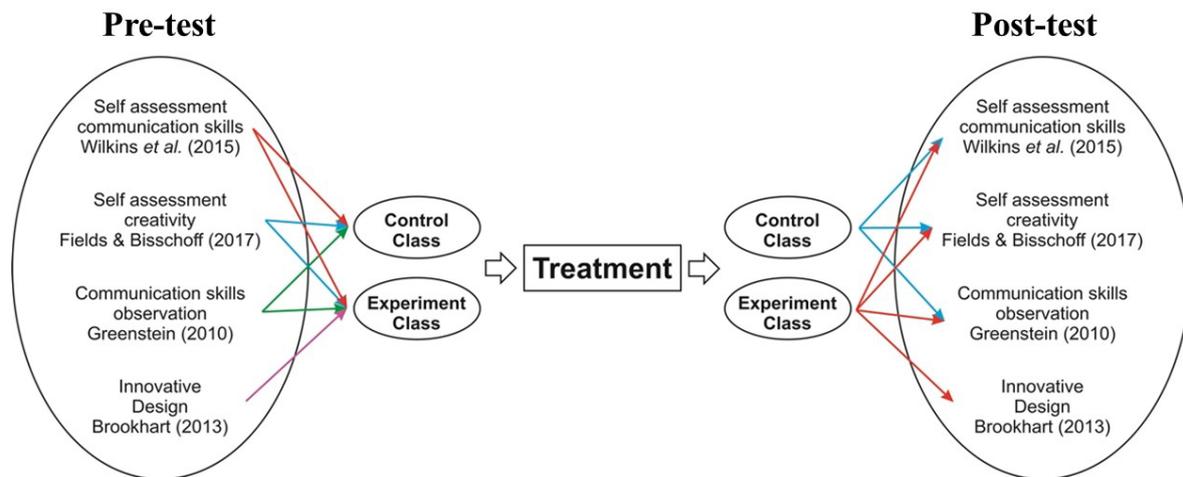
The pre-service teacher education program aims to produce capable and professional teachers (Mergler & Spooner-Lane, 2012). Pre-service teachers need more practice (Genç, 2016), so a lesson study is suitable for pre-service teachers. The constraints experienced by pre-service teachers when practising their skills include classroom and time management, implementing various strategies, and providing feedback on learning (Genç, 2016). These difficulties can be overcome through a lesson study because in the lesson study, collaborative activities occur so that a process of sharing ideas about learning can occur (Goh & Fang, 2017).

Based on the results of previous research, lesson studies have the potential to develop the pedagogical abilities of prospective educator students (Chokshi & Fernandez, 2010). Additional research also shows that a lesson study is suitable for increasing the reflectivity of prospective educator students (Lamb & Ko, 2016; Myers, 2012). Moreover, a lesson study can also increase the self-confidence of prospective educator students (Yakar & Turgut, 2017). By introducing the lesson study to pre-service teachers, they will understand that there is a gap between theory and practice in teaching (Santagata et al., 2007).

## **Research Methods**

This type of research is research and development. Product development is carried out in the form of developing a learning model. Development research uses the Plomp development model (Akker et al., 2013). In the assessment phase, a quasi-experiment was carried out to determine the effectiveness of the learning model, which was developed to improve communication skills and creativity. The subjects of this study were 36 students of Magister Biology Education, who were divided into two classes: experimental, and control classes. In general, the quasi-experimental research design is shown in Figure 1.

**Figure 1.** Quasi-Experimental Research Design



Based on Figure 1, the control and experimental classes conducted a pre-test and post-test self-assessment of communication skills and creativity, as well as an observation of communication skills. For the innovative design, only the pre-test and post-test were carried out in the experimental class. The term ‘innovative design’ refers to the innovative design of the learning design. The instruments used in this study are shown in Table 1. The data analysis techniques used in this quasi-experiment were: ANCOVA to analyse the data obtained from the self-assessment of creativity and communication skills, and the observation of communication skills; and a paired-analysis t-test of the data obtained from the Innovation Design Rubric. Before being analysed by using this test, a pre-requisite test was first completed.

**Table 1:** Research Instruments

Variable	Instrument	Source
Creativity	Self Assessment of Creativity	(Fields & Bisschoff, 2017)
	Innovation Design Rubric	(Brookhart, 2013)
Communication Skills	Self Assessment of Communication Skills	(Wilkins et al., 2015)
	Communication Skills Observation	(Greenstein, 2012)

## Results

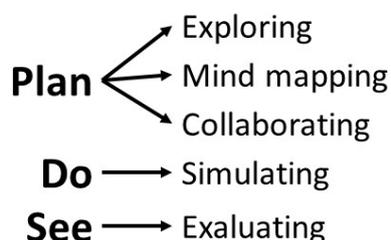
The design stage was carried out by developing a learning model. The results of the development stage of the learning model formulated the five stages of exploring, mind mapping, collaborating, simulating, and evaluating (EMCOSE). The support for learning theory at each stage in the EMCOSE learning model is shown in Table 2.

**Table 2:** Support of Learning Theory at Each Syntax of the EMCOSE Learning Model

No.	Syntax	Learning Theory Support
1	<i>Exploring</i>	<ul style="list-style-type: none"> <li>• <b>Constructivism Theory:</b> the constructivist approach is centred on the construction of meaning through rich experience, in a contextual and authentic way that students obtain through other people or their environment (Gorghiu et al., 2015).</li> <li>• <b>Cognitive Theory:</b> according to the theory of cognitivism, students have entered the formal operation phase. At this stage, the child can operate based on possible hypotheses and is no longer limited by what he or she has faced beforehand (Darmawan et al., 2016).</li> </ul>
2	<i>Mind mapping</i>	<ul style="list-style-type: none"> <li>• <b>Constructivism Theory:</b> students construct their knowledge through existing resources in the surrounding environment (Olusegun, 2015).</li> </ul>
3	<i>Collaborating</i>	<ul style="list-style-type: none"> <li>• <b>Cognitive Apprenticeship Theory:</b> the learning process will occur through interaction with friends or anyone who has a higher cognitive skill or level (Noack et al., 2014).</li> <li>• <b>Collaborative Theory:</b> collaboration is “the joint involvement of the participants in a coordinated effort to solve common problems”. Collaborative interactions are characterised by shared goals, structural symmetry, and high levels of negotiation, interactivity, and interdependence (Lai, 2011).</li> <li>• <b>Metacognitive Theory:</b> determining ideas for planning the learning process based on a similar strategy or method (Fisher, 1998).</li> <li>• <b>Social Cognitive Theory:</b> learning is the result of interacting and observing the environment by being directly involved. The principle of learning is modelling, namely strengthening the model and cognitive processing of that modelling (Moreno &amp; Park, 2010; Waismeyer &amp; Meltzoff, 2017).</li> <li>• <b>Theory of Proximal Development:</b> each individual has two levels of development: the lower level, which can be achieved respectively under normal circumstances, and the upper level, which can be achieved respectively under the influence of a capable adult or peer (Iqbal, 2015).</li> </ul>
4	<i>Simulating</i>	<ul style="list-style-type: none"> <li>• <b>Behaviourism Theory:</b> changes in behaviour are caused by a response to stimuli that are given repeatedly (Skinner, 1948).</li> <li>• <b>Enactive Learning Theory:</b> learning occurs by learning directly from a consequence that one experiences themselves (Mohamadi et al., 2011).</li> </ul>
5	<i>Evaluating</i>	<ul style="list-style-type: none"> <li>• <b>Scaffolding Theory:</b> adults or people who are more knowledgeable should adjust the level of guidance to help students reach solutions (Iqbal, 2015).</li> <li>• <b>Metacognitive theory:</b> awareness and individual judgment about cognitive processes and strategies (Fisher, 1998).</li> </ul>

The EMCOSE model is a model developed based on the basic framework of the lesson study. The relationship between the stages in the EMCOSE learning model and lesson study is shown in Figure 2.

**Figure 2.** The relationship between the EMCOSE Learning Model and Stages in the Lesson Study



Furthermore, the model is validated by several learning experts. The results of the validation are shown in Table 3.

**Table 3:** Results of Learning Expert Validation

No.	Validation Category	Score	Criteria
1	Learning Design	90	Very Valid
2	Lesson Plan	97	Very Valid
3	Learning Materials	100	Very Valid

### Practicality Test Results

The practicality test was completed by asking for opinions from students after carrying out learning by using the EMCOSE model. The practicality results are shown in Table 4.

**Table 4:** Practicality Test Results

No.	Indicator	Percentage (%)	Criteria
1	The EMCOSE model supports developing the capabilities of prospective Biology/Science teacher students	87.5	Very Practical
2	The EMCOSE model is suitable for facilitating the development of the capabilities of Biology/Science teacher candidates	90	Very Practical
3	The EMCOSE model is suitable for developing student competencies to take part in the twenty-first century	90	Very Practical
4	The EMCOSE model can be implemented in lectures for prospective Biology/Science teacher students	90	Very Practical
5	The EMCOSE model supports social system processes, including cooperation, equality, and intellectual freedom	92.5	Very Practical
6	The EMCOSE model supports the principle of the reaction process, including: (a) giving full confidence to students in carrying out assignments from lecturers, and (b) encouraging collaborative	92.5	Very Practical

interaction among students or working groups in learning.		
Overall Average (%)	90	Very Practical

Based on the practicality test, one of the suggestions that many students put forward is the need for better timing; this is indicated by respondent number seven:

*“Time management needs to be considered because sometimes learning exceeds the allotted time” — Respondent 7.*

### Effectiveness Test Results

The EMCOSE learning model’s effect upon student creativity was obtained from the self-assessment scores given to students through a questionnaire. The results of the creativity self-assessment questionnaire scores are shown in Table 5.

**Table 5:** Summary of Creativity Scores through Self-Assessment

Class		Total Corrected Score	Deviation
Experiment	<i>Pre-test</i>	96.02	7.88
	<i>Post-test</i>	103.90	
Control	<i>Pre-test</i>	97.87	5.47
	<i>Post-test</i>	103.34	

\*Maximum score: 156

The results of the ANCOVA test for the creativity questionnaire data are shown in Table 6.

**Table 6:** ANCOVA test Results for Creativity Questionnaire

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	1886.207 <sup>a</sup>	2	943.104	3.882	0.031
Intercept	5141.273	1	5141.273	21.162	0.000
Pre-test	891.120	1	891.120	3.668	0.064
Class	1109.045	1	1109.045	4.565	0.040
Error	8017.399	33	242.951		
Total	434426.656	36			
Corrected Total	9903.607	35			

Based on Table 6, the significance value is 0.40. This indicates that there is a significant mean difference between the classes taught using the EMCOSE learning model and the conventional class. The next assessment is an assessment of innovative design. The results obtained are shown in Table 7.

**Table 7:** Summary of Value of Innovative Design

Class	Average	
	<i>Pre-test</i>	<i>Post-test</i>
Experiment	77.38	80.95

The paired T-test results for the value of the innovative designs are shown in Table 8.

**Table 8:** Paired T-Test Results Value of Innovative Design

Pair	Pre-test – Post-test	Paired Differences				t	df	Sig. (2-tailed)	
		Mean	Std. Deviation	Std. Error	95% Confidence Interval of the Difference				
					Lower				Upper
1		-3.57143	2.44998	0.57747	-4.78977	-2.35308	-6.185	17	0.000

Based on Table 8, the significance value was  $<0.05$ . This indicates a significant increase between the pre-test and post-test scores of the students before and after being taught using the EMCOSE learning model. A summary of the scores obtained by the students' self-assessment of communication skills is shown in Table 9.

**Table 9:** Summary of Score Communication Skills through Self Assessment

Class	Total Corrected Score		Deviation
	<i>Pre-test</i>	<i>Post-test</i>	
Experiment	<i>Pre-test</i>	80.45	4.28
	<i>Post-test</i>	84.73	
Control	<i>Pre-test</i>	72.01	0.56
	<i>Post-test</i>	72.57	

\*Maximum Score: 128

The ANCOVA test results of the communication skills, as measured through the self-assessment, are shown in Table 10.

**Table 10:** ANCOVA test Results for Communication Skills Measured Through Self-Assessment

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	2247.831 <sup>a</sup>	2	1123.916	8.286	0.001
Intercept	3956.119	1	3956.119	29.167	0.000
Pre-test	792.994	1	792.994	5.847	0.021
Class	884.774	1	884.774	6.523	0.015
Error	4475.947	33	135.635		
Total	227841.285	36			
Corrected Total	6723.778	35			

Based on Table 10, the significance value is 0.015. This means that there is a significant difference in the mean of communication skills between the classes that are taught using the EMCOSE learning model and those taught by conventional learning. A summary of the value

of the communication skills obtained by students through the observation is shown in Table 11.

**Table 11:** Summary of The Mean of Communication Skills as Measured through Observation

Class		Average	Deviation
Experiment	<i>Pre-test</i>	73.89	17.5
	<i>Post-test</i>	91.39	
Control	<i>Pre-test</i>	74.72	11.11
	<i>Post-test</i>	85.83	

\*Maximum value: 100

The results of the ANCOVA test of the communication skills, as measured by observation, are shown in Table 12.

**Table 12:** ANCOVA test Results for Communication Skills Measured Through Observation

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	326.624 <sup>a</sup>	2	163.312	8.924	0.001
Intercept	1056.094	1	1056.094	57.707	0.000
Pre-test	48.846	1	48.846	2.669	0.112
Class	293.936	1	293.936	16.061	0.000
Error	603.932	33	18.301		
Total	283600.000	36			
Corrected Total	930.556	35			

Based on Table 12, the significance value is 0.00. This means that there is a significant difference in the mean of the communication skills between the classes that are taught using the EMCOSE learning model and those taught by conventional learning.

## Discussion

The stages cause a significant difference between the classes taught using the EMCOSE learning model and those taught by conventional learning. There are two stages in the EMCOSE learning model that can increase student creativity, which are mind mapping, and collaboration.

At the mind mapping stage, students were asked to make a mind map regarding the learning material they made. Through making a mindmap, students will think creatively about how to place points in a mind map, so that it is easy to learn and understand. Mind mapping allows for the creative exploration required by individuals regarding the concept as a whole, and stretching sub-topics and ideas related to the concept in the overall presentation on a sheet of paper through the depiction of symbols, words, lines, and arrows (Kulsum, 2017).

Another stage that supports the development of student creativity is collaborating. At this stage, students will collaborate to compile learning designs and do other assigned tasks. According to Lai (2011) collaboration is “The joint involvement of the participants in a

coordinated effort to solve common problems". Collaborative interactions are characterised by shared goals, structural symmetry, and high levels of negotiation, interactivity, and interdependence. Interactions that produce detailed explanations are precious for enhancing learning activities (Lai, 2011).

Collaborative activities can increase creativity because in these activities, students can exchange ideas about what they think, so that new ideas will emerge, which are formulated together (Laisema & Wannapiroon, 2014). Based on Pun (2012), group members will share ideas and communicate with each other through collaborative activities. The majority of group members also learn from each other's talents, and creative thinking skills, and their interest in learning can be enhanced.

Communication skills in this study were measured by using observation and self-assessment sheets. The collaborating, and simulating stages support the improvement of communication skills in the EMCOSE learning model and the evaluating stage. The collaborating stage in the EMCOSE learning model places great emphasis on collaborative activities between group members. During collaborative activities in groups, different ideas can emerge among group members during the discussion, which may lead to arguments and teach them to work together as members to reach standard solutions that will lead to the success of their group (Sulaiman & Shahrill, 2015). Collaborative activities also teach group members to be responsible, respect each other's ideas and opinions, work efficiently, and improve their communication skills with members in their group. Collaborative activities improve students' skills in collaborating and leads to several other skills, such as communication and critical thinking, which are achieved through group discussion (Sulaiman & Shahrill, 2015).

Collaboration activities can improve communication skills if these activities meet the following criteria: (1) each member works together in pairs or groups; (2) each member must share responsibility when they work in pairs or groups to develop products, designs, or joint responses; (3) each member must share responsibility when all members of the team are involved in the work, and all contribute to the final result; and (4) each member must make substantive decisions when they actively solve essential issues that will guide their work, namely the content, processes, and products of their group work (Sulaiman & Shahrill, 2015).

Specific communication skills are associated with successful collaboration and lead to good learning outcomes for the children involved (Murphy et al., 2000). During collaborative learning, productive relationships are characterised by conversations that incorporate effective questioning, explanation, clarification of ideas, direction, guidance, and in particular, constructive discussion about disagreement (Murphy et al., 2000). The activities within these collaborative activities can improve student communication skills.

The next stage in the EMCOSE learning model that can develop students' communication skills is the simulating stage, where peer teaching is carried out. Peer teaching is conducted



by a group assigned to be the peer teaching team or lesson study team. This stimulating activity will train students to teach their friends. Peer teaching activities force students to be able to speak in front of other people. Based on research from Şen (2010), microteaching resulted in a significant increase in student communication skills. As students get used to doing peer teaching, the students will improve their communication skills.

The next stage in the EMCOSE model that supports the development of communication skills is evaluating. The evaluation stage is used to evaluate learning carried out either from the learning process or the learning material. At this evaluating stage, students provide suggestions for improving the learning process that is carried out. During this evaluation activity, students will practice presenting their evaluation directly. This will allow students to practice how to communicate well and not offend the group conducting peer teaching. Effective communication pays attention to the intensity and articulation of sound, clear perceptions, emotions when communicating, the credibility of information, and the amount of information provided (Kelvin-Iloafu, 2016).

### **Conclusion and Recommendations**

The developed EMCOSE learning model has met the criteria of being valid, practical, and effective. The effect of the EMCOSE learning model upon student creativity was analysed through ANCOVA. The analysis results show that there is a significant influence on student creativity between the classes taught using the EMCOSE learning model and those taught using conventional learning. The effect of the EMCOSE learning model on student communication skills was also analysed through ANCOVA. The analysis results show that there is a significant influence on student communication skills between the classes taught using the EMCOSE learning model and those taught using conventional learning. The recommendations offered for further research are to conduct further research on how the EMCOSE model influences the improvement of the other skills of prospective teacher students.

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## REFERENCES

- Akker, J. van den, Bannan, B., Kelly, A.E., Nieveen, N. and Plomp, T. (2013), *Educational Design Research*, Netherlands Institute for Curriculum Development (SLO), Enschede.
- Anugrahana, A. (2016), “Peningkatan Kompetensi Dasar Mahasiswa Calon Guru SD Pada Mata Kuliah Pendidikan Matematika Dengan Model Pembelajaran Inovatif”, *Jurnal Penelitian*, Vol. 20 No. 2, pp. 182–187.
- Baker, W.E. and Sinkula, J.M. (2005), “Market Orientation and the New Product Paradox”, *Journal of Product Innovation Management*, Vol. 22 No. 6, pp. 483–502.
- Bjuland, R. and Mosvold, R. (2015), “Lesson study in teacher education: Learning from a challenging case”, *Teaching and Teacher Education*, Elsevier Ltd, Vol. 52, pp. 83–90.
- Boholano, H.B. (2017), “Smart Social Networking: 21st Century Teaching and Learning Skills”, *Research in Pedagogy*, Vol. 7 No. 1, pp. 21–29.
- Brookhart, S.M. (2013), *How to Create and Use Rubrics for Formative Assessment and Grading*, ASCD, USA.
- Chiappe, A. and Rodríguez, L.P. (2017), “Learning Analytics in 21st Century Education: a review”, *Ensaio: Avaliação e Políticas Públicas Em Educação*, Vol. 25 No. 97, pp. 971–991.
- Chokshi, S. and Fernandez, C. (2010), “Challenges to Importing Japanese Lesson Study: Concerns, Misconceptions, and Nuances”, *The Phi Delta Kappan*, Vol. 85 No. 7, pp. 520–525.
- Darmawan, E., Zubaidah, S., Susilo, H. and Suwono, H. (2016), “Simas eric Model to Improve Students’ Critical Thinking Skills”, *Journal of Education & Social Policy*, Vol. 3 No. 6, pp. 45–53.
- Djumingin, S. (2017), “The Practice of Lesson Study Model in Teaching Writing Report Text”, *Journal of Education and Learning*, Vol. 11 No. 1, pp. 103–110.
- Doig, B. and Groves, S. (2011), “Japanese Lesson Study : Teacher Professional Development through Communities of Inquiry”, *Mathematics Teacher Education and Development*, Vol. 13 No. 1, pp. 77–93.
- Dotger, S., Moquin, K.F. and Hammond, K. (2009), “Using Lesson Study to Assess Student Thinking in Science Assessments”, *Educator’s Voice*, Vol. 5, pp. 1–31.
- Fields, Z. and Bisschoff, C.A. (2017), “Developing and Assessing a Tool to Measure the Creativity of University Students”, *Journal of Social Sciences*, Vol. 38 No. 1, pp. 23–31.
- Fisher, R. (1998), “Thinking about thinking: Developing metacognition in children”, *Early Child Development and Care*, Vol. 141 No. 1, pp. 1–15.
- Genç, Z.S. (2016), “More Practice for Pre-Service Teachers and More Theory for In-service Teachers of English Language”, *Procedia - Social and Behavioral Sciences*, The Author(s), Vol. 232 No. April, pp. 677–683.
- Goddard, Y.L., Goddard, R.D. and Tschannen-moran, M. (2007), “A Theoretical and Empirical Investigation of Teacher Collaboration for School Improvement and Student Achievement in Public Elementary Schools”, *Teachers College Record Data*, Vol. 109

- No. 4, pp. 877–896.
- Goh, R. and Fang, Y. (2017), “Improving English language teaching through lesson study: Case study of teacher learning in a Singapore primary school grade level team”, *International Journal for Lesson and Learning Studies*, Vol. 6 No. 2, pp. 135–150.
- Gorghiu, G., Drăghicescu, L.M., Cristea, S., Petrescu, A.-M. and Gorghiu, L.M. (2015), “Problem-based Learning - An Efficient Learning Strategy in the Science Lessons Context”, *Procedia - Social and Behavioral Sciences*, Vol. 191, pp. 1865–1870.
- Greenstein, L. (2012), *Assessing 21st Century Skills: A Guide to Evaluating Mastery and Authentic Learning*, SAGE Publication, Singapore.
- Guo, J. and Woulfin, S. (2016), “Twenty-First Century Creativity: An Investigation of How the Partnership for 21st Century Instructional Framework Reflects the Principles of Creativity”, *Roeper Review*, Vol. 38 No. 3, pp. 153–161.
- Gutierrez, S.B. (2015), “Collaborative Professional Learning through Lesson Study: Identifying The Challenges of Inquiry-Based Teaching”, *Issues in Educational Research*, Vol. 25 No. 2, pp. 118–135.
- Haymore-Sandholtz, J. (2002), “Inservice training or professional development: Contrasting opportunities in a school/university partnership”, *Teaching and Teacher Education*, Vol. 18 No. 7, pp. 815–830.
- Hendayana, S., Suryadi, D., Karim, M.A., Sukirman, Ariswan, Sutopo, Supriatna, A., et al. (2007), *Lesson Study: Suatu Strategi Untuk Meningkatkan Keprofesionalan Pendidik*, UPI Press, Bandung.
- Iqbal, H.M. (2015), *Cognitive Development, Educational Theories Of, International Encyclopedia of the Social & Behavioral Sciences: Second Edition*, Second Edi., Vol. 4, Elsevier, available at: <https://doi.org/10.1016/B978-0-08-097086-8.23099-7>.
- Kanauan, W. and Inprasitha, N. (2014), “Collaboration between Inservice Teachers and Student Intern in Thai Lesson Study”, *Procedia - Social and Behavioral Sciences*, Elsevier B.V., Vol. 116, pp. 28–32.
- Kelvin-Iloafu, L.E. (2016), “The Role of Effective Communication in Strategic Management of Organizations”, *International Journal of Humanities and Social Science*, Vol. 6 No. 12, pp. 93–99.
- Khan, A., Khan, S., Zia-ul-islam, S. and Khan, M. (2017), “Communication Skills of a Teacher and Its Role in the Development of the Students ’ Academic Success”, *Journal of Education and Practice*, Vol. 8 No. 1, pp. 18–21.
- Khokhotva, O. (2018), “Lesson Study in Kazakhstan: case study of benefits and barriers for teachers”, *International Journal for Lesson and Learning Studies*, Vol. 7 No. 4, pp. 250–262.
- Kolifah, K., Prihartati, N.G. and Mudhawaroh, M. (2017), “Application of Innovative Flipped Classroom Learning on Improving Motivation of Midwifery Students in the Antenatal Care”, *Advances in Health Sciences Research (AHSR)*, Vol. 2, pp. 309–315.
- Kulsum, N.U. (2017), “Application Learning Model Mind Mapping for Increase The Creativity and Learning Outcomes”, *Classroom Action Research Journal*, Vol. 1 No. 4, pp. 176–

185.

- Lai, E.R. (2011), *Collaboration: A Literature Review*, USA.
- Laisema, S. and Wannapiroon, P. (2014), “Design of Collaborative Learning with Creative Problem-solving Process Learning Activities in a Ubiquitous Learning Environment to Develop Creative Thinking Skills”, *Procedia - Social and Behavioral Sciences*, Elsevier B.V., Vol. 116, pp. 3921–3926.
- Lamb, P. and Ko, P.Y. (2016), “Case studies of lesson and learning study in initial teacher education programmes”, *International Journal for Lesson and Learning Studies*, Vol. 5 No. 2, pp. 78–83.
- Lenski, S.J., Caskey, M.M., Jr, V.A.A., Lenski, S.J. and Caskey, M.M. (2009), “PDXScholar Using the Lesson Study Approach to Plan for Student Learning Using the Lesson Study Approach to Plan for Student Learning”, *Curriculum and Instruction Faculty Publications and Presentations*, Vol. 40, pp. 50–57.
- Leon-abao, E. De, Ed, D., Boholano, H.B., Ed, D., Dayagbil, F.T. and Ed, D. (2015), “Engagement To Social Networking : Challenges and Opportunities To Educators”, *European Scientific Journal*, Vol. 11 No. 16, pp. 173–191.
- Lubis, J.A. and Lubis, F.A. (2017), “Pengembangan Kreativitas Dan Kompetensi Mahasiswa Dalam Mempersiapkan Pembelajaran Biologi Mata Kuliah Perencanaan Pengajaran Biologi”, *PeTeKa (Jurnal Penelitian Tindakan Kelas Dan Pengembangan Pembelajaran)*, Vol. 1 No. 1, pp. 1–7.
- Lukitasari, M., Handhika, J. and Murtafiah, W. (2017), “21st Century Skills Mahasiswa Calon Guru dalam Pembelajaran Matematika”, *Prosiding Seminar Hasil Penelitian Dan Pengabdian Kepada Masyarakat UNIPMA 2017*, pp. 372–378.
- Lundbäck, B. and Egerhag, H. (2020), “Lesson Study as a bridge between two learning contexts”, *International Journal for Lesson and Learning Studies*, Vol. 9 No. 3, pp. 289–299.
- Mohamadi, F.S., Asadzadeh, H., Ahadi, H. and Jomehri, F. (2011), “Testing Bandura’s Theory in school”, *Procedia - Social and Behavioral Sciences*, Vol. 12, pp. 426–435.
- Moreno, R. and Park, B. (2010), “Cognitive Load Theory: Historical Development and Relation to Other Theories”, in Plass, J.L., Brünken, R. and Moreno, R. (Eds.), *Cognitive Load Theory*, Cambridge University Press, Cambridge, pp. 9–28.
- Murphy, S., Faulkner, D. and Farley, L. (2000), *Learning to Collaborate: Can Young Children Develop Better Communication Strategies through Collaboration with a More Popular Peer*, *European Journal of Psychology of Education*, Vol. 15, available at: <https://doi.org/10.1007/BF03172983>.
- Myers, J. (2012), “Lesson Study as a Means for Facilitating Preservice Teacher Reflectivity Lesson Study as a Means for Facilitating Preservice Teacher Reflectivity”, *International Journal for the Scholarship of Teaching and Learning*, Vol. 6 No. 1, pp. 1–21.
- Najah, A.A., Rohmah, A.F., Usratussyarifah and Susilo, H. (2019), “The Implementation of Problem Based Learning (PBL) Model Improving Students’ Oral Communication Skill through Lesson Study”, *Journal of Physics: Conference Series*, Vol. 1227 No. 1,



available at:<https://doi.org/10.1088/1742-6596/1227/1/012004>.

- Narayanan, S. (2017), “A Study on the Relationship between Creativity and Innovation in Teaching and Learning Methods towards Students Academic Performance at Private Higher”, *International Journal of Academic Research in Business and Social Sciences*, Vol. 7 No. 2005, pp. 1–10.
- Noack, H., Lövdén, M. and Schmiedek, F. (2014), “On the validity and generality of transfer effects in cognitive training research”, *Psychological Research*, Vol. 78 No. 6, pp. 773–789.
- Noviarni. (2014), “Peningkatan Kreativitas Mahasiswa Pendidikan Matematika dalam Mengembangkan LKS Matematika Sekolah melalui Latihan Terbimbing di UIN Suska Riau”, *Edumatica*, Vol. 04 No. 01, pp. 8–15.
- Olusegun, S. (2015), “Constructivism Learning Theory: A Paradigm for Teaching and Learning”, *The International Journal of Research & Method in Education*, Vol. 5 No. 6, pp. 66–70.
- Parr, G., Wilson, J., Godinho, S. and Longaretti, L. (2004), “Improving pre-service teacher learning through peer teaching: process, people and product”, *Mentoring & Tutoring: Partnership in Learning*, Vol. 12 No. 2, pp. 187–203.
- Pishghadam, R., Nejad, T.G. and Shayesteh, S. (2012), “Creativity and its Relationship with Teacher Success”, *BELT Journal*, Vol. 3 No. 2, pp. 204–216.
- Pun, S.-K. (2012), “Collaborative Learning: a means to Creative Thinking in Design”, *International Journal Of Education And Information Technologies*, Vol. 6 No. 1, pp. 33–43.
- Roback, P., Chance, B., Legler, J. and Moore, T. (2006), “Applying Japanese Lesson Study Principles to an Upper-level Undergraduate Statistics Course”, *Journal of Statistics Education*, Vol. 14 No. 2.
- Robeyns, I. (2003), *The Capability Approach: An Interdisciplinary Introduction*, University of Amsterdam, Netherlands.
- Rock, T.C. and Wilson, C. (2005), “Improving Teaching through Lesson Study”, *Teacher Education Quarterly*, pp. 77–92.
- Saavedra, A.R. and Darleen Opfer, V. (2012), “Learning 21st-century skills requires 21st-century teaching”, *Phi Delta Kappan*, Vol. 94 No. 2, pp. 8–13.
- Saito, E. and Atencio, M. (2015), “Lesson study for learning community (LSLC): conceptualising teachers’ practices within a social justice perspective”, *Discourse*, Vol. 36 No. 6, pp. 795–807.
- Saito, E., Murase, M., Tsukui, A. and Yeo, J. (2014), *Lesson Study for Learning Community*, *Lesson Study for Learning Community*, Routledge: Taylor & Francis Group, London, available at:<https://doi.org/10.4324/9781315814209>.
- Santagata, R., Zannoni, C. and Stigler, J.W. (2007), “The role of lesson analysis in pre-service teacher education: An empirical investigation of teacher learning from a virtual video-based field experience”, *Journal of Mathematics Teacher Education*, Vol. 10 No. 2, pp. 123–140.



- Seleznyov, S. (2019), "Lesson study beyond Japan: evaluating impact", *International Journal for Lesson and Learning Studies*, Vol. 8 No. 1, pp. 2–18.
- Şen, A.I. (2010), "Effects of peer teaching and microteaching on teaching skills of pre-service physics teachers", *Egitim ve Bilim*, Vol. 35 No. 155, pp. 78–88.
- Shepherd, A.V. (2019), "Integrating lesson study in Myanmar teacher training", *International Journal for Lesson and Learning Studies*, Vol. 8 No. 1, pp. 34–47.
- Skinner, B.F. (1948), "'Superstition' in the pigeon.", *Journal of Experimental Psychology*, American Psychological Association, US.
- Sudarisman, S. (2015), "Memahami Hakikat dan Karakteristik Pembelajaran Biologi dalam Upaya Menjawab Tantangan Abad 21 serta Optimalisasi Implementasi Kurikulum 2013", *Jurnal Florea*, Vol. 2 No. 1, pp. 29–35.
- Sudrajat, A.K., Susilo, H. and Rohman, F. (2020), "Student perspective on the importance of developing critical thinking and collaboration skills for prospective teacher students", *AIP Conference Proceedings*, Vol. 2215, available at: <https://doi.org/10.1063/5.0000558>.
- Sulaiman, N.D. and Shahrill, M. (2015), "Engaging collaborative learning to develop students' skills of the 21st century", *Mediterranean Journal of Social Sciences*, Vol. 6 No. 4, pp. 544–552.
- Tang, T.S., Hernandez, E.J. and Adams, B.S. (2004), "'Learning by Teaching ": A Peer-Teaching Model for Diversity Training in Medical School", *Teaching and Learning in Medicine*, Vol. 16 No. 1, pp. 60–63.
- Vong, S.A. and Kaewurai, W. (2017), "Instructional model development to enhance critical thinking and critical thinking teaching ability of trainee students at regional teaching training center in Takeo province, Cambodia", *Kasetsart Journal of Social Sciences*, Elsevier Ltd, Vol. 38 No. 1, pp. 88–95.
- Waismeyer, A. and Meltzoff, A.N. (2017), "Learning to make things happen: Infants' observational learning of social and physical causal events", *Journal of Experimental Child Psychology*, Elsevier Inc., Vol. 162, pp. 58–71.
- Wicaksono, R.S., Susilo, H. and Sueb. (2019), "Implementation of Problem Based Learning Combined with Think Pair Share in Enhancing Students' Scientific Literacy and Communication Skill through Teaching Biology in English Course Peerteaching", *Journal of Physics: Conference Series*, Vol. 1227 No. 1, available at: <https://doi.org/10.1088/1742-6596/1227/1/012005>.
- Wilkins, K.G., Bernstein, B.L. and Bekki, J.M. (2015), "Measuring Communication Skills: The STEM Interpersonal Communication Skills Assessment Battery", *Journal of Engineering Education*, Vol. 104 No. 4, pp. 433–453.
- Yakar, Z. and Turgut, D. (2017), "Effectiveness of Lesson Study Approach on Preservice Science Teachers' Beliefs", *International Education Studies*, Vol. 10 No. 6, pp. 36–43.
- Zlati, L., Bjeki, D. and Bojovi, M. (2014), "Development of teacher communication competence", *Procedia - Social and Behavioral Sciences*, Vol. 116, pp. 606–610.

## Attachment

### EMCOSE Learning Model Syntax

Syntax	Students Activity	Lecturers Activity
1	2	3
<i>Exploring</i>	Students explore learning resources, surroundings, course objectives, course materials, etc. Exploring activities are carried out by all students, either acting as the Presenter Team or acting as being studied	Lecturer give assignments to studentss to explore anything that can be used as learning material in class.
<i>Mindmapping</i>	Students make a mindmap about the results of the previous Exploring stage.	Lecturer give assignments to learners to make Mindmaps
<i>Collaborating</i>	Students who act as a presenter team collaborate with each other to design simulating activities that will be applied in the classroom.	Lecturer assist students in carrying out collaborating activities
<i>Simulating</i>	Students who act as a presenter team explain the learning material and perform simulations	Lecturer supervise learning activities
<i>Evaluating</i>	Students carry out evaluations related to simulating activities. Students who act as students who are being taught evaluate the learning process through learning assessment sheets. The students who acts as a presenter team evaluates the activities of the students being learned to be used in the next simulating activity. Evaluating activities can be done inside and outside the learning process. Evaluating outside the learning process is done through online platforms such as Edmodo, Sipejar, Google Classroom, etc.	Lecturer provide an evaluation of the learning process and provide reinforcement related to the material presented. Lecturer lead the discussion process and provide feedback in the online platform.