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Profile of Elementary Teacher Education Students' Communication Skills in Natural Science Online Learning Based STEM Duhita Savira Wardani1* & Jajang Bayu Kelana2 1,2IKIP Siliwangi, Cimahi, Indonesia *Email & Phone: duhita@ikipsiliwangi.ac.id; +6285732745944 Submitted: 2021-00-00 _ _DOI: 10.23917/ppd.v7i2.11404 _ _Accepted: 2021-00-00 Published: 2021-00-00 _ _ _ _ _ _ _ _Keywords: _Abstract _ _Elementary Education Communication Skills STEM Online Learning Natural Science _Background: The objective of this study was to identify the profile of communication skills of Elementary Teacher Education (ETE) students in natural science online learning based STEM. Method: The method used in this study was pre-experimental research with a one shot case study design.

The sample in this study were 25 ETE students at university in Cimahi. The techniques that were used in this study were observation and documentation. The data analyzed by paired sample t-test. The assessment techniques to check data validity were descriptive analysis of the data and hypothesis testing using the t-test. Result: The results of this study showed that (1) there is an effect of the application of STEM-based online science learning on the communication skills of ETE students, (2) Based on these data, it can be seen that most of students are still in the Intermediate category for written communication and "does not Meeting the Standards" for oral communication skills, 32) students' communication skills in STEM-based science online learning still need to be optimized.

Implication: The implications of this study are: First, ETE lecturers in Indonesia must enrich their knowledge and insights into STEM-based learning and communication management. Second, ETE lecturers in Indonesia have to employ communication skills assesment more seriously. The last one, the government, supported by researchers, has

to design an excellent assessment system to solve time limitations. Novelty: The present study revealed the implementation of STEM-based online science learning which is conducted online.

_ _INTRODUCTION / PENDAHULUAN Background / Latar Belakang In line with the development of the world's paradigm of the meaning of education, education is faced with a number of increasingly severe challenges. One of the real challenges is that education should be able to produce human resources who have complete competence. Unlike several decades ago, the competencies expected to be possessed by human resources nowadays are more focused on several competencies, one of which is communication skills.

This communication skill is one of the competencies that is emphasized in the 21st century and is one of the skills that a person must have when entering the world of work (Bybee, 2013). Human resources at this time should have the ability to communicate in order to work together and convey creative ideas. Communication skills are seen not only as soft skills but also seen as one of the keys to facing the challenges of the times (Haryanti & Suwarma, 2018).

Communication skills are meant to communicate effectively in conveying verbal information, criticism, and also the ability to use and write in various media and technologies in a reflective and interactive way. Effective communication emphasizes collaboration, interpersonal skills, personal responsibility, social responsibility and thinking of the public interest as well as two-way communication (Greenstein, 2012). Problem of Study / Masalah Penelitian However, the lack of student communication skills in Indonesia is shown by the findings of research conducted by Marfuah (2017) on grade VII students at junior high school in Depok City in the even semester of the 2015/2016 academic year, it is known that students rarely get assignments to make observations or assignments. of a project nature.

The learning that is carried out is to place students as recipients of information and pour out the contents of the book so that when asked for arguments in the discussion process, students tend not to be able to express their opinions, are not confident, so that in the end students really do not understand the material so that learning outcomes are low. The same problem was found in research conducted by Dipalaya et al. (2016) that learning Biology is still much oriented towards developing and testing students' memory.

Learning tends to be based on rote theory and not based on student experience, so that students 'abilities are simply understood as memorizing abilities so that students'

communication skills are less than optimal. The teacher has started to provide opportunities to communicate in learning, as can be seen from the discussion and question and answer activities that are often carried out in class. However, the expected communication skills have not been developed optimally in learning. Students tend to communicate less interactive, less use of technology, less assertive and effective in delivering messages or information.

Solution / Solusi In connection with the importance of communication skills, these skills should be trained in the learning process. One learning approach that is considered effective is STEM-based learning (Science, Technology, Engineering, and Mathematics). This approach relies on a Project Based Learning approach so that students are often required to be able to communicate good ideas with peers, teachers, or other audiences to convey the results of the learning process they have been through. Therefore, the STEM approach is believed to improve students' communication skills. STEM-based learning is a learning that relies on a cross-disciplinary approach and Project Based Learning.

The purpose of STEM itself is to prepare students to be able to apply their knowledge to solve complex problems and develop STEM competencies (Ritz & Fan, 2015). The STEM approach to learning is expected to produce meaningful learning for students through the systematic integration of knowledge, concepts and skills. Some of the benefits of the STEM approach make students better able to solve problems, innovators, inventors, independent, logical thinkers, and technological literacy (Stohlmann et al., 2012);(Kelana et al., 2020).

With the existence of STEM students are expected to not only solve problems related to STEM, but can solve various types of complex problems that can also develop their high-order communication and thinking skills, besides that STEM can also prepare the needs of 21st century human resources (Bybee, 2013);(Firdaus et al., 2020), even though it is still in the midst of the Covid-19 pandemic. Covid-19 is something that has never been predicted before, where this virus can turn into an endemic virus in the community and it is likely that this virus will not completely disappear.

Referring to the statement from Dale Fisher, Official of the WHO Global Outbreak Warning and Response Network, it was said that the Covid-19 vaccine will likely be ready by the end of 2021. In this regard, the Minister of Education and Culture issued Circular Number 4 of 2020 concerning implementation Education Policy in an Emergency for the Spread of COVID which explains that the learning process is carried out at home through online / distance learning to provide meaningful learning experiences for students / students (Kelana et al., 2021). State of the Art / Penelitian

Relevan Terdahulu In fact, studies on student communication skills have been carried out both in Indonesia and abroad.

These studies include Hausberg et al. (2012) which conducts development and evaluation in improving the communication skills of medical students, Maryanti et al., (2012) examines the relationship between communication skills and student learning activities. In line with this, Dharmayanti (2013) also examines the application of role playing techniques in improving student communication skills, and Thomas et al. (2009) which develops SBAR communication techniques in improving communication skills of medical students.

However, these studies are still limited to offline or face-to-face learning and not many have studied communication skills with STEM through online learning. Gap Study & Objective / Kekosongan Penelitian & Tujuan As a first step in analyzing the effect of STEM-based learning on students' communication skills through online learning, this study aims to identify the profile of communication skills of Elementary Teacher Education students in natural science online learning based STEM. The measured communication skills profile consists of oral communication skills and written communication skills..

METHOD / METODE Type and Design / Jenis dan Desain This research is a pre-experimental research with a One shot case study design. The One-Shot Case Study design is a research design consisting of one group that is given treatment which then observes these results and the absence of a comparison group and randomization (Dantes, 2012; Sugiyono, 2012). The design of the one shot case study can be seen in Figure 1 (Fraenkel, J.R., and Weelen, 2008).

Figure 1: Pre-experimental research with a one shot case study design Note: X : Treatment of independent variable O : Observation or measurement of dependent variable The sample in this study was determined by Convience Sampling and there were 25 Elementary Teacher Education (ETE) students in the 2018/2019 academic year at one of the universities in Cimahi. The independent variable in this study is STEM-based online natural science learning, while the object in this study is student communication skills. The application of STEM in lectures has actually been carried out in the last few semesters, but due to the Covid-19 pandemic in the middle of the even semester, lectures have been transferred through online learning while still applying STEM.

Data and Data Sources / Data dan Sumber Data The data collected in this study are in the form of data on the results of students' oral and written communication skills. The measured student communication skills are divided into oral communication and written

communication. Data collection on oral communication skills was carried out through a presentation process which was assessed based on a rubric adapted from the University of Baltimore (University of Baltimore, 2010) with 6 indicators, namely: 1) Organization, (2) Eye contact, (3) Delivery, (4) Conclusion, (5) Responsiveness, and (6) Multimedia Support.

The results of the student presentations will then be analyzed as a whole and will divide the students into three categories of oral communication skills which can be seen in Table 1. Table 1 Oral Communication Assessment Criteria Total score _Category _ _16-18 _Exeed the standard _ _11-15 _Meet the standard or avarage _ _= 10 _Failed to meet standard _ _ While the data collection of written communication skills was carried out through the process of making a report which was then assessed according to predetermined criteria, which consisted of: (1) Objectives, (2) Background of the Problem, (3) Idea Finding, (4) Making Process, (5) Testing Process, (6) Analysis, (7) Results, and (8) Conclusions and fulfilling the Format and Style requirements that have been determined.

The results of processing grades from student reports are then categorized into several categories based on the rubric adapted from the University of Baltimore, with the scoring criteria which can be seen in Table 2. Table 2 Written Communication Assessment Criteria Total score _Category _ _25-30 _Advance _ _17-24 _Intermediate _ _9-16 _Emerging _ _= 8 _Basic _ _ Data collection technique / Teknik Pengumpulan Data Observation The observations used in this research are participatory observation and direct observation. The author observes informants (lecturers) in assessing both during and outside class activities.

The author participates in lecturer activities when assessing students' oral communication skills which consists of 6 indicators Documentation The method of documentation in this study is intended to obtain data by means of documentation, namely studying documents related to all the data required in the study. The document used in this study is a document report on the results of project implementation carried out by each student to assess students' written communication skills which consists of 8 indicators. Data Validity / Keabsahan Data Moreover, in this data processing activity, a T-Test (paired sample t-test) was used to determine whether there was an effect of the PjBL learning on improving the writing skills of science teaching materials for elementary school teacher candidates. Form the hypothesis if the Asymp.Sig value. (2-tailed)> a, where a = 0.05; then H0 is accepted and interpreted as not having a significant improvement in the writing skills of science teaching materials for elementary school teacher candidates using the Project Based Learning (PjBL) model.

Data analysis / Analisis Data The data analysis method used consisted of descriptive analysis of the data and hypothesis testing using the t-test. The hypotheses proposed in this study are: (1) there is an effect of using STEM-based online science learning on the oral communication skills of PGSD students, (2) there is an effect of using STEM-based online natural science learning on ETE students' written communication skills.. RESULT / HASIL The lecture begins by allowing students to identify problems given through the LKM whose processing process is guided by the lecturer through zoom.

At this meeting, the problem the students encountered was the discovery of a village that did not have a source of electricity and still used kerosene lamps, which is a non-renewable form of energy. It was also explained that the condition of the price of fuel oil will continue to increase because non-renewable energy sources will eventually run out, and there is no PLN in the village because the village is remote. However, the village has the potential for other adequate alternative energy sources such as wind and water.

At this meeting, students are also required to make problem-solving designs to produce tools that use alternative energy as answers to problems encountered individually. At the second meeting, students will begin to realize the results of their thoughts into products that can answer these problems individually by giving them the freedom to choose which designs to use. After students make a complete design with scale and size, students start making tools individually.

The product designs that are expected to be made by each student are designs from propellers for wind power plants or designs for turbines for hydropower plants that can produce the largest electrical energy. When the propeller or mill in the product can move and produce electrical energy, each student must analyze how to make the windmill he made can produce greater electrical energy. So, at the fourth and fifth meetings, each student is allowed to redesign and remake the product or improve the product that has been made so that it can produce greater electrical energy.

After all learning activities were carried out at the sixth meeting, students were asked to present the products that had been made individually. At this meeting, an assessment of students' oral communication skills through presentations will also be carried out. After that, individually, students are asked to prepare a structured report based on the product that has been made as a means of assessing written communication skills.

Based on the research that has been done, it is known that the majority of students are still in the "failed to meet standards" category with a percentage of 56%. On the other hand, none of the students are in the "exceed the standards" category and some of the

other students are in the "meet the standard" category. This indicates that STEM-based science learning can improve students' oral communication skills but still requires improvement in the implementation process. The data can be seen in Table 3.

Table 3 Analysis of Oral Communication Skills Total score _Number of students _% _ _Exeed the standard _- _ _ _Meet the standard or avarage _14 _56 _ _Failed to meet standard _11 _44 _ _From table 3 it is known that more than half of the students have oral communication skills in the category that does not meet the standards. This arises because previously students did not have enough opportunities to practice these oral communication skills. Apart from that, this can also happen because not all learning can be communicated through oral presentations.

As for the results of written communication skills can be seen in Table 4 Table 4 Analysis of Written Communication Skills Total score _Number of students _% _ _Advance _- _ _ _Intermediate _13 _52 _ _Emerging _8 _32 _ _Basic _4 _16 _ _Table 4 shows that the majority of students are already in the intermediate category, namely 13 people or 52%, then 8 students in the emerging category or 32%, 4 students in the Basic category or 16% and none. students who are in the advanced category. This indicates that although the majority of students are already in the Intermediate category, there is still room for students to continue to improve students' written communication skills with STEM-based natural science online learning so that students can reach the Advance category.

Then as for Figure 1 below is an example of a student's answer when asked to mention the purpose of making the product in the report made by the student / Figure 1 Example of Students' Purposes of Making a Product which Got a Point of 1 Figure 1 is an example of explaining and writing student reports for the purpose section with a point of 1 (emerging). The explanation is given a value of 1 because it is deemed not in accordance with the criteria. Meanwhile, Figure 2 shows an example of a student explanation for the objective section with the Intermediate category with a score of 2.

/ Figure 1 Example of Students' Purposes of Making a Product The following is the answer to the part of the goal which is expected to be written by students, "Being able to make simple power generation technology using the principle of energy change through the use of natural energy sources based on problem analysis." such as, energy crisis, alternative energy or natural energy, power generation (or it can be written directly windmills or watermills). Figure 1 only states that the purpose of making the product made is "Finding a solution to the problem by making a tool that can fix the problem" without elaborating on what problems are faced, what tools will be made, and what the conditions are.

Meanwhile, in Figure 2 the purpose of the report is made to appear brief, but the explanation already includes several key words such as "additional energy" which can also be called alternative energy. Then the student also mentioned the previous conditions experienced by the village, so it was assumed that the students could already understand what problems the village was experiencing. Even though the answers to the students' explanations were not complete, the explanation indicated that students could write down the objectives of making the product based on problem analysis.

Based on the results of the normality test and homogeneity test, it was found that the data were normally distributed and not homogeneous, so that the mean similarity test could be continued using the Mann-Whitney U-test as an alternative to the free sample t-test through the SPSS 20 program with a significance level of 0.05. The results of the Mann-Whitney U-Test can be seen in Table 3. Table 3 Output Result Test Statisticsa _ _ _Pos - Pre _ _Z _-4.512b _ _Asymp. Sig. (2-tailed) _.001 _ _a. Mann-Whitney Signed Ranks Test _ _b. Based on negative ranks. _ _ The test criteria based on the Mannwhithney test of the results of the student report scores above only apply to the two-party (2-tailed) test. In Table 3 above, it is seen in Asmp. Sig.

(tailed) shows a significance of 0.001 and 0.001 which is smaller than 0.05 so that H0 is rejected. This means that there is an effect of the application of STEM-based online science learning on the communication skills of ETE students DISCUSSION / PEMBAHASAN The analysis in Table 3 shows that more than half of the students do not have oral communication skills, it can be seen from the results that do not meet the standards. This happened because previously students had not had enough opportunities to practice these oral communication skills.

This condition results in when students get the opportunity to appear in public, the feelings experienced by students are feeling afraid, trembling, nervous (stage fright) so that the pressure when they are going to make a presentation is unavoidable (Saenab et al., 2017). This makes students sometimes forget what to say when speaking in public, even through online learning applications. Communication skills are not only limited to receiving or conveying information, but also including gathering information (Ilyas, 2013).

In STEM-based online science learning, students' oral communication skills have been trained because STEM itself relies on a Project-Based Learning approach where students are often required to be able to communicate good ideas with colleagues, teachers, or other audiences to convey the results of the learning process that has been passed. Railsback (Priansa, 2015) states that PjBL in STEM always includes presentations or

performances. As in the previous project design presentation stage, this presentation process enables students to share tasks in providing information related to the results of their projects.

Information is conveyed communicatively through poster media so that attracting other members to actively ask questions. The question and answer process also build student knowledge related to the concepts discussed (Saenab et al., 2017). From this description, it can be concluded that students' oral communication skills will be able to reach or exceed standards by implement STEM consistently in online learning. Meanwhile, based on Table 4, half of the students are in the intermediate category for written communication skills while the remaining half were in the emerging and basic categories.

The intermediate category indicates that some students can communicate in writing which can be seen from the report on project results that have been written individually. It can be seen how students determine goals, background problems, idea finding, project creation process, trial process, analysis, results, and conclusions as well as fulfilling the predetermined format and style. Experience and basic concepts built from project activities in STEM will become student assets in understanding problems and finding ways to solve them.

Improved written communication skills that occur due to positive treatment/values ??from learning activities by applying a project-based learning model in STEM. Afriana et al. (2016) stated that Project-Based Learning in STEM has several advantages, including; encourage students to do important work; able encourage students to improve collaborative skills in communication; increase motivation in learning; improve student skills to manage learning resources; make students more able to develop and practice communicating skills; provide students with experiential learning through practice and in organizing projects; determine their allocation of time to complete the project and equipment to complete it. This will make students understand the material and be able to communicate their understanding through writing.

In step Figure 1 shows the answers indicating that students have not been able to elaborate on what problems they face, what tools will be made, and what the conditions are. The ability to elaborate is one aspect of creative thinking skills where a person can develop, enrich, and detail ideas (Guilford, 1950; Guilford, 1967; Beck, 2011). The ability to elaborate can be taught in the form of presentations by students to present their work or products.

The presentation process in STEM learning can consistently train students to have the

ability to think fluently and elaborate which can be expressed through verbal and written (Nafiah & Suyanto, 2014; Nurcholis et al., 2013). Moreover, in Figure 2 students have been able to analyze the problems faced and understand that these problems require solutions in one aspect, but still cannot find the right solution in that aspect. Even though the answers to the students' explanations were not complete, the explanation indicated that students could write down the objectives of making the product based on problem analysis.

The ability to analyze problems is closely related to the ability of students to critically review problems from various points of view (Yuniarti & Hadi, 2015). The ability to analyze problems in stages can be developed through project-based learning (PjBL) (Maida, 2011). This is because, in PjBL, students are required to be able to develop their knowledge and skills through a process of problem analysis and investigation with structured open questions to be able to apply knowledge to produce a product (Kelana & Wardani, 2021). CONCLUSION / SIMPULAN Novelty and Contribution / Kebaruan dan Kontribusi Previous research related to communication skills was limited to face-to-face learning dimensions and mostly focused on one aspect of oral communication only.

The present study revealed the implementation of STEM-based online science learning which is conducted online. The present study's findings would be essential for all elementary education parties to create an effective solution for this issue. Limitation and Future Study / Keterbatasan dan Penelitian Lanjut The present study has several limitations. At first, it is only conducted on ETE students in one batch in one university so that it cannot be generalized thoroughly to all ETE students. Second, the study duration was less than a year, so the data was not entirely comprehensive.

Future studies about implementing social attitudes assessment would be better with more representative informants (from various universities) in a whole year study. Implication / suggestions (Implikasi / Saran) This study has three suggestions. First, ETE lecturers in Indonesia must enrich their knowledge and insights into STEM-based learning and communication management. Second, ETE lecturers in Indonesia have to employ communication skills assesment more seriously. The last one, the government, supported by researchers, has to design an excellent assessment system to solve time limitations.

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