

## Analysis of Prospective Elementary School Teachers' Scientific Presentation Skills through STEM Instructional

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### Abstract

Prospective elementary school teachers should not only master knowledge of content material, techniques for creating a work, and proficiency in practical skills. But also how to communicate them effectively and be able to have excellent scientific presentation skills. This is because they will become teachers who must have good scientific presentation skills. There are several aims to conduct this research such as analyzing prospective elementary school teachers' scientific presentation skills through STEM instructional environment, determining the current levels of scientific presentation skills among prospective elementary school teachers per each indicator, and how STEM approach as an instructional environment is applied in the classroom. The method used in this research is descriptive qualitative, and the result for scientific presentation skills in total mostly prospective elementary school teachers in a high-level category. The current level is mostly high for how STEM practicums are created and how to use teaching media, the rest of the indicators (content mastery, language style, physical, verbal, vocal expression, timeliness, and confidence) in the medium-level category for scientific presentation skills. STEM can be one of the instructional environments to train the scientific presentation skills of prospective elementary schools. The summary of this research, the scientific presentation skills of prospective elementary school teachers are at a high level for the category through STEM instructional environment.

**Keywords:** Scientific Presentation Skills, STEM Instructional Environment

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### INTRODUCTION

Many challenges and opportunities appeared in schools, especially at the elementary level in teaching Science, Technology, Engineering, and Mathematics (STEM) subjects (Abrams, Southerland, & Silva, 2007). In this decade, the education system not only talks about the content, and technical skills in STEM subjects but also how to deliver information about complex concepts in science or formulas about science, results or findings, and innovation related to STEM subjects with good communication skills. Communication skills entail conveying a message that is understood similarly across different situations where it is communicated. (Saunders and Mills, 1999). Besides that,

communication skills encompass transmitting a message with mutual understanding within the settings where the communication unfolds (Arslan, 2010).

Communication skills also becoming essential parts of all professions, including for a teacher or prospective elementary school teacher. Because it can be a part of successful learning in teaching process heavily relies on the communication between teacher and students. Moreover, it also becoming wider not only in message transmission but also as a part of the understanding process through communication (Munawaroh and Bisri, 2020). Prospective elementary school teacher usually communicates their ideas and results verbally on formal occasions such as opportunities for students will include seminar presentations: classroom presentations, lecture sessions, defense of an undergraduate thesis, talks at an undergraduate or regular scientific conference: Presentations at a student conference, speeches at a scientific symposium (Clark, 1996).

Many kinds of communication skills are experienced by prospective elementary school teachers, one of which is through scientific presentation skills. Scientific presentation skills entail delivering prepared material in a clear, concise, and confident manner while considering factors that enhance the effectiveness of the presentation. (Wardani, 2016). Besides that, scientific presentation is where prospective elementary school teacher can enhance their experience of sharing their idea, give information about the results of the experiments, and also manage audiences through their communication in public. Based on (Wardani, 2016) scientific presentation skills can be examined in several aspects such as quality of the presentation material, completeness, conciseness, clarity, and delivery of the opening and presentation sequence, presentation closure, use of presentation media, quality of response articulation and answers, physical expression (posture, body movement, gestures, facial expressions, and eye contact), vocal expression (volume, intonation, pauses, speed, and articulation), verbal expression (word choice and sentence effectiveness), presentation media quality, timeliness of the presentation, and confidence. Scientific presentation skill is also the act of conveying information, concepts, emotions, and similar content through various means such as symbols, language, visuals, and numerical data, from a speaker to an audience, typically with a defined objective. (Lubis (2016); Sukaedi (2017); Purwaningsih (2009).

Scientific presentation skills can be examined in every subject area including in STEM as the instructional environment in this research. Through the STEM learning process in the university, prospective elementary school teachers are experienced in teaching science about certain topics in physics, chemistry, and biology combined with engineering processes, simple mathematical calculations, and also technology. Those content are integrated and applied as a STEM approach (Hikmatunisa,2023). Rigid materials that are involved in a STEM instructional environment have another challenge in scientific presentation skills.

The lack of scientific presentation skills can affect poor classroom management, lack of student response in learning, lack of politeness, and students not understanding the material and lesson (Ardiati, 2023). Whereas, meaningful learning can be experienced by students determined by teachers' factors. The effectiveness of teachers in delivering material relies greatly on good interaction or communication between teachers and students. Following the teacher's duty to present material to students through interaction, and communication in the learning process (Haqi, 2015).

Therefore, this research has the title: "Analysis of Prospective Elementary School Teachers' Scientific Presentation Skills Through STEM Instructional Environment". The research also aims to: 1) analyze how prospective elementary school teachers' scientific presentation skills through STEM instructional environment, 2) Determine the current levels of scientific presentation skills among prospective elementary school teachers per each indicator, and 3) How STEM approach as an instructional environment is applied in the classroom?

## **METHOD**

The method used in this research is descriptive qualitative with the study case approach. Data analysis in qualitative is used descriptively in every result and finding. The key to success in descriptive qualitative is to take the data that should be accurate, complete with observation and interview with the students (Neuman, 2014). The data collection techniques that will be employed in this research include observation, interviews, and documentation.

### **1. Observation Technique**

Observation is a data collection technique conducted through direct observation with accompanying recordings of the condition or behavior of the target object. The researcher observed how the STEM instructional environment can facilitate the scientific presentation skills of prospective elementary school teachers.

### **2. Interview Technique**

This research utilizes a structured interview technique, involving direct interviews with representatives of the respondents using prepared questions. Structured interviews involve questions that guide responses within the pattern of the questions posed. The researcher aspires to comprehend deeply how prospective elementary school teachers feel and experience the learning process through the STEM instructional environment in the classroom and how they can achieve a certain level of scientific presentation skills.

### **3. Questionnaire**

Questionnaires are distributed as data collection tools, involving questions that require assessment from respondents regarding the research being conducted. The questionnaire was compiled from prospective elementary school teachers to examine their ability in scientific presentation both as total and also per each indicator.

### **4. Documentation in the form of photographs**

Photographing the work results of respondents in the form of photos serves as documentation of the research findings for further analysis purposes.

These fourth data collection techniques will be conducted to test the validity of the data through technique triangulation and source triangulation in qualitative descriptive research.

The respondents in this research consist of 144 prospective elementary school teachers. They are studied in 4th semester or 2nd year prospective elementary school teachers in 2024. All respondents experienced studying STEM subjects as an instructional environment. All the respondents were divided into groups that consisted of 3 – 4 people to make the STEM teaching media, explaining content science behind the media, mathematics calculation, engineering process also technology in that media. They also present their ideas about the weaknesses and strengths of STEM teaching media that they made, as well as how to teach STEM subjects to elementary students in the simulation session.

All the respondents presented their ideas one by one in front of the classroom, the other group that observed should fill in the questionnaires related to the presenter's performance or peer assessment of the scientific presentation skills of the prospective elementary school teachers. The questionnaire consists of 9 questions in the form of a Likert Scale of 1 to 4 adopted from (Wardani, 2016). The questionnaire is as follows:

**Table 1. Scientific Presentation Skills Questionnaire**

No.	Scientific Presentation Skills	Score			
		4	3	2	1
1.	Content Mastery				
2.	Language style used				
3.	How STEM practicums are created				
4.	Ability to use STEM teaching media during presentation				
5.	Physical expression				
6.	Vocal Expression				
7.	Verbal Expression				
8.	Timeliness of presentation				
9.	Confidences				

Besides that, observation was also examined during the STEM instructional process. How STEM instructional environment influences prospective elementary school teachers on scientific presentation skills. Besides that, interviews were also done to examine some of the representatives of the prospective elementary school teachers related to scientific presentation skills and STEM instructional environment during the learning process.

**RESULTS AND DISCUSSION**

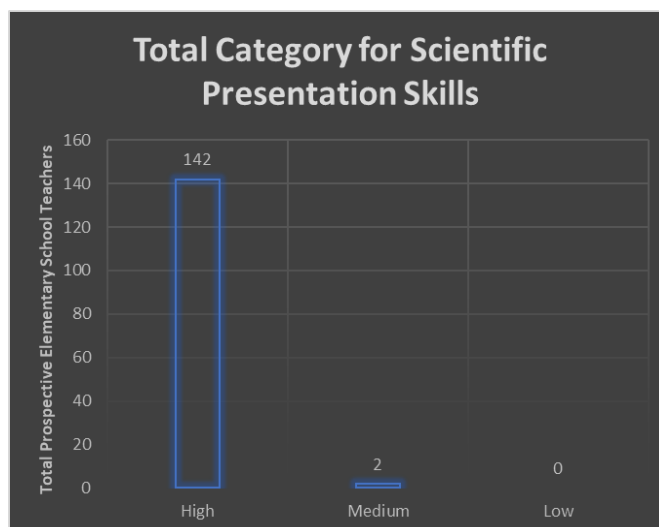
**a. Result**

The results can be found through the questionnaire gathered in this research to acquire scientific presentation skills through STEM instructional environments on prospective elementary school teachers and determine the current levels of scientific presentation skills among prospective elementary school teachers through STEM instructional environments.

**1. Scientific Presentation Skills on Prospective Elementary School Teachers through STEM Instructional Environment.**

The result will be discussed through the explanation in the form of the graph as follows, the graph also will identify and explain the total number of scientific presentation skills categories from 144 prospective elementary school teachers related to STEM instructional environment in the classroom. The graph will explain as follows:

**Graph 1. Scientific Presentation Skills**

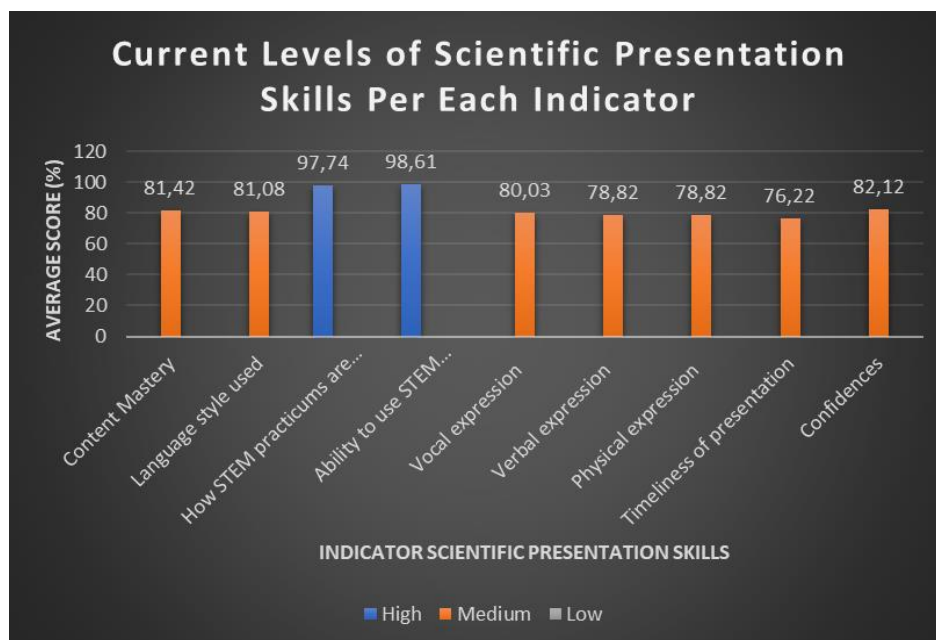


This graph will discuss how many prospective elementary school teachers are classified into three levels or three categories of scientific presentation skills related to the STEM instructional environment. The data is gathered through a questionnaire that consists of 9 questions. After collecting data, it can be seen from three levels which are low, medium, and high. The prospective elementary school teachers mostly possess high scientific presentation skills, totaling 142. However, for the medium category, only 2 people were included in that categorization. There are no students who fall into the low category for the total number of scientific presentation skills among prospective elementary school teachers.

## 2. Determine the Current Levels of Scientific Presentation Skills Per Each Indicator

The result will be discussed through the explanation in the form of the graph as follows, the graph also will identify and determine the current levels of scientific presentation skills per each indicator from 144 prospective elementary school teachers related to STEM instructional environment in the classroom. The graph will explain as follows:

**Graph 2. Indicators Level of the Scientific Presentation Skills**



From the graph 2. It can be seen that nine indicators are examined in scientific presentation skills of the prospective elementary school teachers through STEM instructional environment which: content mastery, language style used, how STEM practicum are created, ability to use STEM teaching media during the presentation, physical expression, vocal expression, verbal expression, timeliness of presentation and confidences. From the graph above, around 81,42% of prospective elementary school teachers can master the content about STEM in the teaching and learning process and include it in the medium category, for language style that students used is almost the same with content mastery is around 81,08% and include in the medium level of category. For an indicator of how STEM practicum are created the prospective elementary school teachers get a result of 97,74% and the ability to use STEM teaching media during the presentation is 98,61%, both of the indicators are included in a high level of category. Besides that, the indicators for expression are divided into three: physical, vocal, and verbal. Three of them have the same level of the category which is in the medium level. For

physical expression is 78,82%, vocal expression is 80,03%, and for verbal expression is 78,82%. The other indicator for scientific presentation skills is the timeliness of presentation which has a percentage of 76,22% and is in the medium level category, while the last indicator is the confidence which is 82,12% and in the medium level of scientific presentation skills category.

### 3. STEM Instructional Environment

STEM becoming the instructional learning approach that is applied in the classroom. Prospective elementary school teachers have to present their ideas by making the teaching media, making the lesson plan for the students related to the STEM approach, how to make the practicum design related to STEM, how to teach science, technology, engineering, and math by teaching media that they have already made by simulation session. Before the simulation, they have to present all their preparation, theory in the science behind their project, asking and answering questions with their classmate, after all done, they have to do a simulation as A real teacher who teaches specific science content through the STEM approach. There is some documentation of the result for the STEM instructional as the environment in the whole classroom. The result of the STEM project can be shown as follows:

**Figure 1. STEM Project Made by Prospective Elementary School Teachers**



The pictures show the STEM instructional environment in the classroom, they also conducted practical work related to STEM, engaging in teaching simulations about the ideas and concepts they created.

#### b. Discussion:

The data already obtained from conducted research and the results also have been shown above. In this research, there are several discussions regarding research questions,

such as 1. Scientific Presentation Skills on Prospective Elementary School Teachers through STEM Instructional Environment, 2. Determine the Current Levels of Scientific Presentation Skills Per Each Indicator, 3. STEM Instructional Environment.

Based on the result, almost all prospective elementary school teachers have a high category in scientific presentation skills with a total number of 142 people, while only 2 that in the medium level. From the interviews, observation, and questionnaire. There are several reasons behind that number, such as the prospective elementary school teachers are in the 4th semester, they are already trained to present in the front of the classroom in many subject courses including STEM, so the annual habit of or repetition of presenting in front of the class scientifically both in a group or individually can be a good training for enhance their ability in scientific presentation skills. Repetition has been regarded to be the basic principle of learning (Clark, 1960). Especially for practicum activity requires many repetitions (Khanam, 2015) and repetition is an iteration that generates variation and can adapt to a changing context (Larsen-Freeman, 2012). Moreover, the prospective elementary school teachers also have enough time to prepare their material and conduct trial and error with their practicum in STEM, creating captivating and pertinent ideas related to the subject, it makes them elaborate more about the tasks, and their readiness also increases as the presentation time approaches. Based on (Martin, 2015) workforce planning and development can increase the readiness of the talent.

The current level of scientific presentation skills can be seen in each indicator, from 9 indicators most of them are in the medium level category as counted in 7 indicators. However, only 2 indicate a high level in the category, which is in the ability to use STEM teaching media during the presentation and how STEM practicum is created. Both of them related to hands-on activity, which already discussed that the prospective elementary school teachers have much time to elaborate on the activity for practicum and making teaching media for their project, from the announcement tasks until their time to present is about 2 weeks. Besides, hands-on activities can enhance interest and engagement in learning (Holstermann, 2010) (Erickson, 2020). Especially for STEM all main activities should be hands-on, and that affects the prospective elementary school teachers, that practicum and how to use STEM teaching media also increase in terms of interest and enthusiasm (Paris, 1998) (Chen, 2020). Hence, the category for how STEM practicums are created and the ability to use STEM teaching media during presentation also can reach the high-level category.

Afterward, 7 indicators reach a medium-level category, indicators are content mastery, language style used, physical expression, vocal expression, verbal expression, timeliness of presentation, and confidence. For content mastery, in a group presentation, several prospective elementary school teachers are active and very proficient in mastering the content material, while others may not delve into it as deeply, the content material referred to here is related to science because the main subject is science, while technology, engineering, and math, can be explained properly. From the interview, it can be seen that because the prospective elementary school teachers vary in terms of background, they come from science, social, and vocational high schools before entering the elementary school teacher study program. Hence, from the results, it can be seen that several students who come from a science background more master the content of science than others, this statement is also supported by (CAEP, 2018) that students from science backgrounds may have an advantage in mastering the content of science. However, the results are also good at the medium level because it means all of them grasp the basic concepts of science, and that is what is needed to equip them to teach elementary school children at primary schools.

The current level of scientific presentation skills also can be seen from the result, that the indicators for language style used, physical, vocal, and verbal expression are in the medium level, fourth of them are about their demeanor in conducting presentations and

simulations as teachers in front of the class. The problem that appears such as some prospective elementary school teachers are unclear in their vocal, and some of them also used informal words or sentences in the simulation session while they are present to be real teachers in the class, from the interview the reasons are because they felt so nervous and cannot handle the vocal tone or even did not know they said formal or informal language while simulation session, but it is only a few cases. The statement also comes from (Scherer, 1968) that nervousness can affect the vocal and expression. Mostly, prospective elementary school teachers can present it well regarding the language style used, physical expression, vocal expression, and verbal expression. Hence, the result is in the medium level of the category.

Nervousness also affects their confidence level (Barent, 2010), as being nervous can diminish the confidence that may have been previously well-prepared for presenting in front of an audience, this happens to the prospective elementary school teachers, some of the cases are like that. However, in only a few cases, mostly they perform well so the result reaches the medium level for the category of scientific presentation skills.

The timeliness of presentations was an issue, particularly among prospective elementary school teachers who were frequently not presenting on time, with many exceeding the allotted time. This trend can be attributed to their enjoyment and enthusiasm for presenting STEM practicums. Consequently, the audience, equally enthusiastic, often engaged in hands-on activities, causing presenters to lose track of time (Robinson, 2013), resulting in presentations extending beyond the designated time limit. These findings suggest that timeliness of presentation falls within the medium-level category in scientific presentation skills in STEM instructional environments.

## CONCLUSION

STEM instructional environment can be one of the suitable instructions to apply for prospective elementary school teachers to train them in scientific presentation skills. The majority of participants demonstrated a high level of proficiency in scientific presentation skills, with only a small number falling into the medium category. This proficiency can be attributed to their training and habituation to present in various subjects, including STEM, throughout their academic journey. Additionally, ample preparation time and opportunities for trial and error during STEM practicum contribute to their ability to create engaging presentations and increase their readiness as presentation time approaches. In conclusion, while prospective elementary school teachers demonstrate strong scientific presentation skills overall, there are areas for improvement, particularly in content mastery, language style, and timeliness of presentation. Addressing these areas can further enhance the effectiveness of STEM instructional environments and better prepare teachers for their future roles in elementary education.

## REFERENCE

- Abrams, E., Southerland, S. A., & Silva, P. (Eds.). (2007). *Inquiry in the classrooms: Challenges and opportunities*. Greenwich, CT: Information Age.
- Ardiati, S. S., & Fauzi, I. A. (2023). Pengaruh Komunikasi Guru Dalam Mengajar Terhadap Efektivitas Pembelajaran (Penelitian Di Madrasah Tsanawiyah Serba Bakti Suryalaya Kecamatan Pageurageung Kabupaten Tasikmalaya). *Journal Education and Government Wiyata*, Vol 1(1), Hal 30-39.
- Arslan, E. (2010). Analysis of communication skill and interpersonal problem-solving in preschool trainees. *Social Behavior and Personality: An International Journal*, 38(4), 523–530. <https://doi.org/10.2224/sbp.2010.38.4.523>.
- Berent, J., & Lemley, A. (2010). *Work makes me nervous: overcome anxiety and build the confidence to succeed*. John Wiley & Sons.
- Chen, J. C., Huang, Y., Lin, K. Y., Chang, Y. S., Lin, H. C., Lin, C. Y., & Hsiao, H. S. (2020).

- Developing a hands-on activity using virtual reality to help students learn by doing. *Journal of Computer Assisted Learning*, 36(1), 46-60.
- Clark, L. L., Lansford, T. G., & Dallenbach, K. M. (1960). Repetition and associative learning. *The American journal of psychology*, 73(1), 22-40.
- Clark, J. M. (1996). *Effective Scientific Presentations*.
- Council for the Accreditation of Educator Preparation. (2018). CAEP 2018 K-6 elementary teacher preparation standards: Initial licensure programs. Retrieved from <http://caepnet.org/standards/k-6-elementary-teacher-standards>.
- Erickson, M., Marks, D., & Karcher, E. (2020). Characterizing Student Engagement with Hands-On, Problem-Based, and Lecture Activities in an Introductory College Course. *Teaching & Learning Inquiry*, 8(1), 138-153.
- Haqi, Luqman. 2015. Pengaruh Komunikasi Antara Guru Dengan Siswa Terhadap Motivasi Belajar Siswa Kelas V MI Matholi'ul Huda 02 Troso Jepara Tahun Pelajaran 2015. Skripsi. Jepara: Uin Walisongo.
- Hikmatunisa, N.P. (2023). *Perspektif dan Langkah Pengintegrasian STEM pada Pembelajaran di Sekolah*. Purwakarta: Taqqadum press.
- Holstermann, N., Grube, D., & Bögeholz, S. (2010). Hands-on activities and their influence on students' interest. *Research in science education*, 40, 743-757.
- Khanam, A. (2015). A practicum solution through reflection: An iterative approach. *Reflective Practice*, 16(5), 688-699.
- Larsen-Freeman, D. (2012). On the roles of repetition in language teaching and learning. *Applied Linguistics Review*, 3(2), 195-210.
- Lubis, A. M. (2016). Pengaruh Penerapan Layanan Bimbingan Kelompok Teknik Diskusi dalam Mengurangi Kesulitan Belajar Matematikadi SMA N 11 Medan TA 2015/2016 (Doctoral dissertation, UNIMED).
- Martin, A. (2015). Talent management: Preparing a "Ready" agile workforce. *International Journal of Pediatrics and Adolescent Medicine*, 2(3-4), 112-116.
- Munawaroh, Q., & Bisri, M. (2020). Hubungan kualitas komunikasi guru dan siswa dengan motivasi belajar Matematika. *Jenius: Journal of Education Policy and Elementary Education Issues*, 1(2), 90-97.
- Neuman, D. (2014). Qualitative research in educational communications and technology: A brief introduction to principles and procedures. *Journal of Computing in Higher Education*, 26, 69-86.
- Paris, S. G., Yambor, K. M., & Packard, B. W. L. (1998). Hands-on biology: A museum-school-university partnership for enhancing students' interest and learning in science. *The Elementary School Journal*, 98(3), 267-288.
- Purwaningsih, S. (2009). Peningkatan Prestasi Belajar Biologi Siswa Kelas X. 1 SMA N 2 Salatiga melalui Metode Proyek dengan Penilaian Presentasi dan Poster. *Lembaran Ilmu Kependidikan*, 38(1).
- Robinson, W., & Bryce, M. (2013). "Willing enthusiasts" or "lame ducks"? Issues in teacher professional development policy in England and Wales 1910-1975. *Paedagogica Historica*, 49(3), 345-360.
- Saunders, S. and Mill, M.A. (1999), The knowledge of communication skills of secondary graduate student teachers and their understanding of the relationship between communication skills and teaching. NZARE / AARE Conference Paper - Melbourne, Conference Paper Number MIL99660.
- Scherer, K. R. (1986). Vocal affect expression: A review and a model for future research. *Psychological Bulletin*, 99(2), 143-165.
- Sukaedi, S. (2017). Peningkatan Prestasi Belajar Pendidikan Kewarganegaraan dengan Metode Presentasi dan Diskusi Kelompok(Siswa Kelas III SDN Candijati 01 Arjasa). *Pancaran Pendidikan*, 5(4), 21-30.
- Wardani, H. (2016). Instrumen Asesmen Pengembangan Presentasi Ilmiah Di Sma. *Journal*

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