

# Analysis of STEM Approaches through Distance Learning

Yoana Nurul Asri, Desta Sulaesih Mursyidah, Vini Rizqi

Universitas Nurtanio Bandung Indonesia

[ynurulasri@gmail.com](mailto:ynurulasri@gmail.com)

Accepted: May 23 <sup>rd</sup> 2021	Reviewed: July 5 <sup>th</sup> 2021	Published: August 20 <sup>th</sup> 2021
--	--	--

**Abstract:** This research is about the analysis of STEM approaches carried out during Distance Learning (PJJ) in the field of electricity. The method used is *experimental design* and qualitative descriptive consisting of the preparation stage, field test stage, and data analysis stage. The subjects came from two classes of 45 people. Data collection techniques in the form of observations, interviews, and documentation. As many as 90% of students can master electrical materials through STEM approaches, especially in the fields of science, technology, and engineering. But in the field of mathematics still needs to be retrained because only 40% can provide a good mathematical solution to the problem given. STEM can be integrated through distance learning by providing structured tasks and systematic evaluation.

**Keywords:** STEM, Distance Learning (PJJ), Electricity

## INTRODUCTION

Learning during this pandemic often finds various obstacles<sup>1</sup> especially in new students who are still adapting to their learning environment<sup>2</sup>. Although today almost all parts of learning are carried out online, but there are some shortcomings caused. These shortcomings such as the ineffectiveness of learning due to lack of interaction between teachers and students, lack of adequate learning facilities in each student, and the dissatisfaction of learning due to interaction between lecturers and students<sup>3</sup>.

In essence, learning aims to train various abilities in learners. These skills include the ability to solve problems, think critically, think creatively, and analyze is an ability that is needed in the 21st century<sup>4</sup>. Therefore, it is important that online learning conducted by students becomes more meaningful and still the same to train various skills of critical thinking, creative, and analysis<sup>5</sup>.

---

<sup>1</sup> Adhetya Cahyani, Iin Diah Listiana, and Sari Puteri Deta Larasati, "Motivasi Belajar Siswa SMA Pada Pembelajaran Daring Di Masa Pandemi Covid-19," *IQ (Ilmu Al-qur'an): Jurnal Pendidikan Islam* (2020); Muh Barid Nizarudin Wajdi et al., "Education Policy Overcome Coronavirus, A Study of Indonesians," *EDUTECH: Journal of Education And Technology* 3, no. 2 (2020): 96–106.

<sup>2</sup> Luh Devi Herliandry et al., "Pandemic Learning during the Covid-19.," *Jurnal Teknologi Pendidikan* (2020); Sakshi Agarwal and Jaya Shankar Kaushik, "Student's Perception of Online Learning during COVID Pandemic," *Indian Journal of Pediatrics*, 2020; Zaid I. Almarzooq, Mathew Lopes, and Ajar Kochar, "Virtual Learning During the COVID-19 Pandemic," *Journal of the American College of Cardiology* (2020).

<sup>3</sup> Muh Barid Nizarudin Wajdi et al., "Pendampingan Redesign Pembelajaran Masa Pandemi Covid-19 Bagi Tenaga Pendidik Di Lembaga Pendidikan Berbasis Pesantren Di Jawa Timur," *Engagement: Jurnal Pengabdian Kepada Masyarakat* 4, no. 1 (2020): 266–277.

<sup>4</sup> Yoana Nurul Asri, "PEMBELAJARAN BERBASIS STEM MELALUI PELATIHAN ROBOTIKA," *WaPFI (Wahana Pendidikan Fisika)* (2018).

<sup>5</sup> Hani Morgan, "Best Practices for Implementing Remote Learning during a Pandemic," *The Clearing House: A Journal of Educational Strategies, Issues and Ideas* (2020); Retno Puji Rahayu and Yanty Wirza, "Teachers' Perception of

One approach that fits especially in the learning needs of the 21st century is STEM, short for interdisciplinary approach to learning among the natural sciences, technology, engineering, and mathematics. In a journal presented in previous research<sup>6</sup> believes that the four-dimensional approach is a harmonious pairing between problems that arise in the real world and problematic learning. The purpose of teaching STEM approaches is suitable for high schools that require complex knowledge<sup>7</sup> and find that STEM represents teaching and learning in the fields of science, technology, engineering, and mathematics. STEM methods can be applied not only at the elementary and intermediate levels, but also at the university or even post-doctoral level. So, integrated education in STEM is a comprehensive learning through the fields of science, technology, engineering, and mathematics to develop students' creativity through the process of problem solving in everyday life.

In this case we can take an example that is with the existence of an online learning system that is currently often used by many schools both from the level of early childhood education, to upper secondary and even college. This distance learning system is very helpful for students in supporting teaching and learning activities during the Covid-19 pandemic<sup>8</sup>. Students can still carry out teaching and learning activities, even if held at their homes. In addition, students will also understand more about what the importance of technology in the industrial era 4.0 as it is today. Distance Learning (PJJ) uses Learning Management System (LMS) software that allows schools or universities to manage online learning or meetings effectively and regularly. Teachers, students, lecturers, students, and school or campus leaders can use many useful features to facilitate learning.

## METHOD

The research methods applied in this study are *experimental design* and qualitative descriptive. The subject consists of two classes of 45 students. Data collection techniques in the form of observations, interviews, and documentation. The entire data collection is through remote observation.

The method is carried out in three stages, namely the preparation stage, the stage in the field, and the data analysis stage. During the preparation stage, the tutor provides a stimulus on an issue related to the topic to be discussed. The next stage is field tests and data collection, namely observations and structured interviews. Both are used to measure critical and creative thinking skills.

---

Online Learning during Pandemic Covid-19," *Jurnal Penelitian Pendidikan* (2020); Lisa Rakhmanina et al., "Students' Perception on Online English Learning during Covid-19 Pandemic Era," *Silampari Bisa: Jurnal Penelitian Pendidikan Bahasa Indonesia, Daerah, dan Asing* (2021); et al., "Students' Perception of Online Learning during COVID-19 Pandemic: A Case Study on the English Students of STKIP Pamane Talino," *SOSHUM: Jurnal Sosial dan Humaniora* (2020).

<sup>6</sup> Clarissa Desyana Putri, Indarini Dwi Pursitasari\*, and Bibin Rubini, "Problem Based Learning Terintegrasi STEM Di Era Pandemi Covid-19 Untuk Meningkatkan Keterampilan Berpikir Kritis Siswa," *Jurnal IPA & Pembelajaran IPA* (2020).

<sup>7</sup> Siti Zubaidah, "STEAM (Science, Technology, Engineering, Arts, and Mathematics): Pembelajaran Untuk Memberdayakan Keterampilan Abad Ke-21," *Seminar Nasional Matematika dan Sains* (2019).

<sup>8</sup> Unik Hanifah Salsabila et al., "Pemanfaatan Teknologi Pembelajaran Pendidikan Agama Islam Berbasis Online Masa Pandemi Covid-19," *Jurnal Penelitian Tarbawi* (2021).

## RESULT AND DISCUSSION

STEM approaches through distance learning are conducted through *video conferences* and structured tasks performed by tutors to learners. STEM consists of four inter-integrated pillars consisting of science, technology, engineering, and mathematics. Previously, an analysis of material by tutors related to what topics can be conveyed through the STEM approach. Next, the tutor presents a problem on the topic to be solved by each group.

In the field of science, each group can convey the basic concepts of the material. Next there is a question and answer session from the tutor to each member in the group about what concepts, laws, and equations will be used. The field of technology can be evaluated from what technology will be used from the *prototype* manufacturing stage to the *finishing* stage. The field of engineering is evaluated through the process of *making prototypes* as well as solutions that can be offered to create an efficient and effective *prototype*. Furthermore, in the field of mathematics, students can convey their work quantitatively.

The topic of the problem is about basic electricity. So that the concepts, laws, and equations that apply to the material. In Figure 1, the group representative has completed the floor plan along with *schematic diagrams* of each room to provide solutions to the given problems.



Figure 1. Group representatives: create a floor plan along with schematic digram



Figure 2. Tool stringing process

In figure 2 is shown the process of stringing tools according to schematics diagrams that have been created. And figure 3 is shown the mockup of the electrical installation that has been made. The four fields integrated in STEM can be applied directly, it's just that each group has its own difficulties in mathematical calculations. This is shown that students still have difficulty in determining the scale to be used in making the room plan.

. In addition, they still find it difficult to calculate the amount of electric current and electrical resistance in a room. As many as 60% of students have not been able to provide a good mathematical solution to the problem given and only 40% can solve it well. So the tutor must re-explain the basic concepts and mathematical calculations that have been submitted before through the STEM approach. This is in line with previous research conducted by (Sumarni et al., 2019) that mathematical ability can be trained through STEM approaches

The field of science can actually be mastered dominantly by each group. But mathematical calculations covered in understanding the concept still show unsatisfactory results. This is inversely proportional in the field of technology and engineering that can be mastered dominantly. As many as 90% of students can express a good solution in this field. This is because they are used to learning hands on before.



Figure 3. Mock electrical installation

## CONCLUSION

Based on the above description it can be concluded that STEM can be integrated through distance learning by providing tasks in a structured and systematic evaluation. As many as 90% of STEM fields are predominantly controlled, namely science, technology, and engineering. But only as many as 40% of students can solve problems in the field of mathematics and the rest still need to be retrained. The advice for further research is that there needs to be a comprehensive evaluation in each STEM field and not just in the final evaluation, so that each field can be reconstructed.

## REFERENCE

- Agarwal, Sakshi, and Jaya Shankar Kaushik. "Student's Perception of Online Learning during COVID Pandemic." *Indian Journal of Pediatrics*, 2020.
- Antonius Setyawan Nur Agung, and Monika Widyastuti Surtikanti. "Students' Perception of Online Learning during COVID-19 Pandemic: A Case Study on the English Students of STKIP Pamane Talino." *SOSHUM : Jurnal Sosial dan Humaniora* (2020).
- Almarzooq, Zaid I., Mathew Lopes, and Ajar Kochar. "Virtual Learning During the COVID-19 Pandemic." *Journal of the American College of Cardiology* (2020).
- Asri, Yoana Nurul. "PEMBELAJARAN BERBASIS STEM MELALUI PELATIHAN ROBOTIKA." *WaPFi (Wabana Pendidikan Fisika)* (2018).
- Cahyani, Adhetya, Iin Diah Listiana, and Sari Puteri Deta Larasati. "Motivasi Belajar Siswa SMA Pada Pembelajaran Daring Di Masa Pandemi Covid-19." *IQ (Ilmu Al-qur'an): Jurnal Pendidikan Islam* (2020).
- Herliandry, Luh Devi, Nurhasanah, Maria Enjelina Suban, and Kuswanto Heru. "Pandemic Learning during the Covid-19." *Jurnal Teknologi Pendidikan* (2020).
- Morgan, Hani. "Best Practices for Implementing Remote Learning during a Pandemic." *The Clearing House: A Journal of Educational Strategies, Issues and Ideas* (2020).
- Putri, Clarissa Desyana, Indarini Dwi Pursitasari\*, and Bibin Rubini. "Problem Based Learning Terintegrasi STEM Di Era Pandemi Covid-19 Untuk Meningkatkan Keterampilan Berpikir Kritis Siswa." *Jurnal IPA & Pembelajaran IPA* (2020).
- Rahayu, Retno Puji, and Yanty Wirza. "Teachers' Perception of Online Learning during Pandemic Covid-19." *Jurnal Penelitian Pendidikan* (2020).
- Rakhmanina, Lisa, Feny Martina, Friang Br Halolo, Syafryadin Syafryadin, and Noermanzah Noermanzah. "Students' Perception on Online English Learning during Covid-19 Pandemic Era." *Silampari Bisa: Jurnal Penelitian Pendidikan Bahasa Indonesia, Daerah, dan Asing* (2021).
- Salsabila, Unik Hanifah, Andini, Fita Triyana, Khalidah Fitri Arum Sari, and Mardaty Rauv. "Pemanfaatan Teknologi Pembelajaran Pendidikan Agama Islam Berbasis Online Masa Pandemi Covid-19." *Jurnal Penelitian Tarbawi* (2021).
- Wajdi, Muh Barid Nizarudin, Iwan Kuswandi, Umar Al Faruq, Zuhijra Zuhijra, Khairudin Khairudin, and Khoiriyah Khoiriyah. "Education Policy Overcome Coronavirus, A Study of Indonesians." *EDUTECH: Journal of Education And Technology* 3, no. 2 (2020): 96–106.
- Wajdi, Muh Barid Nizarudin, M Burhanuddin Ubaidillah, Sri Mulyani, Khoirul Anwar, Lailatul Istiqomah, Fauziah Rahmawati, Sholihatul Atik Hikmawati, Diah Retno Ningsih, and Hasan Syaiful Rizal. "Pendampingan Redesign Pembelajaran Masa Pandemi Covid-19 Bagi Tenaga Pendidik Di Lembaga Pendidikan Berbasis Pesantren Di Jawa Timur." *Engagement: Jurnal Pengabdian Kepada Masyarakat* 4, no. 1 (2020): 266–277.
- Zubaidah, Siti. "STEAM (Science, Technology, Engineering, Arts, and Mathematics): Pembelajaran Untuk Memberdayakan Keterampilan Abad Ke-21." *Seminar Nasional Matematika dan Sains* (2019).