Improving Inference Making Skills Through Role Play Method

Erny Natasha Al Ilami Jamil, Siti Nur Diyana Mahmud

Faculty Education, Universiti Kebangsaan Malaysia, Malaysia
Faculty Education, Universiti Kebangsaan Malaysia, Malaysia

DOI: 10.29322/IJSRP.15.08.2025.p16422
https://dx.doi.org/10.29322/IJSRP.15.08.2025.p16422

Paper Received Date: 12th July 2025
Paper Acceptance Date: 13th August 2025
Paper Publication Date: 20th August 2025

Abstract - The skill of making inferences is drawing conclusions and explaining events by using data collection and past experiences. The researcher found that mastery of inference skills is still at a weak level among students. The purpose of this study is to see the effectiveness of teaching methods that can improve inference making skills among fifth year students in a rural school. The objective of the study is to describe effective teacher teaching methods in improving inference making skills among fifth year students. The study design is actiom research. The sample consists of purposive sampling involving four fifth-year students who cannot make inferences. Demonstration teaching methods are used to samples to improve traditional teaching methods. However, the study sample still cannot make inferences. The researcher continues the study to the second loop which is by using the role play teaching method. Data was collected through observation, worksheets and semi-structured interviews. The findings of the study show that one sample can make an inference on the first loop while all four samples can make an inference on the second loop. Through observation, the sample was less active when the demonstration method was used but very active when the role play method was used. Through the worksheet, only one person can make an inference on the first loop while all four samples can make an inference on the second loop. Through interviews, the sample expressed boredom in the first loop while expressing fun in the second loop. The results of this study are expected to contribute to teaching and learning methods in the classroom in addition to being able to improve the practice of teachers to help students make inferences.

Index Terms- inference making skills, role playing, change of state of matter

i. Introduction

The Industrial Revolution, characterized by the integration of physical, digital, and biological domains, has affected all sectors, including education (Unit Perancang Ekonomi, 2021). In line with the National Education Philosophy—which aims to produce balanced and harmonious individuals intellectually, spiritually, emotionally, and physically, education in Malaysia must emphasize critical thinking (Kementerian Pendidikan Malaysia, 2024).

Critical thinking is the ability to analyze and evaluate information objectively, logically, and systematically in order to make rational decisions. Several skills are involved in this kind of thinking, including questioning, analyzing, evaluating evidence, identifying assumptions, and making conclusions based on solid facts. Critical thinking also involves a sense of curiosity (Facione, P. A., 2011).

In Malaysia, Science learning focuses on scientific reasoning. Scientific reasoning refers to an approach aimed at shaping scientific thinking among students (Kementerian Pendidikan Malaysia, 2017). The implementation of scientific reasoning in Science learning is carried out through discovery inquiry, hands-on and minds-on activities, and the integration of Higher Order Thinking Skills (HOTS). Students must have an interest in learning Science. A study conducted by Ang and Lee (2021) showed that the main factor that influences the level of mastery of Science based on students' self-assessment is students' attitude.

ii. Problem Statement

The researcher is a Science teacher in a primary school. The researcher's students struggle with inference-making skills and often skip inference-related questions. Inference-making is one of the important science process skills (SPS) essential for understanding scientific concepts. However, students often face difficulties in mastering this skill, especially when dealing with abstract concepts like changes in the states of matter.

As a Year 5 Science teacher, the researcher observed that students had trouble making inferences related to changes in matter when taught. Additionally, students were found to be less involved in activities requiring critical thinking. Their perceptions toward Science influence both their interest and achievement. Science is a vast and abstract subject that requires proper understanding of scientific concepts. Most students perceive Science as harder to learn compared to other subjects, resulting in lower achievement (Mastura Mustapha & Azi Azeyanty Jamaludin, 2021).

"Changes in states of matter" is a core topic in the primary Science curriculum, requiring students to understand how heat affects matter in the form of solids, liquids, and gases. This topic is also abstract in nature. According to Akcanca, N. (2020), many concepts in science classes are abstract and difficult for students, presenting a real challenge for teachers. Inference-making is required to help students link observations with accurate scientific concepts.

According to the Kementerian Pendidikan Malaysia, (2024), inference making is drawing conclusions and explaining events based on data collection and past experiences. The researcher's students were only able to state what happened without explaining the events behind them. They were unable to make rational decisions when encountering phenomena. This occurred because the researcher used the "Chalk and Talk" method—merely explaining for students to memorize. Consequently, students could not answer inference-based questions.

Previous studies have shown that students still fail to apply SPS during lab experiments, thus lacking meaningful learning experiences (Lue, 2020). The study found students struggled with skills such as predicting, forming hypotheses, identifying and controlling variables, and recording data. They also had difficulty mastering SPS such as operational definitions, data interpretation, inference-making, and prediction.

Four out of twelve students in the researcher's class could not make inferences. Therefore, the researcher first tried the demonstration method as an improvement over the traditional "Chalk and Talk" approach. Demonstration teaching is teacher-centered, where the teacher plays the main role in showing phenomena. This approach was used as the students involved had low mastery levels.

Later, the researcher tried the role play method, one of the inquiry-based activities. A study by Nadiah Suboh and Rahinah Ibrahim (2023) stated that students can communicate better and develop commendable values when using role play through storytelling activities to improve basic sentence mastery among preschoolers. Thus, role play was used in the second loop of this study.

iii. Research Objective

To describe effective teaching methods used by teachers to improve inference-making skills among Year 5 students.

iv. Literature review

B.F. Skinner emphasized the importance of reinforcement in the learning process. According to Skinner, both human and animal behaviors are learned and controlled through positive or negative reinforcement, which increases the likelihood of behavior being repeated. Skinner believed that positive reinforcement, such as rewards, strengthens behaviors that we frequently perform (Skinner B.F., 1983).

Jean Piaget, a psychologist, stated that learning is an active process in which individuals build knowledge through interaction with their environment. According to Piaget (1970), the concept of schema was introduced. A schema is a mental structure used to understand the world. There are two learning processes: assimilation and accommodation. During assimilation, a person integrates new information into an existing schema, while accommodation involves modifying existing schema to adapt to new information.

Piaget also divided cognitive development into four stages:

1. Sensorimotor stage (from birth to age 2): Individuals learn through physical actions and sensory experiences.
2. Preoperational stage (ages 2 to 7): The use of symbols and language begins to develop, but thinking is still egocentric.
3. Concrete operational stage (ages 7 to 11): Logical thinking starts to develop, but is limited to concrete objects.
4. Formal operational stage (age 11 and above): Individuals are capable of abstract thinking and can formulate hypotheses.

Science process skills (SPS) are important skills that help students succeed in the 21st century. Research has found that students who are proficient in SPS are also skilled in other essential areas such as creative thinking and effective communication (Nuratiqah Aziemah & Muhammad Nor Syafiq, 2020).Inventive thinking skills, communication skills, high productivity, strong values, and spirituality are key focuses of 21st-century skills (Wrahatnolo, 2018). These skills refer to a set of knowledge, abilities, work habits, and personality traits essential for producing successful human capital. They are crucial for securing good jobs in the future. If students master these skills, they will have more opportunities to succeed in their careers (Alismail & McGuire, 2015).

v. Methodology

This study uses the Action Research design based on the Kemmis and McTaggart model (1988). This design involves the processes of reflection, planning, action, and observation. It aims to improve teaching practices in the classroom. The action research design was chosen because it allows for continuous reflection and repeated actions focused on improvement after identifying and analyzing issues. In this study, the researcher who is also the teacher acts as the investigator, aiming to enhance the Teaching and Learning (T&L) of Year 5 students in Science, specifically in the topic Changes in States of Matter.

The Kemmis and McTaggart model consists of four main phases:

1. Planning Phase

In this phase, appropriate teaching methods are identified to enhance inference-making skills among students. Data collection strategies are also planned, which include observations, worksheets and student interviews.

2. Action Phase

Planned teaching activities are implemented in this phase. Daily Lesson Plans (RPH) are constructed to ensure systematic teaching activities. These RPHs are based on the 5E Needham Instructional Model, which includes engage, explore, explain, elaborate and evaluate. The application of this model helps students achieve the intended learning objectives and skills. This is supported by the findings of Ikhsan Othman and Norila Md Saleh (2013), who found that students who underwent T&L using the 5E Needham model demonstrated better mastery of Science Process Skills compared to those taught using conventional methods.

3. Observation Phase

The researcher observes how students respond to the implemented teaching methods continuously. Observation notes and inference worksheets are collected during this phase.

4. Reflection Phase

In this final phase, the researcher reflects and analyzes the outcomes of the actions taken. This analysis helps determine whether the teaching method was effective or if further adjustments are needed.

vi. Findings and Discussions

- First Cycle: Demonstration Method

During the observation phase, the researcher observed the sample students to record their behavior and reactions during the intervention using the demonstration method. The observations were conducted during the teaching and learning (T&L) process using a checklist to note down observed behaviors.The analysis of the observation checklist showed that although students appeared focused on the demonstration, they remained passive. They did not respond or show interest in the activity. None of the students asked questions during the demonstration.

The worksheets given were analyzed. Only one out of the four students successfully made an inference, but the answer was inaccurate. In the first activity which is freezing water, all four students failed to make proper inferences. They simply stated that the water became ice because of the coldness of the refrigerator. In the second activity which is melting ice in the

classroom, all students again failed to infer correctly, saying that the ice melted because it was left in the classroom. In the third activity ehich is boiling water, only one student attempted an inference but still did not provide a precise answer, stating “heat from fire” instead of “presence of heat”.

While from the semi-structured interview, three themes emerged:

- Confused: mentioned 10 times. Students expressed lack of understanding and confusion when asked about the reasons behind the demonstration.
- Abstract: mentioned 15 times. Students struggled to visualize the process of matter changing state. One student questioned how ice could melt without anything “touching” it.
- Bored: mentioned 12 times. Students said they were bored because they were not actively involved; only the teacher performed the demonstration.

These findings clearly show that the demonstration method did not effectively help students improve their inference-making skills.

- Second Cycle: Role Play Method

In this cycle, the researcher used role play as a teaching intervention. During the T&L process, observations were once again made using a checklist to evaluate student behaviors and reactions. From the observation, students showed focus and active participation. They communicated and discussed with peers about what actions to take when the “heat” character approached or left them. Students asked their friends whether their actions were correct, and collaborated to understand the concept of changes in the states of matter. This shows that the role play method was more engaging and successfully sparked student interest, even when dealing with abstract topics like changes in matter. It also helped enhance their inference-making skills.

The worksheets were analyzed and all four students successfully made correct inferences. For scenarios such as melting ice and boiling water, students inferred the presence of heat correctly. When “heat” (played by a student) approached the matter, they understood that the matter changed from solid to liquid, or liquid to gas. For scenarios like freezing water or condensation on a cold glass, students inferred loss of heat. When “heat” disappeared (student moved away), they understood matter changed from liquid to solid, or gas to liquid.

Interview analysis revealed three themes:

- Heat: mentioned 25 times. Students repeatedly referred to the role of heat in each situation.
- Movement: mentioned 18 times. Students described their actions during the role play, moving as heat entered or left the scene.
- Fun: mentioned 20 times. Students expressed enjoyment and preference for activities that involved their direct participation.

vii. Discussion

Comparison between the two research cycles indicates that the role play method had a more positive impact on students' mastery of inference-making skills compared to the demonstration method. This finding is evident as all students involved in the second cycle were able to provide accurate inferences based on the situations involving changes in the states of matter, whereas in the first cycle, most students failed to provide correct inferences.

The effectiveness of the role play method can be explained through Piaget, (1970), which posits that primary school students are in the concrete operational stage. At this stage, abstract learning is challenging, as students require direct and hands-on experiences to comprehend concepts. The role play activity offered students opportunities to move, interact, and personally experience the process of matter changing states, thus fostering a more concrete and meaningful understanding of the concept.

In addition, according to Skinner's Behaviorist Learning Theory (1953), role play acts as a form of positive reinforcement, as students are actively involved, enjoy the activity, and receive immediate feedback from the teacher and peers. This contrasts with the demonstration method, which is more teacher-centered and often causes students to become passive and disengaged.

This study also supports the findings of Nadiah Suboh and Rahinah Ibrahim (2023), who found that role play activities improved basic language skills among preschool students. Although the context of the studies differs, the core principle of active student involvement in the learning process demonstrates the effectiveness of this method across various teaching domains, including Science education.

Furthermore, the findings align with the goals of the Primary School Standard Curriculum (KSSR) for Science, which emphasizes active student engagement through hands-on and minds-on activities to develop science process skills such as making inferences (Kementerian Pendidikan Malaysia, 2017). The role play method effectively meets this requirement by providing opportunities for students to experience changes in matter firsthand, think critically, and make decisions based on observations.

viii. Conclusion

This action research confirms that the role play method is effective in enhancing inference-making skills among Year 5 students, particularly in the topic of changes in the states of matter. The findings show that students grasp scientific concepts more effectively when actively engaged through role play, compared to the more passive and teacher-centered demonstration method. The role play activities helped students to concretely understand the concept of heat presence and loss, while also improving their ability to make inferences based on observations and given scenarios.

The implications of this study are significant for teaching practices in primary schools. Teachers are encouraged to adopt student-centered and inquiry-based approaches, such as role play, especially when teaching Science topics involving abstract concepts. This approach not only enhances students' mastery of science process skills but also increases their interest, motivation, and active participation in the learning process.

In addition, this study has implications for the design of teaching and learning materials (T&L). Teachers can plan role play activities that are systematic and developmentally appropriate for students, in alignment with the Primary School Standard Curriculum (KSSR). The use of this approach can also be extended to other topics in Science or even across other subjects that require deep conceptual understanding.

However, this study has certain limitations in terms of the small sample size and its implementation in only one school. Therefore, it is recommended that future research be conducted with a larger and more diverse sample across various school settings to validate the effectiveness of this method on a broader scale.

Overall, the findings of this study can contribute to improving the quality of Science teaching in primary schools, ultimately nurturing students who are capable of thinking scientifically and making accurate inferences in understanding the phenomena around them.

References

Akcanca N. (2020). An Alternative teaching tool in science education: Educational comics. International Outline Journal of Education and Teaching, 7(4): 1550-1570

Alismail, H. A., & McGuire, P. (2015). 21st Century Standards and Curriculum: Current research and practice. Journal of Education and Practice. 6(6): 150-154

Ang Y. K., & Lee M. F., (2021) Faktor-Faktor Yang Mempengaruhi Penguasaan Sains Dalam Kalangan Murid Sekolah Rendah Kebangsaan. Seminar Kebangsaan Majlis Dekan Pendidikan Universiti Awam Malaysia 2020. Fakulti Pengajian Bahasa Utama Universiti Sains Islam Malaysia.
Facione, P. A (2011). Critical Thinking: What It is and Why It Counts. Insight Assessment.
Ikhsan Othman & Norila Md Salleh. (2013). Pendekatan Konstruktivisme dalam pengembangan kurikulum: Kesannya ke atas penguasaan kemahiran proses sains. Jurnal Pendidikan Sains dan Matematik Malaysia. 3(1): 60-71
Kementerian Pendidikan Malaysia. (2017). Dokumen Standard Kurikulum dan Pentaksiran Sains Tahun 5. Putrajaya. Kementerian Pendidikan Malaysia.

Kementerian Pendidikan Malaysia. (2024). Falsafah Pendidikan Kebangsaan. Kementerian Pendidikan Malaysia. access from https://www.moe.gov.my/ on 23 April 2024.

Lue, I. L. P. (2020). Keberkesanan modul lab-madi terhadap kemahiran penghujahan, kemahiran proses sains dan penguasaan konsep resapan dan osmosis. Tesis Dr. Fal.

Mastura Mustapha & Azi Azeyanty Jamaludin (2021). Analisis Tahap Minat Terhadap Matapelajaran Sains dan Hubungannya Dengan Kemahiran Abad Ke-21. Journal of Science and Mathematics Letters, 9(2), 103-116
Nadiah Suboh & Rahinah Ibrahim. (2023). Keberkesanan Main Peranan dalam Peningkatan Penguasaan Ayat berdasarkan Multimedia Jenis Bercerita, International Journal of Advanced Research in Education and Societ, 5 (3), 103-114.
Nuratiqah Aziemah Razali & Muhammad Nor Syafiq Mohd Sanusi. (2020). Analysis of mastery of Science Process Skills and 21st Century Skills among secondary school students. Jurnal Pendidikan Sains dan Matematik Malaysia. 10(1): 16-20
Piaget J. (1970). Science of Education and the Psychology of the Child. New York. Viking Press.
Skinner B. F. (1953). Science and Human Behaviour. New York. Free Press.
Unit Perancang Ekonomi. (2021). Dasar Revolusi Perindustrian Keempat (4 IR) Negara. Putrajaya: Unit Perancang Ekonomi.
Wrahatnolo, T. (2018). 21st Centuries Skill implication on educational system. IOP Conference Series: Materials Science and Engineering. 296 (1): 1-7

Authors

First Author - Erny Natasha Al Ilami Jamil, Universiti Kebangsaan Malaysia (UKM),

p130100@siswa.ukm.edu.my

Second Author - Siti Nur Diyana Mahmud, Universiti Kebangsaan Malaysia (UKM),

diyana@ukm.edu.my

Correspondence Author - Erny Natasha Al Ilami Jamil, p130100@siswa.ukm.edu.my