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Project-Based Learning, Inquiry Methods, Demonstration Methods, and Psychomotor Abilities: A Review of the Literature

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Abstract: The psychomotor ability of students is one of the important aspects of the learning process. To achieve optimal psychomotor abilities, effective and efficient learning methods must be applied. This literature review article discusses three learning methods that affect students' psychomotor abilities: Project-Based Learning, Inquiry-Based Method, and Demonstration Method. Previous studies have shown that these three learning methods can help improve students' psychomotor abilities. Project-Based Learning can enhance the creativity and cooperation skills of students in a structured learning environment. The inquiry-Based Method can help students improve problem-solving and critical thinking skills through their experiments and discoveries. The Demonstration Method helps students acquire physical skills through observation and direct practice. Although these three learning methods have been proven effective, the selection of the appropriate learning method should be tailored to the characteristics of the students and the learning context.

Keywords: Psychomotor Ability of Students, Project-Based Learning, Inquiry-Based Method, and Demonstration Method

INTRODUCTION

Teaching methods are a crucial concept in the field of education, used to enhance students' abilities. One form of teaching method is the psychomotor learning method, which aims to improve students' motor skills. This literature review article will discuss the psychomotor learning method, which consists of three types of methods, namely project-based learning, inquiry-based method, and demonstration method. Project-based learning is a method that focuses on developing students' abilities in completing projects. Through this method, students will learn by doing a project from start to finish. This method requires

students to work on projects that have complexity and a level of difficulty that suits their abilities so that students can improve their psychomotor skills.

The inquiry-based method is a learning method that focuses on learning through experiments. In the inquiry-based method, students will learn by observing, collecting data, and analyzing data. Through this process, students will be able to improve their psychomotor skills, such as cognitive abilities, observation skills, and practical skills. The demonstration method is a learning method that involves students in the demonstration process, where students will demonstrate the skills they have learned to the class. In this method, students will learn by showing the process and techniques they have learned to improve their psychomotor skills.

In the field of education, the psychomotor learning method is essential to improve students' abilities. Three types of psychomotor learning methods will be discussed in this literature review article, namely project-based learning, inquiry-based method, and demonstration method. Each type of teaching method has different characteristics and objectives, but all aim to improve students' psychomotor skills. Therefore, choosing the right teaching method is crucial to improve the quality of education. Based on the background, the problem can be formulated to build hypotheses :

1. Does project-based learning affect students' psychomotor skills?
2. Does the inquiry-based method affect students' psychomotor skills?
3. Does the demonstration method affect students' psychomotor skills?

LITERATURE REVIEW

The psychomotor ability of students

Psychomotor ability in learning is the ability of an individual to produce physical movements related to problem-solving or task completion, which involves the use of coordination between different nerves, muscles, and senses (Gagne, 1985). The dimensions or indicators of students' psychomotor ability can be grouped into five levels. Imitation: the ability to imitate demonstrated movements. Manipulation: the ability to perform movements involving hand and finger movements. Precision: the ability to perform movements with high precision and accuracy. Articulation: the ability to coordinate fine movements of different body parts, such as hands, eyes, and mouth. Naturalization: the ability to perform complex and difficult movements smoothly and without errors (Gagne, 1985).

Psychomotor ability is an individual's ability to move their body parts effectively and efficiently. It includes the ability to perform fine and gross movements involving the coordination between muscles, nerves, and senses in expressing physical actions. This ability can be possessed by individuals of various ages and educational levels and can be developed through continuous training and practice (Sukmadinata, 2005). The dimensions or indicators of students' psychomotor ability are coordination, and students’ ability to coordinate physical movements smoothly and integrated. Balance is students' ability to maintain their body balance while performing physical movements. Flexibility, students' ability to perform physical movements with a wide and flexible range of motion. Strength is students' ability to perform physical movements with appropriate and effective strength. Endurance is students' ability to continue physical activity for a long time without feeling tired or fatigued. Speed is students' ability to perform physical movements quickly and on time. Accuracy is students' ability to perform physical movements with precision and accuracy (Sukmadinata, 2005).

Psychomotor ability is an individual's ability to execute body movements accurately, effectively, efficiently, and on time (Harsono, 2011). The five dimensions or indicators of students' psychomotor ability are basic physical skills, and the ability to perform basic physical movements such as walking, running, jumping, climbing, and so on. Specific physical skills are the ability to perform physical movements that require specific skills such

as hitting a ball, hitting a racket, dancing, and so on. Manipulative skills are the ability to perform manipulative movements such as assembling, tinkering, and repairing an object. Reflexive movement skills, the ability to perform reflexive movements such as avoiding a suddenly incoming object or catching a falling object. Reaction movement skills are the ability to perform movements that require quick reactions such as running fast to chase or avoid an unwanted object or situation (Harsono, 2011).

The psychomotor ability of students has been widely researched by previous researchers, including (Muslim et al., 2018), (Magdalena et al., 2021), and (Chairilsyah, 2021).

Project Based Learning

Project-Based Learning (PBL) is a learning approach that challenges students to answer complex questions, conduct research, and solve real-world problems. In PBL, students work in groups to produce real products that can be used or publicly displayed. PBL brings learning into real-life contexts, where students can develop critical thinking, creativity, and collaborative skills (Thomas, D. & Seely Brown, 2011). The dimensions or indicators of Project-Based Learning (PBL) are complex questions. PBL requires students to generate complex questions that involve problem-solving, research, and exploration of the topic being studied. Real-world projects. Students must create real-world products that can be used or publicly displayed. Collaboration. Students work in groups to produce challenging real-world projects that involve the use of cross-disciplinary skills and knowledge. Real-life context. PBL brings learning into real-life contexts and enriches students' learning experiences by connecting learning with real-world experiences. Knowledge and skills. Students use the knowledge and skills they have learned to complete real projects and demonstrate a deep understanding of the topic being studied. Reflection. Students reflect on their learning process and the outcomes of the projects they have completed. Reflection helps students understand the learning process they have gone through and enhances their ability to apply the skills and knowledge they have learned (Thomas, D. & Seely Brown, 2011).

Project-Based Learning (PBL) is a learning method that involves students in challenging and meaningful projects or tasks that require the use of cross-disciplinary skills and knowledge to achieve specific goals. PBL emphasizes student-centered learning, where students have control over their learning process and work in groups to complete the project or task (Thomas, J. W., & Mergendoller, 2011). The dimensions or indicators of Project-Based Learning include a focus on a challenging problem or question, sustained inquiry, authenticity, student voice, and choice, reflection, and critique, and elaborated communication. PBL begins with a challenging problem or meaningful question that requires investigation and exploration to find a solution or answer. PBL involves active student engagement, which requires problem-solving, critical thinking, and creative thinking through investigation and exploration. PBL involves collaboration among students to solve meaningful problems or tasks that reflect real-life situations and develop collaborative skills. PBL provides opportunities for students to take control of their learning process, including topic selection, approach, and outcomes of the project or task. PBL involves student reflection and evaluation of the process and outcomes of the project or task, so students can enhance their understanding of the topic being studied. PBL is integrated with the curriculum and expands students' understanding of the topic being studied through diverse and in-depth communication with others inside and outside the group (Thomas, J. W., & Mergendoller, 2011).

Project-Based Learning (PBL) is a learning approach that requires students to actively work in groups to solve authentic, complex, and problem-solving projects. In PBL, students learn by applying the skills and knowledge they have to complete tasks in the real world.

PBL emphasizes student-centered learning, where students have control over their learning process and work in groups to complete the project or task. PBL focuses on developing cross-disciplinary skills and knowledge, problem-solving, critical thinking, creativity, and collaboration skills. PBL involves a series of dimensions or indicators that include a focus on a challenging problem or question, sustained inquiry, authenticity, student voice, and choice, reflection, and critique, and elaborated communication. PBL connects learning with real-life experiences and enhances students' learning experiences by providing opportunities to develop skills that are transferable to the real world. PBL emphasizes student-centered learning, where students have control over the learning process and work independently to achieve predetermined goals (Krajcik, J. S., & Czerniak, 2018). The dimensions or indicators of Project Based Learning include real-world issues, authentic and relevant learning, and challenging projects that are meaningful to students. Problem-solving is an important aspect, as students should have the opportunity to develop problem-solving skills through the projects they work on. The projects should be designed to enable students to identify problems and plan and implement effective solutions. Collaboration is also key, as students must learn to work collaboratively in teams. The project should be designed in such a way that students interact with one another to complete it. Finally, PBL should allow students to gain a deep understanding of the topic they are learning about. The chosen project should be complex and allow students to conduct in-depth research and exploration on the topic (Krajcik, J. S., & Czerniak, 2018).

Project Based Learning has been studied by previous researchers, including (Sukmana & Amalia, 2021), (Nisah et al., 2021), dan (Anggraini & Wulandari, 2020).

The Inquiry Method

The Inquiry Method is a learning approach based on knowledge construction, in which students actively engage in building their understanding through exploration and discovery. Inquiry learning promotes deeper learning, the development of critical thinking skills, and problem-solving (National Research Council., 2000). The dimensions or indicators of the Inquiry Method are essential questions, where students should be encouraged to formulate essential questions as the main focus of learning. The investigation, where students should be involved in self-directed or group investigations. Evidence and explanation, where students should understand that the evidence obtained through investigation forms the basis for the explanations and conclusions they make. Communication, where students should be encouraged to communicate well and clearly to convey their findings and understanding. Thinking skills, where students should acquire critical and creative thinking skills through the inquiry process. Lifelong learning, where the Inquiry Method should stimulate students' interest in continuing to learn throughout their lives. Social context, where the Inquiry Method should take into account the social and cultural context of students and encourage collaborative learning activities. Evaluation, where the Inquiry Method should involve continuous evaluation and reflection on the learning process and its outcomes. The use of technology, where Inquiry Method should use technology to support learning and increase student engagement (National Research Council., 2000).

The Inquiry Method is a learning approach that emphasizes exploration and investigation, where students have the opportunity to develop critical thinking skills, and speaking ability, and participate in collaborative activities (Nicolaidou, I., & Philippou, 2014). The dimensions or indicators of the Inquiry Method are having clear learning goals, learning goals must be established before starting learning with the Inquiry Method. Questioning phase, where students must ask open-ended questions to start learning. Hypothesis setting, where students must develop hypotheses that can be tested and tested through experiments or data collection. Experiment planning and execution, where students

must design and carry out experiments to collect relevant data. Data analysis and interpretation, where students must collect, analyze, and interpret the data that has been collected. Conclusion and problem-solving, where students must formulate conclusions and seek solutions to the problems raised. Reflection, where students must reflect and evaluate the learning process and the results that have been achieved. Communication, where students must communicate well and clearly to convey their findings and understanding. Critical thinking skills, where the Inquiry Method must help students develop critical and reflective thinking skills. Knowledge development, where the Inquiry Method must help students build broader and deeper knowledge about the topic being studied. Collaboration, where the Inquiry Method must encourage collaborative activities in learning. The use of technology, where Inquiry Method should use technology to support learning and increase student engagement (Nicolaidou, I., & Philippou, 2014).

The Inquiry Method is a learning approach where students play an active role in shaping their knowledge. This method allows students to learn through observation, experimentation, and reflection, and gain experience in solving real-world problems (Woods, 2018). The dimensions or indicators of the Inquiry Method are thought-provoking questions: Students should be encouraged to ask complex and challenging questions. Critical thinking, where students should be encouraged to develop critical thinking skills through observation, data collection, and analysis. Collaboration, where the Inquiry Method should encourage students to work together and collaborate effectively. Problem-solving, where students should be encouraged to develop problem-solving skills by exploring and finding creative solutions. Communication, where students should be encouraged to communicate their findings and understanding effectively. Lifelong learning, where the Inquiry Method should stimulate students' interest in continuing to learn throughout their lives. The use of technology, where Inquiry Method should use technology to support learning and increase student engagement. Student-centered learning, the inquiry method should encourage students to play an active role in learning and gain a deeper understanding. In reflection, students should be invited to reflect on and evaluate the learning process and the results achieved. Holistic learning: the inquiry method should consider the interconnection between the topics studied and social, cultural, and environmental aspects (Woods, 2018).

The inquiry method has been extensively studied by previous researchers, including (Y. Astuti & Setiawan, 2013), (Putri et al., 2014), and (Ulandari et al., 2019).

The Demonstration Method

The Demonstration Method is a teaching method in which the teacher demonstrates a procedure or technique and the students observe and take notes on what happens (Gilbert, J.K. & Kotelman, 2005). The dimensions or indicators of the Demonstration Method are that the teacher involves the students in observing and taking notes on the demonstrated procedure or technique (Gilbert, J.K. & Kotelman, 2005).

The Demonstration Method is a teaching method that presents material by showing or demonstrating directly to students something related to the subject matter (Trianto, 2011). The dimensions or indicators of the Demonstration Method are that the teacher can demonstrate the procedure or technique accurately and systematically, the teacher has skills in explaining the stages or steps of the demonstrated procedure or technique, the teacher can provide explanations related to the concepts and principles underlying the demonstrated procedure or technique, the students are active in observing the process demonstrated by the teacher, and the students can understand the concepts and principles underlying the demonstrated procedure or technique (Trianto, 2011).

The Demonstration Method is a teaching method that involves a presentation by a teacher or expert describing or demonstrating a process or phenomenon to illustrate its

underlying principles (Joyce, B., Weil, M., & Calhoun, 2015). The dimensions or indicators of the Demonstration Method are that the teacher can clearly explain the purpose or concept to be taught through the demonstration, the teacher can demonstrate the steps or procedures to be followed by the students accurately and systematically, the teacher can facilitate discussion and questions related to the process or technique demonstrated, the students can follow the process or technique demonstrated by the teacher and understand the intended purpose or concept, and the students can connect the process or technique demonstrated with concepts or principles learned previously (Joyce, B., Weil, M., & Calhoun, 2015).

The Demonstration Method has been extensively researched by previous researchers, including (Arifuddin et al., 2018), (Mulyono et al., 2018), and (Fathoni & Kodri, 2021).

Table 1. Previous relevant research

No	Author (Year)	Previous Research Results	Similarities with this article	Differences with this article
1	(Handayani, 2019; Nadya, Junaidi, HM, 2017; Utami et al., 2021)	Project Based Learning has a positive and significant effect on students' psychomotor abilities	Project Based Learning affects students' psychomotor abilities	-
2	(Imaniarti et al., 2015)(Sulawanti et al., 2019)	The inquiry method has a positive and significant effect on students' psychomotor abilities	The inquiry method affects students' psychomotor abilities	-
3	(Suliwa et al., 2018)(R. K. Astuti, 2017)(Marbun et al., 2019)	The demonstration method has a positive and significant effect on students' psychomotor abilities	The demonstration method affects students' psychomotor abilities.	-
4	(Handayani, 2019)	Project Based Learning has a positive and significant effect on psychomotor abilities and students' critical thinking skills	Project Based Learning affects students' psychomotor abilities.	Project Based Learning affects students' critical thinking skills
5	(Nadya, Junaidi, HM, 2017)	Project Based Learning has a positive and significant effect on psychomotor abilities and student practical learning outcomes	Project Based Learning affects students' psychomotor abilities	Project Based Learning affects Student Practical Learning Outcomes
6	(Imaniarti et al., 2015)	The inquiry method has a positive and significant effect on the psychomotor, cognitive, and affective abilities of students	The inquiry method affects students' psychomotor abilities	The inquiry method affects the cognitive and affective abilities of students
7	(Wardani & Firdaus, 2019)	The inquiry method has a positive and significant effect on the cognitive-psychomotor abilities of students	The inquiry method affects students' psychomotor abilities	The inquiry method affects the cognitive abilities of students
8	(R. K. Astuti, 2017)	The demonstration method dan Audiovisual has a positive and significant effect on students' psychomotor abilities	The demonstration method affects students' psychomotor abilities	Audiovisual Methods affect students' psychomotor abilities
9	(Suliwa et al.,	The demonstration	The demonstration	The demonstration

	2018)	method has a positive and significant effect on the psychomotor, cognitive, and affective abilities of students	method affects students' psychomotor abilities	method affects the cognitive and affective abilities of students
10	(Indah Hafizhah et al., 2022)	Quantum Method Learning has a positive and significant effect on students' psychomotor abilities	-	Quantum Method Learning affects students' psychomotor abilities
11	(Malisa et al., 2018)	Creative problem-solving has a positive and significant effect on students' psychomotor abilities	-	Creative Problem Solving affects students' psychomotor abilities
12	(Murti et al., 2014)	Practicum Method has a positive and significant effect on students' psychomotor abilities	-	Practicum Method affects students' psychomotor abilities
13	(Sari et al., 2016)	Discovery Methods Learning has a positive and significant effect on students' psychomotor abilities	-	Discovery Methods Learning affects students' psychomotor abilities
14	(Kusumaningrum & Setyawati, 2019)	Snowball Methods throwing has a positive and significant effect on students' psychomotor abilities	-	Snowball Methods throwing affects students' psychomotor abilities

RESEARCH

The method used in writing this scientific article is qualitative and literature review, commonly known as library research. In this method, the author will examine theories and relationships or influences between variables from various books and journals, both offline in the library and online sources such as Mendeley, Google Scholar, and other online media.

In qualitative research, the use of literature review should be consistent with the methodological assumptions used, which must be used inductively to avoid directing questions asked by the researcher. One of the main reasons for conducting qualitative research is that it is exploratory, trying to understand a phenomenon or problem in-depth and holistically without limiting research questions to theories or hypotheses that have been previously established. Therefore, the literature review used in qualitative research aims to provide a deeper understanding of the research topic and broaden the researcher's perspective on the phenomenon under study (Ali, H. & Limakrisna, 2013).

RESULT AND DISCUSSION

Based on theoretical studies and relevant previous research, the discussion of this literature review article in the concentration of Education Management is:

The Effect of Project Based Learning on students' psychomotor abilities

Project Based Learning affects students' psychomotor abilities, whereas Project Based Learning dimensions or indicators (identifying problems, planning, compiling, creating, monitoring, solving, testing and presenting, and evaluating) affect the dimensions or indicators of students' psychomotor abilities (Moving, Manipulating, Communicating, Creating) (Handayani, 2019).

To improve students' psychomotor abilities by paying attention to Project Based Learning, what management must do is to increase effectiveness and attractiveness in learning, adequate facilities and infrastructure must be provided. In addition, with adequate facilities and infrastructure, teachers can be more creative and innovative in determining the right learning methods in teaching and learning activities (Nadya, Junaidi, HM, 2017).

The application of the project-based learning model (Project Based Learning) has a positive influence on the development of students' psychomotor skills. Many benefits can be gained through the use of this learning model, such as making students more active learners, making learning more interactive and multidirectional, and making learning student-centered. In addition, this model also allows teachers to act as facilitators, develop students' higher-order thinking skills, provide opportunities for students to manage their task-completion activities to train them to become independent, as well as provide students with a deeper understanding of concepts or knowledge (Nadya, Junaidi, HM, 2017).

Project Based Learning affects students' psychomotor abilities, this is in line with research conducted by: (Handayani, 2019), (Nadya, Junaidi, HM, 2017), and (Utami et al., 2021).

Effect of Inquiry Method on students' psychomotor abilities

The Inquiry method affects students' psychomotor abilities, whereas the dimensions or indicators of the inquiry method (formulating procedures, analyzing results, and drawing conclusions independently) affect the dimensions or indicators of students' psychomotor abilities (formulating hypotheses, preparing experimental tools, assembling experimental tools, making observations/measurements, analyzing data, drawing conclusions on experimental results, and cooperation in groups) (Imaniarti et al., 2015).

Educators can choose a laboratory-based inquiry learning model as one of the learning model choices because it can improve students' psychomotor abilities. However, in its application, it must pay attention to the allocation of time and conditions of students so that the results obtained are optimal. The steps in laboratory inquiry also need to be taught slowly and continuously so that students can get used to formulating problems, making hypotheses, conducting experiments, and searching for information independently. In this case, a laboratory-based inquiry learning model can help learners develop cognitive and psychomotor abilities and increase independence and confidence in the face of problems and challenges. Therefore, a laboratory-based inquiry learning model can be the right choice for educators in increasing the effectiveness of learning (Sulawanti et al., 2019).

If the laboratory-based inquiry learning model continues to be applied, students will form a scientific attitude that includes honesty, hard work, perseverance, and other positive attitudes. The laboratory-based inquiry learning model requires students not to manipulate data, so the data presented is the actual result of experiments carried out by students independently. Students will design and analyze the results of these experiments with their abilities and knowledge. This is in line with the objectives of the 2013 curriculum, where assessment is carried out by taking into account 3 domains, namely cognitive, psychomotor, and affective. Thus, laboratory-based inquiry learning models can help students in the development of scientific attitudes as well as skills and knowledge in the cognitive and psychomotor realms (Sulawanti et al., 2019).

The Inquiry method affects the psychomotor abilities of students, this is in line with the research conducted by: (Imaniarti et al., 2015) and (Sulawanti et al., 2019).

Effect of Demonstration Method on students' psychomotor abilities

The Demonstration Method affects the psychomotor ability of students, where the dimensions or indicators of the demonstration method (two-way communication, student

focus, directed learning process on the material, the learning experience is more inherent) affect the dimensions or indicators of students' psychomotor abilities (visual perception, hearing, movement, action, skills) (R. K. Astuti, 2017).

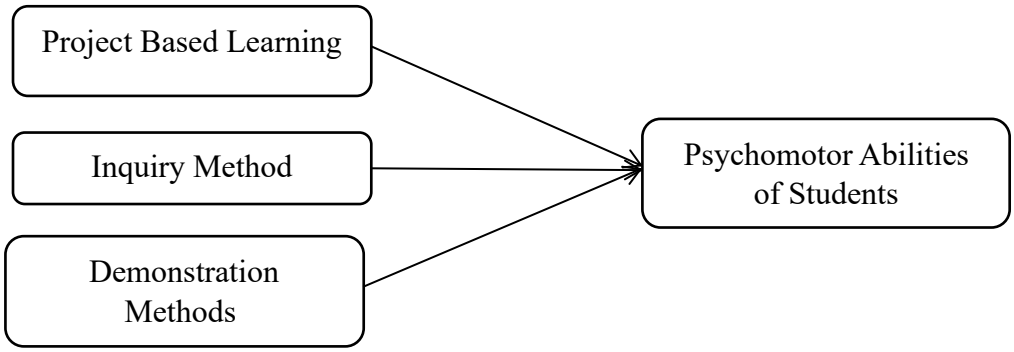
For the learning process to run smoothly and for students to understand the material well, the teacher must have skills in mastering demonstration learning methods. To evaluate the implementation of learning, learning implementation sheet instruments can be used during the learning process that applies demonstration methods. In addition, interesting and fun learning methods for teachers and students can be achieved by applying demonstration methods (Suliwa et al., 2018).

The Demonstration Method has a positive impact on the psychomotor abilities of students, which is evident from the better cognitive learning outcomes of students after using the demonstration method in learning. In addition, students' affective and psychomotor learning outcomes are also excellent when using demonstration methods. Students respond very well to the use of demonstration methods in learning. During the learning process, teachers can carry out demonstration methods very well (Suliwa et al., 2018).

The Demonstration Method affects the psychomotor abilities of students, this is in line with the research carried out by: (R. K. Astuti, 2017) and (Suliwa et al., 2018).

Conceptual Framework

Based on the formulation of the problem, theoretical studies, relevant previous research, and discussion of the influence between variables, then in the process of thinking about this article as below.



Picture 1. Conceptual Framework

Based on the conceptual framework image above, Project Based Learning, Inquiry Methods, and Demonstration Methods affect students' psychomotor abilities. Apart from these three exogenous variables that affect students' psychomotor abilities, many other variables affect them including:

a) Quantum Learning Methods: (Indah Hafizhah et al., 2022)
b) Creative Problem Solving Method: (Malisa et al., 2018)
c) Practicum Method: (Murti et al., 2014)
d) Discovery Learning Methods: (Sari et al., 2016)
e) Snowball throwing method: (Kusumaningrum & Setyawati, 2019)

CONCLUSION

Conclusion

Based on theory, relevant articles, and discussions can then be formulated as hypotheses for further research:

1. Project Based Learning affects students' psychomotor abilities.
2. The Inquiry method affects the psychomotor abilities of students.

3. The Demonstration Method affects the psychomotor abilities of students.

Suggestion

Based on the conclusions above, the suggestion in this article is that many other factors affect students' psychomotor abilities, apart from Project Based Learning, Inquiry Methods, and Demonstration Methods at all types and levels of organizations or companies, therefore further studies are still needed to find out what other factors can affect students' psychomotor abilities in addition to the variables studied in this article. Other factors include quantum learning methods, creative problem-solving methods, practicum methods, discovery learning methods, and snowball throwing methods.

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