DISCOVERY LEARNING MODEL FOR IMPROVING THE STUDENTS' CRITICAL THINKING SKILLS: A NARRATIVE REVIEW

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ABSTRACT

The learning model used in primary schools still tends to use conventional learning, resulting in less optimal critical thinking skills and students' learning outcomes. This study aims to analyze the discovery learning model in improving critical thinking skills and learning outcomes of primary school students. This study uses a narrative review with 2 steps, namely database search, and thematic analysis. The criteria used are articles from national and international scientific journals, articles related to research topics, articles published in the last 5 years with a duration (2016-2021), and articles available full-text pdf versions that have been published on Google Scholar and Research gate. Of the 28 articles obtained, only 25 articles are analyzed. The results of this study indicate that the discovery learning model can improve critical thinking skills and learning outcomes of primary school students.

Keywords: critical thinking skill; discovery learning; narrative review

INTRODUCTION

The 21st century learning demands changes in new learning styles, by increasing 4-skills namely critical thinking, creative, communication, and collaboration [1,2]. The ability to think critically is an important intellectual capital possessed by students when dealing with problems in their daily lives [3,4]. Critical thinking skills are crucial for the world of education to confirm the truth of knowledge [5]. According to the results of a study [6], it was explained that students' abilities in critical thinking were in form of reasoning, expressing, analyzing and problem solving.

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[1] Andreas Lund, Lisbeth M Brevik, and Greta Bj, "Transformative Agency in Teacher Education : Fostering Professional Digital Competence," *Teaching and Teacher Education* 86 (2019), https://doi.org/10.1016/j.tate.2019.07.005.

[2] Arcadius Benawa, "Personal Toughness as Relevance Character in Disruption Era," *International Journal of Advanced Science and Technology* 29, no. 4 Special Issue (2020): 1658–62, http://sersc.org/journals/index.php/IJAST/article/view/6968.

[3] Richard Paul and Linda Elder, "Critical Thinking: Strategies for Improving Student Learning, Part II.," *Journal of Developmental Education* 32, no. 2 (2008): 34–35.

[4] Otang Kurniaman, Eddy Noviana, and Munjiatun Munjiatun, "The Ability of Critical Thinking of Elementary School Students Using a Graphic Organizer Instrument," *JMIE (Journal of Madrasah Ibtidaiyah Education)* 4, no. 2 (2020): 206, https://doi.org/10.32934/jmie.v4i2.166.

[5] Sarwanto, Sarwanto Laksmi Evasufi Widi Fajari, and Chumdari, "Critical Thinking Skills and Their Impats," *Malaysian Journal of Learning and Instruction* 2, no. 2 (2021): 161–87, https://doi.org/10.32890/mjli2021.18.2.6.

[6] Saputri (2020)

The ability to think critically usually begins with a person's ability to criticize various phenomena that occur around him, then judge from his point of view[7]. This is in line with the results of research[8] which explains that by involving critical thinking skills, in which students' cognitive processes are required to systematically and specifically analyze the problems, distinguish these problems carefully and thoroughly, and then identify and review the problems, students are able to learn problem solving strategies.

Based on the description above, it is important for elementary school (SD) students to have the ability to think critically in order to be able to solve problems in their daily life. On the other hand, research[9] explains that thinking skills that are directed through learning in elementary school belong to higher order thinking skills. Critical thinking skills for elementary school students aim to develop attitudes, acquire and integrate knowledge, and solve various problems to enable students to compete on a global scale according to the times[10]; [11].

Teachers may develop students' critical thinking skills by providing learning method that encourages students to think critically and applying effective learning strategies[12]; [13]. The results of the study[14] confirm that the low level of students' ability in critical thinking is caused by the application of learning models that are less innovative and not a student-centered model. Conventional learning models tend to make students

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[7] Bengi Birgili Yazar Soyadı, "Creative and Critical Thinking Skills in Problem-Based Learning Environments," *Journal of Gifted Education and Creativity* 2, no. 2 (2015): 71–71, https://doi.org/10.18200/jgedc.2015214253.

[8] Mira Azizah, Joko Sulianto, and Nyai Cintang, "Analisis Keterampilan Berpikir Kritis Siswa Sekolah Dasar Pada Pembelajaran Matematika Kurikulum 2013," *Jurnal Penelitian Pendidikan* 35, no. 1 (2018): 61–70, https://doi.org/10.15294/jpp.v35i1.13529.

[9] Magdalena et al. (2020)

[10] (Hasnan et al., 2020: 239-249)

[11] Laksmi Evasufi Widi Fajari, Sarwanto, and Chumdari, "Improving Elementary School's Critical Thinking Skills through Three Different PBL-Assisted Learning Media Viewed from Learning Styles," *Journal of E-Learning and Knowledge Society* 16, no. 1 (2020): 55–64, https://doi.org/10.20368/1971-8829/1135193.

[12] Linda M Murawski, "Critical Thinking in the Classroom... and Beyond," *Journal of Learning in Higher Education* 10, no. 1 (2014): 25–30.

[13] Hui Chen Lin et al., "Facilitating Critical Thinking in Decision Making-Based Professional Training: An Online Interactive Peer-Review Approach in a Flipped Learning Context," *Computers and Education* 173, no. June 2020 (2021): 104266, https://doi.org/10.1016/j.compedu.2021.104266.

[14] Winoto & Prasetyo (2020)

passive which will lead to low levels of students' critical thinking[15]; [16]. Hence, there is a need for applying learning model that is in accordance with the 2013 curriculum competency standards of graduates by strengthening a scientific approach with the application of discovery-based learning [17] and problem-based learning model to encourage students to produce contextual works.

The critical thinking embedded in discovery learning model [18, 19] can shape cognitive and psychomotor intelligences of students. However, at the elementary level, discovery learning models are rarely used, resulting in some problems occur during learning activities in several elementary schools, such as: (1) students' learning outcomes are still low because students often find it difficult to comprehend the lesson given by the teacher [20], (2) learning is still teacher-centered so that students are less active in participating in learning[21], (3) learning is not done contextually[22]. Based on these research problems, the novelty of this research article is to produce an analysis of several previous research results related to the discovery learning model regarding to elementary students' critical thinking by using a narrative review approach.

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[15] Brian Myers and James Dyer, "The Influence Of Student Learning Style On Critical Thinking Skill," *Journal of Agricultural Education* 47, no. 1 (2006): 43–52, https://doi.org/10.5032/jae.2006.01043.

[16] SlaŁana ŽivkoviŁ, "A Model of Critical Thinking as an Important Attribute for Success in the 21st Century," *Procedia - Social and Behavioral Sciences* 232, no. April (2016): 102–8, https://doi.org/10.1016/j.sbspro.2016.10.034.

[17] R. Febriana, Y. Haryono, and R. Yusri, "Effectiveness of Discovery Learning-Based Transformation Geometry Module," *Journal of Physics: Conference Series* 895, no. 1 (2017), https://doi.org/10.1088/1742-6596/895/1/012003.

[18] Bruce Joyce and Marsha Weil, *Models of Teaching*, the fifth (New Delhi : New DelhiPrentice Hall of India, 2003).

[19] Joyce A. Castronova, "Discovery Learning for the 21st Century: What Is It and How Does It Compare to Traditional Learning in Effectiveness in the 21st Century?," *Action Research Exchange* 1, no. 1 (2002): 1–12.

[20] (Rahmayani et al., 2019 : 246-253)

[21] (Khasanah & Suprihartini, 2019: 42-48)

[22] Nur Aina Dwi Wulandari, Iswahyudi Joko, and Abdul Karim, "Penerapan Model Discovery Learning Terarah Berbasis Lingkngan Untuk Meningkatkan Hasil Belajar Mata Pelajaran IPA Materi Struktur Dan Fungsi Tumbuhan Siswa Kelas IV SD Islam NU Pungkuran Kecamatan Semarang Tengah," in *Seminar Nasional Pendidikan, Sains Dan Teknologi* (Fakultas Matematika dan Ilmu Pengetahuan Alam, Universitas Muhammadiyah Semarang, 2017).

RESEARCH METHODS

This study applied the Narrative Review approach, which is an approach[23] aiming to analyze and synthesize existing knowledge related to the certain topic to find gaps for the research to be carried out. The type of data used in this research was secondary data. This secondary data was in the form of scientific articles from various sources obtained through Google Scholar which was tied to the research theme. The keywords used in the secondary data search were the discovery learning model, critical thinking skills, and elementary school. The data collection technique in this study used documentation technique, where the collection of journal documents is not limited to space and time[24]. Based on the search results, 25 articles were obtained with the criteria of national and international scientific journals, its relevance to the research topics, published in the last 5 years with a duration (2016-2021), and the availability of easy access links to the full-text pdf version.

RESULT AND DISCUSSION

Result

25 articles related to the topic on discovery learning models that can improve critical thinking skills and learning outcomes of elementary school students became the database of this research. The articles are described in the table. 1 as follows:

Researcher, year, journal	Tittle	Kind, design, research design, instrument, data analysis	Result
Firosalia Kristin, Dwi Rahayau, 2016[25], Scholaria Journal.	The Influence of the Application of the Discovery Learning Model on Social Studies Learning Outcomes in Grade 4 Primary School Students	Quasi-Experimental Research, True Experimental Design, Tests and Observation Sheets	The use of discovery learning models has an effect on social studies learning outcomes for fourth grade primary school students.
Nichen Irma Cintia, Firosalia Kristin, Indri Anugraheni, 2018[26], Educational	Application of the Discovery Learning Model to Improve Creative Thinking	PTK, Kurt Lewin, Tests, rubrics and observation sheets, Quantitative and	The application of the discovery learning model can improve creative thinking skills and thematic learning

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[23] Chitu Okoli and Kira Schabram, "Working Papers on Information Systems A Guide to Conducting a Systematic Literature Review of Information Systems Research," *Sprouts: Working Papers on Information Systems* 10, no. 26 (2011).

[24] Sugiyono, *Metodologi Penelitian Kuantitatif, Kualitatif Dan R&D* (Bandung: Alfabeta, 2008).

[25] Kristin & Rahayu (2016)

[26] Cintia et al., 2018)

Science Perspective Journal.	Ability and Student Learning Outcomes	Qualitative Descriptive	outcomes of fifth grade students at SDN Sidorejo Kidul 02 Tingkir.
Rosemey Ratna Purnawati, Slameto, Elvira Hoesein Radia, 2018[27], Journal of Character Education.	Improving Mathematics Learning Outcomes for Grade 4 Primary School Students Using the 2013 Curriculum-Based Discovery Learning Model	PTK, John Elliot model, Tests and observation sheets, Completeness Analysis and Comparative Analysis	The discovery learning model based on the 2013 curriculum can increase student activity in critical thinking (4C) so that it affects the mathematics learning outcomes of 4th grade students in one of the State Primary Schools in Salatiga.
Yulita Windarti, Slameto, Eunice Widyanti S, 2018, [28], Journal of Character Education.	Improving Critical Thinking Ability and Learning Outcomes through the Application of the Discovery Learning Model in Thematic Learning for Grade 4 Primary School	PTK, Kemmis and Mc Taggart, Tests and observation sheets, Quantitative	The application of the discovery learning model can increase teacher activities in thematic learning.
Windi Oktaviani, Firosalia Kristin, Indri Anugraheni, 2018[29], Scientific Journal of Educational Development,.	Application of the Discovery Learning Model to Improve Critical Thinking Ability and Mathematics Learning Outcomes of Grade 5 Primary School Students	Qualitative Quantitative Research, Kemmis and Mc Taggart Models, Observation Tests and Sheets, Qualitative Descriptive and Comparative Descriptive	The discovery learning model can improve critical thinking skills and mathematics learning outcomes for grade 5 students in SDN 3 Nambuhan.
Ratih Dwi Yulianti Rahayu, Mawardi, Suhandi Astuti, 2019[30], Indonesian Journal of Basic Education..	Improving Critical Thinking Skills and Learning Outcomes of Grade 4 Primary School Students through the Discovery Learning Model	PTK, John Elliot model design, Tests, rubrics and observation sheets, Comparative Descriptive	After going through 2 cycles, the level of critical thinking skills and students' learning outcomes increased, from 7% critical thinking in the very high category to 63% in the very high category, and from 46% of students achieving completeness to 85% of students achieving completeness.
Achmad Khoirul Bichar, Nur Widodo, Hermin Wiyanti, 2019[31], Basicedu Journal	Improving Learning Outcomes of Thermal Energy Transfer Materials Using the Discovery Learning Model in Class V B SDN Ngaglik 01 Batu City	PTK, Kemmis and Mc Taggart, Tests and observation sheets, Quantitative	The discovery learning model can improve students' learning outcomes in science lesson on heat energy transfer material.

[27] Ratna Purnawati et al. (2018)

[28] Windarti et al. (2018)

[29] Ferdinandus et al. (2018)

[30] Rahayu et al. (2019)

[31] Bichar et al. (2019)

Awalus Sa'diyah, Yari Dwikurnaningsih, 2019[32], Education: Research Journals and Educational Articles.	Improving Critical Thinking Skills Through the Discovery Learning Model	CAR, Kemmis and Mc Taggart, Tests and Observation Sheets, Comparative Descriptive and Qualitative Descriptive	The application of the discovery learning model in thematic learning can improve the critical thinking skills of fourth grade students at SDN Kutowinangun 11 by which there is 16.04% increase in the average critical thinking skills of students from cycle I to cycle II and an average score of 68 in cycle I and 81 in the second cycle.
Henik Nur Khofiyah, Anang Santoso, Sa'dun Akbar, 2019[33], Journal of Education: Theory, Research, and Development.	The Influence of Real Object Media-Assisted Discovery Learning Model on Critical Thinking Ability and Understanding of Science Concepts	Quasi-Experimental Research, Post-test-Only Control Group Design, Test, t-Test	(a) There are differences in students' critical thinking skills using the discovery learning model assisted by real object media with students using the discovery learning model. (b) There are differences in conceptual understanding between students who are taught using the discovery learning model assisted by real object media and students who are taught using the discovery learning model.
Toni Hidayat, Mawardi, Suhandi Astuti, 2019[34], Unsika Education Journal,.	Improving Critical Thinking Ability and Learning Outcomes of Class IV Students Through the Discovery Learning Model on the Theme of the Beauty of Diversity in My Country	CAR, John Elliot model, Test, Quantitative Descriptive	Discovery learning model can improve critical thinking skills and learning outcomes of grade 4 students at SDN Dukuh 05 Salatiga. The critical thinking ability of students using the Discovery Learning model is better than using the conventional learning model. The learning outcomes of students in learning using the discovery learning model are better than using the conventional learning model. There is a positive relationship between critical thinking skills and students' increased learning outcomes.
Rini Siswanti, 2019[35], *Indonesian Journal of Education and Learning.*	Application of the Discovery Learning Model to Increase Learning Interest and Learning Outcomes in	Meta-analytical, Descriptive, Documentation Research, Comparative Methods	There is a significant influence on the discovery learning model in increasing student interest and learning outcomes in primary science material.

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[32] Sa'diyah & Dwikurnaningsih (2019)

[33] Khofiyah et al. (2019)

[34] Hidayat et al. (2019)

[35] Siswanti, (2019)

	Primary Science Learning		
Karlina Wong Lieung, 2019[36], *Journal of Primary Education.*	The Effect of Discovery Learning Model on Critical Thinking Skills of Primary School Students	Quasi-Experimental Research, Non Equivalent Control Group Design, Tests, Quantitative	There is an influence from the application of the scientific approach to the discovery learning model on increasing critical thinking skills in the experimental class.
Dianita Eka Prasasti, Henny Dewi Koeswanti, Sri Giarti, 2019[37], Basicedu Journal.	Improving Critical Thinking Skills and Mathematics Learning Outcomes through the Discovery Learning Model in Grade IV Primary School	PTK, Kurt Lewin's model, Tests and observation sheets, Quantitative	(a) Learning using discovery learning models can improve critical thinking skills and learning outcomes of fourth grade students at SDN Tegalrejo 02 Salatiga on flat-shaped materials. (b) The application of discovery learning model steps can improve critical thinking skills and learning outcomes of fourth grade students at SD Negeri Tegalrejo 02 Salatiga which includes providing stimulation, formulating problems, collecting data, processing data, proving data, and drawing conclusions.
Arfika Wedekaningsih, Henny Dewi Koeswanti, Sri Giarti, 2019[38], Basicedu Journal	Application of the Discovery Learning Model to Improve Critical Thinking Skills and Mathematics Learning Outcomes of Students	CAR, Kemmis and Mc Taggart models, Tests, rubrics and observation sheets, Comparative Descriptive	After going through 2 cycles of action, students' critical thinking skills and mathematics learning outcomes increased. In cycle 1, students with a critical thinking category are 4.3% and 52% students achieve the learning outcomes completeness. In cycle 2, students with a critical thinking category are 17.4% and completeness of student learning outcomes become 82%.
Sherviyana dan Mansurdin, 2020[39], Tambusai Education Journal.	Application of the Discovery Learning Model to Improve Integrated Thematic Learning Outcomes in Primary Schools	Research Library Research, Descriptive, Documentation. Qualitative Descriptive	The application of the discovery learning model in learning can help teachers improve student learning outcomes.

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[36] Karlina (2019)

[37] Prasasti et al., (2019)

[38] Wedekaningsih et al. (2019)

[39] Sherviyana & Mansurdin, (2020)

Syiti Mutia Hasnan, Rusdinal, Yanti Fitria, 2020[40], Basicedu Journal.	The Effect of Using Discovery Learning Models and Motivation on Critical Thinking Ability of Primary School Students	Quasi-Experimental Research, Factorial (2x2), Tests and Questionnaires, Quantitative Quasi-Experiments	The critical thinking ability of students who are taught using the discovery learning model is better than the critical thinking skills of students who are taught using conventional learning.
Sarwanto, Fajari, and Chumdari , 2021[41], Malaysian Journal of Learning and Instruction.	Critical thinking skill and their impact on elementary school student	A Qualitative case study, interviews, critical thinking tests	The implication research can be used as a reference point when considering the planning of effective strategies to improve the teaching and learning of critical thinking skills in elementary schools.
Hannya, Firosalia Kristin, 2020, [42] Scientific Journal of Education and Learning.	Meta-analysis of the Use of the Discovery Learning Model in Improving Science Learning Outcomes of Primary School Students	Meta-Analytical, Descriptive, Documentation Research, Qualitative Descriptive	Discovery learning model improves science learning outcomes in students starting from the lowest 10% to the highest 71% with an average of 32.3%.
Fadilah Wulan Dari dan Syafri Ahmad, 2020[43], Tambusai Education Journal.	Discovery Learning Model as an Effort to Improve Critical Thinking Ability of Primary School Students	Research Library Research, Descriptive, Documentation, Qualitative Descriptive	The discovery learning model that is applied can improve the critical thinking skills of primary school students.
Rihayati, Sri Utaminingsih, Santoso, 2020, [44] *Journal of Physics: Conference Series,.*	Improving Critical Thinking Ability Through Discovery Learning Model Based on Patiayam Site Ethnoscience	Quasi-Experimental Research, Non Equivalent Control Group Design, Tests, Instrument Analysis and Data Analysis	The results of the critical thinking skills of the experimental group students using the discovery learning model based on the Estosains Patiayam site were higher than the learning outcomes of the control group's critical thinking skills.
Maulana Dias Putra, Wiyanto, Suharto Linuwih, 2020[45], *Journal of Primary Education,.*	The Effect of Discovery Learning on 21st Century Skills for Primary School Students	Quasi-Experimental Research, Non Equivalent Control Group Design, Tests, Quantitative	The results of the critical thinking skills test showed the average value of the experimental class was 0.78, while the average value of the control class was 0.60. This shows that the discovery learning model has more influence on students' critical thinking skills.

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[40] Hasnan et al., (2020)

[41] Sarwanto, Fajari, and Chumdari, "Critical Thinking Skills and Their Impats."

[42] Hannya & Kristin (2020)

[43] Dari & Ahmad, (2020)

[44] Rihayati et al., (2020)

[45] Putra et al. (2020)

Rochmad Ari Setyawan, Hana Septina Kristanti, 2021[46], Basicedu Journal	Application of Discovery Learning Model in Science Learning to Improve Critical Thinking Ability and Learning Outcomes of Primary School Students	CAR, Kemmis and Mc Taggart spiral model, Test and observation sheet, Comparative Descriptive	After going through the activities of 2 cycles, it shows that the discovery learning model is proven to improve critical thinking skills and student learning outcomes.
Setyawan & Kristanti, 2021[47], Basicedu Journal	Critical Thinking Skills in Science Learning Through the Discovery Learning Model for Elementary School Students	PTK, Stringer model, Test and observation sheet, Comparative Quantitative and Descriptive	The discovery learning model can improve critical thinking skills in science learning of the 4th grade students of SD Negeri Karangduren 01.
Willes Pangesti, Elvira Hoesein Radia, 2021[48], Elementary School.	Meta-analysis of the Discovery Learning Model on the Science Learning Outcomes of Primary School Students	Meta-Analytical, Descriptive, Documentation Research, Qualitative Descriptive	Discovery learning model can improve science learning outcomes of primary school students, from the results of 17% and the highest result of 48% with an average of 28.33%
Kurniaman, Noviana, and Munjiatun, 2021[49], Journal of Madrasah Ibtidaiyah Education.	The ability of critical thinking of elementary school student using graphic organizer instrument	Quantitative descriptive	There is a need for more intensive training for teacher in classroom teaching practice to provide critical thinking. The result was not optimal to implementing the 2013 curriculum if it was not using critical thinking skill.

Table 2
Research design

Research design	Total	Percentage (%)
Model *John Elliot*	4	16
Model *Kemmis* dan *Mc Taggart*	7	28
Model *Kurt Lewin*	2	8
True Experimental Design	1	4
Descriptive	5	20
Factorial 2 x 2	1	4
Posttest-Only Control Group Design	1	4
Model *Stringer*	1	4
Non Equivalent Control Group Design	3	12
Total	25	100%

Table 3
Research Instruments

Research Instruments	Total	Percentage (%)
Test and Observation Sheet	11	44
Test	5	20

[46] Safitri & Mediatati (2021)

[47] Setyawan & Kristanti (2021)

[48] Pangesti & Radia (2021)

[49] Kurniaman, Noviana, and Munjiatun, "The Ability of Critical Thinking of Elementary School Students Using a Graphic Organizer Instrument."

Documentation		5	20
Test and Questionnaire		1	4
Tests, Rubrics and Observation Sheets		3	12
Total		**25**	**100**

Tabel 4
Research data analysis

Analysis Data	Total	Percentage (%)
Comparative Descriptive	3	12
Quantitative Quasi-Experiment	2	8
Qualitative Descriptive	4	16
Qualitative and quantitative	1	4
Quantitative	5	20
Comparative Descriptive and Qualitative Descriptive	2	8
t test	1	4
Comparison Method	1	4
Completeness Analysis and Comparative Analysis	2	8
Quantitative descriptive	1	4
Quantitative and Qualitative Descriptive	1	4
Instrument Analysis and Data Analysis	1	4
Comparative Quantitative and Descriptive	1	4
Total	**25**	**100**

Almost half of the research (36%) was published in 2019. The mostly used design of the study was the Kemmis and MC Taggart model, which is 28%. The instruments used in the study were 44% tests and observation sheets, while 20% of the research applied quantitative data analysis.

Table 5
The kinds of discovery learning model

items	Total	Percentage (%)
Improve critical thinking skills and learning outcomes of primary school students	8	32
Improve critical thinking skills of primary school students	8	32
Improving primary school student learning outcomes	9	36
Total	25	100

The table suggests that based on the narrative review of 25 journals, 8 journals are included in the topic of discovery learning models that can improve critical thinking skills and learning outcomes of primary school students, 8 journals are included in the topic of discovery learning models that can improve critical thinking skills of primary school students, and 9 journals are included in the topic of discovery learning models that can improve primary school student learning outcomes. The analysis of the discovery learning model in improving critical thinking skills and learning outcomes of primary school students is presented in table 5 and table 6 below:

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Table 6
The Analysis of discovery learning model to increase critical thinking skill of primary
school students

Items	Analysis	Emprirical sourse
Elementary school students' critical thinking skills	The results showed that the discovery learning model could significantly improve the critical thinking skills of primary school students both from cycle 1 and cycle 2 and had a higher effect of increase compared to conventional learning.	Ratih, dkk (2019) Nichen, dkk (2018) Syiti, dkk (2020) Fadilah & Syafri (2020) Awalus, dkk (2019) Karlina (2019) Rihayati, dkk (2020) Maulana, dkk (2020)
Critical thinking skills in science learning for elementary school students	The results showed that the discovery learning model could significantly improve critical thinking skills in science learning of primary school students. The increase in critical thinking skills using the discovery learning model assisted by real media is higher than without the help of real media.	Rochmad, dkk (2021) Henik, dkk (2019) Wahyu, dkk (2021)
Critical thinking ability in elementary school mathematics learning	The results of the study show that the discovery learning model can significantly improve critical thinking skills in primary students' mathematics learning.	Dianita, dkk (2019) Windi, dkk (2018) Arfika, dkk (2019)
Critical thinking skills in thematic learning of elementary school students	The results showed that the discovery learning model could significantly improve critical thinking skills in thematic learning of primary school students. Learning using the discovery learning model is better in improving critical thinking skills than learning using conventional learning model.	Yulita, dkk (2018) Toni, dkk (2019)

Table 7
The Analysis of discovery learning model to increase learning outcomes of primary
school students

Items	Analysis	Empirical source
Elementary school student learning outcomes	The results showed a significant increase in learning outcomes both from cycle 1 and from cycle 2 using the discovery learning model.	Ratih, dkk (2019) Nichen, dkk (2018)
Social Studies learning outcomes for elementary school students	The results showed that the discovery learning model had an effect on social studies learning outcomes. This is reinforced that the learning outcomes of the experimental class using the discovery learning model with an average value of 82.08 is higher than the control class that does not use the discovery learning model with an average value of 70.22.	Firosalia (2016)
Science Learning Outcomes for Elementary School Students	The results of the study indicate that the discovery learning model has a significant influence in improving the science learning outcomes of primary school students.	Hannya & Firosalia (2020) Wahyu, dkk (2021) Achmad, dkk (2019) Rini (2019) Rochmad, dkk (2021) Indira, dkk (2018) Willes & Elvira (2021)
Elementary school students' mathematics	The results of the study show that the discovery learning model based on the 2013 Curriculum can improve critical thinking skills in 4C so that it affects	Rosemey, dkk (2018) Dianita, dkk (2019) Windi,

| learning outcomes | the mathematics learning outcomes of primary school students. | dkk (2018) Arfika, dkk (2019) |
| Integrated Thematic learning outcomes for elementary school students | The results of the research and the results of relevant journal reviews show that the discovery learning model can improve the Integrated Thematic learning outcomes of primary school students. | Sherviayana & Mansurdin (2020) Wilda, dkk (2020) Toni, dkk (2019) Yulita, dkk (2018) |

Discussion

Based on the 25 journals that have been reviewed, there are 8 journals that discuss the steps of the discovery learning model. In research [50]; [51]; [52]; [53]; [54]; [55], the steps of the discovery learning model are described as follows: a) stimulation (statement/providing stimulation); b) problem statement (identification of problems); c) data collection; d) data processing, e) verification (proof); f) generalization (drawing conclusions). In the research from [56], it suggests the steps of the discovery learning model as follows: a) formulate the problem; b) make a provisional answer (hypothesis); c) collect data; d) draw conclusions; e) communicate.

Table 8
Data Analysis of the critical thinking skill of primary school students

Tittle	Researcher	Critical thinking skill			
		before	After	Gain	Gain %
Improving Critical Thinking Skills and Learning Outcomes of Grade 4 Primary School Students through the Discovery Learning Model	Ratih Dwi Yulianti Rahayu, Mawardi, Suhandi Astuti	7%	63%	56	62,90%
Application of Discovery Learning Model in Science Learning to Improve Critical Thinking Ability and Learning Outcomes of Primary School Students	Wahyu Candra Dwi Safitri dan Nani Mediatati	3%	54%	53,9	53,90%
Improving Critical Thinking Skills Through the Discovery Learning Model	Awalus Sa'diyah, Yari Dwikurnaningsih	27,70%	61,10%	33,4	46,10%
Improving Critical Thinking Ability and Learning Outcomes of Class IV Students Through the Discovery Learning Model on the Theme of the Beauty of Diversity in My Country	Toni Hidayat, Mawardi, Suhandi Astuti	19,10%	81,70%	62,6	77,30%

[50] Kristin & Rahayu (2016)
[51] Windarti et al. (2018)
[52] Hidayat et al. (2019)
[53] Prasasti et al. (2019)
[54] Sa'diyah & Dwikurnaningsih (2019)
[55] Setyawan & Kristanti (2021)
[56] Sherviyana & Mansurdin (2020)

Improving Critical Thinking Ability and Learning Outcomes through the Application of the Discovery Learning Model in Thematic Learning for Grade 4 Primary School	Yulita Windarti, Slameto, Eunice Widyanti S	30%	82%	52	74,20%
Improving Critical Thinking Skills and Mathematics Learning Outcomes through the Discovery Learning Model in Grade IV Primary School	Dianita Eka Prasasti, Henny Dewi Koeswanti, Sri Giarti	38%	81%	43	69,30%
Application of the Discovery Learning Model to Improve Critical Thinking Ability and Mathematics Learning Outcomes of Grade 5 Primary School Students	Windi Oktaviani, Firosalia Kristin, Indri Anugraheni	26,90%	84,60%	57,7	78,90%
Critical Thinking Skills in Science Learning Through the Discovery Learning Model for Primary School Students	Rochmad Ari Setyawan, Hana Septina Kristanti	11%	83%	72	80,80%
Application of the Discovery Learning Model to Improve Critical Thinking Skills and Mathematics Learning Outcomes of Students	Arfika Wedekaningsih, Henny Dewi Koeswanti, Sri Giarti	4,30%	17,40%	13,1	13,60%
Total		**18,55%**	**67,50%**	**49,3**	**61,50%**

Based on the results of the data analysis above, it is proven that the discovery learning model can improve students' critical thinking skills starting from the lowest 13,6% to the highest 80,8% and the gained score is 49,3 with an average score of 61,50%. According to research[57], discovery learning model affects critical thinking skills of elementary school students with the average critical thinking ability test results using the discovery learning model is higher (67.50%) than the average test results using conventional learning, which is only 18.55%.

Table 9
Data analysis of the learning outcomes of primary school students

Tittle	Researcher	The result learning			
		before	after	Gain	Gain %
Improving Critical Thinking Skills and Learning Outcomes of Grade 4 Primary School Students through the Discovery Learning Model	Ratih Dwi Yulianti Rahayu, Mawardi, Suhandi Astuti	46%	85%	0,39	72,20%

[57] Hasnan et al. (2020)

Title	Authors				
Application of the Discovery Learning Model to Improve Creative Thinking Ability and Student Learning Outcomes	Nichen Irma Cintia, Firosalia Kristin, Indri Anugraheni	38%	84,60%	0,466	75,10%
Efforts to Improve Student Learning Outcomes Using the Discovery Learning Model in Primary Schools	Wilda Agnesia Panjaitan, Ester Julinda Simarmata, Regina Sipayung, Patri Janson Silaban	28,57%	85,70%	0,5713	79,90%
Application of Discovery Learning Model in Science Learning to Improve Critical Thinking Ability and Learning Outcomes of Primary School Students	Wahyu Candra Dwi Safitri dan Nani Mediatati	13%	83%	0,7	80,40%
Improving Learning Outcomes of Thermal Energy Transfer Materials Using the Discovery Learning Model in Class V B SDN Ngaglik 01 Batu City	Achmad Khoirul Bichar, Nur Widodo, Hermin Wiyanti	38,50%	76,90%	0,384	62,40%
Improving Mathematics Learning Outcomes for Grade 4 Primary School Students Using the 2013 Curriculum-Based Discovery Learning Learning Model	Rosemey Ratna Purnawati, Slameto, Elvira Hoesein Radia	50%	90%	0,4	80%
Improving Critical Thinking Ability and Learning Outcomes of Class IV Students Through the Discovery Learning Model on the Theme of the Beauty of Diversity in My Country	Toni Hidayat, Mawardi, Suhandi Astuti	33,30%	85,70%	0,524	78,50%
Improving Critical Thinking Ability and Learning Outcomes through the Application of the Discovery Learning Model in Thematic Learning for Grade 4 Primary School	Yulita Windarti, Slameto, Eunice Widyanti S	38%	85%	0,47	75,80%
Improving Critical Thinking Skills and Mathematics Learning Outcomes through the Discovery Learning Model in Grade IV Primary School	Dianita Eka Prasasti, Henny Dewi Koeswanti, Sri Giarti	35%	85%	0,5	76,90%

Application of the Discovery Learning Model to Improve Critical Thinking Ability and Mathematics Learning Outcomes of Grade 5 Primary School Students	Windi Oktaviani, Firosalia Kristin, Indri Anugraheni	34,61%	84,62%	49,99	76,40%
Application of the Discovery Learning Model to Improve Critical Thinking Skills and Mathematics Learning Outcomes of Students	Arfika Wedekaningsih, Henny Dewi Koeswanti, Sri Giarti	35%	87%	0,52	80%
Efforts to Increase Activeness and Science Learning Outcomes through the Discovery Learning Method in Class V Semester II SDN Madyogondo 2 Ngablak District, Magelang Regency	Indira M.S. Ferdinandus, Stefanus C. Relmasira, Agustina Tyas Asri Hardini	26%	87%	0,61	82,40%
Total		**34,60%**	**84,90%**	**50,2**	**76,67%**

Based on the results of the analysis shown in the table above, it is proven that the discovery learning model can improve the learning outcomes of elementary school students. Starting from the lowest total gain of 13% to the highest of 90% and the gained score is 50,2 with an average of 76,67%. Likewise, the results of a literature study from [58]; [59]; [60]; [61]; show that the discovery learning model can improve student learning outcomes. There is a significant increase in both cycle 1 and cycle 2.

To sum up the discussion above, the following chart depicts the comparison of critical thinking skills and learning outcomes results of elementary school students by applying discovery learning model.

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[58] Pangesti and Radia, "Metaanalisis Pengaruh Model Pembelajaran Discovery Learning Terhadap Hasil Belajar IPA Siswa Sekolah Dasar."

[59] Siswanti, "Penerapan Model Pembelajaran Discovery Learning Untuk Meningkatkan Minat Belajar Dan Hasil Belajar Dalam Pembelajaran IPA SD."

[60] Hannya and Kristin, "Meta Analisis Penggunaan Model Pembelajaran Discovery Learning Dalam Meningkatkan Hasil Belajar IPA Siswa SD."

[61] Sherviyana and Mansurdin, "Penerapan Model Discovery Learning Untuk Meningkatkan Hasil Belajar Tematik Terpadu Di Sekolah Dasar (Studi Literatur)."
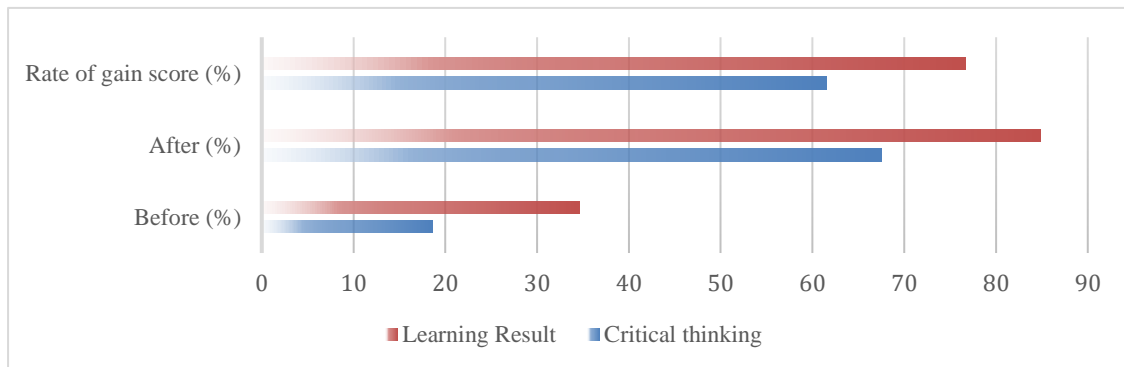
Graphic 1. Comparison of critical thinking and learning outcomes results

Chart 1 above clearly shows that the learning process with the discovery learning model, by investigating the steps, is able to improve students' learning outcomes as well as students 'critical thinking skills. It may be because in this model students have freedom to express their own ideas and opinions.

CONCLUSION

Based on 25 journals that have been reviewed, it shows that the discovery learning model with critical thinking skills has been widely used as an effort to improve the learning outcomes of elementary school students. The critical thinking process in elementary school students must be integrated in the learning process, namely the involvement of students as learning subjects because the 21st century learning model must scientifically collaborate the theories (material and knowledge) and facts with the aim of criticizing the phenomena that exist around students.

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DECLARATION OF CONFLICTING INTERESTS

The results of this research are purely reviewed and analyzed from the research team so that it is believed that there will be no conflict of interest while completing this article.

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