Prosiding Konferensi Ilmiah Dasar
Volume 2, 2020
ISSN: 2621-8097 (Online)
The article is published with Open Access at: http://prosiding.unipma.ac.id/index.php/KID

Scientific-based learning scenario to improve student's higher order thinking skills: A development concept

Ririn Setyowati ✉, Universitas Sebelas Maret
Sarwanto, Universitas Sebelas Maret
Muzzazinah, Universitas Sebelas Maret

✉ *setyowatiririn.2024@student.uns.ac.id*

Abstract: The era of the industrial revolution demands the ability of individuals to think at a high level amid technology-based civilization. Higher Order Thinking Skills are part of essential skills in the 21st century as a provision for future generations to avoid stuttering about future changes. Education becomes the most responsible field in producing quality human resources and has global competitiveness. Teachers as education implementers must realize that students' higher-order thinking skills can be developed if learning is organized in scenarios that are oriented towards active learning. Scientific-based learning scenarios can get students used to finding knowledge through experience, not from material already in the book. The concept of developing a scientific approach component that is integrated into the learning scenario aims to improve the HOTS of students. The development of the HOTS concept from four literature sources, namely concept Anderson & Krathwohl, Brookhart, Marzano, and the Assessment and Learning Center in Indonesia, is an effort to compile HOTS indicators by taking into account the strengths and weaknesses of each concept.

Keywords: Learning scenario, Scientific-based learning, Higher order thinking skills

Abstrak: Era revolusi industri menuntut kemampuan individu untuk berpikir pada tingkat tinggi di tengah peradaban berbasis teknologi. Higher Order Thinking Skills adalah bagian dari keterampilan penting di abad ke-21 sebagai bekal bagi generasi masa depan agar tidak gagap terhadap perubahan di masa mendatang. Pendidikan menjadi bidang yang paling bertanggung jawab dalam menghasilkan sumber daya manusia yang berkualitas dan memiliki daya saing global. Guru sebagai pelaksana pendidikan harus menyadari bahwa keterampilan berpikir tingkat tinggi siswa dapat dikembangkan jika pembelajaran disusun dalam skenario yang berorientasi pada pembelajaran aktif. Skenario pembelajaran berbasis saintifik dapat membuat siswa terbiasa menemukan pengetahuan melalui pengalaman, bukan dari materi yang sudah ada dalam buku. Konsep pengembangan komponen pendekatan saintifik yang diintegrasikan ke dalam skenario pembelajaran bertujuan untuk meningkatkan HOTS siswa. Pengembangan konsep HOTS dari empat sumber literatur, yaitu konsep Anderson & Krathwohl, Brookhart, Marzano, dan Pusat Asesmen dan Pembelajaran di Indonesia, merupakan upaya untuk menyusun indikator HOTS dengan memperhatikan kekuatan dan kelemahan masing-masing konsep.

Kata kunci: Skenario pembelajaran, Pembelajaran berbasis saintifik, Higher order thinking skills

INTRODUCTION

Globalization demands developments in various aspects, including education. Countries in the world have sought to develop the quality of education that is oriented towards optimizing the ability of students through various literacies. Indonesia has entered the era of the industrial revolution 4.0. The use of technology and exceptionally easy access in the future must be accompanied by students' high-level thinking skills or commonly called HOTS. HOTS as a provision for students in preparing themselves shows the quality of an individual amid in technology-based world civilization.

Based on the PISA in 2012, Indonesia ranked 64th out of 65 countries in the fields of literation, mathematics, and reading (OECD, 2012). Ichsan et al. (2019) have also researched for Higher Level Thinking Skills in elementary schools, secondary schools, undergraduate students to masters. Research results published at these levels are still at a low level.

HOTS influences students' thought processes to solve problems that have not even been experienced in real life. HOTS-oriented learning presents situations that require high reasoning and creativity so that if HOTS students are still at a low level, students will not be able to reach the thought process to find solutions to a problem. The main aim of HOTS is to solve real-world problems that begin with practicing solving problems in class. This ability refers to students' decision making skills to solve the problem. If these skills are not developed early on, students will become individuals who stutter about changes and problems that they will experience in the future (Sever & Ersoy, 2019).

Other than that, the teacher-centered approach is still often used in learning. It is very difficult to change because teachers who are not ready and students who are not accustomed to playing an active role in learning. This is common because children are accustomed to doing what is decided by adults. In this case, parents or teachers do not provide sufficient opportunities for students to actively make decisions independently, so students become passive (Pekince & Avci, 2018). Even though the fact is elementary school students have been able to make judgments through the activity of making decisions by asking questions and evaluating (Kaşkaya et al., 2017)

Educational stereotypes in Indonesia are also very difficult to accept developments and changes. An understanding is needed that books are only intermediaries and guidelines, but the student's thought process comes from experience. Because in reality in general, students only accept knowledge as information, not as a willingness to find that knowledge. This is also due to the lack of a teacher's ability to design student-centered plans or learning scenarios.

The development of high-level thinking skills provides awareness to all education implementers that students can demonstrate their existence in the future era depending heavily on this ability. The era of the industrial revolution will continue to develop as well as the ability of Indonesia's young generation not to be left behind and to be recognized by the world. Quality human resources will be the key answer to solving various problems with education as a forum for printing quality human resources. Teachers are one of the most prominent elements of skills education in being able to apply a contemporary approach that enables students to carry out active learning (Hursen & Fasli, 2017) to develop these abilities.

The concept of applying a scientific approach that is integrated into the learning scenario is believed to be able to develop students' higher-order thinking skills. A scientific approach including a student-centered approach is believed to be a golden bridge for the development and development of students' attitudes, knowledge, and skills (Ariyana et al., 2018). Abdullah & Osman's research (2010) regarding inventive scientific thinking skills influences various aspects of ability, one of which is HOTS. Besides, scenario-based learning creates opportunities for students to become more active and improve their real-life skills during their learning process (Sorin, 2012).

Higher Order Thinking Skills (HOTS) is the ability of students to think at a higher level (Ichsan et al., 2019). Lewis & Smith (1993) states that HOTS is an ability that occurs when someone obtains new information and relates it to information that is already in memory to be organized to expand information to enable the discovery of an answer or solution in certain situations. The ability to analyze, evaluate, and create is often referred to as HOTS (Garcia, 2015).

A scientific approach is believed to be able to provide students' thinking skills in facing problems in life (Zo'bi, 2014). The steps of a scientific approach, such as observing, asking, exploring, associating, and communicating can help students in the learning process to become active learners (Indrilla, 2018). Higher-order thinking skills is a new challenge in using the mind to manipulate new information or previous knowledge to reach possible answers in different situations (Heong et al., 2011). Scenario-based learning presents the situation by giving students more active roles and opportunities to develop real-life skills outside the institution and to be able to participate in the global world (Sorin, 2012). Based on the literature study conducted, the combination of the use of learning scenarios based on a scientific approach is the most basic step that can be done by a teacher in developing the higher-order thinking skills of students to prepare for future challenges.

LEARNING SCENARIO BASED ON A SCIENTIFIC APPROACH

A scientific approach is based on Piaget and Vigotsky's learning theory (Danoebroto, 2015). Based on Piaget's theory, learning relates to the formation and cognitive and mental development of children who intellectually adapt and coordinate with the environment, in other words, children's learning processes are not obtained through the teachings of adults and their environment. The cognitive and mental shape of the child is a process that is built in the child himself.

A scientific approach is defined as a learning process that is designed in such a way that students actively contract concepts, laws or principles through the stages of observing, formulating problems, proposing hypotheses, collecting data, analyzing, concluding and communicating these concepts, laws or principles (Hosnan, 2014; Machin, 2014). Chuntala (2019) also suggested that learning through a scientific approach can make students more active in constructing their knowledge and skills.

A scientific approach has been mandated in learning since the implementation of the 2013 Curriculum in Indonesia (Ariyana et al., 2018; Nugraha & Suherdi, 2017). Indonesian education process standards state that learning is done by choosing a scientific approach adapted to the characteristics of competency and education level (Minister of Education and Culture Regulation in Indonesian, 2013). The 2013 curriculum in Indonesia emphasizes cognitive, affective and performance competencies, so students are not only directed to be cognitively intelligent but have attitudes and skilled skills in communicating their knowledge (Ariyana et al., 2018).

Minister of Education and Culture Regulation in Indonesian No. 68/1/2013 states the 2013 curriculum goal is to prepare students to have life skills competencies as individuals and citizens who are loyal, productive, creative, and able to contribute to the lives of people, nations, and people human. Three focus points of the teaching and learning process with a scientific approach, namely attitude (affective), skills (psychomotor), and knowledge (cognitive). Attitude aspects refer to "learners know-why", skills refer to "learners know-how", and reference knowledge to "what learners know" (Atmarizon & Zaim, 2016). These three points are expected to make students creative, innovative, and productive as planned curriculum goals.

The Urgency of Using Learning Scenario

The learning scenario is a sequence of learning process activities arranged by a teacher so that a learning process occurs by what is desired and the achievement of the objectives to be achieved. The learning scenario is the design of learning activities created by teachers that have the potential to achieve certain Basic Competencies following the syllabus that has been created by the teacher. Learning devices are competencies that refer to actions that are rational and meet certain specifications in the learning process (Rando, 2016).

The preparation of a learning scenario is very dependent on the objectives to be achieved, where the steps contained in the scenario have an important influence to direct students to have the ability as expected in the goal. The most important aspect in determining the quality of learning is the extent to which lessons are acceptable and make sense for students (Rando, 2016). To ensure that learning makes sense, teachers must present learning scenarios in an organized manner. The right learning scenario containing active learning components can lead students to find their knowledge. Learning scenarios should include activities on how the teacher arranges the learning steps so that students "find the concept of material as stated in the book", not a step to deliver "what is already in the book".

Sorin (2012) states that learning with scenarios can create opportunities for students to be more active and develop real-life skills during the learning process they experience. The learning scenario designed by the teacher will be a reference for the direction of learning so that if the scenario is structured to display active learning, the learning process will have the opportunity to develop students' abilities. Learning scenarios with scientific methods are oriented to determine reality, conduct experiments, with predetermined steps.

Teachers as directors in learning have a dominant role to prepare scenarios or design active activities for students. The teacher's awareness to make small changes in learning is the main key in building a foundation to form habituation for students in developing their abilities through active learning. The scenarios that have been designed by the teacher lead students to become individuals who can rely on their ability to learn and individuals who are actively developing themselves. Learning scenarios arranged are expected to be able to provide experience, impressions, and meanings to students both in terms of knowledge, attitudes, and skills. This hope is what is called meaningful learning.

The Development of Scientific Approach Components

A scientific approach is an approach that has long been recommended for teachers to present active learning for students. It is necessary to develop a component of the scientific approach to develop strengths and minimize the shortcomings of the scientific approach from various literature sources. The stages of the scientific approach include scientific activities carried out by students in learning. Below are the stages of developing a scientific approach to learning that was presented from various sources, namely Hosnan (2014), Abidin (2014), Permendikbud (Minister of Education and Culture Regulations) (2013), and Daryanto (2014).

TABEL 1. *Scientific approach components*

Hosnan (2014)	Abidin (2014)	Minister of Education and Culture Regulation (2013)	Daryanto (2014)
(a) observing, which is done by identifying and finding a problem;	(a) scientifically observing;	(a) observation, through reading, listening, and seeing (without or with tools)	(a) finding problems;
(b) formulating the	(b) develop	(b) asking questions;	(b) formulating

problem, the formulation of the problem is followed by the activity of submitting and formulating conjectures;	intellectual curiosity through questions;	starting from factual questions to hypothetical questions	problems;
(c) collecting data, through various techniques and methods;	(c) building critical thinking;	(c) gathering information/ experimenting;	(c) collecting data and proposing hypothesis;
(d) analyze the data obtained and draw conclusions from the data that has been analyzed;	(d) experimenting;	(d) associate/ processing information;	(d) analyzing data;
and (e) communicating the concepts, laws, and principles discovered.	and (e) communicating.	and (e) communicating to form networks.	and (e) drawing conclusions.

Based on the stages or steps described from various sources above, a scientific approach can be developed and presented in learning activities with the following stages:

Observing

Observing activities carried out consciously and intentionally and systematically to learn a phenomenon or real object through the senses (Hosnan, 2014). This activity can be done by showing a real object that can be observed, able to attract the attention of students, and cause curiosity or want to know more.

Asking Questions

Asking questions is a process of building knowledge. At this stage, students ask questions about what has happened observed in the previous stage to get more information and understanding about the material. Questions expected at this stage must also require good question criteria: (a) concise and clear, (b) inspiring, (c) focusing on a particular subject, (d) probing and different, (e) valid questions, (f) increasing cognitive levels, and (g) building interactions (Hosnan, 2014; Abidin, 2014). The questioning activity requires interaction between the teacher-students and students-students so that the answers that come up not only come from the teacher but also answers from other students.

Trying or Experimenting

This activity aims to answer the questions in students and provide real and authentic learning by conducting experiments. The try phase can be done through experiments, observations, and interviews, reading texts or books or other sources (Minister of Education and Culture Regulation, 2013)

Reasoning

Reasoning activities can be in the form of analyzing and categorizing data obtained through trying activities. Information or data that has been collected from previous activities, analyzed to find out the relationship between questions and data obtained to obtain a conclusion. Ministry of Education and Culture in Indonesia (2013) explains that the reasoning process must go through: (a) processing information that has been collected from the results of experiments and observing activities and, (b) processing information collected to find solutions from various sources that have different opinions on the contrary. Thus, students are expected to be able to relate learning outcomes or experiment with the reality they find.

Communicating

This activity is the final stage in a scientific approach. At this stage, students communicate, demonstrate, and publish their learning products. The teacher provides feedback, suggestions, or further information related to students' work. The teacher also plays a role to provide correct information for students, so the communicating stage is the stage where students report or provide observations, experiments, and conclusions based on the results of the analysis verbally or in writing.

FOUR HIGHER ORDER THINKING SKILLS CONCEPTS

The ability to think at a higher level is a provision in the face of the Industrial Revolution 4.0. The modern era or commonly referred to as the 21st Century era provides a paradigm shift in the field of education that demands human resources to have the ability to live in the face of the times. Four essential skills in the 21st century, among others: critical thinking and problem-solving, effective communication, collaborating, and creativity and innovation (Ichsan et al., 2019; Partnership for 21st Century Skills, 2020)

The learning environment in the 21st century requires students to develop their thinking abilities that need to be trained early to be able to anticipate changes in the changing world environment today. By applying HOTS, students will understand concepts better, study more deeply, and realize that knowledge is broad. Through better understanding, students can know right or wrong information, can make ideas, can arrange hypotheses to solve problems around them.

Bloom categorizes the six levels of thinking in two skills, namely (a) low-level thinking skills which include remembering (level 1), understanding (level 2), and applying (level 3); and (b) higher-order thinking skills in the form of analytical skills that are analyzing (level 4), evaluating (level 5), and creating (level 6) (Ariyana et al., 2018). The last three levels of thought process are categorized in higher-order thinking skills because these skills will support a person's ability to deal with a problem which is then broken down into smaller parts (analysis) to look for relationships between problems, followed by providing an assessment of the strengths and weaknesses of the conditions occur (evaluation) and then seek an idea or ideas as solutions to problems (create). This flow will familiarize a person as a problem solver

Brookhart (2010) formulates the characteristics of HOTS that play a role in the transfer of knowledge, critical and creative thinking, and problem-solving. The relationship of the three characteristics can be presented in Figure 1.

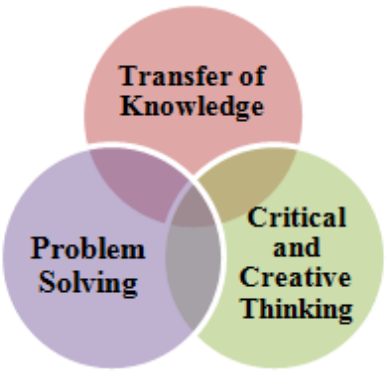

FIGURE 1. *Brookhart's HOTS Characteristics*

HOTS as a transfer of knowledge aims to provide meaningful learning that is the ability of students to apply their knowledge to different situations without the help or

guidance of educators and others. Anderson & Krathwohl (2001) divide the dimensions of knowledge into 4 categories, including: (a) factual knowledge, which consists of the basic elements that students must know in a discipline to solve problems in that discipline; (b) conceptual knowledge, which guides students to know the relationships between elements, can be in the form of schemes, models, or theories; (c) procedural knowledge, that can be termed as "knowledge of how" (Ariyana et al., 2018) so that this knowledge includes the ability to show how students can be able to apply a theory, practice scientific methods using algorithmic skills, techniques and methods (Ahmad & Sukiman, 2019) and (d) metacognitive knowledge, namely knowledge that includes the awareness of students.

HOTS as a process of thinking critically and creatively in learning is an attempt to shape students to be able to think logically or make sense, be reflective and be able to make decisions without the help of others (Brookhart, 2010). Critical thinking refers to the process by which all knowledge and skills possessed by students are used to solve problems, analyze, investigate, draw conclusions, and produce the desired conclusions. Whereas creative thinking refers to the ability of students to think differently, expressing solutions that did not exist before, even though it sounds strange or far-fetched, but this mindset shows that a student has creative thinking abilities (Ariyana et al., 2018). Creative thinking aims to produce change continuously and productive creativity not only shows the capacity for improvement but also the capacity for transformation, in other words the essence of creativity is to produce something new, so it does not always indicate which changes are better or worse (Nosari, 2012). The third characteristic of HOTS as a problem solver is HOTS's function informing students who can solve problems in real life, which are unique so that the procedure for solving a problem will be unique and no longer an ordinary (routine) (Brookhart, 2010).

Revision of Bloom's Taxonomy by Anderson & Krathwohl

Anderson & Krathwohl (2001) made improvements to Bloom's Taxonomy, which are arranged in three indicators as follows:

1. ***Analyze***
   Anderson & Krathwohl explained that analytical skills include problem-solving activities and finding relationships between them. The level of analysis is described in three abilities, namely: (a) differentiating, i.e. distinguishing whether the information is relevant or not; (b) organizing, i.e. recognizing how knowledge is the element that builds a structure; and (c) attributing, namely conveying an opinion from his perspective of the knowledge acquired.
2. ***Evaluation***
   Evaluation skills refer to decision making. Evaluation levels are categorized in two cognitive processes, namely: (a) checking, i.e. checking for errors that exist in a process and (b) critiquing, which provides an assessment of whether an opinion or result is by the criteria.
3. ***Creating***
   The skill of creating is the highest in organizing knowledge. Anderson & Krathwohl revealed that the skill of creating not only produces a unique work but also works from those formed based on various sources to produce something new. The level of creating is categorized into three processes, namely: (a) generating, namely creative activities that explore ideas and ideas to overcome problems; (b) planning, which is determining a method that will be used to solve problems; and (c) producing, namely the implementation of plans that have been prepared to produce an answer, solution or new product.

Brookhart's HOTS Assessment Concept

Brookhart (2010) also formulated three high-level thinking ability assessment indicators, including:

1. ***Assessing Analysis***
   The ability of analysis is assessed by the activity of breaking down information and describing each section for its relationship. Each piece of information is searched for the underlying reasons and then questioned by students who require them to find answers through the activities of differentiating and reasonably organizing information.
2. ***Assessing Evaluation***
   In assessing the ability to evaluate, teachers need to present a material to be assessed by students. The assessment uses criteria as a standard. Criteria can come from students, so this activity requires creativity. Evaluating activities are not just opinions, but must be supported by evidence and logic.
3. ***Assessing Creation***
   Brookhart adapted Bloom's taxonomy in the assessment of creation, where students can unify different things into new ways or rearrange existing things into something new. The ability of students to create is done by formulating varied solutions, planning procedures to achieve goals and produce something new.

Marzano's Thirteen HOTS Dimensions

Marzano et al. (1997) formulated indicators of high-level thinking ability in 13 dimensions, including: (1) comparing, by identifying similarities and differences in concepts; (2) classifying, by grouping things to be defined according to categories based on their attributes; (3) inductive reasoning, by concluding or generalizing principles from information or observations; (4) deductive reasoning, using generalizations and principles to make conclusions; (5) analyzing mistakes, by identifying mistakes in thinking; (6) build support, with supporting statements; (7) analyze perspectives, by identifying various perspectives on a concept and examining the logic behind it; (8) abstraction, by identifying themes that underlie information; (9) decision making, by applying criteria to choose solutions that look the same; (10) investigation, by solving problems that still have confusion or contradiction; (11) problem-solving, by overcoming obstacles or limiting conditions that impede the goal; (12) experimental inquiry, testing the explanation of observed phenomena; and (13) discovery, by developing unique products or processes to meet perceived needs.

The Thought Process Dimension by Indonesian Assessment and Learning Center (Pusmenjar)

In addition to the three experts, Pusmenjar (2020) formulated dimensions of cognitive thinking processes on three levels. Level 1 is knowledge and understanding, level 2 is an application, and level 3 is reasoning. Since 2015, Pusmenjar has suggested that level 3 reasoning is used to measure higher-order thinking skills (HOTS). The following dimensions of the thought process at the level of reasoning formulated by Pusmenjar, as follows: (1) analyzing (C4), in this process, students describe elements, organize, compare, and find implied meaning; (2) evaluating (C5), in this process students compile hypotheses, provide criticism, predict, provide judgment, test and justify or blame; (3) creating (C6), in this process students develop designs, discover, perfect, strengthen, critiquing, change, and build knowledge.

HOTS Indicators Development

Based on the indicators formulated by experts, HOTS indicators were developed by collaborating on aspects or dimensions of the thought process described in Table 2.

TABLE 2. *HOTS Indicators Development*

Analyzing The dimension of the process of analyzing thinking (C4) has the basic word "analysis" which means to parse, both information, problems, objects, and certain elements. Indicators of students' ability to analyze will be seen in the following thought processes: a) Students can distinguish whether the information observed is relevant and important. b) Students can group or classify information that has the same purpose. c) Students can compare the information with one another. d) Students can express opinions from their point of view (attributes). e) Students can organize things that compile information.
Evaluating The dimension of the process of thinking in evaluating (C5) is the ability of students to provide an evaluation or assessment. Indicators of ability to evaluate can be measured by looking at students' abilities in a variety of thought processes, as follows: a) Students can check for errors in information or investigate confusing/contradictory information. b) Students can formulate hypotheses or conjectures after analyzing information. c) Students can criticize whether the information is by the criteria. d) Students can justify or blame information based on their point of view. e) Students can show evidence or logic that supports their opinions. f) Students can make generalizations inductively after observing information. g) Students can make deductive generalizations in concluding.
Creating The dimension of the process of thinking in creating (C6) is the ability of students to uniting different things into new ways or rearranging existing things into something new. Indicators of the dimensions of the thought process of creating students can be formulated as follows: a) Students can explore ideas, ideas, points of view, or hypotheses to overcome a problem. b) Students can plan problem-solving through certain methods or strategies. c) Students can carry out plans that have been prepared to produce an answer, solution, or new product.

CONCLUSION

The ability to think at a higher level is a challenge in the 21st century and the era of increasingly advanced globalization. The teacher has an important role in presenting oriented learning to develop students' thinking abilities. Teachers have an obligation in compiling learning scenarios that can lead students to find knowledge through scientific activities. The scientific approach needs to be applied in the teacher learning scenario so that it is no longer focused on the material in the book.

The development component of the scientific approach consists of (a) observing objects or events that can attract students' curiosity; (b) asking questions to build new knowledge; (c) try or experiment to find out a real phenomenon; (d) reasoning to analyze the difference between knowledge and the real world, (e) communicating to get students accustomed to conveying knowledge gained both orally and in writing. These components will be a promising stage for developing HOTS students which consist of the ability to analyze (differentiate, classify, compare, express opinions, organize, make inductive generalizations, and deductive generalizations); evaluate (check for mistakes, compile hypotheses, criticize, justify/blame and show logical proof); creating (exploring ideas, planning, and implementing plans).

REFERENCES

1. Abidin, Y. (2014). *Desain Sistem Pembelajaran dalam Konteks Kurikulum 2013.* Bandung: PT Refika Aditama
2. Ahmad, I. F., & Sukiman, S. (2019). Analisis Higher Order Thinking Skillss (HOTS) pada Soal Ujian Akhir Siswa Kelas 6 KMI dalam Kelompok Mata Pelajaran Dirosah Islamiyah di Pondok Modern Tazakka Batang. *Jurnal Pendidikan Agama Islam*, 16(2), 137-164. doi: 10.14421/jpai.2019.162-02
3. Anderson, L. W. & Krathwohl, D.R., et al. (2001). *A taxonomy for learning, teaching and assessing: A revision of Bloom's taxonomy of educational objectives*. New York, NY: Longman
4. Ariyana, T., Pudjiastuti, A., Bestary, R, Zamroni. (2018). *Buku Pegangan Pembelajaran Berorientasi pada Keterampilan Berpikir Tingkat Tinggi*. Jakarta: Direktorat Jenderal Guru dan Tenaga Kependidikan Indonesia
5. Assessment and Learning Center (Pusmenjar). (2020). *Ujian Nasional*. Retrieved from https://pusmenjar.kemdikbud.go.id/ujian-nasional-un/
6. Atmarizon, D., & Zaim, M. (2016). The Implementation of Scientific Approach in Teaching English at the Tenth Grade of Senior High School 7 Padang. *Komposisi: Jurnal Pendidikan Bahasa, Sastra, dan Seni*, 17(1), 1-18. doi: 10.24036/komposisi.v17i1.8113
7. Brookhart, S. M. (2010). *How to Assess Higher Order Thinking Skills in Your Classroom*. United State of America, USA: Association for Supervision and Curriculum Development (ASCD)
8. Chuntala, A. D. W. (2019). Saintific Approach in 21st Century Learning in Indonesian Language Learning Vocational School of Pharmacy. *International Journal of Active Learning*, 4(2), 71-77. doi: 10.15294/ijal.v4i2.17181
9. Danoebroto, S. W. (2015). Teori belajar konstruktivis Piaget dan Vygotsky. *Indonesian Digital Journal of Mathematics and Education,* 2(3), 191-198. doi:
10. Daryanto*. (*2014*). Pendekatan Pembelajaran Saintifik Kurikulum 2013*. Yogjakarta: Penerbit Gava Media
11. Garcia, L. C. (2015). Environmental Science Issues for Higher-Order Thinking Skills (HOTS) Development: A Case Study in the Philippines. *Biology Education and Research in a Changing Planet*, 45–54. doi: 10.1007/978-981-287-524-2_5
12. Heong, Y. M., Othman, W. B., Yunos, J. B. M., Kiong, T. T., Hassan, R. B., Mohamad, M. M. B. (2011).The level of marzano higher order thinking skillss among technical education students. *International Journal of Social Science and Humanity,* 1(2), 121-125. doi: 10.7763/IJSSH.2011.V1.20
13. Hosnan, M. (2014). *Pendekatan Saintifik dan Kontektual dalam Pembelajaran Abad 21*. Bogor: Ghalia Indonesia
14. Hursen, C., & Fasli F. G.(2017). Investigating the Efficiency of Scenario Based Learning and Reflective Learning Approaches in Teacher Education. *European Journal of Contemporary Education*, 6(2), 264 – 279. doi: 10.13187/ejced. 2017.2.264
15. Ichsan, I. Z., Sigit, D. V. M., Miarsyah, Ali, A., Arif, W. P., Prayitno, T. A. (2019). HOTS-AEP: Higher Order Thinking Skills From Elementary To Master Students In Environmental Learning. *European Journal of Educational Research,* 8(4), 935-942. doi: 10.12973/eu-jer.8.4.935
16. Indrilla, N. (2018). The Effectiveness of Scientific Approach and Contextual Teaching and Learning Approach in Teaching Writing. *Lingua Cultura,* 12(4), 405 – 413. doi: 10.21512/lc.v12i4.4452
17. Kaşkaya, A., Calp, Ş., & Kuru, O. (2017). An evaluation of factors affecting decision making among 4th grade elementary school students with low socio-economic status. *International Electronic Journal of Elementary Education*, 9(4), 787-808.
18. Lewis, A., & Smith, D. (1993). Defining higher order thinking. *Theory Into Practice,* 32(3), 131–137. doi: 10.1080/00405849309543588
19. Abdullah, M. & Osman, K. (2010). Scientific Inventive Thinking Skills among Primary

Students in Brunei. *Procedia - Social and Behavioral Sciences,* 7, 294–301. doi: 10.1016/j.sbspro.2010.10.041
20. Machin, A. (2014). Implementasi Pendekatan Saintifik, Penanaman Karakter dan Konservasi pada Pembelajaran Materi Pertumbuhan. *Jurnal Pendidikan IPA Indonesia (JPII),* 1, 28 – 35. doi: 10.15294/jpii.v3i1.2898
21. Marzano, R. J., Pickering, D. J., Arredondo, D. E., Blackburn, G. J., Brandt, R. S., Moffett, C. A., Paynter, D. E., Pollock, J. E., Whisler, J. S. (1997). Dimension of Learning Trainer's Manual (2nd Ed). Aurora, Colorado: Mid-continent Research for Education and Learning (McREL)
22. Minister of Education and Culture Regulation 81A. Lampiran Permendikbud Nomor 81A Tahun 2013 Tentang Implementasi Kurikulum Pedoman Umum Pembelajaran, Kementerian Pendidikan dan Kebudayaan Jakarta. Retrieved from http://www.kemdikbud.go.id.
23. Minister of Education and Culture Regulation No. 68. Lampiran Peraturan Menteri Pendidikan dan Kebudayaan Republik Indonesia Nomor 68 Tahun 2013. Tentang. Kerangka Dasar Dan Struktur Kurikulum. Sekolah Menengah Pertama/Madrasah Tsanawiyah, Kementerian Pendidikan dan Kebudayaan, Jakarta. Retrieved from http://www.kemdikbud.go.id.
24. Ministry of Education and Culture. Materi Pelatihan Guru Implementasi Kuriulum 2013, Departemen Pendidikan dan Kebudayaan, Jakarta Retrieved from http://www.kemdikbud.go.id.
25. Nosari, S. (2012). Creativity at the Crossroad Creative Education as Moral Education?. *Creative Education*, 3, 63-65. doi: 10.4236/ce.2012.37B015
26. Nugraha, I. S., & Suherdi, D. (2017). Scientific Approach: An English Learning-Teaching (ELT) Approach In The 2013 Curriculum. *Journal of English and Education,* 5 (2), 112 – 119.
27. OECD. (2012). *PISA Results in Focus "What 15-year-olds know and what they can do with what they know"*, Retrieved from https://www.oecd.org/pisa/keyfindings/pisa-2012-results-overview.pdf
28. Partnership for 21st Century Skills. (2020). *Our mission is to realize the power and promise of 21st century learning for every student—in early learning, in school, and beyond school—across the country and around the globe*, Retrieved from http://www.p21.org
29. Pekince, P., & Avci, N. (2018). Children's Perspective on the Right of Self-determination. *International Electronic Journal of Elementary Education*, 10(4), 431-439. doi: 10.26822/iejee.2018438133
30. Rando, A. (2016). Pengembangan Perangkat Pembelajaran dalam Implementasi Strategi Contextual Teaching Learning untuk Meningkatkan Hasil Belajar IPS Pokok Bahasan Perkembangan Teknologi pada Peserta didik Kelas IV SD. *Jurnal Pendidikan (Teori dan Praktik),* 1 (1), 1 -11. doi: 10.26740/jp.v1n1.p1-12
31. Sever, I., & Ersoy, A. (2019). Investigation of Decision-Making Skills of Fourth Grade Students According to Student and Teacher Opinions. *International Electronic Journal of Elementary Education*, 12(2), 167-182. doi: 10.26822/iejee.2019257664
32. Sorin, R. (2012). *Scenario-based learning: Transforming Tertiary Teaching and Learning*. Paper presented at 8th QS Asia Pacific Professional Leaders in Education Conference, Bali, Indonesia.
33. Zo'bi, S. A. (2014). The Effect of Using Socio-Scientific Issues Approach in Teaching Environmental Issues on Improving the Students Ability of Making Appropriate Decisions Towards these Issues. *International Education Studies,* 7(8), 113-123. doi: 10.5539/ies.v7n8p113