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Reflective Thinking Skills: A Survey Study on Biology Learning in Senior High School

Reflective Thinking Skills: A Survey Study on Biology Learning in Senior High School

Hikmah Nur Fadillah [1], Susriyati Mahanal[2]*, Balqis[3]

[1,2,3] Pendidikan Biologi/Fakultas Matematika dan Ilmu Pengetahuan Alam, Universitas Negeri Malang, Jl. Semarang No. 5, Malang.

Abstrak

Siswa perlu memiliki keterampilan abad 21 dalam belajar agar mampu menghadapi berbagai tuntutan dan tantangan global. Keterampilan berpikir berpikir reflektif merupakan keterampilan fundamental yang penting dimiliki oleh siswa pada pembelajaran abad ke-21. Berpikir reflektif adalah kemampuan indvidu secara terarah dan tepat dalam menyadari, menganalisis, mengevaluasi, dan memotivasi proses belajar sendiri. Tujuan penelitian ini adalah untuk mengetahui keterampilan berpikir reflektif siswa SMA Negeri 3 Wajo. Metode penelitian yang digunakan dalam penelitian ini adalah metode penelitian deskriptif kualitatif. Sampel penelitian ini adalah siswa SMA Negeri 3 Wajo. Jumlah sampel dalam penelitian ini adalah 100 siswa. Keterampilan berpikir reflektif siswa diukur menggunakan instrumen angket. Indikator yang digunakan untuk mengukur keterampilan berpikir reflektif siswa terdiri dari empat yaitu *Habitual Action* (Tindakan Kebiasaan), *Understanding* (Pemahaman), *Reflection* (Refleksi) dan *Critical Reflection* (Refleksi Kritis). Berdasarkan dari hasil analisis yang telah dilakukan, keterampilan berpikir reflektif siswa SMAN 3 Wajo masih berada pada kategori rendah dengan persentase sebesar 37,95% dan perlu ditingkatkan untuk setiap indikator keterampilan berpikir reflektif. Keterampilan berpikir reflektif dapat dilatih dan ditingkatkan melalui model dan metode pembelajaran yang tepat.

Kata kunci: Keterampilan Berpikir Reflektif; Keterampilan Berpikir Reflektif Siswa; Keterampilan Abad ke-21

Abstract

Students need to have 21st-century skills in learning to face various global demands and challenges. Reflective thinking skills are fundamental skills that are important for students to have in 21st-century learning. Reflective thinking is the ability of individuals to be directed and precise in realizing, analyzing, evaluating, and motivating their learning process. This study aimed to see the students' critical thinking skills at SMA Negeri 3 Wajo. The research method used in this study is the qualitative descriptive research method. The sample of this study was students of SMA Negeri 3 Wajo. The number of samples in this study was 100 students. Students' reflective thinking skills were measured using questionnaire instruments. The indicators used to measure students' reflective thinking skills consist of four: Habitual Action, Understanding, Reflection and Critical Reflection. Based on the results of the analysis that has been done, the reflective thinking skills of SMAN 3 Wajo students are still in the low category with a percentage of 37.95% and need to be improved for each indicator of reflective thinking skills. Reflective thinking skills can be trained and improved through appropriate learning models and methods.

Keywords: reflective thinking skills, Students' reflective thinking skills, 21st century skills

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Corresponding Author*
Susriyati Mahanal, Universitas Negeri Malang, *E-mail*: susriyati.mahanal.fmipa@um.ac.id

INTRODUCTION

Students need to have 21st-century skills in learning to face various global demands and challenges. Trilling and Fadel (2009) and Bahri et al. (2019) stated that students must master various skills relevant to 21st-century education. 21st-century learning has very high demands for

education to create quality human resources. Life in the 21st century demands breakthroughs in thinking, acting, and conceptualizing (Wijaya et al., 2016). Reflective thinking skills are fundamental skills that are important for students to have in 21st-century learning (Syamsuddin, 2019; Zubaidah, 2016).

Reflective thinking is the ability of individuals to purposefully and appropriately realize, analyze, evaluate, and motivate their learning process (Gurol, 2011). Reflective thinking skills are one of the higher-order thinking skills that have four indicators, namely "habitual action", "understanding", "reflection", and "critical reflection" (Lethbridge et al., 2013). Reflective thinking skills relate to the critical thinking process, which refers to analyzing and making judgments (Peltier et al., 2005). Students who think reflectively can analyze situations, provide judgments and make subsequent decisions (Funny et al., 2019). The learning process in schools has yet to fully implement a learning model that develops student competencies needed in the 21st century, thus causing students' 21st-century skills to be low (Lufri et al., 2021).

The research results on students' reflective thinking skills in several countries and regions in Indonesia are still in the low category. The research results in Turkey showed that students' reflective thinking skills were still in the low category, with a percentage of 27,36% (Erdogan, 2019). A study in Austria showed that the percentage of students' reflective thinking ability was 34.9%, which means that students' reflective thinking skills were still in the low category (Slepcevic-Zach & Stock, 2018). The research results in South Kalimantan, Indonesia, showed that students' reflective thinking skills were in the medium category, with a percentage of 50% (Fedinafaliza et al., 2021). The reflective thinking skills of students in West Java, Indonesia, showed a percentage of 36.5%, which means it is in the low category (Sihaloho & Zulkarnaen, 2019).

Students' Low reflective thinking skills are caused by an inability to identify problems and associate problems with their knowledge, so they cannot reflect on their knowledge (Sihaloho & Zulkarnaen, 2019). The teacher explains the concepts directly and needs to facilitate students to think reflectively, so students are not trained to build and reflect on their knowledge independently (Salido & Dasari, 2019; Sari et al., 2020). Students' reflective thinking skills are important to be trained in the learning process so that students can understand the concepts learned and relate concepts to experience so that they can solve the problems faced and be able to evaluate these problems (Kurt, 2018). This study aims to determine the reflective thinking skills of students of SMAN 3 Wajo.

METHOD

The research method used in this study is the quantitative descriptive research method. This study used a survey type of research. The sample of this study was students of SMAN 3 Wajo. The number of samples in this study was 100 students. Data collection in this study was

through the dissemination of reflective thinking skills questionnaires with the help of Googleform. Students' reflective thinking skills were measured using questionnaire instruments adapted from Kember et al. (2000). The reflective thinking skills questionnaire consists of 16 statements and has five answer choices, namely Very Agree (VA), Agree (A), Disagree Less (DL), Disagree (D), and Very Disagree (VD). The indicators used to measure students' reflective thinking skills are habitual action, understanding, reflection and critical reflection.

The questionnaire assessment score uses the likert scale with a score of 1-5 as described in Table 1 and the indicators of reflective thinking skills can simply be seen in Table 2.

Table 1. Score on the Likert Scale

Positive Statements	Score	Negative Statements	Score
Very Agree	5	Very Agree	1
Agree	4	Agree	2
Disagree Less	3	Disagree Less	3
Disagree	2	Disagree	4
Very Disagree	1	Very Disagree	5

Tabel 2. Reflective Thinking Indicator

Indicator	Indicator Description	Statement Number
Habitual Action	Automatic actions or performance of students with little awareness of thinking	1, 2, 3, 4
Understanding	Students' ability to understand concepts in academic learning	5, 6, 7, 8
Reflection	Students' ability to engage in intellectual and affective activities, such as asking questions, testing assumptions on problem solving, and finally gaining new understanding and appreciation	9, 10, 11, 12
Critical Reflection	A process of reasoning that eventually achieves a transformation of perspective. Have a consideration identity, able to think reflectively to produce feedback and decisions on learning.	13, 14, 15, 16

RESULT AND DISCUSSION

Result

Research has been carried out by taking data using reflective thinking skills questionnaires consisting of four indicators and four answer choices, namely: Very Agree (VA), Agree (A), Disagree Less (DL), Disagree (D), Very Disagree (VD). Based on the results of the research that has been carried out, the results of the analysis of reflective thinking skills of SMAN 3 Wajo students can be seen in the following table.

Table 3. Results of Analysis of Students' Reflective Thinking Skills

No.	Indicator	Multiple Statements	Percentage (%)	Category
1	Habitual Action	4	46,71	Low
2	Understanding	4	36,05	Low
3	Reflection	4	34,05	Low
4	Critical Reflection	4	35	Low

The diagram of the results of the analysis of students' reflective thinking skills can be seen in the following figure.

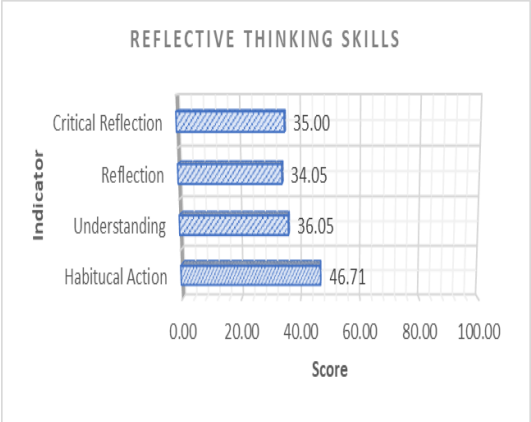

Figure 1. Results of Analysis of Students' Reflective Thinking Skills

Discussion

Habitual Action Indicator

Habitual action whereas a deep approach to learning, which entails an intention to understand meaning and link it to previous knowledge and personal experience to construct new knowledge, is aligned with reflective thinking (Zhang et al, 2017). Habitual actions have been learned before and are often done so that they become activities done automatically with little awareness of thinking (Kember et al., 2000). The analysis results on the habitual action indicator showed an average of 46.71%, which means that students are not used to doing tasks spontaneously and feel no need to think and learn too much as long as they can remember biological material notes for the exam. Students need to be trained in conducting biology discussions and feel no need to study biology material too much because students are still used to following what the teacher says. The achievement of habitual actions is said to be lacking if learning emphasizes memorization rather than reflection, only focusing on what is requested by the teacher without exploring more about what has been learned and only focusing on grades rather than what is learned (Lethbridge *et al*., 2013).

Based on the analysis results, reflective thinking skills on the habitual action indicator still need to be trained by familiarizing students with direct tasks, embracing material, conducting group discussions, and focusing students on the learning process so that students are more accustomed to taking action. Things that can be done to direct students to be more accustomed to acting in the reflection process is to do activities that can develop thinking skills, such as getting used to reading, getting used to writing, and others (Yuen Lie Lim, 2011).

Understanding Indicator

Understanding is a thought or learning called wise action, which is utilizing existing knowledge without trying to reflect it so that its meaning does not change (Mezirow, 1997). Reflective thinking skills are used to increase understanding of oneself, develop one's

potential, assess oneself, increase self-confidence, evaluate learning to achieve learning outcomes (Davis & McDonald, 2019; Zulfikar & Mujiburrahman, 2018).

The analysis results on the understanding indicator showed an average of 36,05%, which means that students' reflective thinking skills on the understanding indicator are still in the low category. Low reflective thinking skills in comprehension indicators are caused by students feeling that they need help understanding important concepts from topics taught in biology subjects and never thinking about the material being studied to understand the material better. Therefore, students' reflective thinking skills on indicators of understanding still need to be trained in a way that leads students to utilize previous knowledge to take action.

Students will better understand the learning context with identifying the problem (Akbar et al., 2022; Sumitro et al., 2019). Understanding the material topic is important for students to plan the learning process and reflect on the next action in achieving the desired learning goals (Hidajat et al., 2019).

Reflection Indicator

Students' ability to engage in intellectual and affective activities, such as asking questions, testing assumptions on problem solving, and finally gaining new understanding and appreciation. Reflection activities can make students active in learning, improve student metacognition, and develop independent learning skills (Greenwood, 2019). Reflection carried out at the end of learning through writing new experiences and knowledge can positively impact students' memory of the material taught (Setiawan, 2018).

The analysis showed that reflective thinking skills in the reflection indicator showed an average of 34,05%, which means it is still in the low category. Students' reflective thinking skills on reflection indicators are low because they have yet to be trained to reassess their learning and feel no need to learn from experience to improve subsequent learning outcomes. In addition, based on the results of the analysis of reflective thinking skills questionnaires on reflection indicators, students mentioned that they did not think about a good way to learn and did not know their learning styles. Therefore, students need to be taught to recognize their respective ways and learning styles.

Learning style needs to be recognized in individuals to concentrate on the learning process, mastering new and difficult information through different ways and perceptions (Balta, 2018; Sari & Sartika, 2021). Learning styles can influence the reflective thinking process because by knowing learning styles, students will be able to reflect on learning by finding out what is needed in the learning process and thinking (Nabilah et al., 2023; Uluçınar Sağır et al., 2016). Reflective thinking skills concern the ability to rethink and reevaluate strategies to make informed decisions (Gencel & Saracaloğlu, 2018). In addition, it is also important to know student learning styles so that teachers can improve students' reflective thinking skills for each learning style owned by students (Mentari et al., 2018).

Critical Reflection Indicator

Critical reflection is validating the truth of actions carried out critically. Reflection requires a critical review of the presuppositions of previous learning, both conscious and unconscious, and their consequences (Kember et al., 2000). The analysis results showed that students' reflective thinking skills on the critical reflection indicator were still in the low category, with an average result of 35.00%. Low reflective thinking skills in critical reflection indicators are caused by students needing to solidify previously known concepts of biological material. Students can also not make up their minds if they find a misunderstanding of concepts with what was previously believed to be true. Indicators of critical reflection on reflective thinking skills are shown in students' ability to use their experiences and ideas in the learning process (Davis & McDonald, 2019; Handayani et al., 2020). Students can be expressed as having reflective thinking skills when students have been able to face difficulties over solutions, correct misunderstandings of concepts and make correct conclusions (Agustan et al., 2017; Aydoğmuş & Şentürk, 2023).

Based on the results of the analysis that has been done, the reflective thinking skills of SMAN 3 Wajo students are still in the low category and need to be improved for each indicator of reflective thinking skills. Reflective thinking skills can be trained and improved through appropriate learning models and methods. Empowering reflective thinking skills can be done through problem-based learning such as the RICOSRE model and Problem-Based Learning (Aydoğmuş & Şentürk, 2023; Gega et al., 2019; Sriyati, 2020; Yuni et al., 2021). The RICOSRE model is a learning model that facilitates students thinking, finding solutions to a problem, getting concepts and relating these concepts to other problems similar to previous problems (Mahanal & Zubaidah, 2017). Problem-based learning is real-life problem-based teaching that can train learners to think critically and analytically. Learning using problems trains students to understand, apply, analyze, synthesize, and evaluate knowledge to solve problems (Hartono & Sari, 2022).

Reflective thinking skills can be developed by directing students to keep a study journal and conduct reflection activities at the end of each lesson (Evans, 2010). The main factor in the learning journal is self-reflection on something that has been read or is being studied, the results of observations made, and students' thoughts during learning (Setiawan, 2018). Reflective thinking skills can be trained by familiarizing students with reflective thinking in the learning process (Nindiasari, 2020). Arguing clearly and supported by relevant sources based on reason also improves reflective thinking skills (Rosmiati et al., 2020).

CONCLUSION

The conclusion from the results of this study is that the reflective thinking skills of SMAN 3 Wajo students in Biology Subjects are still in the low category. This is evidenced by the

analysis of reflective thinking skills, resulting in an average percentage of 37.95%, which means students' reflective thinking skills still need to improve. Students' reflective thinking skills could be higher due to internal student factors and a lack of empowerment of reflective thinking skills from teachers. Therefore, students' reflective thinking skills need to be trained through appropriate learning strategies and empower students' reflective thinking skills in the learning process.

REFERENCES

Agustan, S., Juniati, D., & Siswono, T. Y. E. (2017). Profile of male-field dependent (FD) prospective teacher's reflective thinking in solving contextual mathematical problems. *AIP Conference Proceedings*, *1867*, 1–7. https://doi.org/https://doi.org/10.1063/1.4994437

Akbar, F. N., Kusmayadi, T. A., & Fitriana, L. (2022). Pre-reflective thinking in solving PISA-like questions in terms of self-confidence. *AIP Conference Proceedings*, *2566*(020002), 1–14. https://doi.org/DOI:10.1063/5.0116609

Aydoğmuş, M., & Şentürk, C. (2023). An investigation into the predictive power of reflective thinking on learning strategies. *Reflective Practice*, *24*(2), 210–223. https://doi.org/10.1080/14623943.2022.2158796

Bahri, A., Idris, I. S., Nurman, R., & Ristiana, E. (2019). PBLRQA Strategy Potential in Enhancing Metacognitive Skills of Students with Different Academic Achievement. *Journal of Physics: Conf. Series*, *1317*(012199), 1–9. https://doi.org/10.1088/1742-6596/1317/1/012199

Balta, E. E. (2018). Reflective Thinking Tendencies and Epistemological Beliefs in Terms of Learning Styles. *International Journal of Higher Education*, *7*(6), 106–117. https://doi.org/https://doi.org/10.5430/ijhe.v7n6p106

Davis, A., & McDonald, D. (2019). Teachers' reflections of instructional effectiveness: self-assessment through a standards-based appraisal process. *Reflective Practice*, *20*(1), 125–141. https://doi.org/https://doi.org/10.1080/14623943.2019.1569508

Erdogan, F. (2019). Effect of cooperative learning supported by reflective thinking activities on students' critical thinking skills. *Eurasian Journal of Educational Research*, *2019*(80), 89–112. https://doi.org/10.14689/ejer.2019.80.5

Evans, J. S. B. T. (2010). Intuition and reasoning: A dual-process perspective. *Psychological Inquiry*, *21*(4), 313–326. https://doi.org/10.1080/1047840X.2010.521057

Fedinafaliza, F., Mahdian, M., & Irhasyuarna, Y. (2021). Meningkatkan Kemampuan Berpikir Reflektif Dan Hasil Belajar melalui Implementasi Model FPOEIL. JCAE (Journal of Chemistry And Education), 4, 58–66. https://doi.org/10.20527/jcae.v4i2.623

Funny, R. A., Ghofur, M. A., Oktiningrum, W., & Nuraini, N. L. S. (2019). Reflective thinking skills of engineering students in learning statistics. *Journal of Mathematics Education*, *10*(3), 445–458. https://doi.org/https://doi.org/10.22342/jme.10.3.9446.445-458

Gega, M., Noer, H., & Gunowibowo, P. (2019). Pengaruh Model Problem Based Learning Terhadap Kemampuan Berpikir Reflektif dan Self Efficacy Siswa. *Jurnal Pendidikan Matematika Unila*, *7*(1). https://core.ac.uk/download/pdf/295479887.pdf

Gencel, I., & Saracaloğlu, A. S. (2018). The Effect of Layered Curriculum on Reflective Thinking and on Self-Directed Learning Readiness of Prospective Teachers. *International Journal of Progressive Education*, *14*(1), 8–20. https://doi.org/10.29329/ijpe.2018.129.2

Greenwood, R. (2019). Pupil Involvement in Planning Topics Using KWL Grids: Opinions of Teachers, Student Teachers and Pupils. *Educational Studies*, *45*(4), 497–519. https://doi.org/10.1080/03055698.2018.1509773

Gurol, A. (2011). Determining the Reflective Thinking Skills of pre-service teachers in the learning and teaching process. *Energy Education Science and Technology*, *3*(3), 387–402.

Handayani, U. F., Sa'Dijah, C., Sisworo, Sa'Diyah, M., & Anwar, L. (2020). Mathematical creative thinking skill of middle-ability students in solving contextual problems. *AIP Conference Proceedings*, *2215*(060007). https://doi.org/https://doi.org/10.1063/5.0000645

Hartono, R. I. A. H., & Sari, M. S. (2022). Pengaruh Model Problem Based Learning Berbantuan Asesmen Formatif Terhadap Keterampilan Berpikir Kritis Dan Hasil Belajar Kognitif Peserta Didik Kelas X Mipa Sman 4 Malang Pada Materi Perubahan Lingkungan. *Jurnal Pendidikan Biologi*, *13*(2), 137–151. https://doi.org/10.17977/um052v13i2p137-151

Hidajat, F. A., Sa'dijah, C., Sudirma, & Susiswo. (2019). Exploration of Students' Arguments to Identify Perplexity from Reflective Process on Mathematical Problems. *International Journal of Instruction*, *12*(2), 573–586. https://doi.org/https://doi.org/10.29333/iji.2019.12236a

Kember, D., Leung, D. Y. P., Jones, A., Loke, A. Y., McKay, J., Sinclair, K., Tse, H., Webb, C., Wong, F. K. Y., Wong, M., & Yeung, E. (2000). Development of a questionnaire to measure the level of reflective thinking. In Assessment and Evaluation in Higher Education (Vol. 25, Issue 4, pp. 381–395). https://doi.org/10.1080/713611442

Kurt, M. (2018). Quality in reflective thinking: elicitation and classification of reflective acts. *Quality and Quantity*, *52*, 247–259. https://doi.org/10.1007/s11135-017-0609-1

Lethbridge, K., Andrusyszyn, M. A., Iwasiw, C., Laschinger, H. K. S., & Fernando, R. (2013). Assessing the psychometric properties of Kember and Leung's Reflection Questionnaire. *Assessment and Evaluation in Higher Education*, *38*(3), 303–325. https://doi.org/10.1080/02602938.2011.630977

Lufri, L., Elmanazifa, S., & Anhar, A. (2021). Pengaruh Model Pembelajaran Problem Based Learning Yang Di Intervensi Teknologi Informasi Terhadap Keterampilan Komunikasi Peserta Didik. *Jurnal Pendidikan Biologi*, *12*(3), 182–186. https://doi.org/10.17977/um052v12i3p182-186

Mahanal, S., & Zubaidah, S. (2017). Model Pembelajaran RICOSRE yang Berpotensi Memberdayakan Keterampilan Berpikir Kreatif. *Jurnal Pendidikan: Teori, Penelitian, Dan Pengembangan*, *2*(5), 676–685.

Mentari, N., Hepsi, N., & Pamungkas, A. S. (2018). Analisis Kemampuan Berpikir Reflektif Siswa SMP Berdasarkan Gaya Belajar. *Numerical: Jurnal Matematika Dan Pendidikan Matematika*, *2*(1), 31–42. https://doi.org/https://doi.org/10.25217/numerical.v2i1.209

Nabilah, Amrullah, Lu'luilmaknun, U., & Sriptani. (2023). Analisis Kemampuan Berpikir Reflektif Matematis Siswa Ditinjau Dari Gaya Belajar. *Journal of Classroom Action Research*, *5*(1), 185–193. https://doi.org/10.29303/jcar.v5i1.2643

Nindiasari, H. (2020). *Meningkatkan Disposisi Berpikir Reflektif Matematis Melalui Pembelajaran Dengan Pendekatan Metakognitif* . Universitas Sultan Ageng Tirtayasa. https://dx.doi.org/10.30870/jppm.v13i1.4724

Peltier, J. W., Hay, A., & Drago, W. (2005). The Reflective Learning Continuum: Reflecting on Reflection. *Journal of Marketing Education*, *27*(3), 250–263. https://doi.org/https://doi.org/10.1177/0273475305279657

Rosmiati, R., Liliasari, L., Tjasyono, B., Ramalis, T. R., & Satriawan, M. (2020). Measuring the level of reflective thinking of physics pre-service teachers using effective essay argumentation. *Reflective Practice*, 565–586. https://doi.org/10.1080/14623943.2020.1777957

Salido, A., & Dasari, D. (2019). The analysis of students' reflective thinking ability is viewed by students' mathematical ability at senior high school. *Journal of Physics: Conference Series*, *1157*(2), 0–6. https://doi.org/10.1088/1742-6596/1157/2/022121

Sari, A. D., Noer, S. H., & Asmiati. (2020). Pengembangan Model Creative Problem Solving (CPS) untuk Meningkatkan Kemampuan Berpikir Reflektif Siswa. *Jurnal Cendekia: Jurnal Pendidikan Matematika*, *04*(02), 1115–1128. https://doi.org/10.31004/cendekia.v4i2.318

Sari, N., & Sartika, S. B. (2021). Korelasi Gaya Belajar dengan Hasil Belajar Kognitif pada Mata Pelajaran IPA SMP. *LENSA (Lentera Sains) Jurnal Pendidikan IPA*, *11*(1), 1–7. https://doi.org/10.24929/lensa.v11i1.114

Setiawan, D. (2018). Perbandingan Keterampilan Metakognitif Dan Hasil Belajar Pada Model Pbl Terintegrasi Peta Konsep Dan Refleksi Belajar. *Jurnal Pendidikan Biologi*, *9*(1), 17–22. http://journal2.um.ac.id/index.php/jpb/article/view/3959/2951

Sihaloho, R., & Zulkarnaen, R. (2019). Studi Kasus Kemampuan Berpikir Reflektif Matematis Siswa SMA. *Sesiomadika*, 736–741..

Slepcevic-Zach, P., & Stock, M. (2018). ePortfolio as a tool for reflection and self-reflection. *Reflective Practice*, *19*(3), 291–307. https://doi.org/10.1080/14623943.2018.1437399

Sriyati. (2020). *Pengaruh Model RICOSRE (Reading, Identifying, Constructing, Solving, Reviewing, Extending) terhadap Kemampuan Berikir Reflektif Matematis Siswa*. Universitas Islam Negeri Syarif Hidayatullah.

Sumitro, N. K., Sa'dijah, C., Raharjo, S., & Rahardi, R. (2019). The emergence of metacognitive activities through the scaffolding interaction. *International Journal of Recent Technology and Engineering*, *8*(1), 665–672.

Syamsuddin, A. (2019). Analysis of prospective teacher's mathematical problem solving based on a taxonomy of reflective thinking. *Journal of Physics*, *1157*(3), 1–7. https://doi.org/10.1088/1742-6596/1157/3/032078

Trilling, B., & Fadel, C. (2009). *21st Century Skills. Learning for Life in Our Times*. Wiley.

Uluçınar Sağır, Ş., Aslan, O., Bertiz, H., Oktaf, & Öner Armağan, F. (2016). Investigation of the relationship between pre-service science teachers' perceived self-efficacy in science teaching and disposition toward reflective thinking. *European Journal of Science and Mathematics Education*, *4*(3), 331–344. https://files.eric.ed.gov/fulltext/EJ1107829.pdf

Wijaya, Y. E., Sudjimat, D. A., & Nyoto, A. (2016). Transformasi Pendidikan Abad 21 Sebagai Tuntutan Pengembangan Sumber Daya Manusia Di Era Global. *Seminar Nasional Pendidikan Matematika*, *1*, 263–278.

Yuen Lie Lim, L.-A. (2011). A Comparison of Students' Reflective Thinking Across Different Years in a Problem-Based Learning Environments. *Instructional Science*, *39*(2), 171–188. https://doi.org/DOI 10.1007/s11251-009-9123-8

Yuni, Y., Kusuma, A. P., & Huda, N. (2021). Problem-based learning in mathematics learning to improve reflective thinking skills and self-regulated learning. *Al-Jabar Jurnal Pendidikan Matematika*, *12*(2), 467–480. https://doi.org/10.21831/pg.v14i2.25034

Zhang, X., Jiang, S., Ordóñez de Pablos, P., Lytras, M. D., & Sun, Y. (2017). How virtual reality affects perceived learning effectiveness: A task–technology fit perspective. *Behaviour & Information Technology*, *36*(5), 548-556.https://doi.org/10.1080/0144929X.2016.1268647

Zubaidah, S. (2016). Keterampilan Abad ke-21 : Keterampilan yang diajarkan Melalui Pembelajaran. *Seminar Nasional Pendidikan*, 1–17.

Zulfikar, T., & Mujiburrahman. (2018). Understanding Own Teaching: Becoming Reflective Teachers Through Reflective Journals. *Reflective Practice*, *19*(1), 1–13. https://doi.org/10.1080/14623943.2017.1295933