



Students' Habits of Mind Profiles of Biology Education Department at Public and Private Universities in Pekanbaru, Indonesia

Nurkhairo Hidayati

Universitas Islam Riau, Indonesia, khairobio@edu.uir.ac.id

Tengku Idris

Universitas Islam Riau, Indonesia, tengkuidriszone@gmail.com

The habit of mind is the habit of smart thinking when facing certain situations. Structured and continuous learning can improve smart thinking. The research aimed to acquire habits of mind (HoM) profiles of Biology Education students in Pekanbaru, Riau, Indonesia. The study was done in three universities, namely Riau University, Islamic University of Riau, and Lancang Kuning University. The sampling technique used was purposive sampling with 497 samples. The data were obtained using questionnaires consisting of three components, i.e., self-regulation, critical thinking, and creative thinking, which were then distributed into 60 items. The data were analyzed using the descriptive quantitative method. The research showed that the HoM of Biology Education students could be categorized as adequate at around 71.96%. The highest percentage was found in Y students university followed by Z students university, whereas the lowest rate was found in X university. Self-regulation was the highest component of minds of habit in this research followed by creative thinking, while critical thinking was placed the last. It can be concluded that HoM Biology Education students in Pekanbaru were categorized as adequate. In addition, the findings of the research can be used as a reference for the universities in general and the lecturers in particular to design appropriate teaching and learning strategies.

Keywords: biology education, habits of mind, university students, students' habits, mind

INTRODUCTION

Developing a country certainly needs human resources that can think and act accordingly to be able to make appropriate decisions. Every individual who has those abilities is then expected to be able to overcome various kinds of problems in her/his daily life (Ongardwanich, Kanjanawasee, & Tuipae, 2015). To reach the goal, the memorization technique in teaching and learning activities is not enough since analyzing and synthesizing the lessons is the true meaning of understanding knowledge. When

Citation: Hidayati, N., & Idris, T. (2020). Students' Habits of Mind Profiles of Biology Education Department at Public and Private Universities in Pekanbaru, Indonesia. *International Journal of Instruction*, 13(2), 407-418. <https://doi.org/10.29333/iji.2020.13228a>

university students do not have a deep understanding of their related-field, then it will be difficult to reach learning objectives (Wright, 2011), to increase thinking ability, as well as to solve complex problems (Rodzalana & Saat, 2015). Therefore students need social competences (Pinto, Caramelo, Coimbra, Terrasêca, & Agrust, 2016)

The ability to think and solve problems is not obtained by learning activities that are memorized and textbooks but requires a learning design that is able to stimulate students to think and solve problems. The first step in solving a problem is actually thinking about the consequences of the matters being solved (Noreen, Whyte, & Dritschel, 2015). It means that someone has to act cleverly to solve the problem. Of course, being clever here does not only relate to someone's understanding of the matter but also how to act accordingly to solve the matter efficiently. Indeed, the ability to be smart that is mentioned before is known as habits of mind (Costa, Arthur L. & Kallick, Bena, 2000).

At first, the concept of habits of mind began with research in the field of education and the development of the brain. According to this concept, HoM is related to behavior that can be used easily to solve problems (Alhamlan, Aljasser, Almajed, Almansour, & Alahmad, 2018). Habits are instinctive, so solving problems does not require the ability to remember. Other concepts about HoM are also associated with a set of dispositions that are learned and implemented before completing certain tasks (Costa & Kallick, 2000) through sustainable practice. In more detail, (Costa & Kallick, 2000) explain the concept of habits that can equip students to make more appropriate choices in the school environment and outside the school environment. Some examples of concepts such as thinking habits are raising problems, taking responsible risks, and applying initial knowledge to new situations.

Another origin of the concept of HoM refers to the theory proposed by Gardner. This theory explains that intelligence has a broader meaning because it is associated with psychometric findings on the coding of symbols. The main aspect of this theory is that intelligence must be linked to a particular learning domain. In other words, intelligence is not positioned as a different type of domain that is not in contact with other domains. This theory also suggests looking at the learning process through non-verbal information processing channels, such as shapes, colors, and textures. All students are able to have all three information processing channels. This finding was confirmed through research conducted by the Brain Project Group. The results of this study indicate 80% of participants are better off verbally, and around 50% as object-visualizers among a sample of 3,800 participants (Groff, 2014).

One characteristic of someone who has habits of mind can be seen from the speed of thinking, being able to read situations accurately, and being able to plan solutions to problems correctly. A series of activities carried out without the need for deep thought and without using certain theorems but is the impact of habitual thinking. Goldenberg in (Sword, Sword, & Stevens, 2013). Several experts have developed habits of mind through numerous studies such as (Costa, Arthur & Kallick, Bena, 2000) as well as who then divide habits of mind into 16 indicators. Moreover, Costa and Kallick claim that habits of mind are the highest characteristic of smart thinking to solve problems in

addition to being a success indicator in the academic field, working environment, and social life.

Habits of mind were developed through the work of Costa and Kallick in 1985 and subsequently developed by (Marzano, 1992) through the dimension of learning. The position of habits of mind in the dimension of learning developed by Marzano (1992) and (Marzano, Pickering, & McTighe, 1993). The dimension of learning consists of attitudes and perceptions, acquiring and integrating knowledge, extending and refining knowledge, using knowledge meaningfully, and habits of minds. Marzano in (Sriyati, 2011) explains the interrelationship between the dimensions of learning as follows: these five dimensions of learning do not work separately but work together. All dimensions of learning are influenced by "attitudes and perceptions" in the first dimension and "habits of productive thought" (habits of mind) in the fifth dimension. The first and fifth dimensions become important factors that must be considered in the learning process. Therefore the first and fifth dimensions become the background in the Figure. Students must have attitudes and perceptions that are conducive to learning and use habits of thought effectively.

Habits of mind can be influenced by the teaching and learning process of university students. One of the factors that can affect habits of mind is feedback giving. A research was done by (Idris, Sriyati, & Rahmat, 2014); (Haka & Sriyati, 2016) found out that feedback in portfolio assessment was affecting habits of mind; not only helping students in correcting their mistakes but also in supporting a little bit of knowledge they have already known before (Finn, Thomas, & Rawson, 2017).

In relation to the statement stated by Costa and Kallick, habits of mind among university students indeed become the base of the teaching and learning process. They need to have a thinking habit of being able to respond to every problem during the learning process. This habit will be something fundamental when they have issues and have to find a solution. Besides, the habit itself is an act that people show very well in inappropriate situations which are done without further consideration since it is usually done continuously (Burgess, 2012).

Habits of mind are shaped when students give responses to answers, questions, or problems in which correct answers are yet to be known. This process will not only help lecturers observe how their students memorize but also how students create knowledge (Costa & Kallick, 2000). Habits of mind can be divided into three categories, namely: self-regulation, critical thinking, and creative thinking (Marzano, Pickering, & McTighe., 1993). Science for all Americans in (Volkman & Eichinger, 2010) wrote that integrity, perseverance, justice, curiosity, open-mindedness, skepticism, and imagination are parts of habits of mind that show humanities in daily life.

Habits of mind indeed support students in everyday life since they are the combination of many skills, attitudes, and past experiences. It means that there are connections between a mindset to another. Therefore, it can be inferred that habits of mind have to be used when making decisions. These decisions include sensitivity to contextual codes in various situations to determine the appropriate points in decision making.

Individual who is smart in thinking will be able and ready to face any kinds of changes. In this case, university life is a point where someone is in transition between teenagers to adult life, including psychological development. University students have the responsibility to study, yet he/she has to begin thinking about the future. ASCD (2009) stated that a good start when introducing habits of mind is by developing a deep understanding and appreciating one's habits.

Since habits of mind are considered essential in determining one's life, it is needed to apprehend habits of mind profiles in students as a provision to face life's problems. Various studies that have examined several HoM aspects have been carried out in Indonesia. Some of these studies, such as creative thinking (Rahardjanto, Husamah, & Fauzi, 2019; Sandika & Fitrihidajati, 2018), critical thinking (Ramdiah, Mayasari, Husamah, 2018), and self-regulation (Turiman, Omar, Daud, & Osman, 2012); (Yahya & Arfandi, 2017). However, from various existing studies, studies that examine HoM profiles in Indonesia are still rare. In fact, this kind of research has never been done in Pekanbaru. Therefore, in this study, the HoM profile in Pekanbaru was done. Based on the aforementioned background, this research is intended to examine habits of mind profiles of Biology Education Studies students in Riau, Indonesia.

METHOD

Research Sample

The research was done in Biology Education Department in three universities in Riau, Indonesia, namely Islamic University of Riau, Riau University, and Lancang Kuning University. The population of this research was all students of Biology Education in Pekanbaru City. The sample was taken using purposive sampling, with 497 students between 19-21 years old.

Research Instrument

The research used questionnaire of habits of mind which was developed from Sriyanti questionnaire (Sriyati, 2011); (Marzano., Pickering, & Metighe, 1993) and (Marzano, 1992) consisting of 60 items (22 items of self-regulation statements, 23 items for critical thinking and 13 items for creative thinking). This questionnaire used a Likert scale with five answer choices namely strongly agree, agree, doubt, disagree and strongly disagree. The questionnaire used was validated constructively by experts and empirically using the Pearson Product Moment. The validity test indicated that all the items were valid, and the reliability of the instrument was reliable (0.724). Furthermore, the content outline of the questionnaire can be seen in Table 1.

Table 1
Questionnaire Outline of Habits of Mind

Component	No	Indicator
Self Regulation	1	Recognizing self-thinking
	2	Making effective plans
	3	Understanding and using the needed information
	4	Becoming sensitive toward feedbacks
	5	Evaluating the effectiveness of acts
Critical Thinking	1	Being accurate and able to look for accuracy
	2	Being clear and able to look for clarity
	3	Being open
	4	Being able to position oneself when there is a guarantee
	5	Being sensitive and able to recognize friends' abilities
Creative Thinking	1	Being able to involve oneself in tasks although the answer and solution has not yet to be found
	2	Trying hard to expand skills and knowledge
	3	Creating new ways or point of view outside the common knowledge

Data Analysis

The next step to do was analyzing the data from the questionnaire, where each item consisted of 5 score choices. The analysis was done by calculating a percentage based on the total scores of the questionnaire that had been filled by the samples. Then, the researcher interpreted the data and categorized them into several groups, Excellent (86-100%), Good (76-85%), Pretty Good (60-75%), Fair (55-59%), Poor ($\leq 54\%$) (Purwanto, 2008).

FINDINGS

Based on the research that had been done in Biology Education students at Pekanbaru, the habits of mind of students in University X can be seen in Figure 1, Figure 2, Figure 3, and Table 2 show habits of mind (HoM) of students in University Y and University Z.

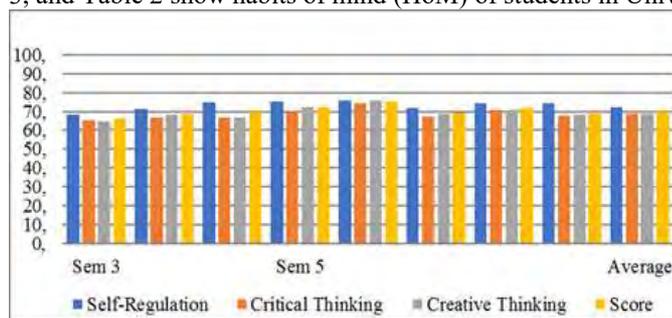


Figure 1
Research Data of Biology Education Students of X University

It can be seen from Figure 1 that the pretty good score of Biology Students at University X is 69.85%, which is categorized as pretty good. From the three components of HoM,

self-regulation has the highest score 72.50%, which falls into pretty good followed by creative thinking, which is categorized as pretty good (68.91%), while the lowest score is in critical thinking components with around 68.80% (pretty good).

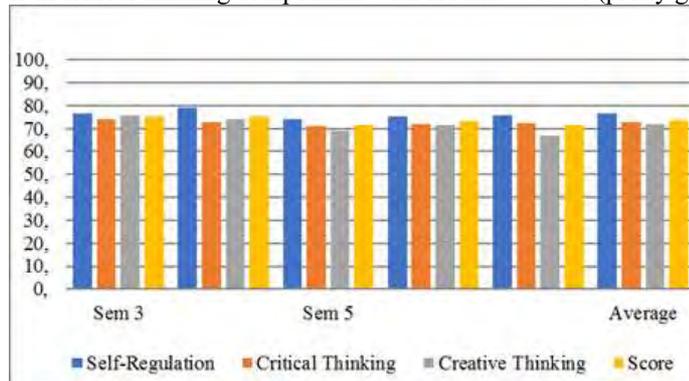


Figure 2
Research Data of Biology Education Students of Y University

Figure 2 describes the habits of mind profiles of Biology Students in University Y. Generally, the students belong to a pretty good category, with 73.69%. University Y has the highest score compared to the other two. Furthermore, the university has a different result with self-regulation in the first place, with 76.43%. The lowest component is creative thinking with 72%, while critical thinking placed the second with 72.64%. It can be concluded that University Y is included in a pretty good group.

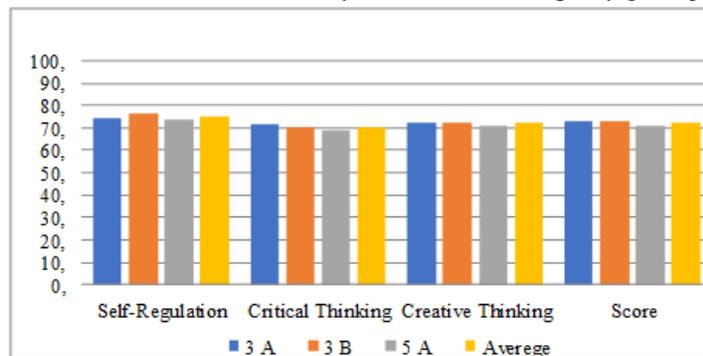


Figure 3
Research Data of Biology Students of Z University

Figure 3 shows that HoM of Students in University Z is considered good with pretty good score of 72.34%. From the three components, self-regulation is the highest (74.80%, pretty good) followed by creative thinking (71.98), and critical thinking (70.25%, pretty good). Furthermore, indicators of each HoM components can be seen in Table 2 as follows.

Table 2
HoM Profiles of Biology Education in Pekanbaru City

Component	Indicator	Univ X	Univ Y	Univ Z	Average	Category
Self Regulation	1 Recognizing self-thinking	70.58	73.00	73.10	72.23	Pretty Good
	2 Making effective plans	72.16	78.38	72.38	74.31	Pretty Good
Critical Thinking	3 Understanding and using information	75.71	79.32	79.62	78.22	Good
	4 Becoming sensitive toward feedbacks	64.54	66.92	67.59	66.35	Pretty Good
	5 Evaluating the effectiveness of acts	79.50	83.39	80.84	81.24	Good
	Average	72.50	76.20	74.71	74.47	Pretty Good
	1 Being accurate and able to look for accuracy	73.51	80.43	77.05	77.00	Good
Creative Thinking	2 Being clear and able to look for clarity	66.31	71.16	69.87	69.11	Pretty Good
	3 Being open	65.69	69.08	68.10	67.62	Pretty Good
	4 Being able to position oneself when there is a guarantee	64.12	68.35	64.54	65.67	Pretty Good
	5 Being sensitive and able to recognize friends' abilities	71.08	73.64	71.71	72.14	Pretty Good
	Average	68.14	72.53	70.25	70.31	Pretty Good
Total	1 Being able to involve oneself in tasks although the answer and solution has not yet to be found	71.70	72.70	71.67	72.02	Pretty Good
	2 Trying hard to expand skills and knowledge	66.71	69.97	70.38	69.02	Pretty Good
	3 Creating new ways or point of view outside the common knowledge	68.35	71.41	73.75	71.17	Pretty Good
	Average	68.92	71.36	71.93	70.74	Pretty Good
Total		69.85	73.69	72.34	71.96	Pretty Good

Table 2 confirms the general description of HoM profiles of Biology Education students in universities at Pekanbaru City. The table shows that the students' habits of mind can be categorized as pretty good (71.69). From the three universities that become sample, the one that obtains the highest score is University Y (73.69), followed by University Z (72.34) and University X (69.85). Despite differences in numbers, students HoM profiles at those universities are considered pretty good.

Further examination of Table 2 shows the pretty good score of each HoM component of the students. The highest component is self-regulation (74.47, pretty good Category). They are followed by creative thinking (74.47, pretty good category) and critical thinking (70.31, pretty good category). These scores indicate that the habits of mind of the students need to be improved since none of them reach a good category. The HoM scores comparison between sophomore students (semester 3) and junior students (semester 5) can be seen in Table 3.

Table 3
HoM Comparison of Semester 5 Students and Semester 3 Students

Semester	Self Regulation	Critical Thinking	Creative Thinking	HoM	Category
5	71.55	70.20	70.49	70.75	Pretty Good
3	71.82	69.85	71.30	70.99	Pretty Good
Average	71.69	70.03	70.90	70.87	Pretty Good

Table 3 indicates that HoM of third-semester students (70.99) is higher compared to fifth-semester students (70.75), but both are categorized in a pretty good group. The pattern that can be seen in each semester is that self-regulation dominates other components (71.60%) while critical thinking is in the last place (70.03%), yet both are in the same category i.e. average.

DISCUSSION

Biology Education Students habits of mind in Pekanbaru city belong average group with 71.96%. Taking more attention to each university, it is known that the result score does not have a big gap in the same category. As the researcher sorts the position, University X has the highest score, followed by University Z and University Y. Two of the three universities are private universities while the other one is a public university. Each university has specific requirements for students' enrolments. Also, many students expect to study at a public university so that the competition among them is harder than those who choose private universities. As a result, it causes different inputs from each university.

The result of the research shows that students input has no effect on the increasing score of HoM. It can be seen from the data that students at those universities do not have a big gap, and most of them can be categorized as pretty good. The students HoM itself indeed cannot be separated from the teaching-learning process. It is, then, supported by other researches claiming that there are increasing scores of HoM influenced by teaching-learning process, such as giving formative assessment (Haka, N. B., Sriyati, 2016); (Idris et al., 2014) and giving interesting learning media (Papadopoulos, 2018).

In relation to the aforementioned statements, there are HoM score differences from sophomore students (third semester) and junior students (fifth semester). Those with higher year obtained higher scores compared to the lower year in University X. This result indicates that teaching and learning activities bring positive effects toward better HoM. It is also in line with the number of courses received as well as a longer learning process. However, University Y and Z have different patterns. The HoM score of students in third semester is higher than students in fifth semester. It indicated that the lecturers at those universities had made improvements during the teaching and learning process resulting in the increasing score of the lower year students. Based on the interview, the lecturers of the two universities state that they pay more attention to the process and don't merely look at the final result. Some learning methods and models conducted by lecturers in semester 3 of Y university and Z university were using open discussion, problem-solving, guided inquiry, and blended learning. This learning model can improve students' thinking (Kleinstuber, 2014). The learning activity has an effect on increasing critical thinking and creative thinking (Risnawati, Andrian, Azmi, Amir, & Nurdin, 2019).

Self-regulation has the highest HoM score of all the components. This result is in line with most researches confirming that self-regulation has the highest score (Haka, N. B., Sriyati, 2016); (Sriyati, 2011). Self-regulation itself is related to the ability to manage oneself. When an individual can lead him/herself, then it is expected that he/she will be able to finish the task or to solve the problems. The better the students to manage themselves, the better the score they receive in their courses. Furthermore, (Morosanova & Fomina, 2017) stated that self-regulation brings essential contributions to the learning outcomes. Besides, self-regulation has a significant influence on controlling emotions, thinking, and the act of the students (Mägi, Männamaa, & Kikas, 2016).

Generally, students' thinking habit is in Pretty Good category. When compared to sophomore (semester 3) and junior (semester 5), then it can be confirmed that the younger year students have a better habit compared to the latter. This research is quite different from the one done by (Huber & Kuncel, 2016), which resulted that more learning experiences give a positive effect on the development of critical thinking. Despite the fact that the data are still categorized Pretty Good, it can be justified that thinking habit is not only affected by experiences but also other factors such as academic achievement, student's backgrounds, genders, and ethnic groups (Giancarlo & Facione, 2014).

The next aspects of HoM were critical thinking and creative thinking. Both aspects of the HoM was a pretty good category. The aspects of critical thinking and creative thinking were pretty good because during the learning process lecturers not only convey information directly but also provide opportunities for students to find and share information. For example, lecturers scout students for information about a topic through various sources such as the internet or events that are around students. During the learning process, the lecturer asks students to convey information that has been obtained to their classmates. This learning process can improve students' thinking skills. Critical thinking is related to the process of analyzing and evaluating information so that it can make decisions based on the results of the evaluation (Abrami, Bernard, Borokhovski, Waddington, & Wade, 2015) while creative thinking is related to the ability to generate original ideas that require cognitive abilities (Kaufman, Quilty, Grazioplene, Hirsh, Gray, Peterseon and Deyoung., 2015). Both aspects of the HoM are interrelated because to find new ideas or solutions requires critical thinking skills (Muglia, Saiz, Rivas, Maria, Vendramini and Franco., 2018).

The last component being researched is creative thinking which is known to be the primary skill that is needed in education to prepare an individual to face his/her future life (J. C. Kaufman & Beghetto, 2009); (Runco, 2008). The research affirms that the students' creative thinking is good enough, yet it still needs improvement. This result is possibly related to students' willingness to finish a task, although they have no idea whether or not it is correct. Several missions were done differently from the initial clues given by the lecturer, yet the result is acceptable. This strengthens a hypothesis that students actually can think out of the box. Therefore, lecturers are expected to give tasks that can stimulate students' creative thinking ability. Many ways can be done by lecturers, such as giving open-ended questions, asking students to listen to recorded audio then asking them to retell it, or playing a role-play (Henriksen, Good, & Mishra, 2015).

HoM is one of the essential skills needed to be mastered by university students. Therefore, teaching and learning processes are expected to be able to facilitate it. This research can be used as an initial depiction of Biology Education students' habits of mind in Pekanbaru, Indonesia. This research surely needs more profound studies by observing more thoroughly on factors affecting habits of mind. Then, the result can be used to develop learning strategies that can improve students' habits of mind. In addition, these results become the basis for the government to conduct an ongoing

curriculum evaluation at the elementary, secondary, and tertiary levels of the competencies and soft skills of the younger generation.

CONCLUSIONS

It can be concluded from the research that Biology Education students' habits of mind can be categorized as Pretty Good with 71.96%. The highest aspect is self-regulation, creative thinking, and critical thinking at the last place. When making differences between sophomore and junior students, it can be inferred that third-semester students are better compared to fifth-semester students. This research can be used as the base of future studies in determining the most appropriate way to improve habits of mind at the university level.

ACKNOWLEDGMENT

This research was supported by the Ministry of Research, Technology and Higher Education of the Republic of Indonesia.

REFERENCES

- Abrami, P. C., Bernard, R. M., Borokhovski, E., Waddington, D. I., & Wade, C. A. (2015). Strategies for teaching students to think critically: A meta-analysis. *Review of Educational Research*, 85(2), 275–314. <https://doi.org/10.3102/0034654314551063>.
- Alhamlan, S., Aljasser, H., Almajed, A., Almansour, H., & Alahmad, N. (2018). A systematic review: Using habits of mind to improve student's thinking in class. *Higher Education Studies*, 8(1), 25–35. <https://doi.org/10.5539/hes.v8n1p25>.
- Burgess, J. (2012). Emotional and behavioural difficulties the impact of teaching thinking skills as habits of mind to young children with challenging behaviours. *Emotional and Behavioural Difficulties*, 17(1), 37–41.
- Costa, Arthur L., E., & Kallick, Bena, E. (2000). *Assesing & reporting on habits of mind. A developmental series, book 3*. Alexandria, VA: Association for Supervision and Curriculum Development.
- Costa, A. L., & Kallick, B. (2000). *The 16 habits of mind identified by costa and kallick include*. Alexandria, VA: Association for Supervision and Curriculum Development.
- Finn, B., Thomas, R., & Rawson, K. A. (2017). Learning more from feedback: Elaborating feedback with examples enhances concept learning. *Learning and Instruction*, 54, 104-113 <https://doi.org/10.1016/j.learninstruc.2017.08.007>.
- Giancarlo, C. A., & Facione, P. A. (2014). A look across four years at the disposition toward critical thinking among undergraduate students toward critical thinking among. *The Journal of General Education*, 50(1), 29–55. <https://doi.org/10.1353/jge.2001.0004>.
- Groff, J. S. (2014). Expanding our “frames” of mind for education and the arts. *Harvard Education Rev*, 83(1), 15–39. <https://doi.org/10.17763/haer.83.1.kk34802147665819>.
- Haka, N. B., Sriyati, S. (2016). Peran Asesmen Kinerja Dalam Meningkatkan Habits of Mind Siswa D SISWA. In *Prosiding seminar nasional biologi* (pp. 468–472). Bandung: UPI Press. Retrieved from <http://docplayer.info/49739059-Peran-asesmen-kinerja-dalam-meningkatkan-habits-of-mind-siswa.html>.
- Henriksen, B. D., Good, J., Mishra, P., & the Deep-Play Research Group. (2015).

- Rethinking technology & creativity in the 21st century embodied thinking as a trans-disciplinary habit of mind, *TechTrends*, 59(1).
- Huber, C. R., & Kuncel, N. R. (2016). Does college teach critical thinking? a meta-analysis. *Review of Educational Res*, 1–38. <https://doi.org/10.3102/0034654315605917>.
- Idris, T., Sriyati, S., & Rahmat, A. (2014). Pengaruh Asesmen Portofolio Terhadap Habits of Mind dan Penguasaan Konsep Biologi Siswa Kelas XI. *Pen Bio*, 6(1), 63–67.
- Kaufman, J. C., & Beghetto, R. A. (2009). Beyond big and little: The four c model of creativity. *Rev. of General Psychology*, 13(1), 1–12. <https://doi.org/10.1037/a0013688>.
- Kaufman, S. B., Quilty, L. C., Grazioplene, R. G., Hirsh, J. B., Gray, J. R., Peterson, J. B., & Deyoung, C. G. (2015). Openness to experience and intellect differentially predict creative achievement in the arts and sciences. *Journal of personality*, 84(2) 4, 1–11. <https://doi.org/10.1111/jopy.12156>
- Kleinstuber, A. (2014). *The impact of professional development in the arts upon habits of mind and teacher efficacy* (Unpublished doctoral dissertation). California State U.
- Mägi, K., Männamaa, M., & Kikas, E. (2016). Pro fi les of self-regulation in elementary grades: Relations to math and reading skills. *Learning and Individual Differences*, 51, 37–48. <https://doi.org/10.1016/j.lindif.2016.08.028>.
- Marzano, R. J. (1992). *A different kind of classroom: Teaching with dimention of learning*. Alexandria, VA: Association for Supervision and Curriculum Development.
- Marzano, R. J., Pickering, D., & Mctighe, J. (1993). *Assessing student outccomes: performance assessment using the dimension of learning model*. Alexanderia, VA: Mid-Continent Regional Education Lab.
- Matsuura, S., Sword, S., Pietcham, M.B., Stevens, G., & Al Cuoco (2013). Mathematical habits of mind for teaching: Using language in algebra classrooms. *The Mathematics Enthusiast*, 10(3), 735-776.
- Morosanova, V. I., & Fomina, T. G. (2017). Self-regulation as a mediator in the relationship between anxiety and academic examination performance. *Procedia-Social and Behavioral Sci*, 237, 1066–1070. <https://doi.org/10.1016/j.sbspro.2017.02.156>.
- Muglia, S., Saiz, C., Rivas, S. F., Maria, C., Vendramini, M., Almeida, L. S., ... Franco, A. (2018). Creative and critical thinking: Independent or overlapping components? *Thinking Skills and Creativity*, 27, 114–122. <https://doi.org/10.1016/j.tsc.2017.12.003>.
- Noreen, S., Whyte, K. E., & Dritschel, B. (2015). Investigating the role of future thinking in social problem-solving. *Journal of Behavior Therapy and Experimental Psychiatry*, 46, 78–84. <https://doi.org/10.1016/j.jbtep.2014.08.004>.
- Ongardwanich, N., Kanjanawasee, S., & Tuipae, C. (2015). Development of 21 st century skill scales as perceived by students. *Procedia-Social and Behavioral Sciences*, 191, 737–741. <https://doi.org/10.1016/j.sbspro.2015.04.716>.
- Papadopoulos, I. (2018). Using mobile puzzles to exhibit certain algebraic habits of mind and demonstrate symbol-sense in primary school students. *Journal of Mathematical Behavior*, 53, 1–18. <https://doi.org/10.1016/j.jmathb.2018.07.001>.
- Pinto, M., Caramelo, J., Coimbra, S., Terrasêca, M., & Agrust, G. (2016). Defining the key

competences and skills for young low achievers' in lifelong learning by the voices of students, trainers and teachers. *JSSE-Journal of Social Science Education*, 15(1), 53–62. <https://doi.org/10.4119/UNIBI/jsse-v15-i1-1465>.

Rahardjanto, A., Husamah, & Fauzi, A. (2019). Hybrid-PjBL: Learning outcomes, creative thinking skills, and learning motivation of preservice teacher. *International Journal of Instruction*, 12(2), 179–192.

Risnawati, Andrian, D., Azmi, M. P., Amir, Z., & Nurdin, E. (2019). Development of a definition maps-based plane geometry module to improve the student teachers' mathematical reasoning ability. *International Journal of Instruction*, 12(3), 541–560. <https://doi.org/10.29333/iji.2019.12333a>.

Rodzalana, S. A., & Saat, M. M. (2015). The perception of critical thinking and problem solving skill among Malaysian undergraduate students. *Procedia-Social and Behavioral Sciences*, 172(2012), 725–732. <https://doi.org/10.1016/j.sbspro.2015.01.425>.

Runco, A. M. (2008). Creativity and education. *HKTA-New Horizons in Education*, 56(1). Retrieved from <http://www.hkta1934.org.hk/NewHorizon/abstract/2008m/10-Revised%20creativity%20and%20education.pdf>.

Sandika, B., Fitrihidajati, H., Training, T., Java, E., Sciences, N., Surabaya, U. N., & Java, E. (2018). Improving creative thinking skill and scientific attitude through inquiry-based learning in basic biology lecture toward students of biology education. *Jurnal Pendidikan Biologi Indonesia*, 4(1), 23–28.

Saputro, S., Masykuri, M., Sutanto, A., Education, S., Program, D., & Maret, U. S. (2018). Students' critical thinking skills profile: Constructing best strategy in teaching chemistry. *International Journal of Pedagogy and Teacher Education*, 2, 71–76.

Ramdiah, S., Mayasari, R., Husamah, A. F. (2018). The effect of TPS and PBL learning models to the analytical ability of students in biology classroom. *Asia-Pacific Forum on Science Learning and Teaching*, 19(2). Retrieved from <https://www.eduhk.hk/apfslt/>.

Sriyati, S. (2011). *Penerapan Asesmen Formatif Untuk Membentuk Habits of Mind Mahasiswa Biologi*. Universitas Pendidikan Indonesia. Retrieved from <https://docplayer.info/56173936-Penerapan-asesmen-formatif-untuk-membentuk-habits-of-mind-mahasiswa-biologi.html>.

Turiman, P., Omar, J., Daud, A. M., & Osman, K. (2012). Fostering the 21st century skills through scientific literacy and science process skills. *Procedia-Social and Behavioral Sciences*, 59, 110–116. <https://doi.org/10.1016/j.sbspro.2012.09.253>.

Volkman, M. J., & Eichinger, D. C. (2010). Habits of mind: Integrating the social and personal characteristics of doing science into the science classroom. *School Science and Mathematics*, 99(3). <https://doi.org/https://doi.org/10.1111/j.1949-8594.1999.tb17462.x>.

Wright, G. B. (2011). Student-centered learning in higher education. *Journal of Teaching and Learning in Higher Education*, 23(3), 92–97.

Yahya, M., & Arfandi, A. (2017). The role of elf regulation in finishing the final task of vocational higher education student. In *Proceedings of the 2nd International Conference on Education, Science, and Technology* (pp. 118–120). Paris: Atlantic.