Biology Teachers: Knowledge in Authentic Assessment Through Cooperative Integrated Reading and Composition Based Scientific Approach (CirsA)

Refirman Djamahar¹,a, Rizhal Hendi Ristanto¹, Ericka Darmawan²
¹ Biology Education, Faculty of Mathematics and Natural Sciences, Universitas Negeri Jakarta, Indonesia
² Biology Education, Faculty of Teacher Training and Education, Universitas Tidar, Indonesia

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ABSTRAK
Evaluation activities of biology learning process for learners is teachers’ and education units’ responsibility. An authentic assessment is crucial to be implemented in the learning process so that learners could be guided to have abilities in knowledge as well as attitudes and skills. The research aims in 2019 is to observe 50 biology teachers’ differences in biology teachers’ skills in Bekasi Regency, Indonesia in mastering authentic assessment knowledge in biology learning before and after the implementation of training activities through a Scientific Approach-based Cooperative Integrated Reading and Composition (CirsA). CirsA, a learning developed by integrating a CIRC-based scientific approach, expected to facilitate teacher learning in accordance with the objectives. The research is a quasi-experiment using one group pretest-posttest design. The research independent variable includes CirsA learning model, whereas the dependent variable is concept understanding of authentic assessment. The research data are analyzed using descriptive statistics that encompasses teachers’ response on learning and analysis of average pretest and posttest. The research results indicate that there is an influence of CirsA learning application on the concept mastery of authentic assessments of Biology teachers.

Keyword: CIRC, CirsA, Biology teacher, Authentic assessment.

PENDAHULUAN
The 21st century requires people to be adaptive to rapid changes occur in the environment (Redhana, 2019; Tsai, Shen, & Lin, 2014). Changes also occur in education system in Indonesia (Djamahar et al., 2019; Djamahar, Ristanto, Sartono, Ichsan, & Muhlisin, 2018) that require a thorough transformation of learning process so that teachers in Indonesia could adapt to the existing condition. It is expected that teacher quality could be developed that could improve learners’ knowledge quality, training, equity and achievement (Lewis, 2016; Pang, 2016; Ristanto, Zubaidah, Amin, & Rohman, 2018a). Education system improvement needs to consider educational principles. One of them is actively involving learners in learning activities; thus, teachers are no longer become a learning center and the learning become a learner centered (Setiawan, Corebima, & Zubaidah, 2013).

Strong, intelligent and independent generation that holds on to spiritual values is manifested through the implementation of the 2013 Curriculum (Afrianto, 2019; Lestari, Mertha, & Kusmiyati, 2019; Noviar, 2016). The 2013 Curriculum aims to build and empower Indonesian people who are competent as a person and a citizen who is faithful, productive, creative and affective as well as has a deep competence in community life (Djamahar et al., 2018). The new curriculum has a principle in prioritizing learning outcome in cognitive, skill and attitude aspects in
accordance with Indonesia’s characters (Abdullah, 2016; Djamahar et al., 2019).

The 2013 Curriculum implementation is conducted using authentic assessment. The assessment is useful to assist teachers to improve learning quality (Charoencha, Phuseeorn, & Phengsawat, 2015; Naganuma, 2017; Villarroel, Bloxham, Bruna, Bruna, & Herrera-Seda, 2018). Therefore, teachers’ knowledge on authentic assessment should be continuously empowered to achieve teachers’ skill in developing and applying the authentic assessment in learning. It is especially in biology learning where various facts and obstacles are found. Various obstacles are found in the 2013 Curriculum implementation through authentic assessment in biology learning. Teachers face an obstacle in the 2013 Curriculum assessment. Based on observations and interviews, the obstacle is related to the assessment that coincides with learning process so that the teaching and learning process becomes less effective. The teachers feel burdened since they must add up every score obtained by the students and describe the score per subject. To overcome the obstacle, it is expected that the assessment scope could be reduced. Therefore, teachers expect the government to give an in-depth training for teachers who still have less understanding on the 2013 Curriculum (Abdullah, 2016). The obstacle also encounters by biology teachers in Bekasi Regency. It is difficult for them to implement the 2013 Curriculum through authentic assessment. The 2013 Curriculum directs teachers to teach through scientific approaches. The curriculum implementation with scientific approaches aims to provide understanding for learners in recognizing various content or information without depending on the teachers. The scientific approaches in learning involve the following skills: observe, ask, experiment, associate and communicate (Fajarianingtyas, Akbar, & Herowati, 2019; Susilo, 2016).

One of efforts to optimize teacher’s assessment process is by improving the teacher ability in learning quality which includes the teacher’s ability to access authentic assessments. Considering the importance of teachers having quality in providing learning at school and willing and able to carry out all the provisions relating to their profession, it is deemed necessary to provide education and training (Sudja, 2017). It can be conducted through, one of them, training using an appropriate learning model. The use of appropriate model in biology learning will improve teaching and learning activity effectiveness and efficiency (Kusumaningtias, Zubaidah, & Indriwati, 2013). The 21st century requires a learning model that could encourage learners to be active and find a concept independently.

Cooperative learning model is one of active learning models that emphasizes on group work to solve a problem. It could be defined as one of learning strategies that counts heavily on group learning (Darmawan et al., 2016). Learners are encouraged to learn in group by forming a small group to start learning that begins with planning, discussion to evaluation (Ilahi, 2016). These activities are conducted together so that all learners participate and have responsibility to create learning, collaborative groups also allow peer learning to occur, so learning will be more effective (Darmawan, 2019).

Cooperative learning model is known in its various types. Learning that emphasizes reading activity is Cooperative Integrated Reading and Composition (CIRC) learning. CIRC is the basis for developing Cirsa, so it is important to discuss it before going further. The learning model could monitor and activate learners’ reading activity. It is a learning process that emphasizing learners to involve in e learning process through activities of reading, discussion, concept finding and rewriting it with opinion and reflection (Camacho & Legare, 2015;
Gupta & Ahuja, 2014; Kivunja, 2014; Mutofín, Degeng, Ardana, & Setyosari, 2017). The learning activity could provide opportunities for learners to explore information through reading, discussion and rewriting activities in group.

Scientific approach-based Integrated Reading and Composition (CIRC) learning model stresses on learning aspect that is not only emphasizing on reading and writing processes but also scientific activities, such as observe, ask, try/experiment, associate and communicate (Djamahar et al., 2018; Ekawati, Susetyarini, Pantiwati, & Husamah, 2015). CIRC learning model is in accordance with the 2013 Curriculum that expects teachers to conduct learning using a scientific approach. The Cirsa model is designed with CIRC learning model principles that underscore reading process (Ristanto, Djamahar, Heryanti, & Ichsan, 2020; Djamahar, Ristanto, Sartono & Darmawan, 2020). The reading activity is an often neglected process in learning, especially in conventional learning (Djamahar et al., 2018). It causes learners’ reading ability to decrease, whereas high literacy activity has positive impact on learners’ learning in the classroom (Olander, 2013; Surpless, Bushey, & Halx, 2014; Yacoubian, 2018). According to Djamahar et al., (2018), the model superiority lies on its ability to be used for all contents in Biology subject since the subject contains daily life concepts and it must be understood through reading. Based on the background that CIRC enriched with a scientific approach merges into an effective learning model. The Cirs model development design is equipped with learning media of syllabus, learning plan and learner worksheet.

The approach would provide opportunities for learners to experience it themselves, to follow a process, observe an object, analyze, prove, and draw conclusion on a circumstance by themselves (Noviar & Hastuti, 2015). In learning process, the learning model applied by teacher has not accommodated a scientific approach, including CIRC learning model; therefore, the scientific approach based CIRC learning model or Cirs is expected to enhance teacher's ability to access student authentic assessments. Based on the existing researches, the researcher tries to design and prove the influence of a scientific approach-based Cooperative Integrated Reading and Composition (CIRSA) learning model on the strengthening of teachers’ authentic assessment understanding to learners. The model stresses on participants’ activities to involve in training process through activities of reading, discussion, concept finding, and rewriting it with opinion and reflection (Gupta & Ahuja, 2014). The scientific approach is the 2013 Curriculum implementation that is intended to provide understanding to learners in recognizing various content or information without depending on teachers. When the Cirs model is applied in classroom learning, it is expected to improve understanding of authentic assessment by the teachers of MGMP of Biology in Bekasi Regency and give insight about the Cirs application in classroom learning.

The mastery of concept is defined as one’s ability in mastering experiences in the form of concepts, principles as well as laws in science as information ever given to students (Lancor, 2014; Ristanto et al., 2018a). Mastery is an understanding or capability of using knowledge, intelligence and so on by someone to solve problems or issues (Araya et al., 2010; Gündüz, Alemdağ, Yaşar, & Erdem, 2016; Istiana & Awaludin, 2018). Concept mastery is one’s ability to explain with their understanding of content. It is an effort that must be done by someone in recording and re-transferring some information from a certain subject content and using it to solve problems, analyze and interpret a certain event (Lancor, 2014; Leong, Mohd Said,
According to Gunawan et al., (2016) the measurement of concept mastery is conducted in learning by compiling essay test based on Bloom’s Taxonomy C1 to C6. Based on the study, it can be concluded that Biology concept mastery is students’ ability to understand, interpret and apply content and it can be used to solve problems. Indicators used are cognitive realm of Bloom’s taxonomy consisted of six cognitive process dimensions. The six dimensions include: remember (C1), understand (C2), apply (C3), analyze (C4), evaluate (C5) and create (C6).

Evaluation activity of learning process to learners becomes teachers’ and related education unit’s responsibilities. It comprises learning process and outcome by applying principle of continuous learning completeness. Types of learning outcome evaluation in education units consist of a) class assessment; b) final test; c) basic ability test; and d) quality assessment. Learner evaluation is performed periodically, thoroughly, transparent and systemic to achieve certain competence standard.

The 2013 Curriculum implementation encounters various obstacles. The obstacles include teacher’s evaluation technique must be real and authentic, difficulties in scientific approach implementation in learning process and difficulties to develop a learning process that could make students active (Ristanto, Zubaidah, Amin, & Rohman, 2017). The authentic assessment is essential to be applied in the learning process so that learners could be guided to not only have abilities in knowledge but also attitudes and skills. The demand of the 2013 Curriculum includes authentic assessment.

Once it is prevailed, the authentic assessment is considered as an appropriate assessment to appraise learners’ learning outcome. It is in accordance with Permendikbud No. 104/2014 article 2 paragraph 2 stating that authentic assessment is the main approach in appraising learners’ learning outcome by educators.

Training is a type of learning process to acquire and improve skills outside the applicable education system in a relatively shorter period of time and with methods that prioritize practice rather than theory, so the theme of increasing the ability to apply authentic assessment in learning classes to teachers was taken. The training conducted here is ongoing training that focuses on the use of authentic assessments and their use. The authentic assessment is an information collection process by teacher on the development and learning achievement conducted to learners through a variety of techniques that able to appropriately reveal, prove, or indicate that learning objectives have been mastered and achieved.

The assessment is not only emphasizing on the cognitive aspects but also the affective and psychomotor aspects. Problems occurred in Bekasi Regency include lack of skill among biology teachers in the implementation of authentic assessment in learning activities. It indicates teachers’ less understanding of the method. Teachers have difficulty in implementing the authentic assessment with the right procedures. The condition is related to activities that support the implementation that have not intensive. Therefore, ongoing discussion activity for teachers is required on how the implementation of authentic assessment.

The authentic assessment could be applied in line with the application of learning model. One of the appropriate learning models is a scientific approach-based learning. A new learning model that integrates the approach is Cooperative

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Integrated Reading and Composition (CIRC). The integration is CIRSA, which is a learning model that could help teachers in applying authentic assessment to be more contextual through reading (Djamahar et al., 2018).

In its development, authentic assessment in 21st century learning experiences some changes. The presence of technology changes the way teachers assess their students’ ability, which is no longer have to use a paper. Authentic assessment can be done using technology. Teachers could use certain applications, such as edmodo, kahot or google classroom, which is the simplest application. For example, a teacher wants to assess their students’ abilities in conducting presentation in front of the class. The authentic assessment that can be done is by giving assessment in the form of Google form to their peers (Barber, King, & Buchanan, 2015; Bolat & Karakuş, 2017). Based on the description, authentic assessment could be combined with Cirsa as a technology-based learning.

METHODS

Research Design

The research used one group pretest-posttest design. The independent variables applied in the model was Cirsa learning model, whereas the dependent variable was concept understanding of authentic assessment of MGMP Biology teachers in Bekasi Regency, Indonesia. Research activities include the delivery of material on authentic assessment in general and the implementation of biology learning in high school. Question and answer activities and discussions and continued with the assignment of developing authentic assessment instruments and presenting products. The syntax refers to Cirsa learning. The research design is illustrated in Table 1.

| Table 1. One group pretest-posttest experimental design. |
|--------------------------------------------------------|
| Pretest | Treatment | Posttest |
| T₁ | X₁ | T₂ |

Note: T₁ = Pretest, T₂= Posttest, X₁ = Cirsa Learning

Population and Sample

The research population was all SMA (senior high school) Biology teachers in Bekasi Regency, Indonesia. Sampling was conducted using random sampling technique to select one group that would be treated with Cirsa learning. The biology teachers involved in the research consisted of 50 teachers.

Research Instruments

The research instrument was an authentic assessment understanding with six questions. The instrument was valid and reliable, which was carried out by a trial of Biology Teachers in Bogor Regency, Indonesia. Grids, questions, rubric assessments, and key test answers were developed by referring to Bloom's taxonomy for assessing biology teachers' knowledge about authentic assessment. The research was done in several stages, namely: pre-test, delivery of authentic content assessment through the Cirsa learning model, and post-test.

Data Analysis

The research data collection results were analyzed using descriptive statistics. Normality and homogeneity tests were performed as a requirement for hypothesis testing. The normality test used One-Sample Kolmogorov-Smirnov, whereas the homogeneity test used Levene’s Test of Equality of Error Variances. The hypothesis testing used paired t-test and all the testing techniques were conducted with statistical analysis program of SPSS 23.0 for Mac with significance level of 0.5%.

RESULTS AND DISCUSSION

The analysis of pretest and posttest score data on authentic assessment
knowledge of teachers of MGMP of Biology in Bekasi Regency is presented in Table 2.

Table 2. Average Score of Authentic Assessment Knowledge.

| No | Topic                                                         | Average | Pretest | Posttest |
|----|--------------------------------------------------------------|---------|---------|----------|
| 1  | Authentic assessment definition                             | 30.50   | 67.50   |
| 2  | Authentic assessment forms                                  | 35.00   | 70.85   |
| 3  | Authentic assessment scopes                                 | 40.00   | 75.25   |
| 4  | Authentic assessment implementation in biology learning     | 45.00   | 60.20   |
| 5  | Authentic assessment relevance to the 21st Century Skills    | 25.85   | 60.35   |
|    | Average                                                     | 35.27   | 66.83   |

Based on Table 2, it is known that the weakest aspect of the biology teachers before the implementation of authentic assessment training was difficulties in connecting the assessment with the relevance of must-have skills by biology teachers. The pretest results also indicated that teachers had been implemented several authentic assessments into biology learning; however, they faced difficulties when they were asked to explain related theories, definitions, forms, and scopes of authentic assessment. The assessment results after posttest suggested that teachers’ understanding of authentic assessment increased. The teachers were capable of understanding the definition, forms and scopes of authentic assessment after learning through Cirsa model. The results of response questionnaire given to the teachers regarding the training activities are displayed in Table 3.

Table 3 Summary of Teachers’ Response Results on Authentic Assessment Skill Empowerment Learning Process.

| No | Statement                                                                 | N  | Average | Category       |
|----|--------------------------------------------------------------------------|----|---------|----------------|
| 1  | After the activity, I am interested to learn more on authentic assessment development | 50 | 3.65    | Strongly Agree |
| 2  | The speakers master the content on authentic assessment development      | 50 | 3.77    | Strongly Agree |
| 3  | After the training activities, I gain new information through discussion on authentic assessment development | 50 | 3.62    | Strongly Agree |
| 4  | After the training, I understand the authentic assessment procedures and its various forms. | 50 | 3.46    | Agree          |
| 5  | Authentic assessment is easy to develop in biology learning              | 50 | 3.62    | Strongly Agree |
| 6  | Authentic assessment needs to be applied in biology learning             | 50 | 3.73    | Strongly Agree |
| 7  | According to me, authentic assessment development will add my works load as a biology teacher | 50 | 2.15    | Disagree       |
| 8  | Authentic assessment provides fairness to learners                       | 50 | 3.62    | Strongly Agree |
| 9  | Authentic assessment is essential to be applied in biology learning      | 50 | 3.65    | Strongly Agree |
| 10 | Each learner in biology learning is unique and has potential for community success | 50 | 3.77    | Strongly Agree |
|    | Average                                                                   | 50 | 3.51    | Strongly Agree |
According to Table 3, it can be concluded that the teachers of MGMP of biology in Bekasi Regency agreed that the authentic assessment training provide better understanding and motivation. The teachers also understood the importance of authentic assessment in providing fairness in the assessment process and believed that each participant is unique and has their own strengths and weaknesses. It is required in fair evaluation of learners’ learning outcome.

The result of normality test of authentic assessment knowledge data obtained a significant value (level) in all posttest groups (0.450) that was greater than the alpha of 0.05. It suggested that Ho stating that the biology teachers’ authentic assessment concept understanding is not deviated from normal distribution data was accepted. The homogeneity test for biology teachers’ authentic assessment concept understanding posttest data obtained a significant value of 0.278, which was greater than the alpha of 0.05; therefore, H₀ stating that variance between biology teachers’ authentic assessment concept understanding data was not different or homogeneous was accepted.

### Table 4 Summary of Analysis Prerequisite Tests.

| Test          | Sig. | α  | Description |
|---------------|------|----|-------------|
| Normality     | 0.450| 0.05 | Normal     |
| Homogeneity   | 0.287| 0.05 | Homogeneous |

Based on the result of hypothesis testing using paired t-test method with SPSS program (Table 5) it was found that the sig. value was 0.000, which was smaller or equal to 0.05. It can be concluded that there was a difference between pretest and posttest after the application of Cirsan learning in discussion of MGMP teachers’ authentic assessment in Bekasi, West Java.

### Table 5 Summary of analysis paired t-test.

| Test        | N    | α     | p value | Result  | Keterangan     |
|-------------|------|-------|---------|---------|----------------|
| Paired t-test | 50   | 0.000 | 0.05    | p < α   | H₀ rejected    |

The research aimed to analyze the influence of Cirsan learning model application on biology teachers’ authentic assessment knowledge in Bekasi Regency, West Java. The research result indicated that there was a difference in biology teachers’ authentic assessment understanding before and after the implementation of content delivery activities through Cirsan learning model. The posttest score results were higher than the pretest results on authentic assessment understanding in biology learning.

Cirsan contribution to the achievement of authentic assessment understanding for biology teachers was related to Cirsan learning syntax. The Cirsan learning model is a learning design innovation by modifying CIRC type cooperative learning model with scientific approach (Djamahar et al., 2018). In the 2013 Curriculum, teachers are expected to apply scientific approaches in classroom learning. The scientific approaches consist of 5M (Mengamati, Menanya, Mencoba, Menalar, dan Mengkomunikasikan) or (observe, ask, try, reasoning and communicate). The learning model stresses on a learning aspect that is not only focusing on reading and writing processes but also scientific activities, such as observe, ask, try/experiment, associate and communicate (Djamahar et al., 2019).

The scientific approach-based CIRC learning model is a learning design that is in accordance with the 2013 Curriculum that expects teachers to apply learning using scientific approaches (Burhanudin & Sodiq, 2018; Marjan, Arnyana, & Setiawan, 2014). Teachers encounter a variety of obstacles in the 2013 Curriculum implementation (Abdullah, 2016; Merta,
Suarjana, & Mahadewi, 2015). The Cirsa learning model is designed in accordance with the cooperative learning principles and it has characteristics in terms of discussion, reading and presentation. The reading activity is an often-neglected process in learning, especially in conventional learning (Djamahar et al., 2018). It causes one’s reading ability to decrease, whereas high literacy activity has positive impact on learners’ learning in the classroom (Ekantini & Wilujeng, 2018; Sarkar & Corrigan, 2014; Udompong, Traiwichitkhun, & Wongwanich, 2014).

The superiority of Cirsa learning model in improving authentic assessment was related to the division of teachers into 6 (six) groups. The division of group was based on authentic assessment types. Each group focused to analyze authentic assessment types. Discussion activity in group would make members positively depended to each other, which was in accordance with cooperative learning principle (Ristanto, Zubaidah, Amin, & Rohman, 2018b). The success and target achievement would be influenced by every member (Baloche & Brody, 2017; Navarro-Pablo & Gallardo-Saborido, 2015). Goals achievement was based on the definition of authentic assessment types, types of instrument used, and example of authentic assessment instrument in biology learning.

The Cirsa learning model was proven to help the biology teachers to combine reading and writing activities with scientific approaches. These activities were integrative activities in the implementation of authentic assessment understanding in biology learning. Reading learning with Cirsa model consisted of several main elements, namely: group formation activity, learning source searching, analysis and presentation. These activities were based on scientific approaches.

The CIRC type cooperative learning is one of learner-centered learning models (Gokhale, 1995; Liu, 2007; Loes & Pascarella, 2017). In the research, the active activities conducted were emphasizing on group work by the biology teachers to solve problems together, which was mastering the authentic assessment of biology learning. The cooperative learning also named as one of learning strategies that emphasizes group learning (Nam, 2017; Osho & Williams, 2018; Unin & Bearing, 2016; Wallace, Preston, & Harvie, 2016). The virtue of group in the research encouraged the biology teachers in the activities to learn together by forming small groups and analyzing types of authentic assessment. The activities started with planning, which was by collecting information related to the authentic assessment types from various sources.

Next, discussion and up to evaluation were done together so that all teachers participated and had responsibility to produce ideas on authentic assessment development. By conducting discussions in the Cirsa syntax there will be pedagogical communication between the teacher and the teacher. The communication activities include; guide, direct, educate, and foster interpersonal potential. Pedagogic communication is able to create effective learning. The nature of an effective learning is a learning process that not only focuses on learning outcomes but also the learning process. The learning process here is expected to be able to provide a good understanding, the process of internalizing knowledge, and changes in the way of thinking of teachers who are expected to change their views and ways of teaching (Suyatno, 2019). Some previous studies have found that there is a correlation between pedagogic communication and effective learning, which means that in Cirsa learning involves the principles of pedagogic communication, the learning process in the classroom will be effective.

The cooperative learning model is known in various types. Learning that gives emphasize to reading activity is Cooperative Integrated Reading and
Composition (CIRC) learning. The learning model could monitor and activate learners’ reading activity. This learning process underlines learners’ active involvement in the learning process through such activities as reading, discussion, concept finding and rewriting it through opinion and reflection (Liu, 2007; Mozzer & Justi, 2012; Mutrofin et al., 2017; Tesfaye & Berhanu, 2015). The learning activities could provide opportunities for learners to explore information through activities of reading, discussion and rewriting it in a group.

The research findings indicated that increased understanding of authentic assessment in biology learning through Cirsa learning was in significant category. The Cirsa learning was not only effective to be applied in biology learning at the secondary school level (Djamahar et al., 2019, 2018) but also effective in improving biology teachers’ understanding of authentic assessment. It is also appropriate to be applied in various levels to improve knowledge.

In its implementation, Cirsa could be used with a variety of technological devices. The presence of technology in learning is very helpful in performing classroom learning innovation. In Cirsa utilization, technology could play a role as a tool to perform authentic assessment. The technology facilitates the assessment, especially for students in the secondary school level where Smartphone is familiar amongst them. Therefore, it will be easy for students to answer questions given by the teachers using the Smartphone. As consequence, it will support the learning (Boholano, 2017; Qian, Owen, & Bax, 2018).

The likely-to-occur obstacles could be related to internet connection that must be provided by the school. Students might encounter difficulties in accessing internet during biology learning with Cirsa. The obstacle could hinder the implementation of authentic assessment. The school, as a facilities and infrastructures provider, must be able to facilitate the obstacle so that students could learn well. The use of technology could also support the 21st century learning. Students who are less able to use technology in learning will find difficulties to compete in the 21st century learning (Boholano, 2017; Farisi, 2016).

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CONCLUSION

The research results indicated that Cirsa learning is able to provide increased understanding to teachers of the importance of using authentic assessments in learning Biology, in Bekasi. The results also strengthen other research results on the Cirsa learning effectiveness model to improve the ability of teachers in the use of authentic assessments in Biology learning in high school. It is expected that further research could test Cirsa learning model effectiveness on effective and psychomotor aspects both in school and teacher levels.

REFERENCES

Abdullah. (2016). Implementasi penilaiaan autentik kurikulum 2013 pada pembelajaran pendidikan agama Islam di madrasah tsanawiyah negeri 2 palangka raya. FITRAH: Jurnal Kajian Ilmu-Ilmu Keislaman, 2(2), 59–81. https://doi.org/10.24952/fitrah.v2i2.4
Afrianto, A. (2019). Challenges of Using Portfolio Assessment as an Alternative Assessment Method for Teaching English in Indonesian Schools. International Journal of Educational Best Practices. https://doi.org/10.31258/ijebp.v1n2.p106-114

Araya, R., Calfucura, P., Jiménez, A., Aguirre, C., Palavicino, M. A., Lacourly, N., … Dartnell, P. (2010). The effect of analogies on learning to solve algebraic equations. Pedagogies: An International Journal, 5(3), 216–232. https://doi.org/10.1080/1554480X.2010.486160

Baloche, L., & Brody, C. M. (2017). Cooperative learning: exploring challenges, crafting innovations. Journal of Education for Teaching, 43(3), 274–283. https://doi.org/10.1080/02607476.2017.1319513

Barber, W., King, S., & Buchanan, S. (2015). Problem based learning and authentic assessment in digital pedagogy: Embracing the role of collaborative communities. Electronic Journal of E-Learning, 13(2), 59–67. https://doi.org/10.1002/tl.7401

Boholano, H. B. (2017). Smart Social Networking: 21st Century Teaching and Learning Skills. Research in Pedagogy, 7(1), 21–29. https://doi.org/10.17810/2015.45

Bolat, Y., & Karakuş, M. (2017). Design implementation and authentic assessment of a unit according to concept-based interdisciplinary approach. International Electronic Journal of Elementary Education, 10(1), 37–47. https://doi.org/10.26822/iejee.2017131885

Burhanudin, M., & Sodiq, I. (2018). Kendala Guru Sejarah dalam Kurikulum 2013 Menggunakan Pendekatan Saintifik di SMK Negeri 7 Semarang. Indonesian Journal of History Education.

Camacho, D. J., & Legare, J. M. (2015). Opportunities to Create Active Learning Techniques in the Classroom. Journal of Instructional Research, 4, 38–45.

Charoencha, Ic., Phuseeorn, S., & Phengsawat, W. (2015). Teachers development model to authentic assessment by empowerment evaluation approach. Educational Research and Reviews, 10(17), 2524–2530. https://doi.org/10.5897/ERR2015.2243

Darmawan, E. (2017). Pengaruh Penerapan Model Pembelajaran Simas Eric (Skimming-Mind Mapping-Questioning-Exploring-Writing-Communicating) Pada Siswa Berbeda Terhadap Keterampilan Metakognitif, Berpikir Kritis dan Pemahaman Konsep Siswa SMA di Malang. DISERTASI dan TESIS Program Pascasarjana UM.

Darmawan, E., Zubaidah, S., Susilo, H., & Suwono, H. (2016). Simas Eric model to improve students’ critical thinking skills. Journal of Education & Social Policy, 3(6), 45-53. https://doi.org/10.1080/JESP.2016.486767

Djamahar, R., Ristanto, R. H., Sartono, N., Ichsan, I. Z., Darmawan, E., & Muhlisin, A. (2019). Empowering Student’s Metacognitive Skill through Cirsad Learning. In Journal of Physics: Conference Series (Vol. 1227, p. 12034). Malang. https://doi.org/10.1088/1742-6596/1227/1/012034

Djamahar, R., Ristanto, R. H., Sartono, N., Ichsan, I. Z., & Muhlisin, A. (2018). CIRSA: Designing Instructional Kits to Empower 21st Century Skill. Educational Process: International
Djamahar, R., Ristanto., R. H., Sartono, N., & Darmawan, E. (2020). Approaches to respiratory and excretion systems teaching: An innovative learning through cirsa. Universal Journal of Educational Research, 8(6), 2204-2210. https://doi.org/10.13189/ujer.2020.080602

Ekantini, A., & Wilujeng, I. (2018). The Development of Science Student Worksheet Based on Education for Environmental Sustainable Development to Enhance Scientific Literacy. Universal Journal of Educational Research, 6(6), 1339–1347. https://doi.org/10.13189/ujer.2018.060625

Ekawati, R., Susetyarini, E., Pantiwati, Y., & Husamah, H. (2015). Peningkatan hasil belajar dan kemampuan berpikir kritis dengan model pembelajaran cooperative integrated reading and composition (CIRC). Jurnal Pendidikan Biologi Indonesia, 1(3), 298–306.

Fajarianingtyas, D. A., Akbar, N. A., & Herowati, H. (2019). Developing students’ worksheet based on scientific approach in cell as the system of life. Biosfer: Jurnal Pendidikan Biologi, 12(1), 109–121. https://doi.org/10.21009/biosferjpbo.12n1.109-121

Farisi, M. I. (2016). Developing the 21st century social studies skills through technology integration. Turkish Online Journal of Distance Education-TOJDE, 17(1), 16–30. https://doi.org/10.17718/tojde.47374

Gokhale, A. A. (1995). Collaborative Learning Enhances Critical Thinking. Journal of Technology Education. https://doi.org/10.21061/jte.v7i1.a.2

Gündüz, A. Y., Alemdağ, E., Yaşar, S., & Erdem, M. (2016). Design of a problem-based online learning environment and evaluation of its effectiveness. The Turkish Online Journal of Educational Technology, 15(3), 49–57. https://doi.org/10.1017/CBO9781107415324.004

Gupta, M., & Ahuja, J. (2014). Cooperative integrated reading composition (CIRC): impact on reading comprehension achievement in English among seventh graders. IMPACT: International Journal of Research in Humanities, Arts and Literature, 2(5), 37–46.

Ilahi, M. T. (2016). Pendidikan Berbasis Moral. Jakarta: Ar-Ruzz Media.

Istiana, R., & Awaludin, M. T. (2018). Enhancing biology education student's ability to solve problems in environmental science material through inquiri model-based lesson study. Biosfer: Jurnal Pendidikan Biologi, 11(1), 57–66. https://doi.org/10.21009/biosferjpbo.11-1.6

Kivunja, C. (2014). Teaching students to learn and to work well with 21st century skills: unpacking the career and life skills domain of the new learning paradigm. International Journal of Higher Education, 4(1), 1–11. https://doi.org/10.5430/ijhe.v4n1p1

Kusumaningtyas, A., Zubaidah, S., & Indriwati, S. E. (2013). Pengaruh problem-based learning dipadu strategi numbered heads together terhadap kemampuan metakognitif, berpikir kritis, dan kognitif biologi. Jurnal Penelitian Kependidikan, 1(23), 33–47.

Lancor, R. A. (2014). Using Student-Generated Analogies to Investigate Conceptions of Energy: A multidisciplinary study. International Journal of Science Education, 36(1), 1–23.

Indonesian Journal of Science and Education, Volume 4, Nomor 2
Leong, S. S. M., Mohd Said, H., Shahrill, M., & Perera, J. S. H. Q. (2016). Using lesson study to enhance meaningful understanding on the topic of pressure. *International Journal of Environmental and Science Education, 11*(15), 8425–8435.

Lestari, N., Mertha, I. W., & Kusmiyati, K. (2019). Profil assessmen autentik pada guru-guru di smp negeri se-kota maramat. *Jurnal Penelitian Pendidikan IPA*. https://doi.org/10.29303/jppipa.v5i1.186

Lewis, J. M. (2016). Learning to lead, leading to learn: How facilitators learn to lead lesson study. *ZDM - Mathematics Education, 48*(4), 527–540. https://doi.org/10.1007/s11858-015-0753-9

Liu, E. Z. F. (2007). Developing a personal and group-based learning portfolio system. *British Journal of Educational Technology, 38*(6), 1117–1121. https://doi.org/10.1111/j.1467-8535.2006.00691.x

Loes, C. N., & Pascarella, E. T. (2017). Collaborative Learning and Critical Thinking: Testing the Link. *The Journal of Higher Education, 88*(5), 726–753. https://doi.org/10.1080/00221546.2017.1291257

Marjan, J., Arnyana, I. B. P., & Setiawan, I. G. A. N. (2014). Pengaruh pembelajaran pendekatan saintifik terhadap hasil belajar biologi dan keterampilan proses sains siswa MA Mu’allimat NW Pencor Selong Kabupaten Lombok Timur Nusa Tenggara Barat. *E-Journal Program Pascasarjana Universitas Pendidikan Ganesha, 4*, 1–12.

Merta, I. M. E. D., Suarjana, I. M., & Mahadewi, L. P. P. (2015). Analisis Penilaian Autentik Menurut Pembelajaran Kurikulum 2013 Pada Kelas IV SD No. 4 Banyuasri. *E-Journal PGSD Universitas Pendidikan Ganesha.*

Mozzer, N. B., & Justi, R. (2012). Students’ Pre- and Post-Teaching Analogical Reasoning When They Draw their Analogies. *International Journal of Science Education, 34*(3), 429–458. https://doi.org/10.1080/09500693.2011.593202

Mutofin, Degeng, N. S., Ardhana, W., & Setyosari, P. (2017). The Effect of Instructional Methods (Lecture-Discussion versus Group Discussion) and Teaching Talent on Teacher Trainees Student Learning Outcomes. *Journal of Education and Practice, 8*(9), 203–209. Retrieved from http://search.ebscohost.com/login.aspx?direct=true&db=eric&AN=EJ1138824&site=ehost-live

Naganuma, S. (2017). An assessment of civic scientific literacy in Japan: development of a more authentic assessment task and scoring rubric. *International Journal of Science Education, Part B: Communication and Public Engagement, 7*(4), 301–322. https://doi.org/10.1080/21548455.2017.1323131

Nam, C. W. (2017). The effects of digital storytelling on student achievement, social presence, and attitude in online collaborative learning environments. *Interactive Learning Environments, 25*(3), 412–427. https://doi.org/10.1080/10494820.2015.1135173

Navarro-Pablo, M., & Gallardo-Saborido, E. J. (2015). Teaching to Training Teachers through Cooperative Learning. *Procedia - Social and Behavioral Sciences, 180*(November 2014), 401–406.
Noviar, D. (2016). Pengembangan Ensilokopedi Biologi Mobile Berbasis Android Dalam Rangka Implementasi Kurikulum 2013. Jurnal Cakrawala Pendidikan, 15(2), 198–207. https://doi.org/10.21831/cp.v15i2.8255

Noviar, D., & Hastuti, D. R. (2015). Pengaruh model problem based learning (pbl) berbasis scientific approach terhadap hasil belajar biologi siswa kelas x di sman 2 Banguntapan T. A. 2014/2015. Bioedukasi, 8(2), 42–47.

Olander, C. (2013). Why am i learning evolution? Pointers towards enacted scientific literacy. Journal of Biological Education, 47(3), 175–181. https://doi.org/10.1080/00219266.2013.821750

Osho, G. S., & Williams, F. (2018). An Empirical Investigation of the Impacts of Web-Based Distance Education: Evidence for Justice Studies. Journal of Educational Issues, 4(2), 15–26. https://doi.org/10.5296/jei.v4i2.13049

Pang, J. S. (2016). Improving mathematics instruction and supporting teacher learning in Korea through lesson study using five practices. ZDM - Mathematics Education, 48(4), 471–483. https://doi.org/10.1007/s11858-016-0768-x

Qian, K., Owen, N., & Bax, S. (2018). Researching mobile-assisted Chinese-character learning strategies among adult distance learners. Innovation in Language Learning and Teaching, 12(1), 56–71. https://doi.org/10.1080/17501229.2018.1418633

Redhana, I. W. (2019). Mengembangkan Keterampilan Abad Ke-21 Dalam Pembelajaran Kimia. Jurnal Inovasi Pendidikan Kimia, 13(1), 2239–2253.

Ristanto, R. H., Zubaidah, S., Amin, M., & Rohman, F. (2017). Scientific Literacy of Students Learned Through Guided Inquiry. International Journal of Research & Review, 234(5), 23–30.

Ristanto, R. H., Zubaidah, S., Amin, M., & Rohman, F. (2018a). From a reader to a scientist: developing cirgi learning to empower scientific literacy and mastery of biology concept. Biosfer: Jurnal Pendidikan Biologi, 11(2), 90–100.

Ristanto, R. H., Zubaidah, S., Amin, M., & Rohman, F. (2018b). The Potential of Cooperative Integrated Reading and Composition in Biology Learning at Higher Education. International Journal of Educational Research Review, 3(1), 50–56.

Sarkar, M., & Corrigan, D. (2014). Promotion of scientific literacy: Bangladeshi teachers’ perspectives and practices. Research in Science and Technological Education, 32(2), 162–181. https://doi.org/10.1080/02635143.2014.905462

Setiawan, D. C., Corebima2, A. D., & Zubaidah, S. (2013). Pengaruh strategi pembelajaran reciprocal teaching (RT) dipadu pemberdayaan berpikir melalui pertanyaan (PBMP) terhadap kemampuan metakognitif biologi siswa SMA Islam Al – Ma’arif Singsosari Malang. Jurnal Pendidikan Universitas Negeri Malang, 1–7.
Sudja, I. N., & Yuesti, A. (2017). The Influences of Education and Training, Leadership, Work Environment, Teacher Certification On Discipline and Teacher’s Professionality In High School at Bali Province. *Scientific Research Journal (SCIRJ)*, 5(9).

Surpless, B., Bushey, M., & Halx, M. (2014). Developing scientific literacy in introductory laboratory courses: A model for course design and assessment. *Journal of Geoscience Education*, 62(2), 244–263. https://doi.org/10.5408/13-073.1

Susilo, M. J. (2016). Pembelajaran IPA Biologi Berbasis Scientific Approach Di SMP Muhammadiyah 2 Depok Sleman. *Proceeding Biology Education Conference*, 13(1), 97–101.

Suyatno, S., Urbayatun, S., Maryani, I., Bhakti, C., & Sulisworo, D. (2019, May). Teacher Pedagogic Communication for Effective Learning. In *First International Conference on Progressive Civil Society (ICONPROCS)* 2019. Atlantis Press.

Tesfaye, S., & Berhanu, K. (2015). Improving Students’ Participation in Active Learning Methods: Group Discussions, Presentations and Demonstrations: A Case of Madda Walabu University Second Year Tourism Management Students of 2014. *Journal of Education and Practice*, 6(22), 29–33.

Tsai, C.-W., Shen, P.-D., & Lin, R.-A. (2014). Exploring the Effects of Student-Centered Project-Based Learning with Initiation on Students’ Computing Skills. *International Journal of Information and Communication Technology Education*, 11(1), 27–43. https://doi.org/10.4018/ijicte.2015010102

Udompong, L., Traiwichitkhun, D., & Wongwanich, S. (2014). Causal Model of Research Competency Via Scientific Literacy of Teacher and Student. *Procedia - Social and Behavioral Sciences*, 116(2001), 1581–1586. https://doi.org/10.1016/j.sbspro.2014.01.438

Unin, N., & Bearing, P. (2016). Brainstorming as a Way to Approach Student-centered Learning in the ESL Classroom. *Procedia - Social and Behavioral Sciences*, 224, 605–612. https://doi.org/10.1016/j.sbspro.2016.05.450

Villarroel, V., Bloxham, S., Bruna, D., Bruna, C., & Herrera-Seda, C. (2018). Authentic assessment: creating a blueprint for course design. *Assessment and Evaluation in Higher Education*, 43(5), 840–854. https://doi.org/10.1080/02602938.2017.1412396

Wallace, H. D., Preston, L., & Harvie, K. M. (2016). Assessing curriculum planning for humanities inquiry: The challenges and opportunities of poster presentation. *Australian Journal of Teacher Education*, 41(12), 67–82. https://doi.org/10.14221/ajte.2016v41n12.5

Yacoubian, H. A. (2018). Scientific literacy for democratic decision-making. *International Journal of Science Education*, 40(3), 308–327. https://doi.org/10.1080/09500693.2017.1420266