 ISEJ: Indonesian Science Education Journal

ISSN: 2716-3350

Vol. 2, No. 1, Januari 2021, Hal 17-26

**Assessment Instruments of Learning Motivation and Science Learning Outcomes of Class V Elementary School Students**

Ahmad Walid1, Hadiwinarto2

1, Mahasiswa Program Studi Doktor Pendidikan FKIP Universitas Bengkulu

2 Fakultas Keguruan dan Ilmu Pendidikan Universitas Bengkulu

Correspondent e-mail:

1 [dongawalid19@gmail.com](mailto:dongawalid19@gmail.com),

2 [hadiwin@unib.ac.id](mailto:hadiwin@unib.ac.id)

**Abstract**

This research aims to evolve an instrument of learning motivation assessment and natural science learning outcomes. The development model used in this research was 4D, consists of define, design, develop, and disseminate. This study was only carried out until the develop stage. The subject of this research was a science learning evaluation instrument consisting of a grid, questionnaire sheet and a test of natural science learning outcome. Data collected using questionnaire and test methods. The data would be analyzed for the validity and reliability of each instrument. The average value 0.92 and 1 obtained from the results of the learning motivation assessment and learning outcome instrument validity analysis, which means that both of these assessment instruments have a very high validity. While the results of the learning motivation assessment instruments reliability analysis 0.86 and natural science learning outcome 0.87, which means that both of these instruments have a high level of reliability. From these results, it could be explained that the development of learning motivation assessment and natural science learning outcome instrument were feasible to be developed and used to make assessment of student.

**Keywords**: Instruments, Motivation, Result, Study, Natural Science.

INTRODUCTION

In essence, the purpose of human life is to live and make a better and more decent life. To get this, a person must have complex things in his life in the form of an insight, behavior and good craftsmanship. These three components can be obtained through education. Sujana (2019), education is a way to help the souls of students both physically and mentally to become better humans. According to Dewantara (in Marwah, et al, 2018), education is various efforts made by parents to children to support the progress of their lives. So, education is an effort to create better humans.

One of the ways to get education in the State of Indonesia is through formal educational institutions. The most important education unit in accommodating formal education procedures is Elementary School (SD). Many lessons are taught in elementary schools, one of which is Natural Sciences (IPA). Astalini & Kurniawan (2019) explain that science is a process that students go through which results in understanding in the form of concepts related to nature. Agustini, et al (2016)

stated that at the basic education level, teaching science aims to prepare students through various competencies and adaptation skills in various environments and challenges that will be found in the future. Meanwhile, according to De Vito (in Norazaini, 2017) argues that effective science learning is science that connects with daily activities, students are given opportunities to hone their skills, and build understanding in students that science lessons are important in this life.

learning Sciencecan be well received, if students have an interest or high encouragement in carrying out the learning process and accompanied by good teachers in managing the learning process. Meanwhile, if students do not have interest or encouragement is good and is not matched by a good teacher in managing the learning process, the participants cannot understand science learning students. If science learning cannot be understood by students, it is very impact on student learning outcomes on science learning.

The results of observations and interviews on 21 and 22 October 2019 at SDN 1 Bengkulu City, especially in class V in science subjects shows that student learning motivation is lacking and learning outcomes are still below Minimum Completeness Criteria (KKM). To complement the results of interviews and observations has been done, then continued with the study of the documents of the UTS IPA grade V SDN 1 students Bengkulu City, 2019/2020 academic year. Based on the results of the study The science midterm test score document shows that there are still many students who do get a score below the Minimum Completeness Criteria (KKM). This proves that still low learning motivation and science learning outcomes of class V SDN 1 Bengkulu City, Academic Year 2019/2020.

There are several causes for the low learning motivation and science learning outcomes based on observations in class V SDN 1 Bengkulu City, among them teachers are still not able to maximize the application of an innovative learning model, lack of question and answer process during lessons, and teachers often experience difficulties to assess the level of learning motivation and learning outcomes that have been achieved by students because of the tool the evaluation used cannot measure well and is not in accordance with that must be measured, so that the data obtained is inaccurate and wrong.

Based on the results of the literature review and the author's logical argument, the solution can be is given namely by developing an instrument that the teacher can use for assess the learning motivation and learning outcomes of students. This solution was chosen considering if the instrument continues to be used, it will provide a biased judgment. Research This development has a difference with the previous development research conducted by Trimawati, et al (2020); Astalini & Kurniawan (2019); and Hamid (2016). The difference lies in the research subjects used, namely elementary school and the variables used are learning motivation and student learning outcomes. In deciding instrument of assessment of learning motivation and student learning outcomes, the teacher must be able to determine appropriate assessment instrument that can assess the extent of motivation and outcome levels student learning in the learning process. The learning motivation instrument developed by in this study is a learning motivation instrument in the form of a questionnaire and the learning outcome assessment instrument developed was a multiple choice test (objective).

Motivation is something that is important to someone. According to Uno (in Arjuniwati, 2019), motivation is rooted in the words- motive which means a determination that exists within the individual to carry out an activity. Monika & Adman (in Andriani & Rasto, 2019) define motivation as a driving force to grow and increase enthusiasm for learning activities. The motivation that exists in students is very influential on the development of student learning processes and outcomes.

Learning outcomes can be defined as something that is important in the learning process, because the learning outcomes obtained by students reflect student understanding. Kennedy (in Maulida & Mukminan, 2016) learning outcomes are the results that explain the understanding or abilities of students in the learning process. According to Yusuf (2015) learning outcomes are a symbol of student success or achievement in the learning process. Meanwhile, Sudjana (in Huntaruk & Simbolon, 2018), learning outcomes are competencies that students have after undergoing a learning experience. So, learning outcomes, namely an ability that students have after carrying out the learning process at a certain time, learning outcomes are also used as a measure to assess students' understanding in the learning process.

# METHOD

Type of this research is Research and Development. The development model used in this research is 4D, consisting of define, design, develop, and disseminate (Thiagarajan in Dewi & Akhlis, 2016). However, thestage disseminate cannot be carried out considering time and financial limitations.

In this study, the implementation of the 4D model consists of: (1) The define phase is the initial phase or becomes the initial foundation in conducting a research. (2) This definition phase consists of needs analysis, student characteristic analysis, task analysis. The design stage is the stage which contains a plan. The design stage aims to make a plan or initial framework for the assessment of learning motivation and science learning outcomes. (3) The develop phase is the phase used in producing a development product. Thisphase develop has the goal of producing an assessment instrument after going through the guidance and improvement process. This stage consists of an expert assessment which is carried out by testing the content validation analysis using a validation sheet that is submitted to the expert, then the expert will provide an assessment and input that is useful for improvement and refinement of the resulting product anddevelopmental testingteststhatthe instrument into There are 3 different elementary schools, namely SD Negeri 3 Bengkulu with 32 students, SDN 5 Bengkulu with 34 students, and SDN 24 Bengkulu with 24 students.

The student learning motivation instruments used were in the form of a grid and a questionnaire sheet. Sugiyono (2017), a questionnaire is a data collection technique consisting of a collection of questions submitted to respondents. Widoyoko (in Purnomo & Palupi, 2016) questionnaire, which is a data collection method in the form of written questions to respondents. Meanwhile, the student learning outcomes instruments used in the form of grids and objective test sheets. Arikunto (in Aji & Winarno, 2016) test is a collection of problems in the form of questions that are submitted to students to measure students' understanding and expertise. Azwar (in Suharman, 2018), the test is a systematic procedure that is arranged according to certain techniques and rules.

The learning motivation assessment instrument is based on indicators according to Uno (2008), namely: (1) the desire and desire to succeed; (2) encouragement and need in learning; (3) the existence of hopes and aspirations for the future; (4) there is appreciation in learning; (5) there are activities that are interesting in learning; (6) there is a conducive learning environment, allowing a student to learn well. This indicator is developed into 24 statements which are divided into 12 positive statements and 12 negative statements. The science learning outcome instrument is arranged based on KD from theme 8 which is developed into 10 indicators and produces 30 objective items. Each item has 4 alternative answers to be chosen by the students. The resulting instruments were in the form of a grid and an objective test sheet totaling 30 items. This study uses data analysis techniques in the form of validity analysis and instrument reliability analysis. The validity analysis is divided into analysis of content validity and item validity.

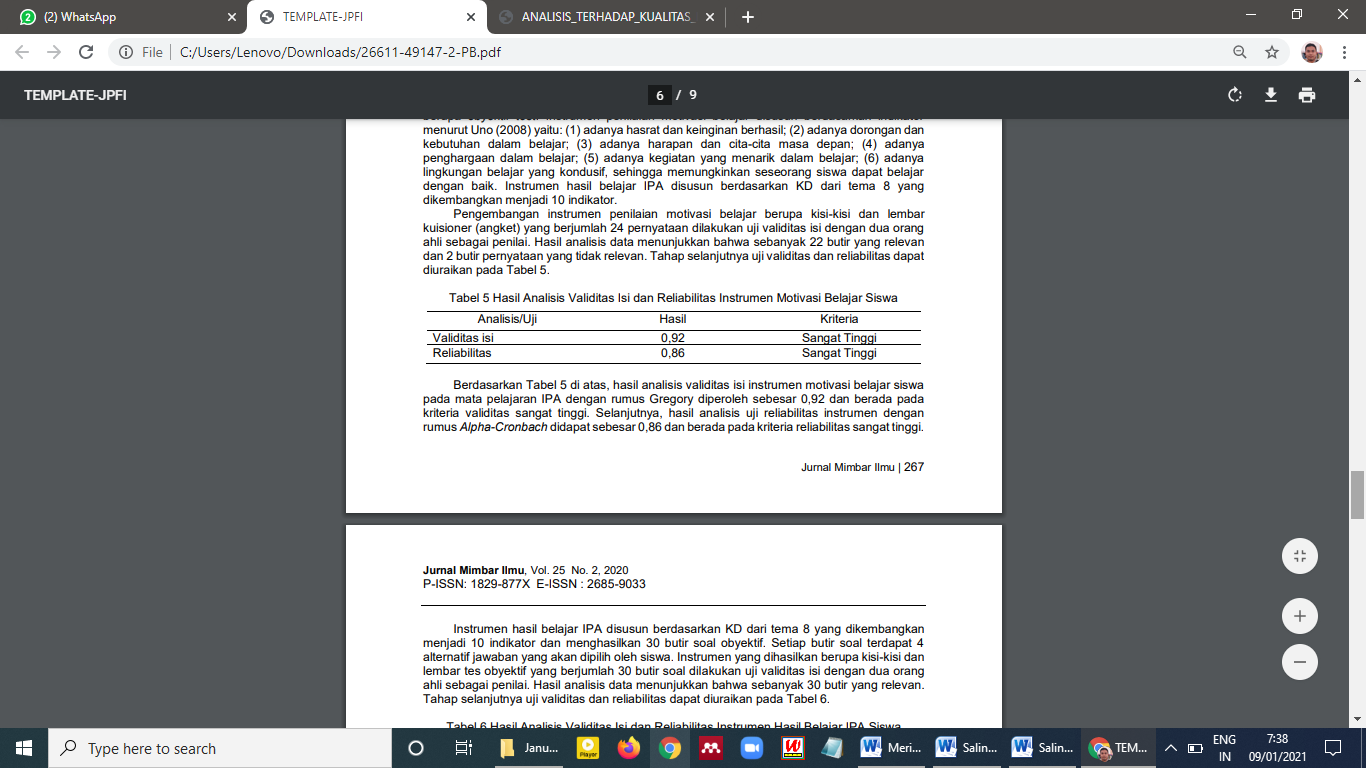
# Results and Discussion

The results of this development are in the form of learning motivation instruments and science learning outcomes for class V on theme 8. The development model used in this research is 4D, consisting of define, design, develop, and disseminate. This development research is only carried out until thestage develop. The instrument used to assess student learning motivation was a questionnaire, while the instrument used to assess science learning outcomes was an objective test. The learning motivation assessment instrument is based on indicators according to Uno (2008), namely: (1) the desire and desire to succeed; (2) encouragement and need in learning; (3) the existence of hopes and aspirations for the future; (4) there is appreciation in learning; (5) there are activities that are interesting in learning; (6) there is a conducive learning environment, allowing a student to learn well. The science learning outcome instrument is arranged based on basic competency from theme 8 which is developed into 10 indicators.

The development of learning motivation assessment instruments in the form of lattices and questionnaire sheets (questionnaire) totaling 24 statements was tested for content validity with two experts as assessors. The results of data analysis showed that as many as 22 items were relevant and 2 items were irrelevant. The next stage of the validity and reliability test can be described in Table

Table 1

Results of the Analysis of Content Validity and Reliability of the Student's Learning Motivation Instrument

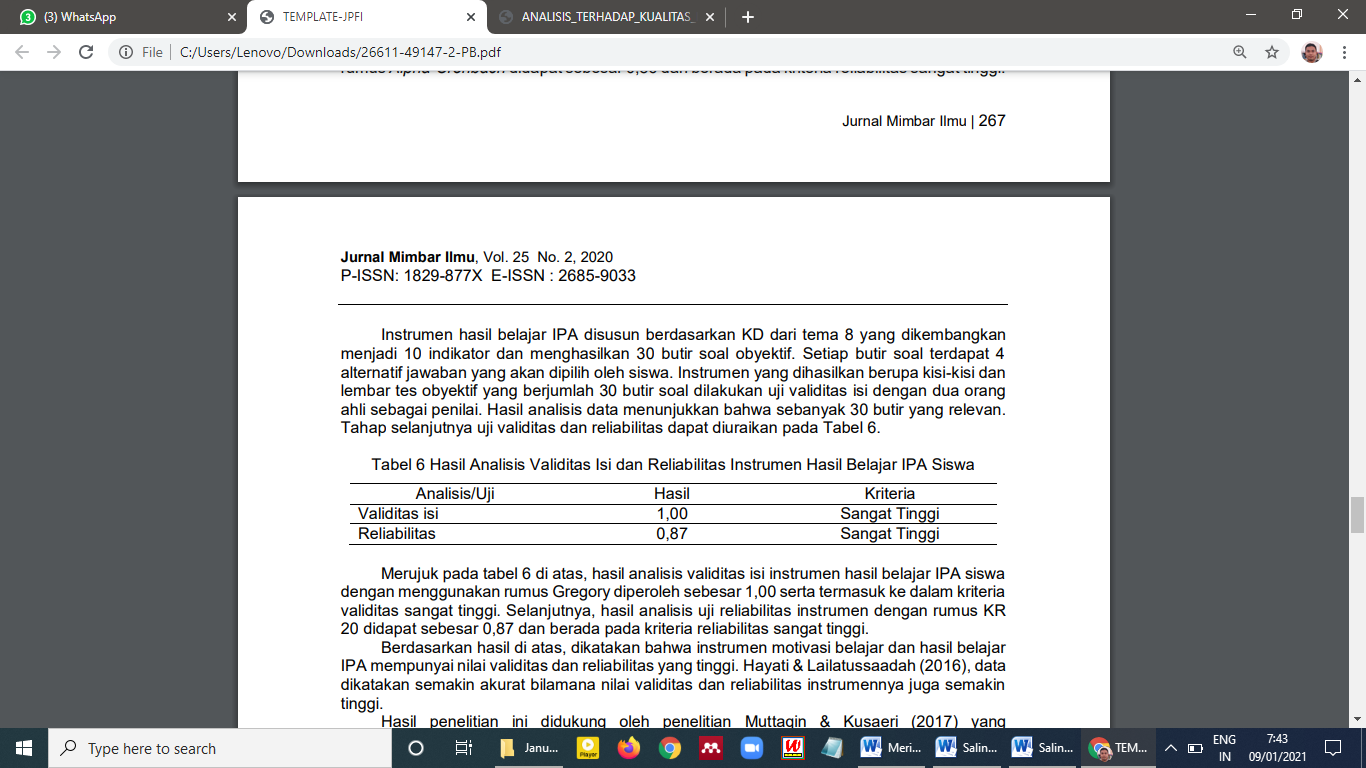


Based on Table 1 above, the results of the analysis the validity of the contents of the student learning motivation instrument in science subjects with the Gregory formula was obtained at 0.92 and was at very high validity criteria. Furthermore, the results of the analysis of the instrument reliability test with theformula Alpha-Cronbachwere obtained at 0.86 and were at very high reliability criteria.

Science learning outcomes instruments are arranged based on KD from theme 8 which is developed into 10 indicators and produces 30 objective items. Each item has 4 alternative answers to be chosen by the students. The resulting instrument in the form of a grid and an objective test sheet totaling 30 items was tested for content validity with two experts as assessors. The results of data analysis showed that as many as 30 items were relevant. The next stage of the validity and reliability test can be described in

Table 2

Results of the Analysis of Content Validity and Reliability of the Instruments for Student Science Learning Outcomes



Referring to table 2 above, The results of the analysis of the content validity of the student's science learning outcomes using the Gregory formula were 1.00 and included in the very high validity criteria. Furthermore, the results of the analysis of the instrument reliability test with the KR 20 formula were obtained at 0.87 and were at very high reliability criteria.

Based on the above results, it is said that the instrument of learning motivation and science learning outcomes has high validity and reliability values. Hayati & Lailatussaadah (2016), the data is said to be more accurate if the value of the validity and reliability of the instrument is also higher.

The results of this study are supported by research by Muttaqin & Kusaeri (2017) which shows that the instrument developed is very valid with an average total validity of 3.6 and has a very high reliability of 0.819. Other researchers who support this research are Dewi & Prasetyo (2016) which shows that the science assessment instrument consisting of 36 items has a very high validity of 1.00 and a very high reliability of 0.90, so it can be concluded that the instrument is very suitable for use.

The instrument for assessing learning motivation and learning outcomes is feasible to develop because the assessment instrument is something that must be in the learning process as a tool used to obtain all information to determine the level of student ability objectively. In line with Arikunto (in Hardiani, 2017) an instrument is a tool used to facilitate the process of collecting certain data effectively. Gronlund (in Abdullah, 2015), the assessment is something that is carried out in stages which consists of the stages of collecting, analyzing, and translating information to determine the level of understanding or skills achieved by students. The instrument is said to be good according to Winarno (in Aji & Winarno, 2016) if it has criteria including validity, reliability, and practicality.

## CONCLUSION

# Referring to the results and discussion, conclusions can be drawn including: (1) development of learning motivation assessment instruments in the form of a questionnaire totaling 24 statements divided into 12 positive statements and 12 negative statements. The results of data analysis show that as many as 22 items are relevant with a validity of 0.92 and a reliability of 0.86, which means that the validity and reliability of the learning motivation instrument are at very high criteria. So that this instrument is appropriate and feasible to use to assess student learning motivation. (2) developing an instrument for assessing the learning outcomes of science learning using an objective test totaling 30 questions. The results of data analysis showed that all items were relevant, with a validity of 1.00 and reliability of 0.87, which means that the validity and reliability of the instrument of science learning outcomes were included in very high criteria. So that this instrument is appropriate and suitable for measuring student learning outcomes in science. The suggestions that can be conveyed include: (1) Educators should deliver material with full motivation that makes student learning outcomes develop.

# Learning motivation and student learning outcomes using instruments that meet the requirements of a good measuring instrument. (2) The principal should facilitate teachers to improve their skills in developing quality learning evaluation instruments or tools so that they are able to carry out assessments properly. (3) Other researchers should use the results of this study as a reference in developing assessment instruments with other topics or subjects, but to explore more diverse sources as a consideration in developing similar products. Other researchers can also continue this research at the implementation stage through experimental research.

# REferensi

Abdullah, R. 2015. The Urgency of Class-Based Assessment of Social Studies Subjects in Madrasah Tsanawiyah. Latanida Journal. Volume 3, No. 2.

Adesoji, F. A. dan Omilani, N.A. 2012. A Comparison of Secondary Schools Students Levels of Conception of Qualitative And Quantitatif Inorganic Analysis. American Journal of Scientific And Industrial Research. ISSN: 2153-649X.

Agung, AAG 2011. Research Procedure A Practice Approach. Singaraja: Ganesha University of Education.

Agustini, KSA, Gading, IK, & Tristayani, LA 2016. The Effect of Experimental Learning Methods on Science Process Skills in Group B Semester II TK Kartika VII-3. e-Journal of Early Childhood Education Ganesha University of Education. Volume 4, No. 2, p. 1–10.

Agusyana, Y. 2011. Olah Data Skripsi dan Penelitian SPSS 18. Jakarta: Gramedia Aydin, A. 2013. Representation of Science Process Skills In The Chemistry Curricula for Grades 10, 11, and 12/ Turkey. International Journal of Education and Practice, 2013, 1(5) : 51-63.

Aji, BS, & Winarno, ME 2016. Development of Knowledge Assessment Instruments for Physical Education and Health Subjects (PJOK) Class VIII Odd Semester. Journal of Education: Theory, Research, and Development. Volume 1, No. 7, p. 1449–1463.

Akinbobola, A. O. dan Afolabi, F. 2010. Analysis of Science Process Skills in West African Senior Secondary School Certificate Physics Practical Examinations in Nigeria. American-Eurasian Journal of Scientific Research 5 (4): 234-240. ISSN 1818-6785

Andriani, R., & Rasto, R. 2019. Learning Motivation as a Determinant of Student Learning Outcomes. Journal of Office Management Education. Volume 4, No. 1, p. 80–86.

Ango, M.L. 2002. Mastery of Science Process Skills and Their Effective Use in the Teaching of Science: An Educology of Science Education in the Nigerian Context. International Journal of Educology 1 (16) : 11-30.

Arikunto, S. 2007. Dasar-Dasar Evaluasi Pendidikan. Jakarta : PT Bumi Aksara. Ariyati, E. 2009. Keterampilan Proses Sains. Makalah Tidak Dipublikasikan. Program Studi Ilmu Pengetahuan Alam Konsentrasi Pendidikan Biologi-SL. Sekolah Pasca Sarjana Universitas Pendidikan Indonesia.

Arjuniwati, A. 2019. Increasing Motivation and Learning Outcomes Through the Application of the Numbered Heads Together (NHT) Learning Model to the Opportunity Material for Class XII Mathematics Subjects. Tambusai Education Journal. Volume 3, No. 1, p. 1–13.

Astalini, & Kurniawan, DA 2019. Instrument Development for Middle School Students' Attitudes Toward Natural Science Subjects. Journal of Science Education (JPS). Volume 7, No. 1, p. 1–7.

Borg, W.R dan Gall, M.D. 1983. Educational Research An Introduction (4th Ed). White Plains : Logman Inc.

Borg, W.R., Gall, M.D., dan Gall, J.P. 2007. Educational Research An Introduction (8th Ed). White Plains : Logman Inc.

Budiyono. 2009. Statistika Dasar untuk Penelitian. Surakarta: UNS Press. Chabalengula, V.M., Mumba, F. dan Mbewe, S. 2012. How Pre-Service Teachers Understand and Perform Science Process Skills. Eurasia Journal of Mathematics,

Candiasa, IM 2011. Testing Research Instruments Accompanied by ITEMAN and BIGSTEPS Applications. Singaraja: Ganesha University of Education.

Cullinane, A. dan Liston, M. 2011. Two Tier Multiple Choice Question : An Alternative Method of Formative Assessment for First Year Undergraduate biology Students. Limerick : National Center for Excellence In Mathematics and Education Sciences Teaching and Learning.

Depdiknas. 2008. Panduan Penulisan BcuotmirmSoitatlo. Juaskearrta : Depdiknas.

Dewantari, A. 2015. Laporan Pengolahan Hasil Angket SNP SMAN 1 Surakarta dan SMAN 2 Surakarta Tahun Pelajaran 2014/2015. Laporan Tidak Dipublikasikan. Pascasarjana FKIP Universitas Sebelas Maret Surakarta.

Dewi, NDL, & Prasetyo, ZK 2016. Development of Science Assessment Instruments to Map Critical Thinking and Practical Skills of Middle School Students. Journal of Science Education Innovation. Volume 2, No. 2, p. 213–222.

Dewi, NR, & Akhlis, I. 2016. The Development of Multicultural Education-Based Natural Science Learning Tools Using Games to Develop Student Character. Unnes Science Education Journal. Volume 5, No. 1, p. 1098–1108.

Halaydina, T.M dan Downing, S.M. 1989. A Taxonomy of Multiple Choice Item Writing Rules. Applied Measurements In Education, 2(1), 37-50.

Hamid, MA 2016. The Development of ICT-Based Student Learning Outcomes Assessment Instruments in Basic Electrical Electronics Learning. Scientific Journal of Electrical Engineering Education. Volume 1, No. 1, p. 37–46.

Hardiani, IN 2017. Development of Social Attitudes Assessment of Social Studies Learning Instruments for Class IV SD. Journal of Educational Partners. Volume 1, No. 6, p. 2550– 0481.

Harlen, W. 1992. The Teaching of Science: Studies in Primary Education. London: David Fulton Publishers.

Hayati, S., & Lailatussaadah. 2016. The Validity and Reliability of the Active, Creative and Fun Learning Knowledge Instrument (PAKEM) Using the Rasch Model. Scientific Journal. Volume 16, No. 2, p. 169–179.

Huntaruk, P., & Simbolon, R. 2018. Improving Student Learning Outcomes with Teaching Aids in Science Subjects for Class IV SDN Number 14 Simbolon Purba. SEJ (School Education Journal). Volume 8, No. 2, p. 121–129.

Kartimi. 2012. Pengembangan Alat Ukur Berpikir Kritis pada Konsep Termokimia untuk Siswa SMA Peringkat Atas dan Menengah. Jurnal JPII 1 (1) (2012) 21-26.

Kilic, D. dan Saglam, N. 2009. Development of Two Tier Diagnostic Test to Determine Students Understanding of Concepts In Genetics. Egitim Arasmalari-Eurasian Journal of Education Research, 36, 227-244.

Koyan, IW 2011. Assessment in Education. Singaraja: Undiksha Press.

Kutluay, Y. 2005. Diagnosis of Eleventh Grade Student Misconceptions About Geometric Optic By A Three-Tier Test. Thesis. The Graduate School of Natural and Applied Sciences of Middle East Technical University.

Kwen, B.H. dan Cheng, A.K. 2005. Using Two Tier Reflective Multiple Choice Questions to Cater to Creative Thinking. AARE 2005 International Education Research Conference.

Marwah, SS, Syafe'i, M., & Sumarna, E. 2018. The Relevance of the Concept of Education According to Ki Hadjar Dewantara with Islamic Education. Indonesian Journal of Islamic Education. Volume 5, No. 1, p. 14–26.

Maulida, EFJ, & Mukminan. 2016. Implementation of Media Assisted Teams Games Tournaments to Improve Learning Outcomes and Attitudes Toward Social Studies Learning. Social Harmony: Journal of Social Studies Education. Volume 3, No. 1, p. 27–38.

Muttaqin, MZ, & Kusaeri, K. 2017. Development of written test assessment instruments in the form of descriptions for problem-based learning of pies on the subject of Fiqh. Tatsqif Journal. Volume 15, No. 1, p. 1–23.

Nofiana, M. 2013. Pengembangan Instrumen Evaluasi Two-Tier Multiple Choice Question untuk Mengukur Keterampilan Berpikir Tingkat Tinggi pada Materi Kingdom Plantae. Tesis Tidak Dipublikasikan. Universitas Sebelas Maret.

Norazaini. 2017. Improving Science Learning Outcomes Using Natural Environment Media in Class III Students. Journal of Primary School Teacher Education. Volume 7, No. 6, p. 716–722.

Permendiknas No. 20 Tahun 2007. Standar Penilaian Pendidikan. Jakarta : Depdiknas. Permendiknas No. 22 Tahun 2006. Standar Isi Pendidikan. Jakarta : Depdiknas.

Permendiknas No. 23 Tahun 2006. Standar Kompetensi Lulusan. Jakarta : Depdiknas.

Purnomo, P., & Palupi, MS 2016. The Development of Mathematics Learning Outcomes Tests for Solving Problems Related to Time, Distance and Speed for Class V Students. Research Journal (PGSD Special Edition). Volume 20, No. 2, p. 151–157.

Purwanto, N. 2010. Prinsip-Prinsip dan Teknik Evaluasi Pengajaran. Bandung : PT Remaja Rosdakarya.

Ramirez, R.P.B. dan Ganaden, M.S. 2008. Creative Activities and Students’ Higher Order Thinking Skills. Journal of Education Quarterly, Vol 66 (1), 22-23.

Rusfidra. 2006. Penilaian Proses Belajar Mengajar IPA Di Kelas Melalui Pedagogi. Tersedia di: http://rayapkabel.wordpress.com/ diakses pada 25 April 2014.

Rustaman, N.Y., dkk. 2012. Strategi Belajar Mengajar Biologi. Common Textbook JICA IMSTEP. Bandung: FPMTP A UPI.

Sagala, S. 2011. Konsep dan Makna Pembelajaran untuk Membantu Memecahkan Masalah Belajar dan Mengajar. Bandung : Alfabeta.

Sampson, V. 2006. Two-Tier Assessment. Teacher Toolkit. Arizona : College of Education At Arizona State University In Tempe.

Science & Technology Education, 2012, 8(3), 167-176. Southern Illinois University Carbondale, USA.

Stiggins, R.J. 1994. Student Centered Classrom Assesment. USA: Macmillanr College Publishing Company.

Subali, B. 2009. Pengembangan Tes Pengukur Keterampilan Proses Sains Pola Divergen Biologi SMA. Makalah disajikan pada Prosiding Seminar Nasional Biologi, Lingkungan dan Pembelajarannya. Jurdik Biologi, FMIPA, Universitas Negeri Yogyakarta, 4 Juli 2009.

Sudjana, N. 2009. Penilaian Hasil Proses Belajar Mengajar. Bandung : PT Remaja Rosdakarya.

Sugiyono. 2017. Quantitative, Qualitative, and R & D Research Methods. Bandung: Alfabeta.

Suharman. 2018. Tests as a Measure of Academic Achievement. Scientific Journal of Islamic Religious Education. Volume 10, No. 1, p. 93–115.

Sujana, IWC 2019. Functions and Objectives of Indonesian Education. ADI WIDYA: Journal of Basic Education. Volume 4, No. 1, p. 29–39.

Sukiman. 2012. Pengembangan Sistem Evaluasi. Yogyakarta : Insan Madani. Suparlan. 2006. Guru Sebagai Profesi. Yogyakarta: Hikayat Publishing.

Supranata, S. 2004. Panduan Penulisan Tes Tertulis Implementasi Kurikulum 2004. Bandung: PT Remaja Rosdakarya Offset.

Susilo, H. 2013. Pengembangan Tes Keterampilan Proses Sains Materi Sistem Pencernaan Kelas XI SMA N 1 Pemalang. Skripsi. Tersedia di lib.unnes.ac.id/18954/1/4401408098.pdf diakses pada 2 Februari 2015.

Treagust, D.F. 2006. Development and Use of Diagnostic Test to Evaluate Students Misconception In Science. International Journal of Science Education, 10, 2 pp 159-169.

Trimawati, K., Kirana, T., & Raharjo, R. 2020. Development of Integrated Science Assessment Instruments in Project Based Learning (PJBL) Model to Improve Middle School Students' Critical and Creative Thinking Ability. QUANTUM: Journal of Science Education Innovation. Volume 11, No. 1, p. 36–52.

Tuysuz, C. 2009. Development of Two-Tier Diagnostic Instrument and Assess Students Understanding In Chemistry. Scientific Research and Essay Academic Journals Vol 4 (6) pp. 626-631, June 2009. ISSN 1992-2248.

Uno, HB 2008. Motivation & Measurement Theory. Jakarta: PT Bumi Aksara.

Vichitvejpaisal, P., et al. 2011. Developing a Two-Tier Diagnostic Test to Assess Arterial Blood Gates Learning by Students with Different Background Knowledge In Anesthesiology. South-East Asian Journal of Medical Education Vol 5 No 2, 2011.

Walid, A., Sajidan, S., Ramli, M., & Kusumah, R. G. T. (2019). Construction of the assessment concept to measure students' high order thinking skills. Journal for the Education of Gifted Young Scientists, 7(2), 237-251.

Wartono. 2003. Strategi Belajar MengacjaormFmiistiktao.uMsearlang: JICA.

Widodo, W. 2013. Implementasi Kurikulum 2013 dalam Pembelajaran Sains dan Keterkaitannya dengan Ide-Ide Penelitian Pendidikan Sains Menuju Indonesia Maju. Makalah disajikan dalam Seminar Nasional Pendidikan Sains UNS.

Yuliati, L. 2008. Model-Model Pembelajaran Fisika. Malang : Universitas Negeri Malang.

Yusuf, M. 2015. Assessment and Evaluation of Education: Pillars of Information Providers and Activities to Control Quality of Education. Jakarta: Prenadamedia Group.