

# Encyclopedia based Material for Science Course to Improve Communication Ability of Ibtidaiyah Madrasah Students

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**Keywords:** material development, teaching materials, encyclopedia, natural sciences, communication skill.

**Abstract:** This study aims to produce encyclopedia-based science teaching materials, describe attractiveness, and explain the level of effectiveness of teaching materials that have been developed to improve communication skills of students of Islamic Elementary Schools (MI). The development model uses the ADDIE Model. The results of validation of material experts, design experts, and learning experts, teaching materials that have been developed have very valid criteria of 96%. The percentage of attractiveness of teaching materials is 91.63% with a very interesting category. The results of the pre-test and post-test conducted to obtain information about student communication skills obtained significant values, with an average difference of 20.28, and the results of the t-test analysis showed that  $t\text{-count} > t\text{-table}$ .

## 1 INTRODUCTION

Communication skill belongs to one of the skills that are needed by the people of the 21st century, as well as a skill that must be possessed for the workforce (Bybee, 2013). Workers in a company that lacks 21st century skills will be in an unfavorable position to be competent globally, and will experience difficulties in facing the challenges that arise along with the development of science knowledge and technology (Andrew & Taylor, 2009).

The ability to communicate is not just soft-skill, more than that communication becomes a very important aspect in life, when someone can communicate well, it will affect the improvement of their quality of life as it supports their other skills (Iriantara, 2014). Communication skills can be trained in the learning process, including in science learning, for example, when students perform project performance through presentations, and when they make reports in the form of written communication (Taryono, 2016). Therefore, this study concerns with efforts to train communication skills in science learning at the primary education level, especially at the Madrasah Ibtidaiyah (Islamic

primary school) level, by providing encyclopedia-based teaching materials.

This study aims to produce encyclopedia-based teaching materials for science subjects to improve communication skills of the students. It tries to explain the advantages of encyclopedia-based teaching materials in science subjects to improve student's communication skills. Furthermore, this study seeks the effectiveness level of teaching-based materials encyclopedia on science subjects on student communication skills.

## 2 METHOD

This study employs research and development design. It contains of three main components: (1) the development model, (2) development procedures, and (3) product trials (Sugiyono, 2013, 2016). This research and development model was adapted from Analysis, Design, Development, Implementation and Evaluation (ADDIE) model. The steps of this research are the analysis of the students' background and needs, the design of a set of specifications for an effective, efficient and relevant student environment,

the development of all material for students and managing the material, the implementation of the instructions produced, formative and summative evaluation of both results development.

Product trials can be achieved well by setting several components, including the selection of trial design, subject of the test, type of data, instrument of data collection, and technical data analysis. Product trials were conducted simultaneously with science learning material experts, learning design experts, and learning experts or teachers (Sukmadinata, 2007).

This research was conducted at Maulana Malik Ibrahim State Islamic University of Malang and Madrasah Ibtidaiyah Assa'adah Sukowati Bungah Gresik, East Java, Indonesia. The type of data in this study is verbal data for pre-development research and verbal and nonverbal data for post-development research. Pre-development verbal data is obtained from observations during learning, interviews with teachers, and analysis of teaching materials. Verbal data after development was obtained from suggestions and notes from science learning material experts, learning design experts, learning experts or teachers. Nonverbal data were obtained from questionnaires and scores of students' pre-test and post-test results before and after receiving treatment.

Data collection instruments were in the form of interviews, observation, analysis of questionnaire teaching materials and test instruments. Data analysis techniques used are qualitative data analysis techniques and quantitative data analysis techniques. Qualitative data analysis techniques are carried out by (1) collecting verbal written data, (2) transcribing verbal verbal data, (3) collecting, selecting, and classifying written verbal data and the results of verbal verbal transcripts based on criteria, and (4) analyzing data and formulating conclusion of analysis. Quantitative data analysis techniques are carried out in two ways, namely (1) the average analysis technique and (2) the t test of two groups that are not related to each other (paired sample t-test).

### 3 FINDINGS

The product developed is in the form of encyclopedia-based instructional materials on Science course to improve students' communication skills. The targeted communication skills in developing these teaching materials include: (1) discussing the results of activities of a problem or event; (2) presenting experimental data in the form of tables or figures; (3) answering questions from

problems; (4) conveying data verbally; and (5) making conclusions in writing.

With these five indicators, it can be obtained the extent to which communication skills, competencies possessed by students to be able to find out the effectiveness level of encyclopedia-based teaching materials. These indicators are observed from the results of the pre-test and post-test as well as the communication skills competency test exercises contained in the teaching material "Encyclopedia of Children of the 21st Century Earth and Natural Events".

The five indicators are integrated in each chapter. In detail, this encyclopedia-based teaching material has been completed with an encyclopedia usage guide, book content, competency standards and basic competencies. The material content covers the scope of the earth and the universe in the subject matter of the earth and natural events, Qur'anic literacy, and concept maps interesting facts. It is also completed with 21st century communication skills competency tests, reflections, national exam questions, and glossaries. Figure 1 and 2 are the cover and the specification of the contents of the developed teaching materials.



Figure 1: The cover of the developed teaching materials

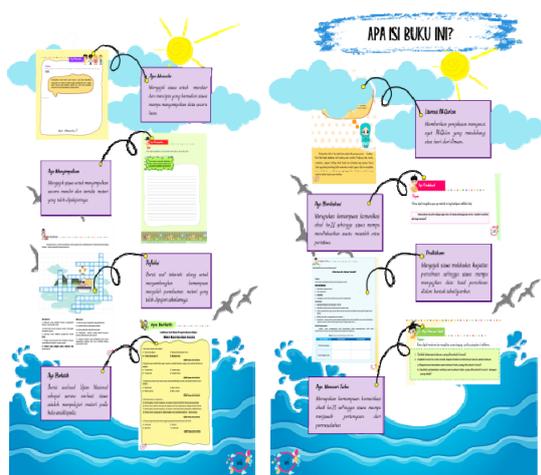


Figure 1: Content specification.

The data analyzed in this study include presentation and analysis of the results of developing encyclopedia-based teaching materials. It contains product specifications, and the validity of material experts, design experts, and learning experts. On the second stage, it concerns with presentation and analysis of product attractiveness. As the final stage is the presentation and analysis of product effectiveness.

Based on the results of product validation, it was obtained that the aspects of material or content experts were 96% achieved. In terms of design, it attains 96%, and 96% on learning aspect. To enhance its quality, the revision is done by changing the title font of the Earth and Natural Event material to be more highlighted so that it attracts primary school students. In addition, it needs changing the writing font on the concept map to a clearer font with a larger size. Further, the explanation of the material is shortened so as to make it easier for students to understand the material briefly but remain clear. On the material of the water cycle process, the language is revised to adapt easily to the sequence of processes. As an example is revising the terms which were originally written “evaporated-precipitation-condensation” into “evaporation-precipitation-condensation”. As the final revision is to shorten the material regarding the process of the formation of the earth. This part is also integrated with the verses of the Qur'an.

On the aspect of attractiveness, it obtained 91.63%, which shows very interesting teaching material. From the aspect of product effectiveness, the data show that this teaching material is effective. This result was obtained through t test which showed that there were significant differences before and after students were treated with a significance value of 0.00 (<0.05) (Thoifah, 2015).

## 4 DISCUSSION

The final form of this research and development is an encyclopedia-based teaching material for science subjects to improve student communication skills. The subject matter of the material described is on earth and natural events for fifth graders. The presence of this encyclopedia-based teaching material is as a complement to the availability of existing teaching materials but does not yet have criteria for indicators of student communication skills.

The instructional materials developed are teaching materials that are relevant to the current curriculum where the main purpose of this development is to improve students conceptual understanding along with students' communication skills (Bellanca, 2012). Indicators of communication skills used include five aspects, namely, being able to discuss the results of activities of a problem or event, being able to present experimental data in the form of tables of figures, being able to answer questions from problems, being able to convey data verbally, and being able to make conclusions in writing.

In addition to product specifications, the data is also explained qualitatively and quantitatively where the calculation of validity questionnaires by several experts obtains that in terms of material quality it reaches the standard of good content (96%). The design also fulfills the standard as evaluated by the experts (96%). The materials also support the aspects of learning experts (96%).

The qualitative data are obtained from a review of comments and suggestions from several experts so that some changes were done to improve the quality of the materials. The significant change concerns with the look of the content by changing the title font of the Earth and Natural Event material to be more highlighted to attract primary school students. Not only changing the type of font but also its size is considered necessary to support student's understanding. As some parts of the materials are still lengthy, another revision is made to make a shortened explanation of the material. It is done to facilitate student's comprehension. The revision is also done concerning the concept given for instance by changing the part of speech from verb into noun. The completeness of the material is also supported by being integrated with the verses of the Qur'an.

Aspects of the content of attractiveness are highlighted by selecting a new model with an interesting theme and placing enrichment material and learning support material in the column "do you know?". In the aspect of presentation, communication skills competencies are presented in

various forms and different colors, depending on the indicators to be achieved so that students do not feel bored or confused (Murti, 2013).

The material presented in the exercise is enriched with questions to maximize inquiry-based student learning. In elementary school students, learning this model is needed to develop thinking competencies, process information into the realm of cognition, while developing encyclopedia-based science knowledge (Zoldosova & Matejovicova, 2010).

In the aspect of language, attractiveness is highlighted by the use of words that are easily understood by students. The selection is diction "do you know?", "Qur'an literacy", "note", "glossary", "let's discuss", "let's find out", "let's try", "let's conclude", "practicum", and "let's practice" is also used as a puller for students with different picture illustrations and attractive colors. In the graphic aspect, bright colors and matching pictures with material in sufficient quantity are chosen.

The use of visual aspects through drawing illustrations is a significant tool for developing children's abilities in shaping historical thinking patterns. Historical imagery of aspects of knowledge occupies special memory that supports children's understanding (Dilek, 2010). Likewise the development of teaching models, children can be asked to explain their learning outcomes visually through the drawing method. The assessment in the form of images also has the carrying capacity for student understanding and long-term knowledge retention.

In children, reading variation is very necessary as one of the reading motivation (Wigfield et al., 2016). Every child has a reading interest and different cognitive development potential, therefore the use of encyclopedias in science learning for children of Islamic elementary school age is considered effective to accelerate reading interest. Thus, it will be a significant supporting capacity for further maturation of child literacy (Castro, et al., 2011).

The effectiveness aspect is known that through the t test, the significance value is 0.00 which means  $<0.05$ , there are significant differences before and after treatment and the hypothesis is accepted. The effectiveness aspect was analyzed by comparing the pre-test and post-test scores of students before receiving treatment and after receiving treatment.

Aspects assessed in this study include aspects of communication skills. First is the ability to discuss the results of activities of a problem or event. This is relevant to the skill of making the connection between the information in the written sources with the oral discussion presented in the class. This becomes one of the challenges the students needed that integrate between writing activities with the real experience during the learning (Gerde et al., 2015).

Another indication is the ability to present experimental data in the form of tables figures. Since understanding abstract data and present them is not easy for students, the ability to present the data in the form of tables or figures becomes another significant competence of communication skills. Creating visual representation is one of the challenges for students to make it more meaningful compared than description using longer explanation (DeJarnette, 2018).

Students are also expected to be able to answer questions from problems. This activity will change the orientation of learning from the teacher center into student center activities where the learning outcomes can be assessed more easily (Li & Tsai, 2018). Using problem based learning, teacher can identify the progress of student's understanding on the science course material presented.

Another skill that indicates improvement of communication ability is the performance to submit data verbally. In this case, the student's engagement with others to ensure the understanding of the data performed during the discussion support the quality of class interaction. The activity of verbalizing the data involves sharing resources that can be done in both group or class discussion (Knapp, 2018).

As the final mark of communication skill is the ability to make conclusions in writing. For primary school children writing task is not easy, particularly in making conclusion in their writing. Through the teaching materials on science which drawing attention to interesting topics from their environment, it can support making natural connection with their observation as their daily experience (Bingham et al., 2018).

## 5 CONCLUSION

Based on the development process and the results of trials on encyclopedia-based teaching materials, it can be concluded that the encyclopedia-based teaching materials are presented in accordance with the objectives of developing instructional materials that facilitate students in understanding scientific material, especially on Earth and Natural Events.

This teaching material is used for fifth graders at Madrasah Ibtidaiyah Assa'adah Sukowati Bungah Gresik. Based on the validity test by material or content experts, design experts, and learning experts, this material on science subjects is declared to be very valid for use in the learning process. The attractiveness of encyclopedia-based teaching materials based on the percentage of data obtained is 91.63%.

The analysis of the effectiveness level of instructional materials on students' communication skills obtained the calculation results of t-count of 5.55 and t table of 1.696. This shows that this encyclopedia-based teaching material development product is effectively used in learning.

The development of this teaching material is one manifestation of the commitment for developing the quality of education for Muslim children in the world. The same thing is also intensified in other developing countries (Mwaura & Marfo, 2011) to promote the quality of graduates of Islamic primary schools that gain competency achievements according to national education goals.

## REFERENCES

- Bellanca, J. 2012. *Proyek Pemelajaran yang di Perkaya Jalur Praktis Menuju Keterampilan Abad ke-21*. (transl.) Jakarta: PT Indeks
- Bingham, G. E. Quinn, M. F. McRoy, K. Zhang, X. & Gerde, H. K. 2018. Integrating writing into the early childhood curriculum: a frame for intentional and meaningful writing experiences *Early Childhood Education Journal* 46( 6), 601–611.
- Bybee, R. W. 2013. *The Case for STEM Education - Challenges and Opportunities*. Virginia: NSTA Press.
- Castro, D. C.; Pérez, M. M; Dickinson, D.K. & Frede, E. 2011. Promoting language and literacy in young dual language learners: research, practice, and policy *Child Development Perspectives* 5(1), 15-21
- De Rocco, A. & Taylor. 2009. *The Innovation Imperative in Manufacturing: How the United States Can Restore Its Edge*. Boston: The Boston Consulting Group
- DeJarnette. A.F. 2018. Students' challenges with symbols and diagrams when using a programming environment in Mathematics *Digital Experiences in Mathematics Education* pp. 1-23, <https://doi.org/10.1007/s40751-018-0044-5>
- Dilek. G. Y. 2010. Visual thinking in teaching history: reading the visual thinking skills of 12 year-old pupils in Istanbul. *Education 3-13* 38(3), 257-274
- Gerde, H. K Bingham, G. E. & Pendergast, M. L. 2015. Reliability and validity of the Writing Resources and Interactions in Teaching Environments (WRITE) for preschool classrooms *Early Childhood Research Quarterly* 31(1), 34–46.
- Iriantara, Yosol. 2014. *Komunikasi Pembelajaran*. Bandung: Simbiosis Rekatama Media.
- Knapp, N.F. 2018. Increasing interaction in a flipped online classroom through video conferencing” *TechTrends* pp.1-7, <https://doi.org/10.1007/s11528-018-0336-z>
- Li, H. & Tsai, T. 2018. Investigating teacher pedagogical changes when implementing problem-based learning in a year 5 Mathematics classroom in Taiwan *Asia-Pacific Education Resarch* 27 (5), 355–364
- Murti, K.E. 2013. *Pendidikan abad 21 dan implementasinya pada pembelajaran di Sekolah Menengah Kejuruan (SMK) untuk Paket Keahlian Desain Interior*, Artikel Kurikulum 2013 SMK
- Mwaura, P. M. & Marfo, K. 2011. Bridging culture, research, and practice in early childhood development: the madrasa resource centers in East Africa *Child Development Perspectives* 5(2), 237-255.
- Sugiyono. 2013. *Metode penelitian pendidikan*. Bandung: Alfabeta.
- Sugiyono. 2016. *Metode penelitian kuantitatif, kualitatif, dan R&D*. Bandung: Alfabeta.
- Sukmadinata, N.S. 2007. *Metode Penelitian Pendidikan*. Bandung: PT Remaja Rosdakarya.
- Taryono. 2016. Penerapan pembelajaran berbasis proyek dan pembelajaran berbasis masalah pada mata pelajaran Fisika untuk meningkatkan keterampilan abad 21 (4cs) siswa SMP. Thesis, Universitas Pendidikan Indonesia.
- Thoifah, I. 2015. *Statistika Pendidikan dan Metode Penelitian Kuantitatif*. Malang: Madani.
- Wigfield, A.; Gladstone, J. R. & Turci, L.L. (2016) Beyond Cognition: Reading Motivation and Reading Comprehension *Child Development Perspectives* 10(3), 190-195.
- Žoldošová, K. & Matejovičová, I. 2010. Finding out how the elementary school children manipulate with empirical material and how they process the obtained information *International Electronic Journal of Elementary Education* 2(3), 327-347.