DEVELOPMENT OF A GUIDED INQUIRY-BASED E-MODULE ON RESPIRATORY SYSTEM CONTENT BASED ON RESEARCH RESULTS OF THE POTENTIAL SINGLE GARLIC EXTRACT *(Alliumsativum)* TO IMPROVE STUDENT CREATIVE THINKING SKILLS AND COGNITIVE LEARNING OUTCOME

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Abstrak. Rendahnya keterampilan berpikir kreatif dan hasil belajar kognitif disebabkan oleh kesulitan mahasiswa dalam memahami konsep yang terdapat dalam bahan ajar yang digunakan dan kurangnya bahan ajar yang menuntut keterampilan berpikir kreatif mahasiswa. Penelitian ini bertujuan untuk menghasilkan *e-module* berbasis inkuiri terbimbing pada materi sistem respirasi berdasarkan hasil penelitian potensi ekstrak bawang putih tunggal *(Allium sativum)* yang valid, praktis, dan efektif. Model penelitian pengembangan yaitu ADDIE dengan tahapan *analyze, design, develop, implement, and evaluate*. Teknik pengumpulan data keterampilan berpikir kreatif dan hasil belajar kognitif terdiri dari 20 butir soal sesuai tingkatan taksonomi Bloom dan keterampilan berpikir kreatif yaitu *fluency, elaboration, flexibility, originality,* dan *metaphorical thinking.* Data penelitian berupa data kualitatif dan data kuantitatif. Teknik analisis data kualitatif dilakukan dengan mengelompokkan data berupa saran, pendapat, dan komentar perbaikan yang terdapat pada angket validasi dan uji coba produk yang dikembangkan. Teknik analisis data kuantitatif diperoleh melalui instrumen pengumpulan data pada angket validasi dan uji coba produk dalam bentuk persentase. Analisis data keterampilan berpikir kreatif dilakukan dengan uji statistik non parametrik (*Quade*'s *rank analysis of covariance)* dan hasil belajar kognitif dilakukan dengan uji ANAKOVA. Hasil penelitian diperoleh kevalidan oleh ahli materi sebesar 100%, ahli pembelajaran sebesar 99,32%, ahli praktisi lapangan sebesar 96,6% dengan kategori sangat valid, sedangkan nilai kepraktisan oleh mahasiswa sebesar 89,21% dengan kategori sangat praktis. Keefektifan *e-module* dilihat dari peningkatan rata-rata nilai keterampilan berpikir kreatif dengan selisih 39,4 dan hasil belajar kognitif mahasiswa dengan selisih 40,92. Kesimpulan yang diperoleh *e-module* yang dikembangkan sangat valid, sangat praktis, dan efektif digunakan.
Kata Kunci: Modul Elektronik, Inkuiri Terbimbing, Keterampilan Berpikir Kreatif, Hasil Belajar Kognitif, Hasil Penelitian

Abstract. The low creative thinking skills and cognitive learning outcomes are caused by the difficulty of students in understanding the concepts contained in the teaching materials used. Another factor that causes difficulty in understanding the concept of student learning is not optimal due to the application of learning models, resulting in a lack of activity and interest in student learning. The research aims to produce an electronic module based on the guided inquiry on respiration system material based on the results of the study of the potential for a single garlic extract *(Allium sativum)* that is valid and practical. The development model used in this study is ADDIE with the stages of analyzing, design, develop, implement, and evaluate. Data collection

techniques for creative thinking skills and cognitive learning outcomes consist of 20 items according to Bloom's taxonomic level and creative thinking skills namely fluency, elaboration, flexibility, originality, and metaphorical thinking. Research data in the form of qualitative data and quantitative data.Research data in the form of quantitative data and qualitative data. Techniques analysis of qualitative data is grouping data in the form of suggestions, opinion, and comments for improvements contained in the validation questionnaire and trial of the product being developed. Quantitative data analysis techniques were obtained through data collection instruments in the validation questionnaire and product trials in the form of percentages. Data analysis of creative thinking skills is done by non-parametric statistical tests (Quade's rank analysis of covariance) and cognitive learning outcomes are done by ANACOVA test.The results of the study were validated by 96.6%, and practicality value by students at 89.21% with a very practical category. The effectiveness of e-modules is seen from the increase in the average value of creative thinking skills with a difference of 39.4 and cognitive learning outcomes of students with a difference of 40.92. The conclusions obtained by the developed e-module are very valid, very practical, and effective in use.

Keywords: Electronic Modules, Guided Inquiry, Creative Thinking Skills, Cognitive Learning Outcomes, Research Result

INTRODUCTION

Creative thinking skills have several benefits, namely: it could train students to develop various ideas and arguments, ask questions, acknowledge the truth of a dispute, and even make students be open and responsive towards different perspectives (Forrester, 2008; Herlina, 2018). Efforts to achieve creative human resources are conducted through, among others, implementation of higher education that refers to the Indonesian Qualification Framework (KKNI). The learning process in the Universitas Negeri Malang (UM) has referred to the KKNI. Learning achievement in the KKNI consists of attitude, knowledge, and skills that are related to one another (Perpers, 2012; Kemenristekdikti, 2018).

Application of learning achievement in skills, especially creative thinking skills in education, is not optimal (Alzoubi et al., 2016; Khoiri, 2017). In general, the learning process in higher education has not become a tool to empower students' creative thinking skills (Safilu, 2010; Herlina, 2018). It isessential to integrate a learning implementation that applies creative thinking skills in every course. One course where creative thinking skills need to be improved is Human Anatomy and Physiology course. It is due to the results of a preliminary study conducted by giving multiple-choice and essay questions to 26 students that obtain an average score of creative thinking skills of 4.28, which is considered a low category. It has not achieved one of the profile achievements of the Human Anatomy and Physiology course, namely: able to plan an independent investigation and to be creative and innovative by finding, analyzing, and solving problems in Human Anatomy and Physiology field. The low student creative thinking skills is related to the result of student cognitive learning outcome (Nurdin&Setiawan, 2016). Based on the preliminary study by giving multiple-choice and essay questions, the average score of student cognitive learning outcome is 41.42 or in the low category.

The low student creative thinking skills and cognitive learning outcome have to do with student difficulty in understanding concepts in teaching materials used. Preliminary study results, namely prove several difficulties encountered by students: content in the teaching materials is hard to comprehend (61.53%), lack of detail in content in the teaching material (50%), and teaching materials are less attractive in terms of images, book appearance, and less communicative language (42.30%). Another obstacle faced by the student is difficulty in understanding the content, especially respiratory system content. The content is difficult since it contains many respiratory system mechanisms

that are hard to understand, and it requires the support of animation pictures or learning videos.

Based on problem identification conducted in the Human and Animal Physiology learning, efforts done include providing teaching materials that could improve student learning interest and following the demand for technology development. Teaching stuff of the e-module on respiratory system content has never been used by students in learning (65%). Teaching materials the students care for are those with explicit instruction for use (69.23%), clear and short description (88.40%), and equipped with images and clear explanation. Moreover, learning is supported by animation or videos that facilitate students to understand content-related concepts (92.30%).The development of e-modules is an alternative teaching material that is suited to student needs, technological development, and expected to learn outcomes in the Human Anatomy and Physiology courses. E-module is defined as a form of presentation of systematically prepared independent learning materials whose application uses electronic media and internet networks in the learning process, complemented by video, animation and audio presentations to enrich learning experiences (Montagnes, 2000; Gujjar, 2007; Krnel, 2009; Achmad, 2020).In addition to the e-module development, another effort to be done to create active and creative learning that involves students during the learning process is by implementing an appropriate learning model, in this case, guided inquiry and contextual learning based on own experience that is equipped with research results. A learningprocessthatutilizesguidedinquiry-basede-modulesbased on researchresultsis a combination of educationthatcouldhelpstudentstolearnmoreeffectivelytoimprovestudents'learningoutcome (Carey, 2010), learning motivation (Gordon, 2001; Perdana, 2017), creativity (Sarianti, 2016), independence and creative thinking skills (Krnel, 2009; Yusnaeni, 2017; Kadir, 2017). The research results will be integrated into the developed guided inquiry-based e-modules; thus, it could facilitate students to understand content with contextual and simple content presentation (Lestari, 2015).Based on analysis explanation and background of the problem, an e-module needs to be developed according to criteria and demand to be achieved in a thesis entitled "Development of a Valid, Efficient, and Effective Guided Inquiry-Based E-Module on Respiratory System Content based on Research Results of Single Clove Garlic (*Alliumsativum*) Potentials to Improve Student Creative Thinking Skills and Cognitive Learning Outcome.

METHOD

The research type was development research. The research was intended to produce a guided inquiry-based e-module on respiratory system content based on research results to improve student creative thinking skills and cognitive learning outcomes.The research was conducted at the Universitas Negeri Malang (UM) in June 2019-March 2020.The development procedures used the ADDIE model through four stages, namely: analysis, design, development, implementation, and evaluation (Branch, 2009). The ADDIE development model was used to develop a guided inquiry-based e-module on respiratory system content based on research results.

The instruments used in this research were the implementation of learning syntax sheets, pretest-posttest creative thinking and cognitive learning outcomes of students, validation of material experts, media experts, field practitioners, guided inquiry electronic module practicality questionnaire sheets given to observers and students. Data collection techniques are giving questions about pretest-posttest to students before and after learning. Retrieval of creative thinking skills data consists of 5 items that are adjusted to aspects of creative thinking skills according to Trefinger (2003), namely fluency,

elaboration, flexibility, originality, and metaphorical thinking. Retrieval of cognitive learning outcomes data consists of 15 items that are adjusted to the level of Bloom's taxonomic cognitive level that is applying (C3), analyzing (C4), evaluating (C5).

The research on the development of a guided inquiry-based e-module based on research results used qualitative and quantitative data. Opinions, comments, and suggestions for improvement from validators, and students were the qualitative data sources. The quantitative data sources included scores of validators' assessment questionnaires and practicality by students. Instruments in the research data collection were in the form of need analysis questionnaires, expert validation questionnaires, and preliminary trial/practicality questionnaires. The data analysis technique used included qualitative and quantitative descriptive analysis techniques. The qualitative data analysis technique was conducted by grouping information in the form of opinions, suggestions, and comments for improvement contained in the validation questionnaires and trial of product developed. The quantitative data analysis technique obtained from data collection instruments in the validation questionnaires and product trials in the form of percentages. The following formula used in the percentage of data analysis.

$$P = \frac{\sum X}{\sum Xi} \, X \, 100\%$$

Description:
P = Percentage
$\sum X$ = Total score of respondents' answer
$\sum Xi$ = Total ideal score

The data analysis of students' creative thinking skills and cognitive learning outcome was conducted using analysis of covariance test (ANCOVA). If the tested data did not meet the requirement or the data were not normally distributed and homogenous, then the non-parametric test analysis technique was used. Results obtained for creative thinking skills did not meet the requirement; thus, the non-parametric test analysis technique was performed. On the contrary, results obtained from the analysis of cognitive learning outcome fulfilled the criteria for analysis of covariance test.

Criteria for validation analysis results included 85.01-100.00% isvery valid or could be used, 70.01-85.00% is reasonably accurate or could be used with a little revision, 50.01-70.00% is less reliable or it is suggested not to be used since it requires many changes, 01.00-50.00% is invalid or must not be used. Criteria for practicality analysis consisted of 81.00-100.00% is very practical or could be used, 61.00-80.00% is practical or could be used with a little revision, 41.00-60.00% is less practical, or it is suggested not to be used since it requires many changes, 21.00-40.00% is impractical or must not be used, 00,00-20,00% very unrealistic or must not be used (Akbar, 2013).

RESULTS AND DISCUSSION

The product generated from the research was in the form of an e-module that could be used either independently or with a guide from the lecturer, and it could be used at anytime and anywhere by the students. The e-module contained respiratory system content and is designed based on guided inquiry-based on research results. Stages in the ADDIE development model consisted of analyzing, design, develop, implement, and evaluate steps (Branch, 2009) were stages in the e-module development.The result of each level is described as follows.

Result of Analyze

The analysis stage was conducted by providing need analysis questionnaires to students and lecturers of the Human and Animal Physiology course and performing a class observation. According to the class observation result, the learning was conducted using a presentation and discussion method. The class observation also supported by the outcome of need analysis questionnaires given to two lecturers of the course that used presentation and discussion in their learning. The course lecturers stated that they never used a guided inquiry-based e-module based on research results in their education, especially in respiratory system content. Learning sources used were different comprised textbooks (61.50%), LKM (student worksheet) (88.40%), scientific articles (61.50%), printed module (69.20%), and electronic module based on research results (38.40%). Likewise, students had used printed modules (76.92%), but in terms of e-module (65%), they never applied it in the respiratory system content. The respiratory system content (80.76%) was considered as complicated by the students, and it required teaching material development. The difficulty was related to the content in the teaching materials that were hard to understand 961.53%), content in the teaching material was less explicit and detail (50%), and it was less interesting to read (image, display, and less communicative language) (42.30%). The students expected teaching materials with if there would be a teaching material development, explicit instruction for use (60.23%), clear description (88.40%), and equipped with clear image and explanation (92.30%). In addition to the student response questionnaires, the students also provided with multiple choice and essay tests to find out their initial creative thinking skills and cognitive learning outcome of students who had taken the Animal and Human Physiology course. Based on the recapitulation of the test results for 26 students, the average score of creative thinking skills was 4.28, and the cognitive learning outcome was 41.42, which were considered as a low category. The teaching material developed in the research was a teaching material that utilized electronic media or internet network and UM *sipejar* web that was accessed using internet connection in a PDF format.

Result of Design

The design stage was a prototype design stage of the guided inquiry-based e-module based on research results. The e-module content design was limited to respiratory system content in the Human Anatomy and Physiology course, and the study was adjusted to the learning achievement of the respiratory system content. The e-module was developed using PowerPoint, Microsoft Word 2013, and Corel Draw X7 software. The font used in the e-module was Maindra GD with a font size of 12. Color selection in the e-module display was adjusted to the student interest and based on need analysis results, which was dominantly blue.

Result of Develop

The development stage was a guided inquiry-based e-module based on research results that were adjusted to the prototype arranged in the design stage. The developed e-module consisted of introduction, content, and closure. The introduction section comprised cover, e-module profile, instructions for use for lecturer as well as students, learning achievement, and creative thinking skill aspects. The content section included a guided inquiry syntax-integrated student learning activity sheet, a review of LKM content based on research results, content description, formative tests, and assessment sheet.The developed e-module is also integrated with the guided inquiry learning model. The guided inquiry learning model consists of seven stages, namely the exploration of phenomena, focusing questions, planning investigations, conducting investigations, analyzing the results of investigations, constructing new knowledge, and communicating the knowledge acquired (Joyce & Weil, 2000; Martin, et al., 2005; Bel , 2009; Gengarelly & Abrams, 2008; Llewellyn, 2013).The results of research on learning activities are in the syntax of exploring phenomena. The advantages of integrating

research results in guided inquiry-based e-modules are that it can make students easy to understand the material with contextual and simple material presentation (Lestari, 2015), improve concept understanding, creative thinking skills, cognitive learning outcomes (Department of National Education, 2008),can measure and evaluate learning outcomes independently through activities in the form of experiments, more practical to carry anywhere (Directorate of High SchoolDevelopment, 2017),and learning is more interactive because it is equipped with audio and video (Gunadharma, 2011).

The closure consisted of summative tests, key answers, references, and glossary.The summative test is a learning experience test or all subject matter that has been completed (Hodgson, 2010). Summative tests function to produce scores that are useful for making decisions on student performance (Cruz, 2011; Darini, 2013) and to measure overall student understanding of the respiration system material (Arifin, 2009; Darini et al., 2013). The answer key contained in the e-module works so that students can measure their own abilities independently with the answer criteria by the answer key scoring rubric. The glossary serves to help students know the definition of terms contained in e-modules that are not known or understood (Susanti, 2016), so that students easily understand the concepts contained in the e-module (Faot et al., 2016).

In the e-module based guided inquiry developed has certain characteristics. The development of e-modules is packaged in the form of electronic media, so students can use these teaching materials wherever and whenever. So, guided inquiry-based e-modules that are contextually developed and attractively packaged can increase the interest and active involvement of students in learning (Rahma, 2012; Astuti & Setaiwan, 2013) and discover concepts through their own construction (Astuti & Setaiwan, 2013). In addition, guided inquiry-based e-modules guide students to analyze logically, express opinions, discuss data, present data, solve problems based on the facts found to get conceptual understanding (Rusche & Jason, 2011; Concerned, 2017). The advantages of learning using e-modules are: 1) clarifying and facilitating the material so that it is not too verbal, 2) overcoming the limitations of time, space, and senses for lecturers or students, 3) accessing the e-module can be outside of learning hour, 4) increasing motivation learning, 5) students can learn according to their desires, needs, and abilities, 6) students can measure their abilities through evaluations contained in e-modules (Ministry of National Education, 2008).

The development stage results were also supported by supporting media containing in the e-module. Results obtained from the supporting media were in the form of the whole design of the e-module, photos, and videos that had been loaded on the e-module. A preliminary trial was conducted following the development. The preliminary trial was done to 15 students who had taken the Human Anatomy and Physiology course at the UM. The preliminary trial questionnaires consisted of three significant components of assessment, namely: ease of use, effectiveness in learning time, and benefits. The overall practicality value was 86.13, with a convenient category.The content that has been developed will be uploaded to the web sipejar UM is www.sipejar.um.ac.id. and students access online.

Result of Implement

The implement stage was started with the lecturer prepared learning process and the students. The preparing learning process stage was done by preparing all media to be used in the learning process, such as SAP and tools and materials used to conduct classroom investigation. In the implementation activities, the researcher acted as a lecturer who would apply the developed product. The student preparation stage was conducted to determine the number of students who would participate in the learning process of the Human Anatomy and Physiology course. The determination of the number of students served to form groups in the experimental and control classes. The learning

implementation schedule for each category included learning socialization and followed by two meetings, each with a different topic.

Result of Evaluate

The evaluation stage was conducted in every development stage that consisted of four steps (analyze, design, develop, and implement) as described previously. Steps in performing evaluation result analysis included analyzing data of validation and practicality results of the guided inquiry-based e-module based on research results. The validation was done by a content expert, learning expert, and field practitioner expert. Validation by the content expert consisted of three aspects, namely: content feasibility (content and questions), presentation feasibility, and language feasibility. The content feasibility aspect value was 100%, as well as in question feasibility. The presentation feasibility and language feasibility aspects had the same amount, which was 100%. The validation result by the content expert as a whole was 100% with a very correct category. The appropriateness of the content of the material contained in the e-module must be true, correct, and careful (Prastowo, 2014), because the e-module implements constructive learning (Ministry of National Education, 2008) and helps students build their own understanding (Permendiknas, 2010). Validation by the learning expert comprised four aspects, namely: graphic, presentation, language, and e-module. The validation value of the visualelement was 97.5%, whereas the presentation aspect, language aspect, and e-module aspect all had an amount of 100%. The overall validation result of the learning expert was 99.32%, with a very correct category.A good e-module has an attractive appearance, clear form of the image, and title (Asyhar, 2012; Ministry of National Education, 2008). The linguistic aspects of e-modules must use standard language so that they are easy to understand and use the correct spelling (Akbar, 2013; Ministry of National Education, 2008).The validation by the field practitioner expert included four aspects, namely: language feasibility, content feasibility, presentation feasibility, and guided inquiry syntax. The validation value of the language feasibility aspect was 96.42%, the content feasibility aspect was 90%, presentation feasibility aspect was 97.5%, and the guided inquiry aspect was 96.6%. The overall validation result of the field practitioner expert was 96.6%, with a very valid category. The result of the overall practicality of the guided inquiry-based e-module was 89.21% with a convenient category.Quality e-module learning must pay attention to the components determined by BSNP, namely the aspects of the appropriateness of the content/material, aspects of language and images, as well as the aspects of display presentation (BNSP, 2014).

The practicality of the e-module is carried out by 15 students who take the Human Anatomy and Physiology course. Every aspect and point of evaluation gets very practical value. In the aspect of ease of use consisting of seven aspects of getting 88.3 (very practical), the aspect of effectiveness of learning time consists of two aspects of getting a value of 89.16 (very practical), and the aspect of benefits consisting of fifteen aspects of getting a value of 96.53 (very practical). Based on the total scores of 15 students of practical inquiry-based e-module guided on the respiration system material based on the results of the study of the potential of a single garlic extract obtained a value of 89.21 with a very practical category.Clear images or illustrations in e-modules to support the content contained in e-modules and serve to help students in learning (Prastowo, 2014). In addition, the use of colors used in e-modules and the use of simple language can add interest in reading and ease students in understanding the material (Rufii, 2015).

The effectiveness of e-modules is done by looking at the results of the student pretest and posttest. The effectiveness of the product is a product quality criterion that is developed seen from the presence or absence of influence on the user (Nieveen, 2007). Based on the data analysis results of creative thinking skills showed the average value of the pretest of the control and experimental class is 19 and 35. The average value of

the posttest obtained by the control and experimental class is 52 and 74.4. Based on this it shows that the difference in the pretest and posttest values of the control and experimental classes is 33 and 39.4. Judging from every aspect of creative thinking skills students get a comparison of the average score of creative thinking skills in Table 1.

Table 1. Average creative thinking skill scores

No	Aspek	Average initial score	Average control class score	Average experiment class score
1.	*Fluency*	1,3	2,1	2,9
2.	*Originality*	2,7	2	2,8
3.	*Elaboration*	2,4	2,1	3,1
4.	*Flexibility*	3,1	2,2	3
5.	*Methaporathingking*	1,4	1,7	2,9

Hypothesis test results of creative thinking skills do not meet the requirements to try to the parametric difference test.351394,012 with p-value = 0,000 <α (α = 0.05). The results of the analysis show that there are significant differences in creative thinking skills between students who learn to use e-modules based on the guided inquiry on respiration system material based on research results (experimental class) and students who do not use e-modules based on guided inquiry-based on research results (control class) . The stages of the syntax of guided inquiry have proven effective in improving students' creative thinking skills (Bell, 2009; Rooney, 2009; Sadeh, 2011; Husen, 2015)

The results of the analysis of cognitive learning outcomes data show the average value of the control and experimental pretest classes is 27 and 36. After learning, students are given a post-test problem. In the control class not given treatment or without using e-modules based on guided inquiry, because in the experimental class were given treatment by applying guided inquiry-based e-modules. The average posttest scores of the control and experimental class are 46 and 76.92. This shows the difference between the pretest and posttest scores of the control and experimental classes of 19 and 40.92. Hypothesis test results of cognitive learning outcomes of students show that the data in the study has met the requirements of parametric statistics (ANACOVA). Based on the ANACOVA hypothesis test results showed that p-value = 0,000 <α (α = 0.05). The conclusion of the analysis that there are differences in creative thinking skills and cognitive learning outcomes between the control class and the experimental class after being treated using guided inquiry-based e-modules on the respiration system material based on the results of the study of the potential of a single garlic extract (Allium sativum). This proves that guided inquiry-based e-modules based on research results can improve student cognitive learning outcomes (Ikayanti & Suhartatik., 2016; Khan & Iqbal, 2011; Putu et al., 2017; Sarah & Ngaisah, 2016; Simsek & Kabapinar, 2010; Syahdiani et al., 2015; Tias, 2017). The stages in the syntax of guided inquiry learning models have proven to be effective in improving student cognitive learning outcomes (Ergul..m et al., 2011; Simsek & Kabapinar, 2010). This is in line with the difference in values at each level of the cognitive level measured. The average value of C3 or apply cognitive level is 85.18, C4 or analyze cognitive level is 80.75, C5 or evaluate cognitive level is 73.29.

CONCLUSION

Conclusions of this study as follows.
1) The guided inquiry-based e-module based on research results was very valid and very practical. The result of validation by the content expert was 100%, learning expert was 99.32%, and field practitioner expert was 96.6% with the very valid category. The result of module practicality was 89.21% with a convenient category.
2) There was a significant difference in the creative thinking skills between students who learned using the guided inquiry-based e-module in the respiratory system content based on research results and those who did not use the e-module. The e-module could improve students' creative thinking skills with $F_{calculate}$ = 351394.012 and *p-value* = 0.000 < α (α = 0.05).
3) There was a significant difference in the cognitive learning outcome between students who learned using the guided inquiry-based e-module in the respiratory system content based on research results and those who did not use the e-module. The e-module could improve students' cognitive learning outcome with p-value = 0.008 < α (α = 0.05).

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REFERENCES

Achmad, S.R. 2020. Design of e-module with RME approach do improve the creative thinking ability of students. *International Journal of Scientific & Technology Research,* 9(3):5229-5232.

Akbar, S. 2013. *Learning device instrument.* Bandung: PT. Remaja Rosdakarya.

Alzoubi, A.M., Al Qudah, M.F., Albursan, I.S., Bakhiet, S.F., & Jabar, A.S. 2016. The effect of creative thinking education in enhancing creative self-efficacy and cognitive motivation. *Journal of Educational and developmental psychology,* 6(1):117-130.

Arifin, Z. 2009. *Learning evaluation*. Bandung: PT Remaja Rosdakarya.

Astuti, Y. & Setiawan, B. 2013. Development of student worksheets (LKS) based on guided inquiry approach in cooperative learning on heat material. *Indonesian Natural Sciences Education Journal,* 2(1):88-92.

Asyhar, R. 2012.*Creative developing learning media*. Jambi: Reference. Hal:155.

Branch, R.M. 2009. *Instructional design: The addie approach.* New York Springer

Bell, T. 2009. Collaborative inquiry learning: models, tools, and challenges, *International Journal of Science Education*, 32(3):349-377.

BSNP. 2014.*Textbooks instrument rating.* Jakarta: MIPA Specialization Group.

Carey, G. 2010. Integrativemetabolism: an interactive learning tool for nutrition, biochemistry and physiology. *Journal of College Science Teaching,* 39(4):16-22.

Cruz, E. Diaz, H. & Kortemeyer, G. 2011. The effect of formatif assesment in Brasilia an universitas physicscourses. *Revista Brasileirade Ensinode Fisica,* 33(4):4501.

Darini, N.M., Martha, N., & Artawan, G. 2013. Analysis of The quality Indonesian language summative tests for class VII SMP Negeri 8 Denpasar even semester year 2012. *E-Journal Program Pascasarjana Universitas Pendidikan Ganesha*, *2*(19):5-8.

Department of Nasional Education. 2008. *Guidelines for development of teaching materials.* Jakarta: General Management of Primary & Secondary Education, Directorate of High School Trustees.

Depdiknas. 2008. *Teaching material development guide.* Jakarta: Depdiknas.

Direktorat Pembinaan Sekolah Menengah Atas. 2017. *Implementation guide 21st Century skills curriculum 2013 in High school.* Jakarta: Dit. PSMA Ditjen Primary and Secondary Education.

Ergul, R., Simsekli, Y., Calis, S., Ozdilek, Z., Gocmencelebi, S., & Sanli, M. 2011. The effect inquiry-based science teaching on elementary school students science process skill and science attitude. *Bulgarian Journal of Science and Education Policy Education*, 5(1):46–68.

Forrester. 2008. Thinking creatively. *R & D management,* 5(3):253-254. http://doi.org/ 10.1111/j.1467-9310.1985.tb00549.x.

Faot, M.M., Zubaidah, S., & Kuswantoro, H. 2016. Development of soybean cultivation technique module as a vocational highschool teaching material. *Journal of Education,* 1(7):1421–1426.

Gengarelly, L.M. & Abrams, E.D. 2008. Closing The gap: inquiry in Research and the secondary science classroom. *Journal of SciEduc. Technol.,* 18:74-84. USA: University of New Hampshire.

Gujjar, A.A. & Malik, M.A. 2007. Preparation of instructional material for distance teacher education. *Turkish Online Journal of Distance Education-TOJDE*, 8(1):55-63

Gordon, D. & Jeannette, V. 2001. *Learning revolution.* Bandung: Kaifa.

Herlina, V.Y. & Tirta, I. M.2018. *The level of students creative thinking skills in solving probability problem through Scientifiec approach*, 7:6495

Husen, D.N. 2015. Improving students creative thinking skills. *Bioeducation Journal*, 3(2):367-372.

Hodgson, C. & Pyle, K. 2010. *A literatur review of assessment for learning in science.* SloughBerks: National Foundation for Educational Research.

Ikayanti, R. & Suhartatik. 2016. The effect of implementation of guided inquiry learning models on the ability to understand concepts and sciences process skills of grade ix students in SMP Negeri 1 Lumajang. *National Seminar II in 2016*, FKIP Biology Education Program Collaboraton with the Center.

Joyce, B., Weil, M., & Calhoum, E. 2007. *Models of teaching (eight edition). translated achmad fawaid dan ateilla mirza.*Yogyakarta: Pustaka Pelajar.

Kadir, Lucyana, & Satriawati, G. 2017. The implementation of open-inquiry approach to improve students' learning activities, responses, and mathematical creative thinking skills. *Journal on Mathematics Education,* 8(1):103-114.

Kemenristekdikti. 2018. *Guide do compiling higher Education curriculumin industrial era 4.0 third edition.* Jakarta: Directorate General of Learning and Student Affairs, Ministry of Research, Technology, and Higher Education.

Khoiri, N., Riyadi, S., Kaltsum, U., Hindarto, N., & Rusilawati, A. 2017. Teaching creative thinking skills with laboratoris work. *International Journal of Science and Applied Science: Conference Series*, 2(1):256. https://doi.org/10.20961/ijsascs.v2i1.16722

Krnel, D. & Bajd, B. 2009. Learning and e-materials. *Act a Didactic a Napocensia.* 2(1):97-108

Lestari, U., Oktaviana, I., & Sumitro, S.B. 2015. Development of teaching material based on Perm membrane protein characterization Research in biotechnology subjects. *Florea: Journal of Biology and Learning, 2*(2). .https://doi.org/10.25273/florea. v2i2.413.

Llewellyn, D.J. 2013. *Teaching High school Science through inquiry and argumentation.*USA: Corwin.

Martin, R., et al. 2005. *Teaching science for alk children: an inquiry approach (with "video explorations" video workshopcd-rom).* USA: Alyynand Bacon 75 Arlington St Sulte 300 Boston.

Montagnes, I. 2000. *Textbooks and learning materials*. World Education Forum. Dakar, Senegal

Nurdin, S. & Setiawan, W. 2016. Improving students' cognitive abilities and creative thinking skills on temperatur & concepts through an exelearning-assisted problem based learning. *International Journal of Scientific and Technology Research,* 5(12):59-63.

Nieveen, N. 2007. Formative evaluation in Educational desing research. *Paper presentedin An Introduction to Educational Design Reseach,* Shanghai, 23-26 Agustus 2007.

Perdana, F.A., Sarwanto, S., Sukarmin, S., & Sujadi, I. 2017. Development of e-module combining Science process skills and dynamics motion material do in creasing critical thinking skills and improve student learning motivation senior high school. *International Journal of Science and Applied Science: Conference Series,* 1(1):45. https://doi.org/10.20961/ijsascs.v1i1.5112

Perpres R.I. 2012. *Republic of Indonesia presidentil regulation no. 8 of 2012 concerning the Indonesia National qualification framework (KKNI).* Jakarta: Presiden RI.

Prihatin, P., Prayitno, B.A., & Rinanto, Y. 2017. The development of guided inquiry-based modules on mushroom material to improve the critical thingking ability of grade x highschool students 1 cepogo boyolali. *Inquiry Journal*, 6(1):75–90. https://doi.org/10.20961/inkuiri.v6i1.17268.

Prastowo, A. 2014. *Creative guides make innovative teaching materials.* Yogyakarta: Diva Press.

Putu, M.E., Hidayah. Y., & Adawiyah, R. 2017. Guided inquiry learning to improve student learning outcomes in class XI science of SMA negeri 1 teweh timur on motion system material. *Journal of Biological Education,* 3(4):144–151.

Rahma, A.N. 2012. Development of learning tools model adjacent sets solubility material and solubility Products to grow critical thinking skills and empathy students on The environment. *Journal of Educational Research and Evaluation,* 1(2):133-138.

Rufii, R. 2015. Developing module on constructivist learning strategis do promote students' Independence and performance. *International Journal of Education,* 7(1):18-28.

Rusche, S.N. & Jason, K. 2011. "You have to absorb your self in it": using inquiry and reflection to promote student learning and self-knowledge. *American Sociological Association,* 39(4). DOI:10.1177/0092055X11418685: SAGE.

Rooney, C. 2009. How am I using inquiry-based learning do improve May practice and do encourage higher order thinking pamong May students of mathematics?. *Educational Journal of Living Theories,* 5(2):99-127.

Sadeh, I, & Zion, M. 2011. Which type of inquiry project do highschool biology student prefer: openorguide?. *ResEduc.* 42 (831848). *Springer*. Israel: Bar-11an University.

Safilu. 2010. The nature and strategy of biology learning do improve students' thinking skills. *Journal of Biological Education,* 2(1):1-11.

Sarianti, T.M. 2016. The effect of ict-based learning on students' creative thinking on the material of motion Systems in humans class XI of SMAN 2. *Bionatural Journal,* 3(1):1-12.

Sarah, S. & Ngaisah, S. 2016. The use of inquiry-based modules to improve students learning outcomes and independent character. *Jurnal PPKM II*, 114–120.

Simsek, P. & Kabapinar, F. 2010. The effect of inquiry-based learning on elementary students' conceptual understanding of matter, scientific process skills, and science attitude. *Procedia Social and Behavior Science*, 2:1190–1194.

Syahdiani, Kardi, S., & Sanjaya, I.G. 2015. The development of interactive multimedia based on inquiry into the material of the human reproductive system to improve learning outcomes and train students' critical thingking skills. *Journal of Science Education in Postgraduated State University of Surabaya*, 5(1):2089–2107.

Susanti, E. 2016. Glossaryof Indonesia vocabulary in a variety of social media. *Dialektika*, 3(2):229–250.

Tias, I.W.U. 2017. The application of guided discovery models to improve science learning outcomes of elementary school students. *Dwija Cendikia Pedagogic Research Journal*, 1(1):50–60.

Yusnaeni, Y., Corebima, A.D., Susilo, H., & Zubaidah, S. 2017. Creative thinking of low Academic student under gong search solven create and share learning integrated with metacognitive strategy. *International Journal of Instruction*, 10(2):245–262. https://doi.org/10.12973/iji.201