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The Development of Learning Design of Human Reproductive System with Religious Science Insights to Improve Critical Thinking Ability of Madrasah Aliyah's Students

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Abstract

The purpose of this research is to produce materials to teach human reproductive system with religious science insight and to improve the critical thinking ability of MA students. The research and development design (R&D), the development model used by *ADDIE* using 2 classes as the research subjects: XI- science of MA Negeri Rembang and XI- science of MA Mu'allimin Mu'allimat Rembang. The instruments used were tests and non-tests, which consisted of 10 question items to measure students' critical thinking abilities, validation questionnaires, teacher and student responses questionnaires, and also interview guides. The result of the syllabus validation from the material expert gave an average score of 0,85 and the media expert gave an average score of 0,95. The validation results of lesson plan from material experts gave an average score of 0,83 and media experts gave an average score of 0,98. The results showed that the valid teaching materials were excellent categories. The material expert gave an average score of 4,25 and media experts gave an average score of 5. The average responses score from MA Negeri Rembang's teachers was 85 and MA Mu'allimin Mu'allimat Rembang's teachers was 79. The average score of MA Negeri Rembang students' responses to the teaching materials reached 98 and MA Mu'allimin Mu'allimat Rembang students was 97. Based on pre-test and post-test results for simple argumentation ability indicators obtained an average score of N-gain students MA Negeri Rembang 0,75 and MA Mu'allimin Mu'allimat Rembang 0,70. The indicator of ability to connect between concepts obtained an average score of N-gain in MA Negeri Rembang of 0,69 and MA Mu'allimin Mu'allimat of 0,76. The average post-test result score for the indicator of ability to connect between the concepts of MA Negeri Rembang reached 89,64 and MA Mu'allimin Mu'allimat reached 86.73, while the indicator of ability to give simple arguments MA Negeri Rembang reached 88,73 and MA Mu'allimin Mu'allimat reached 86,82. It can be concluded that teaching materials of human reproductive system religious science insight was valid and contributed to improve the ability of critical thinking students. Therefore, teaching materials can be used in the learning of the human reproductive system.

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INTRODUCTION

Education has an important role in determining the establishment and development for the nation, through education we can still invest a good attitude in students and provide competence to Indonesian students. As stated in law of the Republic of Indonesia number 20 year 2003 concerning the National Education System. In the purpose of national education, the religious dimension is an integrated part of the national education objectives. (Makhin, Maryuningsih, & Saifuddin, 2014).

The national education aims to produce a young generation who capable of facing the times with devout and faith in the One True God. Its realization requires a variety of efforts, among others through the idea of scientific integration. This idea is motivated by dualism or scientific dichotomy between general science and religious science (Hamzah, 2015).

Biology learning in grade XI MA in reproductive system material has not connected religious values and without using other media or teaching materials that support the learning, even though there are already teaching materials in the form of LKS (Student Worksheet). In addition, the textbook has not shown any integration of religious insights into biological material, teachers also have not associated the concept of KI 1, namely comprehend fully and practice the teachings of religions embraced. The lack of teaching materials containing religious science and most students using textbooks and teaching materials in the form of LKS sold in the market as a source of learning, it is necessary to teach the integrated reproductive system of religious science that is arranged by teachers themselves to support the education.

The learning design is all forms of materials (both information, tools, and text) that are systematically arranged and used to help students in carrying out learning activities (Prastowo, 2015). The purpose of biology learning is to know various materials, concepts, and connections with each other and apply these concepts of biology in everyday life. One of the lessons that can make learning in the classroom more meaningful is if science learning is integrated into religious scores that will be expected to improve students' critical thinking skills (Purwaningrum, 2015).

Integration is a mixing or fusion that is usually done to two or more cultures and languages into one unity (Zein, Ali, & Zin, 2018). The learning process of religious of science integration is important to be done especially by schools with Islamic background. The learning process of religious of science integration can create a complete understanding by students in learning a lesson both in terms of science and also in terms of Islamic science (Qur'an). Therefore, schools with Islamic background should be able to implement the combining steps between two or more teaching materials that support each other to produce teaching materials that are in accordance with the expectations of the integration process.

Biology science deals with the universe and all the processes that occur in it as its object, so that teachers are easier to convey teaching material, because students do not only learn but also understand the concepts that exist and related to the real life. So that the relationship of biology with Qur'anic verses shows an education system that integrates worldly knowledge in religious science harmoniously and symbiotically (Janbuala, 2013).

The connection between the Qur'an and science can be proven through *Kauniyah* verses. *Kauniyah* verses are verses of the Qur'an that contain greatness about the universe and all its contents. One example of *Kauniyah* verse on the evolution of living things is At-Tin verse 4, An-Nur verse 45 and other verses that become the source of student integration (Azis, 2018).

It is crucial to develop a learning design in the form of modules that are expected to improve the religious and spiritual of students or teachers, increase innovation and variety of teaching materials in schools and students can learn more independently in accordance with the existing instructions. The duties and responsibilities of religious education towards students do not only carried by religious teachers, but are the responsibility of the school comprehensively (Mulyani, 2018). Based on the focus of the problem above, the formulation of the problem of developing the design of learning human reproductive system with religious insight science to improve the critical thinking ability of MA students.

According to Fadhlullah, 2017, critical thinking is not a studied concept, but rather a

process, the orientation of the mind encompasses the cognitive realm and effective reasoning. Critical thinking ability is an ability that must exist to be mastered by students in solving problems in religious science learning. Dwyer et al. (2014) argued that in addition, critical thinking training ultimately helps a person to become more adaptable to the surrounding environment, flexible and able to cope with the development of the latest information that continues to grow. Critical thinking is also important to have in the reproductive system material because some of the concepts of reproductive systems that occur in everyday life must be integrated into religion.

RESEARCH METHOD

This type of research is research and development. The products developed are teaching materials of the human reproductive system with religious science insight to improve the critical thinking ability of MA students. The development procedure in this research used ADDIE development model consists of five stages of research that have been modified, among others: (1) analysis, (2) design, (3) development, (4) implementation (5) evaluation. The research was conducted in MA Negeri Rembang and MA Mu'allimin Mu'allimat Rembang in the 2019/2020 school year, and the research population was class XI - science in even semester. The data sources from this study were students of MA Negeri Rembang and MA Mu'allimin Mu'allimat Rembang, and biology teachers in each school.

The test subjects were the readability of teaching materials consisted of 10 students of grade XI-science students of MA Negeri Rembang and 10 students of grade XI-science MA Mu'allimin Mu'allimat Rembang. The test subjects of feasibility were validation of syllabus, lesson plan and teaching materials by 2 validators. While the effectiveness sample was 36 students of grade XI science MA Negeri Rembang and 33 students of grade XI science MA Mu'allimin Mu'allimat Rembang. Data collection techniques and instruments in this study used two types of instruments, namely tests and non-test presented in Table 1. The test instrument is a set of questions to measure students' critical thinking abilities. While non-test instruments consist of validation sheets, questionnaires, and observation sheets.

Table 1 Details of data collection techniques and instruments

No.	Data	Data Collection Techniques	Instruments
1.	First Research	Non-Test	Questionnaire sheet and interview guide
2.	Validity of reproductive system learning design	Non-Test	Learning design scoring questionnaire
3.	Effectiveness of reproductive system learning design	Test and Non- Test	tests and questionnaires of students' responses
4.	Characteristics of reproductive system learning design	Non-Test	Learning design scoring questionnaire
5.	Critical thinking ability	Test	Multiple choice questions and essays
6.	Teachers Response	Non-Test	Interview guide
7.	Students Response	Non-Test	Questionnaire sheet

Syllabus, lesson plan and teaching materials were tested accordingly by material and media experts. Validation of syllabus, lesson plan, and teaching materials were assessed using questionnaires. The score of

the research results was arranged in a tabulation of data. Afterwards, it was qualified by searching the percentage of all aspects. Students' response data obtained from the questionnaire sheet readability of teaching materials. Reproductive system human being religious science insight to the critical thinking ability of students was measured by checking the lists, then doing the formulation of student responses in percentage using formulas.

Teacher's data responses to the development of human reproductive system teaching materials with religious science insights to students' critical thinking ability with check list questionnaires to teachers, assessment results score tabulation of data, then being qualified by searching the percentages of all aspects with the formula. Student value data was calculated by statistical test. The purpose of this data processing was to know the critical thinking ability of students. The data obtained described the analytical ability of pre-test and post-test problems to the intended competencies in each learning syntax.

RESULTS AND DISCUSSION

Characteristics of Human Reproductive System Teaching Materials with Religious Science Insights

Based on preliminary study results obtained from the potential and problems indicated that learning materials in MA Negeri Rembang and MA Mu'allimin Mu'allimat Rembang showed the data that biology learning, especially human reproductive system material, teachers used teaching materials in the form of textbook and LKS. In addition, the textbook have not shown any integration of religious insights into biological material. Madrasah Aliyah program which is a religious-based school, have not been identified to apply the process of religious science learning in every learning.

Teachers needed to increase innovation and variety of teaching materials in school, or teachers could develop teaching materials containing materials and questions for discussion materials so that students were more active and have critical thinking skills. This is in accordance with what is expressed by (Nold, 2017), the role of teachers in the learning process is difficult to replace, because teachers should be able to develop independent teaching materials according to students' thinking abilities, to be precise the development of students' critical thinking abilities and adapted to the school environment. This point has the same agreement with Hastuti (2013), the achievement of learning indicators in order to succeed, it is expected that teachers need to develop learning materials that are in accordance with the compiled indicators.

Teaching materials of human reproductive system with religious science insight is equipped with several characteristics including, the cover of teaching materials are attractively designed with modest colors, with contrasting title colors to explicate the title and each color sheet of the content of different science discussions. It is designed to increase students' interest in reading and facilitate students in learning. The teaching materials equipped with relevant Qur'anic verses in accordance with science materials and each sub-chapter of the material is equipped with an explanation of the interrelationship between religious of science and glossary. It contains materials along with the integrated questions of religious science for discussion materials so that students are more active and have critical thinking skills in conducting learning activities in the classroom. Additionally, it can be used by students to learn at home or elsewhere by practicing students' memory in lessons through questions. This point has the similar study with Parappilly (2013) that the purpose of teaching materials is developed to: 1) facilitate teachers in carrying out learning; 2) assist students in learning something; 3) to make the learning activities more interesting.

According to Safita (2018), the image media in learning is to facilitate teachers in delivering lesson materials to students. It is expected that learning activities are more interesting, otherwise students will be more easily obtain the lesson material delivered by the teacher. Furthermore, this idea is also supported by Amalina, et al., (2019): learning methods that are well-known to be an alternative to improve student learning outcomes, using learning methods that apply image media so that students will be more active in what they see and they do not just imagine what cannot be seen in real life, so it increases the interest in reading and

making it easier for students to learn.

According to Alias (2015), improving students' critical thinking skills through teaching materials is considered more effective than practicing critical thinking skills through teaching and learning activities directly without teaching materials. The reasons are because in the teaching material there are indicators, materials, activities, and exercises that are very clearly plotted and adapted to critical thinking aspects. In addition, it is also supported by the opinion of Peter et al., (2011), if in learning activities do not use teaching materials, obviously students do not understand how to measure skills that must be achieved through indicators and practice questions.

Teaching materials are equipped with relevant Qur'anic verses in accordance with the science material. Each sub-chapter of the material is equipped with explanations integrated with religious science namely: a) Reproductive organs (Q.S At-Tin: 4), b) Menstruation (Q.S Al-Baqarah: 222), c) Fertilization, Pregnancy (Q.S Al-Mu'minun : 12-14), d) Breastfeeding (Q.S Al-Baqarah: 233), and e) Disease disorders (Q.S An-Nur: 2). Teaching materials are provided with relevant practice questions in each discussion of learning methods, which is recognized to be an alternative to improve students learning outcomes. Additionally, learning activities, materials, and evaluations in teaching materials are well-appointed with religious values originated from Verses of the Quran and Hadith. Thus, students do not only learn related to reproductive system material but they also learn to analyze problems in the human reproductive system integrated with Quranic verses and hadiths, then provide solutions and applied them in daily life. In accordance with the opinion of Wahyuni (2015), it can be said that preparing and using teaching materials well, interesting and precise, then constructing students' knowledge and practicing problem solving, eventually it can accumulatively improve students' critical thinking skills and students' learning outcome.

Validation of Feasibility of Human Reproductive System Teaching Materials with Religious Science Insight According to Expert Scoring

The process after the preparation of supplementation of human reproductive system material with religious science insight was validation by experts. Scoring from the experts needed to be obtained so that valid teaching materials supplements did not occur misconceptions or errors to the content of teaching materials and can be used in the teaching and learning process. The material experts scored based on the content and validity components, while media experts scored based on the presentation and graphic components. It is in accordance with the study of science teaching materials analysis by Nepal (2019) that his research showed there are important errors or misconceptions in biology teaching materials that can affect learning and its outcomes.

The teaching materials of religious science insight as a supplement to the teaching material of the human reproductive system in Madrasah Aliyah developed based on the study of potentials and problems, scored the feasibility by material experts, media experts, and users i.e. teachers and students. Score 0,85 from material expert, 0,94 from media expert and based on user response result namely: teachers and students achieved $\geq$ 75%.

The general factors that influenced the validity of human reproductive system learning designs with religious science insights became exact valid in general as follows: 1) Indicators set out in expert validation instruments sheet in accordance with the requirements of the design of developed learning equipment ; 2) The scope of the material, the depth of the material, the degree of difficulty of the material, the order of the material is presented according to the level of physical, intellectual, social, emotional, and spiritual development of the student; 3) The presentation showed the consistency between KI, KD, indicators, main subject, learning activities, assessment, time allocation, learning resources and learning products; 4) Grammar and spelling appropriate with developed spelling. The above factors are appropriate with Wijayanti (2017) that stating the results of validation construction and validation of the contents of learning designs in the form of syllabus, lesson plan, teaching materials and category assessment instruments are very valid and worthy to be used for the learning process if in accordance with the guidelines for the preparation of learning plans.

Good teaching materials must pay attention to the feasibility of the content, the feasibility component of the content / material and validity, in order to achieve the objectives of learning: improving the knowledge, activity and learning outcomes of students. It is apt in Sundari research (2018) that good teaching materials must guarantee the potential & competence of successful students in biology; stimulate independent thinking and creativity of students; develop and train reflexive and metacognitive abilities as well as connections in daily life.

Based on the criteria for scoring teaching materials by the National Education Standards Board (BSNP), the criteria for teaching materials including the feasibility of the content/material component, language feasibility, presentation feasibility and eligibility for graphing. Good teaching materials must pay attention to the feasibility of teaching materials content, at least referring to the objectives that students will achieve, namely basic competencies (BSNP, 2014).

Information about religious science insights of teaching materials is in accordance with the study of potentials and problems in the school environment. This teaching material was also arranged based on the analysis of school needs and school environment needs. Contextual-based teaching materials had the strong potential to improve the quality of learning. In conformity in the policy direction contained in Law No. 20 of 2003 stated that curriculum development at all levels and types of education was developed with verified principles in accordance with education units, regional potentials and students.

Materials that associated with the real condition of the student's environment and during learning were given in the form of discussion, observation, or problem solving making learning more meaningful and encouraging students to make connections between the knowledge they have and their application in daily life (Zhang, 2017). Nevertheless, in reality, the preparation of teaching materials was not recognized by teachers because of several constrained factors, such as time and cost. It would be better if both teachers and the school work together to make this happen so that it produces students who master science and technology, as well as improving the quality of learning.

Language is a media used to convey a message from the speaker to the listener. Language needs to be presented as best as possible so that the message conveyed can be transferred correctly without any misconceptions, it can also be understood. According to BSNP (2014), teaching materials fulfill the grammatical component if the written information or messages can be communicated to the reader logically and easily accepted according to the student's cognitive stage. Based on table 4.7, the score obtained by the teaching material for the grammar component from the material expert and the student as a user is included in the excellent criteria or very feasible was 4,26. The material in the teaching material was described in a communicative language and easy to understand by the student. This happened because the language was modified to the user and arranged coherently, consistently and consistently. Tahrin's research (2014) shows that the feasibility of grammar in teaching materials must meet several aspects, namely: (1) the suitability of the student's intellectual level; (2) accuracy of grammar and spelling; (3) encourage critical thinking; (4) consistency of using terms and symbols; (5) the effectiveness of the sentence; and (6) accuracy of the sentence structure.

A teaching material must have an attraction to make students want to learn it. The attraction of teaching materials can be placed in several parts such as the cover and content, by placing stimuli in the form of images or illustrations and equipped with relevant question exercises in each discussion of learning methods (Nisa, 2018). Based on table 4.8, the graphing component was scored 4,73 by experts which means the criteria were excellent and the teaching material was worthy scored. The point of view, letter size and layout composition in the cover design got the highest score from a media expert of 5. At the time of the trial, students admitted interested in learning teaching materials after seeing the front cover with the title color in contrast to the color of the image on the cover that deliberately designed as such so that it can be read clearly by the student. The design used was minimalist with images that fit the theme of the reproductive system. According to Haka et al. (2020), teaching materials are interesting and creating a pleasant learning atmosphere, so that students do not feel bored while studying it and it help students understand the concepts and learning materials. Students prefer teaching materials arranged with attractive designs and drawings in

accordance with the theme of the teaching materials (Permatasari. 2019).

Implementation of Human Reproductive System Teaching Materials with Religious Science Insights Effective to Improve Critical Thinking Ability of MA Students

Development research is a research that aims to produce a particular product and then test the effectiveness of the product. Supplements of teaching materials that have received input from experts were then applied in the learning process to find out the effectiveness in learning. The effectiveness of supplements of teaching materials was scored based on the results of learning. The scoring of the study results began by giving pre-test and post-test questions that have been validated by experts.

Students were first given a pre-test question before learning using a supplement of religious science insights of teaching materials. After that, the teacher provided learning materials using supplements of religious science insights of teaching materials. According to the study using teaching supplement, the teacher gave the same test question material as the pre-test, then the results were analyzed as post-test score. Pre-test and post-test results have been obtained, then further analyzed using N-gain calculations. This is done in order to really know the improvement of students' critical thinking ability.

Table 2 Average Score Improve Critical Thinking Ability of MA Students

Aspect	*Pretest*		*Posttest*		N-gain	
	1	2	1	2	1	2
Average MA Negeri Rembang	38,18	32,36	89,64	88,73	0,69	0,75
Average MA Mu'allimin Mu'allimat Rembang	29,94	34	86,73	86,82	0,76	0,70
Highest Score MA Negeri Rembang	60	57	100	97	0,99	0,99
Highest Score MA Mu'allimin Mu'allimat Rembang	53	57	97	100	0,99	1
Lowest Score MA Negeri Rembang	19	21	73	75	0,23	0,51
Lowest Score MA Mu'allimin Mu'allimat Rembang	18	14	73	49	0,52	0,24

Explanation:
1 : Indicators of the ability to connect between concepts
2 : indicators of provide simple arguments

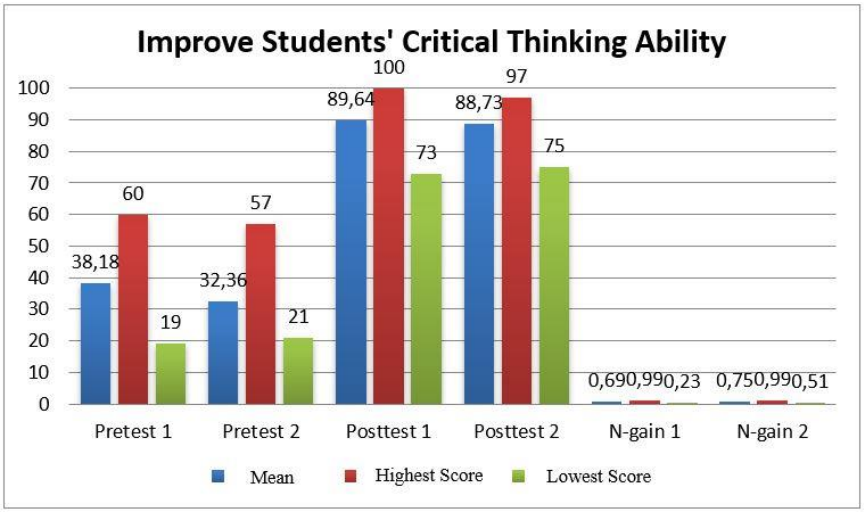

Figure 1 Score Effective to Improve Critical Thinking Ability of MA Students Negeri Rembang

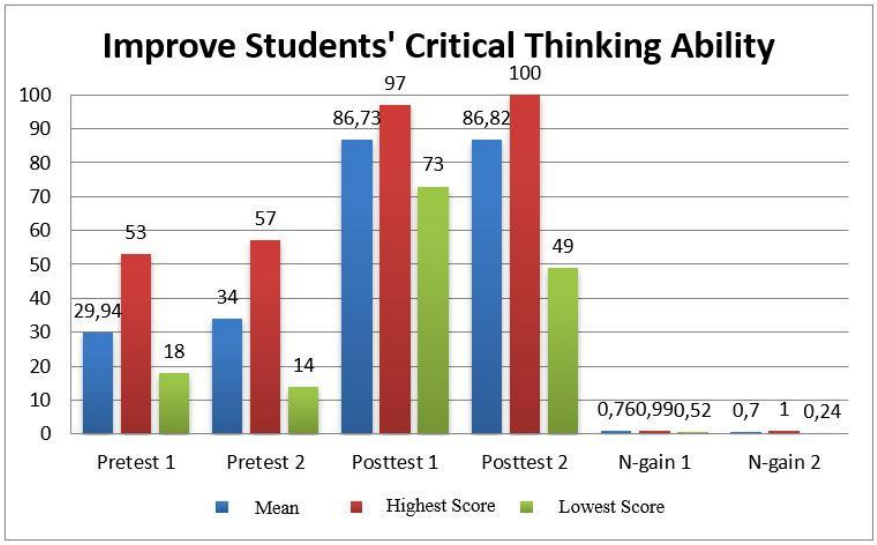

Figure 2 Score Effective to Improve Critical Thinking Ability of MA Students Mu'allimin Mu'allimat

The data obtained were then assessed. The results of student learning analysis could be concluded that the average score of post-test value was much better than the pre-test result meaning that there was a difference in value between before and after treatment using human reproductive system teaching materials with religious science insight in the learning process. Based on pre-test and post-test results to the indicator ability to give a simple explanation obtained the average score of N-gain students MA Negeri Rembang 0,75 and MA Mu'allimin Mu'allimat 0,70. Indicators ability concluded problems according to the topic obtained an average score of N-gain in MA Negeri Rembang of 0,69 and MA Mu'allimin Mu'allimat of 0.76.

The average post-test result score for the indicator ability concluded problems according to the topic of MA Negeri Rembang reached 89,64 and MA Mu'allimin Mu'allimat reached 86,73, while the indicator ability gave a simple explanation of MA Negeri Rembang reached 88,73 and MA Mu'allimin Mu'allimat reached 86,82. The post-test score above the specified KKM score of 75 and showed that learning using teaching materials has been successfully applied. The summary of student learning outcomes could be seen in attachments 13 to 18. In this critical thinking skill assessment, there were also students who did not reach the criteria of completeness. Hajar et al. (2018) stated several factors that cause students to be incomplete in learning include: 1) students who have different intelligence; 2) the way students deal with difficulties (problems) varies depending on how the student's daily learning process is; 3) School classification has an impact on students' high-level thinking skills.

The critical thinking skills of students in this study also trained by providing essay questions with a higher order thinking (C4-C6) cognitive level at each end of the LKPD section. The questions described in this LKPD were able to improve students' thinking ability, ability to provide alternatives, answers and the ability to distinguish useful and useless information and the ability to evaluate that fall into critical thinking criteria (Ratnaningtyas & Wijayanti, 2016). Furthermore, the questions given by the teacher to stimulate curiosity and increase the information / knowledge of students also have a cognitive level according to HOT. Evaluation questions in the form of multiple choice questions and essay presented in learning materials also had HOT criteria. This is in accordance with Arifin (2017) who stated that HOT questions can be used to measure students' critical thinking abilities and can improve the ability to think logically, creatively, innovatively, and the ability to work with teams.

Based on the description above, the teacher needs to develop the critical thinking skills of students in the learning process. In accordance Kustiani's opinion (2020) stated that efforts to raise students' critical

thinking ability is an obligation that must be done by teachers in the learning process in every meeting, teachers should be able to apply a critical way of thinking to students. In addition, it is also supported by Haryati's opinion, (2013) teachers can provide opportunities and support to students to be able to raise students' critical thinking skills by providing additional teaching materials that are expected to help students develop knowledge of reasoning skills that can later affect students' critical thinking skills. Based on the research results of students' work in completing pre-test and post-test question sheets to find out the critical thinking ability given in this study showed that the critical thinking ability of the average student in a high category.

CONCLUSION

The design of human reproductive system teaching materials developed with religious science insights to improve the analytical ability of students in MA is stated valid with excellent criteria based on the scoring of material experts, media experts, teachers and students. Teacher and students gave positive responses to the implementation of religious science insights of teaching materials in the learning of the human reproductive system. Religious science insights of human reproductive system teaching materials are effectively applied to improve the critical thinking ability of MA students.

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