Tadris: Jurnal Keguruan dan Ilmu Tarbiyah 4 (1): 41-49 (2019)
DOI: 10.24042/tadris.v4i1.4101

TADRIS: JURNAL KEGURUAN DAN ILMU TARBIYAH
(Tadris: Journal of Education and Teacher Training)
P-ISSN: 2301-7562 | E-ISSN: 2579-7964
ejournal.radenintan.ac.id/index.php/tadris/index

Critical Thinking Ability and Student's Personal Religious Beliefs: An Analysis of DBUS Model Implementation

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Article History:
Received: March 28th, 2019
Revised: May 18th, 2019
Accepted: June 15th, 2019
Published: June 26th, 2019

Keywords:
Critical thinking,
DBUS model,
Personal Religious Beliefs (PRB)

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Abstract: The recent value integration of science and religion has become a topic of research in Indonesia, especially in developing critical-thinking skills and students' personal religious belief. The purpose of this research is to see the results of the implementation of the DBUS (Discovery-Based Unity of Sciences) learning model analyzed in detail at each step of the learning. This research uses a qualitative approach with interactive analysis of data reduction, data presentation, and conclusion drawing. The research sample was 101 students and two biology lecturers from UIN Walisongo Semarang, Indonesia, 94 students and two biology lecturers from UIN Sunan Kalijaga Yogyakarta, Indonesia. The results of the analysis of this research show that, by implementing the DBUS learning model, students learn constructively, meaningfully, and can apply each syntax in the learning process to develop critical-thinking skills and students' personal religious beliefs. The DBUS learning model becomes a way to integrate the value of science and religion in developing students' abilities to learn constructively and meaningfully so they can develop critical-thinking skills and personal religious beliefs (PRB).

INTRODUCTION

Education is now entering the challenges of the 21st-century, where learning is focused on students' abilities and learning skills (Mishra & Mehta, 2016; Siswanto, 2018; Yuliati, 2017). Students' learning skills can improve the quality of human resources (Hasmunarti, Bahri, & Idris, 2018). Human quality can be formed through several things, one of which is critical thinking skills (Suherman, 2015).

Critical-thinking is an indicator of 21st-century education included in the cognitive domain (Makhrus, Harjono, Syukur, Bahri, & Muntari, 2018; Rahayu, Mayasari, & Huriawati, 2019). In addition to the cognitive domain, the other component that must be considered is the realm of spiritual attitudes which will ultimately shape human resources with character especially in science learning (Abbas & Bin Hassan, 2014; Ali, 2018; Anwar, Saregar, Hasanah, & Widayanti, 2018; Kholifah, 2018; Sari & Jusar, 2017).

Biology is a science that is closely related to human behavior and life (Syafaruddin & Lestari, 2018). In learning biology, critical-thinking skills are one of the abilities that must be achieved (Gultom & Adam, 2018). The fact is that

learning now emphasizes mastery of concepts, but there are very few activities that can stimulate students' critical-thinking skills (Fitriani & Ikhsan, 2017; Ibrahim, Akmal, Marwan, & Hasan, 2018; Walid, Sajidan, Ramli, & Kusumah, 2019). The implementation of science and religious values integration has not yet appeared (Mulyani, Asyhar, Yelianti, & Syarial, 2018). In addition to critical thinking skills, the integration of religious values in learning must be empowered (Rahmawati, 2018), to establish religious beliefs (Andrian, Kardinah, & Ningsih, 2018; Lubis & Harahap, 2018). So that students will experience meaningful learning (Arsal, Dirawan, Hala, & Tahmir, 2018; Weng, Lin, & She, 2017).

One of the efforts to solve these problems is an effective learning process (Jatmiko, Kartina, Irwandani, Pricilia, & Rahayu, 2018; Saregar et al., 2018). Teachers as facilitators must be skilled in choosing model and media suitable with the characteristics of the learning material (Barus & Sani, 2017; Muis & Bahri, 2018; Suranti, Gunawan, & Sahidu, 2016), An appropriate learning model will influence thinking ability in the learning process (Sudin, Duda, & Supiandi, 2018).

The types of learning model suitable to improve the critical-thinking include team assisted individualization (Mardiani, Maasawet, & Hardoko, 2018), group investigation dan guided inquiry learning model (Aini, Ramdani, & Raksun, 2018), and DBUS learning model (Discovery Based Unity of Sciences) (Khasanah, 2018). The researchers analyzed the DBUS learning model that is able to empower the students' critical-thinking skills and personal religious belief.

DBUS learning model is an integrative discovery model that is based on the integration of unity of science, through this learning model, the students are able to improve learning abilities constructively and meaningfully so that they can develop thinking skills and personal beliefs (Khasanah, Sajidan, Sutarno, & Prayitno, 2018).

This research is in line with previous studies that succeeded in developing and implementing the DBUS learning model in empowering critical thinking skills and personal beliefs student (Khasanah, 2018), The difference between this research and the previous one lies in the learning process through the DBUS model in developing students' critical thinking and personal beliefs.

METHOD

This research employs the qualitative approach with an interactive analysis of data reduction, data presentation, and conclusion (Sugiono, 2010). The samples of the research were 101 students and two lecturers from UIN Walisongo Semarang and 94 students and two lecturers from UIN Sunan Kalijaga Yogyakarta. The subjects of this research were general biology lecturers and first-semester biology students. Data collection techniques in this research were observations of the implementation of learning and the documentation of lecturer assessment.

RESULT AND DISCUSSION

DBUS learning model has 6 steps called local wisdom orientation, analytical statements, observation & data collection, data processing, religion-based association, generalization & awareness. The results of this research indicate that 21st-Century education must pay attention to the integration of science and religion and to remember the importance of empowering critical-thinking skills and religious beliefs of students. The results of the research analysis prove that the values of science and religion can be integrated. The following are integration data from the DBUS model on each indicator of critical-thinking skills, namely: interpretation, analysis, evaluation, conclusions, explanations, and self-regulation, as well as indicators of

personal religious beliefs (PRB); religious views about science and personal interpretations of the views of religion (table 1). The observation of the learning process was carried out to obtain data on critical-thinking skills, and the interview was carried out to investigate the students' religious beliefs in the biotechnology learning practice.

Table 1. The Linkages of Research Components

No	DBUS Model	Integration of Critical Thinking	Personal Religious Belief
1	Local wisdom orientation	Trained by describing the problems occurring in the community and environment, exploring developing phenomena related to concepts in order to be able to provide logical and reasonable information and considerations to a conclusion (Explanation and self-regulation)	By utilizing the phenomena in the environment, empathy is embedded with the surrounding environment so that the PRB can be better, thus, learning could be more meaningful (the views of religion regarding science and the personal interpretations on religious views)
2	Analytical statements	Conduct research on Qur'an verses related to the basis of traits inheritance. Surah al-Mukminun: 13-14 and al-A'rof: 52 (Analysis)	By conducting verse research of the Qur'an, it further enhances the student's belief that Allah the Almighty has arranged everything. It can be seen from the value of PRB both UIN Walisongo and at UIN Sunan Kalijaga experience improvement (the views of religion regarding science and the personal interpretations on religious views)
3	Observation and data collection	The activities of observing, information gathering, group discussions, and conducting evaluations (Evaluation)	Able to apply the characteristics of Rasulullah PBUH (*Sidiq, Tabligh, Fathonah, and Amanah*) in the practicum activities (the views of religion regarding science and the personal interpretations on religious views)
4	Data processing	Collecting data, conducting inferences, explaining opinions, and carrying out analysis (Interpretation)	Honesty and perseverance when doing data processing in groups (the views of religion regarding science and the personal interpretations on religious views)
5	Association base on religion	Able to integrate and associate data obtained with the basis of law and faith in religion (Conclusion)	Communicate and discuss the results of practical analysis (the views of religion regarding science and the personal interpretations on religious views)
6	Generalization and awareness	Able to do self-regulation, inference, and evaluation (Evaluation)	Having stronger religious belief so that learning concepts is more meaningful than the science learning process so that critical-thinking skills and the PRB could be empowered (the views of religion regarding science and the personal interpretations on religious views)

Table 1 explains the integration of DBUS model in empowering critical-thinking skills and religious beliefs in the biology learning process. The success of the implementation will be discussed in

detail in the analysis of each step of the DBUS model as follows.

The syntax is described in the sequence of activities in learning activities. The DBUS model has six steps, including Local Wisdom orientation, Analytical statements, Observation & Data collection, Data Processing, Association base on Religion, Generalization & Awareness.

Step 1: Local Wisdom Orientation

Students observed and described the events or problems encountered surrounding the campus or the students' residence either directly or from an observation about the basis of inheritance and Biotechnology (Exploration of opinions). Developing issues related to the incestuous marriage, and the halal and haram processed food technology (alcohol from fermented cassava and cooking spices).

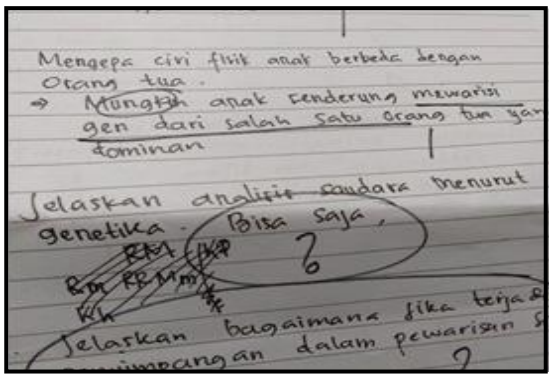


Figure 1. The Control Class Answer Sheet at the Local Wisdom Orientation Step

The exploration in the control class was still lacking. Judging from the way the answer, they were still in doubt. This caused by the lack of students' experience. The students were not employing environmental phenomena as a basis for mastering concepts. The students' critical-thinking skills were trained by describing the problems happening in the community and environment, exploring the phenomena related to the concepts in order to be able to provide logical and reasonable information as the considerations for the conclusion.

Exploration was carried out in groups by expressing opinions in the group. In the control and experiment class, both UIN Walisongo and UIN Sunan Kalijaga showed an increase. Students in the experimental class were able to mention more examples and were able to interpret their opinions in groups so that the class was more active.

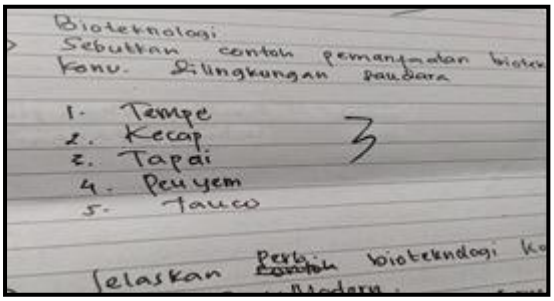


Figure 2. The Experimental Class Answer Sheet at the Local Wisdom Orientation Step

The results of the first step process took advantage of the phenomenon in the environment. The students were embedded with a sense of empathy with the surrounding environment so that their PRB can be better, and the learning can be more meaningful.

Step 2: Analytical Statement

Students conducted activities to find out and formulate the problems referring to learning resources and higher order thinking skills (HOTS). Students filled in the worksheets provided in groups. The proposed hypotheses from the problems given is shown in the following figure.

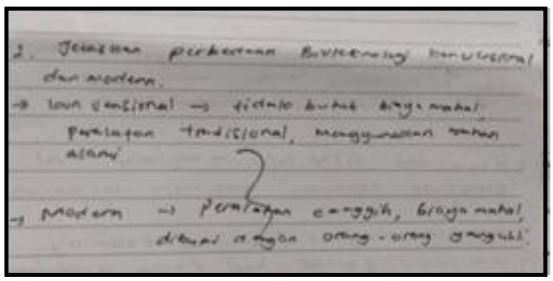


Figure 3. The Post-test Answer Sheet of the Experimental Class in the Analytical Statement Step

In the second step, the students compiled an experimental plan in the form of student worksheets in groups. Worksheets cover a variety of conventional biotechnology and modern biotechnology. They created tables of various types of conventional biotechnology and modern biotechnology.

Students conducted Quranic verse research related to the basis of the inheritance traits in Surah-Surah Al-Mukminun: 13-14 and Al-A'rof: 52. By conducting the research, it further enhances the students' belief that Allah the Almighty governs everything. Judging by the score of PRB, both UIN Walisongo and UIN Sunan Kalijaga showed an improvement.

Step 3: Observation & Data Collection

In this third step, the students observed the traditional values (*bibit, bebet, and bobot*) and conventional biotechnology (making fermented cassava and fermented legumes) that can be used as learning resources. Students collected relevant information and read literature, observe objects, and conducted an interview. They collected community opinion, religious leaders, for example, MUI (Board of Indonesian Islamic Religious Figures), research books (interpretations and laws) related to the problems and concepts learned. Students did lab works by answering questions and proving hypotheses through answering questions in student work reports.

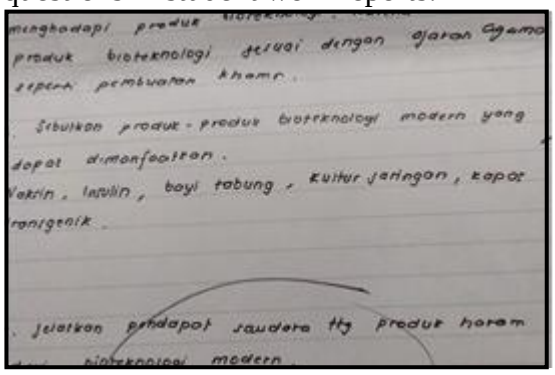

menghadapi produk
produk bioteknologi sesuai dengan ajaran agama
seperti pembuatan khamr.
Sebutkan produk - produk bioteknologi modern yang
dapat dimanfaatkan.
Vaksin, insulin, bayi tabung, kultur jaringan, kapas
transgenik.
Jelaskan pendapat saudara ttg produk haram

Figure 4. The Post-test Answer Sheet of the Experimental Class in the Observation & Data Collection Step

The students' critical-thinking skills seen in this third step include the activities of observation, information gathering, group discussions, and conducting evaluations. The emphasized PRB is that the students should be able to apply the prophet's characteristics (*Sidiq, Tabligh, Fathonah, and Amanah*) in practicum activities.

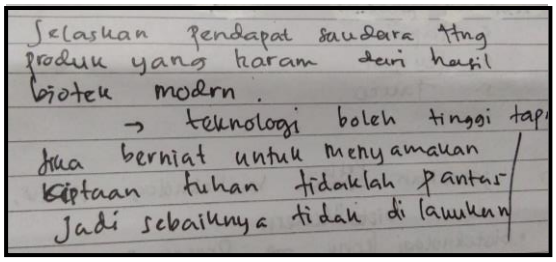
Step 4: Data Processing

In this step, the students did data processing, analyzed the results and informed the results of experiments that by a discussion based on data, facts, theories and the latest findings (journals and papers). The students discussed the data obtained in groups.

The critical-thinking skills can be seen during the students' activities of collecting data, conducting inferences, explaining opinions, and conducting analysis. The students' showed their PRB in honesty and perseverance when doing data processing in groups.

Step 5: Association Based on Religion

Lecturers and students discussed the integration between topics with verses from the Qur'an and Hadith relevant to the topic, examined if there are conflicts arise between the Qur'an and Hadith on the topic of traits inheritance. Students understood the concepts and theories through examples found in everyday life. They communicated and discussed the results of practical analysis through presentations by representatives in front of the class.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bioteh modrn.
→ teknologi boleh tinggi tapi
jika berniat untuk menyamakan
ciptaan tuhan tidaklah pantas
Jadi sebaiknya tidak di lakukan

Figure 5. Posttest Answer Sheet at the Association Based on Religion Step

Students' critical-thinking skills can be seen in the discussion and question and answer session during the learning process. Their critical-thinking skills can be re-empowered through analysis and explanation when they were asked to integrate and associate data obtained with the Islamic laws.

Step 6: Generalization & Awareness

Students drew conclusions from data, statements, and opinions of concepts learned with scientific work to develop recommendations/follow-up. Students determined attitudes and actions by integrating concepts that have been studied with the religion and skills possessed.

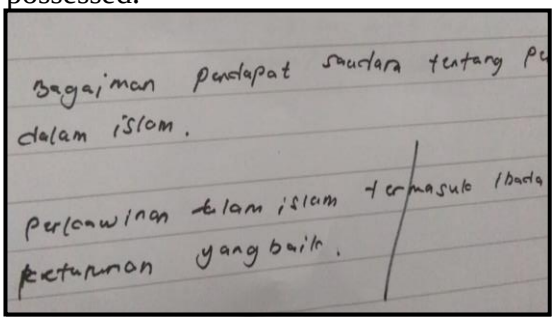

Figure 6. Posttest Answer Sheet of the Generalization & Awareness Step

The observed critical-thinking skills are that the students are able to do self-regulation, inference, and evaluation. Students had a strong religious belief so that learning concepts was more meaningful in the process of science learning so that critical-thinking skills and PBH could be more reinforced. The students were able to implement and behave as individuals or as better members of society after meaningful learning.

The DBUS model is one of the solutions that can be implemented in the classroom. A good learning process provides opportunities for students to find concepts, theories, rules, or understanding through examples found in everyday life. In line with previous research, this research has been successful in developing and implementing the DBUS model in developing critical-thinking skills and students' PRB (Khasanah, 2018; Khasanah et al., 2018)

Islamic universities, (PTAI) including UIN Walisongo, have a strategic role in realizing educational goals by educating critical and religious students. The importance of knowledge accompanied by strong faith and noble character is the rationale for the integration of science and religion in education. The integrated concepts involve various angles of research, up to their contextual uses and application. The students, facilitated by lecturers, to research the application of concepts with the DBUS model, are expected to be able to construct knowledge from their own experience.

CONCLUSION

This research concludes that, through the DBUS learning model, the students can gain direct experience by exploring and observing the surrounding, conducting information gathering, data processing, verification, and generalization so that they can process the strength to receive, store, and apply concepts they learned. Train the students to be able to discover various thoroughly studied (holistic), meaningful, authentic, and active concepts. The DBUS learning model becomes a way to integrate the value of science and religion in developing students' abilities to learn constructively and meaningfully so they can develop critical-thinking skills and personal religious beliefs (PRB).

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