

DEVELOPMENT OF CONTEXTUAL EDUCATION TO IMPROVE GRADUATE COMPETENCE OF BIOLOGY EDUCATION STUDY PROGRAM

Entin Daningsih, Yokhebed, Endi Nursapikka, Widya Qamariah, Apriani,
Aulia Rahma Chaniago, Gita Faramita
email: ed_soehadmi@yahoo.com

Biology Education Study Program, Institute of Teacher Training and Education,
Tanjungpura University, Pontianak West Kalimantan, Indonesia 78124

Abstract

The students must prepare their best education and have good characters to compete due to tight globalization. This study aimed to describe the process of character building with contextualism. The method used in this research was quantitative descriptive with contextualism approach which has seven stages in its implementation namely constructivism, questioning, investigation, learning community, modelling, reflection, and authentic assesment. There were five students as a reseach team involving in this study. Students went through the first three stages by finding superior fruits and made their products and related to syllabus curriculum 2013. They chose laboratory work to implement their products in schools. The reflection stage was shown by the capability of the team to do the authentic assesment in the schools. They fulfilled questionnaire containing nine indicators of characters as an authentic assesment. All character scores were high except innovation score indicating improving innovation require more experience and learning process.

Keyword: Contextual, character building, learning process, research team

INTRODUCTION

The competition to obtain the job and to face the globalization is getting tight. Every one to survive or win the competition must prepare with education. Beside this formal education, the competition also challenges every one to have exellent characters. The Decree of Higher Education Number 12 in the Year of 2012 article 1 obligates every learner to have equal opportunity in developing her/his potency. Chapman (2011) stated that character building can be done since young or school age.

The Decree of Higher Education Number 12 in the Year of 2012 article 1 states, these characters' development can be engaged through the existing courses of field study at university. Biology Education Study Program at Faculty of Teacher and Training Education (FKIP) of Tanjungpura University has a mandate to produce professional education graduates (Data Profil Prodi Pendidikan Biologi, 2015). The professionalism of a teacher is required not only to have adequate knowledge but also to have skills both in education and personal, professional, social, and paedagogic competence (The Decree Number.14 in the Year of 2005). In the same profile of Biology Education Study Program, the graduate also is expected to be entrepreneur. Thus biology students that become teachers can also face challenges to be more independent. The independent character can be build through a process of development in the learning process that makes students more creative and innovative. In character building, the values of

character can also be embedded in school program (Chapman, 2011) Therefore, students as prospective teachers not only provide themselves more independent but also be able to manage the class in order to implement more real education.

In contextual education there are seven main components namely\): constructivism, questioning, investigation, learning society, modeling, reflection, and authentic assessment (Depdiknas in Zakiah, 2017). In this stage, students are faced with a problem and are required to find out knowledge related to questions that may lead to a particular investigation or attempt. Students as prospective teachers should be able to apply the results of the investigation to the their students. In applying to students, they should be able to choose appropriate learning methods with their findings (products) and create a fun learning atmosphere for students in the schools. The selection of the right method facilitates the student or prospective teacher in reflecting on the method chosen and done by the them. Based on the results of this reflection, students are also able to perform an evaluation of authentic assessment of cognitive, psychomotor, and affective values.

All stages in contextual education are able to form student personalities that can take advantage of short time to create more enjoyable learning, relating to learning materials with daily life, be able to assess the quality of students' authentic assesment, and can utilize the surrounding environment as learning resources (Jumadi, 2003). This ability can be established through student education process that can put forward a credible knowledge and make the foundation for subsequent action. To underpin this ability, students must be equipped with the knowledge, technology and skills needed to face the challenges of the times.

The Biology Education Study Program is based on a curriculum filled with biological sciences and education. To concoct these two fields into one skill or competence from Biology Education Study Pogram, students can obtain in contextual education. The purpose of this study described the process of character building with contextual approach through food processing. This research also aimed to improve the competence of Biology Education graduates with the development of contextual education program through food processing.

METHOD

This research used quantitative descriptive method with contextual approach. This research has seven stages performed by the students. The seven stages can be seen in the Figure 1.

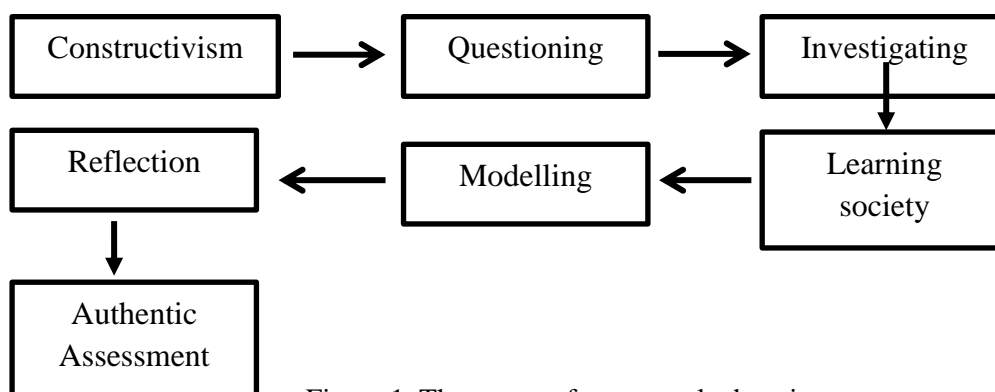


Figure 1. The stages of contextual education

Five college students of Biology Education Study Program in the seventh semester who finished the study courses except pre service teacher training (PPL) and course of work

implementation (KKN) engaged in the program in the form of research team (*Payung Penelitian*).

In the first stage, the team was challenged by the supervisor giving the question of what plants that give superior fruit or product and having problem with their shelf life and need food processing to give the economic benefit. The team was also asked if any related to curriculum 2013 of senior high school. The challenge to produce products from plants could be developed into a fun learning for students and can be reflected and evaluated authentically in the school. This process in addition to forming students to be capable to implement into the classroom also shapes the character of the team students to improve the curiosity, hard work, perseverance, and can work together in a team (team work) so that when become a teacher in the field, team students are able to face the challenge of times. In the first stage in contextual approach that is constructivism, students discussed and formulated problems related to superior fruits and connected it with the senior high school syllabus of curriculum 2013.

The second stage is questioning. The team students interviewed the farmers about the superior fruits and interviewed teachers from five senior high schools to ask the material delivered in the syllabus of Senior high school Curriculum of 2013. Based on the Curriculum of 2013 revision in the 2016 there is a subject material of plantae with sub-material the role of plants in the economic field. Further interview with the teacher indicated that every school delivers the sub material theoretically and only show the different product from any plant that can be benefit for economy. The team students were able to find the information about the superior plant in the location of the nearest town or West Kalimantan province. The five students who were engaged the research first determined the superior fruits in West Kalimantan.

The third stage of contextual education is the investigation. The team students looked for fruit products sold in the city of Pontianak. Then team students discussed and had ideas the ways that could be used for student learning in schools on the sub-material of the plant role in the economic field. After determining the stages of samples and products made then the team students determined the method, Method selected by the team students with the reasons in addition to know the plants also know and carry out the processing of plants into profitable products. The team students should be able to determine what products can be generated or modified so as to provide an economic role for both the local community and the students themselves. The team students discovered the character and plant classification and the possibility of product development. Progress of this stage can be seen from the background of student design proposal that were presented in the seminar for their bachelor degree..

The fourth stage is learning community. The team students found ideas for processing fruits and products so that the product can be accepted by society. The team student came up with the suitable product and modified the recipes to be unique and different with the existing products. The team student did some limited trials involving 10 other students as panelist. The process of the food was also planned for learning process of senior high school students.

The fifth stage is modeling. After the team students modified food recipes and finished limited trial, they selected a learning method to implement it in the schools, The learning method should be fun, relate more to surrounding situation and give good example in submaterial according to the curriculum, improve the ability of students and can be evaluated for authentic assessments of cognitive, psychomotor and affective values.

The sixth stage is reflection. The team students choose the method used to discover the reflection of the students in the schools. This method uses a student response

questionnaire and observation form to perform authentic assessments in a chosen learning method. Team students' reflection on the character development program was shown on the ability of the team students conducting both for response of their students with questionnaire and authentic assessment. The statement of each item in questionnaire has a gradation of positive to negative answers, consisting strongly agree (SS), agree (S), disagree (TS) and strongly disagree (STS).

The result of questionnaire of student response in a chosen learning method was analyzed using Likert scale. The Likert scale is the scale used to measure the attitudes, opinions, and perceptions of a person or group of people about social events or phenomena (Sugiyono, 2013). In this study used a closed statement with scalar in a range of Strongly Disagree (1), Disagree (2), Agree (3), and Strongly Agree (4).

The percentage of each questionnaire item was obtained by the formula:

$$\text{NRS\%} = \frac{\text{score total of respondents' answer}}{\text{Ideal score}} \times 100\% \dots\dots\dots (1)$$

NRS% = students' rate response

Ideal score = maximal score x total respondents

The percentage categories of student response' rates are calculated as follows (Riduwan, 2012)

80% ≤ NRS ≤ 100%: very high

60% ≤ NRS < 80% : High

40% ≤ NRS < 60% : enough

20% ≤ NRS < 40% : low

0% ≤ NRS < 20% : very low

Evaluation of the chosen method implementing to senior high school students was written in the assessment of psychomotor and affective observations while the cognitive was evaluated with the format of student work (LKS).

The last stage is the authentic assessment. The team students who have done research team, wrote the results of their research into their thesis. The results of the thesis was examined in the defence. The overall process of the development of this program can be concluded from the results of questionnaires of the team students who have completed their research. Character evaluation of nine indicators was analyzed from these team students shown whether the development of character building program was succesful or need improment.

FINDINGS AND DISCUSSION

Findings

Basically plants have many benefits, one of which is in the field of economics. Students found out the superior plants that can be used as products and have the role in the economic field. Students discussed and did various ways to find out the superior plants in West Kalimantan. The team students found three plants namely ginger (*Zingiber officinale* Roscoe.), papaya (*Carica papaya* L.) and pineapple (*Ananas comosus* L. Merr) that were abundant in Ponianak. According to the BPS province of West Kalimantan, ginger is in third place with total production amounting to 128.650 kg. According to the BPS papaya lies in first place with a total of 48.680 CWT. The pineapple has a total production of 30,447 tons. Ginger and pineapple plant are the leading commodities in the Regency of Kubu Raya, precisely the Rasau Jaya region, while the papaya fruit is a leading commodity in Pontianak City precisely in the Siantan region, North Pontianak.

Further discussion by the team students found in the 2013 curriculum revision of 2016 there was material on the plant with the sub-material of plant role in economy.

In the second stage of contextual education the team students interviewed the farmer of ginger and pineapple in Kubu Raya Regency and papaya farmers in Pontianak. Some farmers suffer losses because not all marketing area can receive the fruit harvest. The problems that arise to farmers are due to the abundant amount of crops so that the crops that can not be distributed will decay because the fruits are stored too long. Based on the interview with the farmers, the farmers had limited knowledge to process the fruits. The above issues made the team students was encouraged to find solutions for both farmers and sellers to have more shelf life and higher economic value.

Further interview with teachers from SMA Negeri 4 Pontianak, SMA Negeri 6 Pontianak, SMA Muhammadiyah 1 Pontianak, MAN 1 Pontianak and MAN 2 Pontianak found out all the teachers have the same method to deliver the submaterial to their students. The teachers delivered the submaterial theoretically and used 2 x 45 minutes. Teachers introduced plants that had economic value. As a result, the team students wanted to make innovations in delivering sub-material of plant role in the economic field. In the syllabus of curriculum 2013 revised in 2016, this sub-material of plant roles in economics is applied by theoretical learning. But in this case the team students were required to make a learning innovation on the sub-material.

Currently, the team students have been doing constructivism, questioning in the contextual education. In the constructivism stage, the team students defined problems related to the superior fruits where the fruits have abundant amount and the lack of processing. In addition, the team students connected with high school syllabus about the curriculum of 2013 revised in 2016. Students conducted interviews to farmers to prove the formulation of the problem gained. Based on the results of interview to farmers, it is known that the fruit will be abundant in the harvest time, while the fruit market is limited to the area of Pontianak City, and Kubu Raya only. This causes losses to farmers, because the fruits can decompose quickly due to the accumulation in the long term. In addition, students also interviewed biology teachers from five senior high schools in Pontianak City. Based on the Curriculum of 2013 revised in 2016 there is the subject material of plantae with sub-material the plant role in the economic field. In the sub-material of the plant role in the economic field, the teachers deliver the material with conventional method and without the help of the instructional media. The team students who engaged in the team research first determined the leading product of the plants in West Kalimantan. With the results of interviews with farmers and teachers, students were challenged to connect between the problems faced by farmers and teachers. At this time, the team students went through constructivism and questioning stages.

After the problem was revealed, the team students continued with the investigation stage where the team students looked for types of fruit products sold in Pontianak City. Then the team students discussed methods that could be used for student learning in schools on the sub-material of the plant role in the economic field. After determining the stages of samples and products were made then the team students determined the method. The method of laboratory work was chosen by the team students with the reasons that in addition to know the plants, the students would also know and carry out the processing of plants into profitable products and can provide information as well as tangible evidence of the plant role to students in high school.

The team students found out the ideas to process the fruits and the product so it can be accepted in the community. With the challenge how the fruits were processed, the team students looked for the best products that could be processed by the students in the school and possibly at home. Based on the results of the recipe searched by the team students,

four types of food and one type of beverage were selected that were ginger donut, papaya bingka, papaya cake, pineapple candy, and ginger syrup. Food products that have been modified with the addition of superior fruits of West Kalimantan was applied in the learning process on the sub-material of the plant role in the field of economics with laboratory work method. This laboratory work was conducted by involving five schools namely SMA Negeri 4 Pontianak, SMAN 6 Pontianak, MAN 1 Pontianak, MAN 2 Pontianak, and SMA Muhammadiyah 1 Pontianak. In the implementation of laboratory work in the school, the tools and materials needed was prepared by the team students so that students of senior high schools did not need to prepare the tools and materials. Senior high school students performed laboratory work for 2x45 minutes. They were given the learning media three days before the laboratory work, so that senior high school students learned the learning media before laboratory work. Prior to the laboratory work, the team students showed again the learning media to remind students about the stages of product making contained in the instructional media. After that, senior high school students carried out the laboratory work by making the product in accordance with the direction contained in the learning media. After the laboratory work of food processing product was completed, senior high school students were required to complete the response questionnaire. The average percentage of questionnaire responses results of student responses in five schools was 87.14% (data was not shown).

In addition, in the process of the implementation of the laboratory work, students both carried out laboratory work and evaluated during laboratory activities with three aspects of the assessment namely cognitive aspects of using student's worksheets (LKS), affective and psychomotor aspects using the observation sheets. As the results of the analysis of the three aspects of the assessment on the five schools for research by the student can be seen in Table 1.

Table 1. Average Scores of Three Aspects of Assessment in Five Schools in Pontianak

No.	Assessment	Average of students grade
1	Cognitive	87.27
2	Affective	90.58
3	Psychomotor	89.70

It was shown that the average values of students on the cognitive, affective, and psychomotor aspects were 87.27, 90.58, and 89.70, subsequently (Table 1). At this stage students demonstrated their ability to pass through the reflection stage. The team students were able to not only did the modeling by choosing the right method for learning but also the team students performed an authentic evaluation of their students which was shown by the results of affective, psychomotoric, and cognitive assessment. The results of the research conducted by the team students were used as the data in the preparation of their thesis. In the implementation of the modelling and reflection stages, the team students were obliged to present their thesis on the study program as stages of completing their study. The result of thesis assessment was one of the authentic assessment of this development program. The results of the thesis was examined in the defence. The overall process of the development of character building program can be inferred from the results of questionnaires to the team students who have completed their research on time (four years).

Furthermore, questionnaire to the team students explored the response of the team students to the program of this research. The student response questionnaire consists of nine indicators. The results of student responses was shown in Table 2.

Table 2. The Results of Student Response Questionnaire

No.	Indicator	Grade	Percentage %
1	Independency	80	90.0
		85	
2	Skill	90	90.0
		95	
3	Interest	90	90.0
4	Motivation	85	85.0
5	Innovation	80	80.0
6	Curiosity	80	85.0
		90	
7	Hard work	100	100.0
8	Perseverance	95	95.0
9	Team Work	100	100.0
Average Response Results			90.56

Discussion

The character building of the students to be independent, creative, and be able to cooperate are some of the characters that are expected and can be realized through education (Susanti, 2013). In this character building program, the team students were trained as the team research (payung penelitian). Students explore knowledge based on basic information assigned by the supervisor. In this process, the students found out the leading plants in Pontianak City and Kubu Raya Regency.

Currently, students built knowledge with the background of prior knowledge. This stage is a constructivism stage of contextual education. In this process, the team students cultivate curiosity and thoroughness in drawing knowledge from reliable sources. Students learned to put together the ideas through discussions and relate about education and surrounding problem related to the superior fruits. The team students performed the stages of constructivism from contextual education.

In searching and finding processed food products/beverages, the team students looked for the characteristics by using raw materials from these leading plants. The characteristic is associated with regional elements, traditional or ease of processing so as to enable consumers interested in buying it. In this process, the team students are required to take initiative, creative and innovative. The process of character education about creativity can be formed through the process of experience or education (Budiarti, 2015). The successful achievement of this creativity measurement is shown by the students producing modified food products for the needs of the embodiment of the method they have chosen in schools. Students are currently investigating what products exist and developing products that are modified to be studied and tested first. This stage is the stage of investigation and community learners.

The students' findings are related to the educational material. The team students should be able to link their findings to school needs. Through early interviews with biology teachers in five senior high schools, the team students explored the information on how the teachers teach the plant role in the field of economics. As a prospective teacher, the team students think exactly what methods are appropriate for submission of this material based on findings in the field. In this process the student can compare which method is

the best and take the initiative to choose the method. Students at this time reached the modeling stage of contextual education.

From the method chosen, the students in the schools concluded the laboratory work method can provide real learning as well as students have skills in the food processing of plants having economic value. Inquiry and problem-based laboratory learning were reported to be able to improve the students' ability in thinking and practical skills (Cacciatore & Sevian, 2009; Fakayode, 2014). According to Hernes (2003), one of the seven global challenges facing education is linking better education between education and the local economy. Johnson (2002) formulated the notion of Contextual Learning (CTL) as follows: "The CTL system is an educational process that aims to help students see meaning in the academic material. They are studying by connecting academic subjects with the context of their daily lives, that is, with the context of their personal, social, and cultural circumstances. To achieve these aims, the system encompasses the following eight components: making meaningful connections, doing significant work, self-regulated learning, collaborating, critical and creative thinking, nurturing the individual, reaching high standards, and using authentic assessment."

According to Carnduff dan Reid (2003), laboratory work in universities was needed to train three areas which were practical skills, transferable skills, and intellectual stimulation. These skills could be trained by giving opportunities to students to design their experiments in the laboratory which were integrated into the learning process (Limoto & Frederick, 2011; Tsaparlis & Gorezi, 2007).

To realize the implementation of selected methods in the sub-material role of plants in the field of economics, the team students tried to match the tools and materials needed in processing food products. In this process, the establishment of other characters in the form of hard work, perseverance and cooperation within the team is formed with fund as efficiently as possible. The nature of hard work (perseverance), tenacity and teamwork in team (Fatmahanik, 2016) is a character that is necessary to face the challenges of an increasingly competitive world. According to Huda (2012), characters that are essential in the face of challenges will help the success of one's life.

In the implementation of the chosen method of learning, the team students were required to prepare a validated RPP and developed an authentic learning format in the form of psychomotor and affective observation sheets, using time according to allocation and implementing the RPP. The development of this process, the team students developed their professionalism related to education. Gunstone and Champagne (1990) argued that laboratory work could successfully be used to promote conceptual change if small qualitative laboratory tasks were used. Such tasks aid in students' reconstructing their thinking as less time is spent on interacting with apparatus, instructions, and recipes, and more time spent on discussion and reflection. However, Hodson (1990) described laboratory work as often being dull and teacher-directed, and highlighted the fact that students often failed to relate the laboratory work to other aspects of their learning. Nevertheless, graduates with professional ability are able to compete and be more independent in their work (Suharsono dan Fitriana, 2008).

After the entire process of character building program was done, the team students reported their activities in the form of thesis and articles in a timely manner. At the end of this process the team students were evaluated through a student response questionnaire. All the team students involved in this process were categorized very high on the development of character building program. This very high category of students' characters demonstrated independence, skill, interest, motivation, innovation, curiosity, hard work, perseverance and team work. The team students realized to get the work done,

they needed to work hard and team work (100%) followed by perseverance (95%). Of the nine indicators, the fifth indicator of innovation was the indicator with the lowest grade of 80%. This character is a character that is not easily built without adequate knowledge and experience (Budiarti, 2015). For the development of this indicator program, an indicator of innovation requires a more effective way in learning process and experience. This development type of character education program needs to be implemented to the students in order to produce graduates who can face the challenges of the times while meeting the competency of the graduates listed in the study program profile.

CONCLUSION

Contextual education in character building is necessary. In the implementation, seven contextual stages must be planned and evaluated for its success. Observation and questionnaire in reflection and authentic assessment were used to evaluate the team student who engaged with research. The ability to inquire and choose the method and perform authentic evaluations by the team students on their students in the schools showed the success of this character building process followed by authentic assessment with questionnaire score of 90.56% which was included in very high category. Hard work and ability to work in team were scored 100% and lies in the highest indicator, proving the team research contributed well to character building in order to be more competence. Of the nine indicators of student characters, the innovation indicator scored the lowest score of 80% showing the character of innovation requires more effective learning experience and process. The last result of this contextual education was shown by the success of the team students completing their thesis on time and getting the perfect scores (A's). Contextual education program in the form of team research (*payung penelitian*) like this improves graduate competence and can be used in the learning process in the other fields.

REFERENCES

- Budiarti, Y. (2015). Pengembangan Kemampuan Kreativitas dalam Pembelajaran IPS. *Jurnal Promosi*, 3, 61-72.
- Cacciatore, K.L. & Sevian, H. (2009). Incrementally Approaching an Inquiry Lab Curriculum: Can Changing a Single Laboratory Experiment Improve Student Performance in General Chemistry. *Journal of Chemical Education*, 86, 498-505.
- Carnduff, J., Reid, N. (2003). *Enhancing Undergraduate Chemistry Laboratories, Pre-Laboratory and Post-Laboratory Exercise, Example and Advice*. London: Education Departement, Royal Society of Chemistry.
- Chapman. (2011). Implementing character education into school curriculum. *ESSAI*: vol. 9, article 11.
- Data Profil Prodi Pendidikan Biologi. FKIP Universitas Tanjungpura. (2015).
- Fakayode, S.O. (2014). Guided-Inquiry Laboratory Experiments in the Analytical Chemistry Laboratory Curriculum. *Journal Analytical and Bioanalytical Chemistry*, 4, 1267-1271.
- Fatmahanik, U. (2016). Membentuk Karakter Peserta Didik Melalui Pembelajaran Matematika Realistik di MI. *Jurnal Cendekia*, 14, 107-122.
- Gunstone, R.F., & Champagne, A.B. (1990). *Promoting conceptual change in the laboratory*. In E. Hegarty-Hazel (Ed.), *The student laboratory and the science curriculum*. London: Routledge.

- Hodson, D. (1990). A Critical Look At Practical Work In School Science. *School Science Review*, 71, 33-40.
- Huda, S. (2012). Pendidikan Karakter Bangsa dalam Perspektif Perubahan Global. *Jurnal Media Akademika*, 27, 359-385.
- Jumadi. (2003). Pembelajaran Kontekstual dan Implementasinya. *Makalah*. Jogjakarta: UNY
- Limoto, D.S. & Frederick, K.A. (2011). Incorporating Student-Designed Research Projects in the Chemistry Curriculum. *Journal of Chemical Education*, 88, 1069-1073.
- Riduwan. (2012). *Metode & Teknik Menyusun Proposal Penelitian*. Bandung: Alfabeta.
- Sugiyono. (2013). *Metode Penelitian Pendidikan (Pendekatan Kuantitatif, Kualitatif, dan R&D)*. Bandung: Alfabeta.
- Suharsono, A. dan S. Fitriana. (2008). *Pentingnya Profesionalisme Guru dalam Meningkatkan Kualitas Pendidikan*. Online. (download.portalgaruda.org/article.php?article=88320&val=537 Diakses 12 November 2017).
- Susanti, R. (2013). Penerapan Pendidikan Karakter di Kalangan Mahasiswa. *Jurnal Al-Ta'Lim*, 1, 480-487.
- Tsaparlis, G., & Gorezi, M. (2007). Addition of a Project-Based Component to a Conventional Expository Physical Chemistry Laboratory. *Journal of Chemical Education*, 84, 668-670.
- Undang-Undang No 14. 2015. Tentang Guru dan Dosen.
- Undang-Undang No 12. 2012. Tentang Pendidikan Tinggi
- Zakiah, N. E. (2017). Pembelajaran dengan Pendekatan Kontekstual Berbasis Gaya Kognitif untuk Meningkatkan *Self Awarness* Siswa. *Jurnal Teori dan Riset Matematika (TEOREMA)*, 2, 11-20.