Pedagogik Journal of Islamic Elementary School
Oktober 2022, Vol.5, No.2, hal.199-212
ISSN(E):2615-3904
DOI : 10.24256/pijies.v5i2.2812
2022 PGMI IAIN Palopo. https://ejournal.iainpalopo.ac.id/index.php/PiJIES/

The Effect of Conceptual Change Approach Through Discussion Activities in Social Studies Learning on Concept Mastery and Student Social Sensitivity

Pengaruh Model Perubahan Konseptual Melalui Kegiatan Diskusi dalam Pembelajaran IPS Terhadap Penguasaan Konsep dan Kepekaan Sosial Murid

Utami Febriani[1], Muhammad Basri[2], Idawati[3]
Universitas Muhammadiyah Makassar
e-mail: fbrianiutami19@gmail.com[1]

Received: 19-06-2022 Accepted: 24-10-2022 Published: 30-10-2022

How to cite this article:
Febriani, U., Basri, M., & Idawati. (2022). The Effect of Conceptual Change Approach Through Discussion Activities in Social Studies Learning on Concept Mastery and Student Social Sensitivity. *Pedagogik Journal of Islamic Elementary School*, Vol. 5(2), 199–212. https://doi.org/10.24256/pijies.v5i2.2812

Abstract
This study aims to determine the effect of the conceptual change approach through discussion activities on students' mastery of concepts and social sensitivity in social studies learning. The research method is quasi-experimental with a non-equivalent control group design. This study used a saturated sample of 50 students consisting of 25 in class VA as the control class and 25 in class VB as the experimental class. Data collection techniques were carried out using tests and questionnaires. The research data were analyzed through descriptive and inferential analysis using SPSS 25. Based on the results of the study, it can be concluded that the model of understanding the concept through discussion activities in social studies learning affects the mastery of concepts and social sensitivity of fifth-grade students at the State Elementary School 117 Inpres Kurusumange, Maros Regency.
Keywords: *conceptual change approach; discussion; social sensitivity*

Abstrak
Penelitian ini bertujuan untuk mengetahui pengaruh model perubahan konsep (MPK) melalui kegiatan diskusi terhadap penguasaan konsep dan kepekaan sosial murid dalam pembelajaran IPS. Metode penelitian yang digunakan adalah quasi eksperimental dengan desain penelitian nonequivalent control group design. Penelitian ini menggunakan sampel jenuh sebanyak 50 murid yang terdiri dari 25 murid kelas VA sebagai kelas kontrol dan 25 murid kelas VB sebagai kelas eksperimen. Teknik pengumpulan data dilakukan dengan cara tes dan pemberian angket. Data hasil penelitian dianalisis melalui analisis deskriptif dan analisis inferensial menggunakan SPSS 25. Berdasarkan hasil penelitian dapat disimpulkan bahwa model pemahaman konsep (MPK) melalui kegiatan diskusi dalam pembelajaran IPS berpengaruh

terhadap penguasaan konsep dan kepekaan sosial murid kelas V SDN 117 Inpres Kurusumange, Kabupaten Maros.
Kata kunci: *model perubahan konsep; diskusi; kepekaan sosial*

©Pedagogik Journal of Islamic Elementary School. This is an open-access article under the Creative Commons - Attribution-ShareAlike 4.0 International license (CC BY-SA 4.0)

Introduction

The renewal of the curriculum from KTSP to the 2013 curriculum resulted in many significant changes in learning activities. Assessment in the 2013 curriculum is not only focused on cognitive aspects but also psychomotor and affective. In addition, learning that used to be teacher-centered is now student-centered. The teacher only acts as a facilitator and motivator for students to achieve learning objectives. The student center approach to 2013 curriculum learning requires teachers to be more creative in carrying out learning so that students can actively participate in learning.

In line with the principles of the 2013 curriculum, Social Sciences is one of the subjects whose goal is to develop students' knowledge and social attitudes. The learning process of Social Sciences does not only emphasize mastery of the material as much as possible so that Social Science learning is not only aimed at developing knowledge, values, critical thinking but also social sensitivity, and attitudes, and social skills to examine social life that is faced daily and foster a sense of pride and love for the development of Indonesian society (Asy'ari, 2015). This aligns with the social science definition according to Supardan (Hilmi, 2017). That social science is a science that studies behavior and social activities in a shared life. Furthermore, (Asy'ari, 2015) argues that learning social sciences in schools is expected to be able to increase social sensitivity and social participation of students to be sensitive to social problems that occur in society, have a positive mental attitude towards repairing all inequalities that happen and be skilled solve problems, whether it befalls themselves or those that occur community. However, in the implementation of learning at this time, there is still a misunderstanding of concepts between students and teachers. The concept error in question is that students are rarely allowed to build concepts obtained during learning, in which the concepts and learning activities of students only go through rote memorization without paying attention to concepts. This causes students to memorize lessons rather than understand what they are learning.

The impact of these misunderstandings on social science learning is that the objectives of social science learning are not achieved optimally. Students only memorize the subject matter without understanding the concepts obtained, so the goal achieved is only mastery of the material. In contrast, the purpose of developing social character is not achieved. This is in line with the opinion (Nenowati, 2021) that the problem of learning social science is the essence of learning social science as a subject that acts as a

medium for developing student character. Social science learning is not only about transferring knowledge but also transferring value.

The development of social sensitivity skills in social science subjects at the elementary school level is developed from issues, events, or problems of social life as a theme and then studied with various branches of social science (Asy'ari, 2015). To facilitate the understanding of students' concepts in the social science learning process, namely by providing direction regarding the concepts taught to students, not only as memorization but more than that, by giving understanding students can better understand the concept of the lesson itself. Understanding concepts not only requires students to know, but students are also required to know, master, understand, and capture the meaning of the concepts being taught to lead to the stage of utilizing what students have understood (Sundari & Adriana, 2018). The teacher must ensure that students understand the given concept before giving a new one (Hilmi, 2017).

Based on data obtained by researchers through interviews with Class 5 teachers of public elementary schools 117 Inpres Kurusumange, it was found that 75% of fifth-grade students did not understand the concept of learning in social science subjects. This was seen when conducting discussion activities. Discussion activities were less effective because they had not increased their understanding of social science concepts, causing students to find it difficult to summarize the material using their language, understand and explain the learning material provided by the teacher, and are less able to conclude social science lessons. Many focus on developing and testing students' memory, causing students to still focus on memorizing theories and not based on student experience so that students' abilities are only limited to memorization skills and students' shared understanding of conceptual understanding. In social science subjects, researchers chose theme seven, entitled *peristiwa dalam kehidupan*, as one of the materials in social science that will identify whether students understand the material and the concepts in the material.

One learning model that aims to improve students' conceptual understanding is the conceptual change approach. The conceptual change approach is a learning model that is used to change the initial concepts possessed by students to fit a new concept or the presence of a new concept with convincing evidence, making students feel satisfied, clear, understand, and feel the benefits in life (Mai, 2020). The conceptual change approach is a learning model based on constructivism. The conceptual change approach can change students' misconceptions or intuitions into scientific concepts, improve

conceptual understanding, and improve learning outcomes (Sentyasa, 2004; Suparno, 2005).

The conceptual change approach refers to four critical variables of the abstract change process, namely (1) dissatisfied, students are not satisfied with the concepts they already have in explaining the information they know, (2) intelligible, new concepts that are known to students can be understood and build understanding, (3) plausible, the learner must feel that the new concepts make sense, the knowledge not only builds a coherent understanding but must become a belief, (4) fruitful, the learner must find that the new concepts obtained are useful and play a role in building new insights (Putra et al., 2014).

Several previous research results show that the conceptual change approach has a positive effect on student learning outcomes (Rapih, & Sutaryanto, 2017;) and students' conceptual understanding (Putra, 2014; Pebriyanti, 20015; Makhrus et al., 2014; Mai, 2020; Rohma, 2018; Thomas, B.I, 2012; Baser, 2010, Ardana, et al., 2004). The influence of the conceptual change approach on understanding the concept is that researchers are interested in seeing its effect on social sensitivity through research. In this study, researchers will use a concept change model through discussion activities so that students are actively involved in understanding the concept. This study will examine the effect of the concept change model through discussion activities on the mastery of concepts and social sensitivity of students in social studies learning fifth grade of public elementary school 117 Inpres Kurusumange, Maros Regency.

Method

This research is a quasi-experimental research with a nonequivalent control group research design. The sample in this study was 50 fifth-grade students determined through saturated sampling. The VA class consisted of 25 people as the control class, and the VB class consisted of 25 people as the experimental class. Researchers collected data using test techniques and questionnaires through test instruments and questionnaires. The test was conducted twice in the control and experimental classes, namely the pretest and posttest. The research data were analyzed using descriptive and inferential analysis through SPSS 25.

Result

Data on students' mastery of social science concepts was obtained through tests. There are two tests carried out, namely the pretest and the posttest. The data from the pretest and posttest were analyzed using SPSS 25.

Control Class

Table 1 *Recapitulation of Mastery Test Results of Social Science Concepts Control Class*

Descriptive statistics	*Pretest*	*Posttest*
Mean	56,2000	80,6000
N	25	25
Std. Deviation	15,76388	7,68115
Median	55,000	80,0000
Sum	1405,00	2015,00
Modus	40	80
Minimum	35,00	65,00
Maximum	80,00	90,00
Range	45,00	25,00

The data on students' mastery of social studies concepts were then entered in the category table to see the category of student score acquisition at the pretest stage.

Table 2 *Categorization of Social Studies Concept Mastery in Control Class*

Score	Category	Frequency		Percentage (%)	
		Pretest	*Posttest*	*Pretest*	*Posttest*
0 – 39	Not Very Good	3	-	12%	0%
40 – 55	Not enough	11	-	44%	0%
56 – 65	Enough	2	1	8%	4%
66 – 79	Good	6	7	24%	28%
80 – 100	Very Good	3	17	12%	68%
Total		25	25	100%	100%

Based on the table above, it can be seen that the mastery of the social studies concept in the control class at the pretest stage was three people with a percentage of 12% in the not very good category, 11 people or 44% is not enough category, two people or 8% in enough category, six people or 24% are in a good category, and three people or 12% are in the very good category. While at the post-test stage, there were no students who were in not enough and not very good categories. In the good category, as many as one person with a percentage of 4%. In the good category, as many as seven people with a percentage of 28%, and in the very good category, as many as 17 people with a percentage of 68%.

Experiment Class

Table 3 *Recapitulation of Experimental Class Social Science Concept Mastery Test Results*

Descriptive statistics	***Pretest***	***Posttest***
Statistik description	64,000	83,2000
Mean	25	25
N	17,13914	10,09125
Std. Deviation	65,0000	90,0000
Median	1600,00	2080,00
Sum	40	90
Modus	40,00	60,00
Minimum	90,00	95,00
Maximum	50,00	35,00

Data penguasaan konsep IPS murid kemudian dimasukkan dalam tabel kategorisasi untuk malihat kategori perolehan skor murid pada tahap *postest.*

Table 4 *Categorization of Social Science Concept Mastery Experiment Class*

Score	**Category**	**Frequency**		**Percentage (%)**	
		Pretest	***Posttest***	***Pretest***	***Posttest***
0 – 39	Not Very Good	-	-	0%	0%
40 – 55	Not enough	9	-	36%	0%
56 – 65	Enough	5	3	20%	12%
66 – 79	Good	4	3	16%	12%
80 – 100	Very Good	7	19	28%	76%
Total		25	25	25	100%

Based on the categorization table above, at the pretest stage of mastery of social studies concepts in the experimental class, there were nine people with a percentage of 36% in the Not enough category, five people with a rate of 20% in the enough category, four people with a ratio of 16% in the good category, and seven people with a percentage of 28% are in the very good category. While at the post-test stage, no students were in the not very good and not enough categories. In the enough and good categories, every three people with a percentage of 12%, and in the very good category, as many as 19 people with a percentage of 76%.

Description of Student Social Sensitivity Results

A questionnaire analysis of students' social sensitivity was conducted using SPSS 25. The results of the questionnaire analysis can be seen in table 5.

Table 5 *Statistical Analysis of Social Sensitivity Questionnaire*

Descriptive statistics	Control Class	Experiment Class
Mean	82,8800	86,0000
N	25	25
Std. Deviation	5,91833	5,90903
Median	84,0000	88,0000
Sum	2072,00	2150,00
Modus	89	88
Minimum	70,00	74,00
Maximum	90,00	95,00
Range	20,00	21,00

After the student social sensitivity questionnaire was processed, the data was converted into a categorization table to classify students' social sensitivity based on several categories.

Table 6 *Categorization of Student Social Sensitivity*

Score	Category	Frequency		Percentage (%)	
		Control Class	Experiment Class	Control Class	Experiment Class
S < 75	Not enough	4	2	16%	8%
75 < S < 83	Enough	8	6	32%	24%
83 < S < 92	Good	13	12	52%	48%
92 < S < 100	Very Good	-	5	0%	20%
Total		25	25	25	100%

Based on the categorization table above, it can be seen that in the social sensitivity control class, there are four students in the Not enough category with a percentage of 16%, and in enough category, as many as eight students with a percentage of 32%, in the good category as many as 13 students with a percentage of 52%. There are no students who are in the very good category. While in the experimental class, the social sensitivity of students in the Not enough category is only two, with a percentage of 8%. In enough categories, as many as six students with a percentage of 24%. In the good category, as many as 12 students with a percentage of 48%, and in the very good category, as many as five students with a percentage of 20%.

Inferential Statistical Analysis Results

Normality test

Before testing the hypothesis, the researcher first conducted a normality test on the data on concept mastery and students' social sensitivity to see whether the data were normally distributed or not. In this test, the researcher used the Kolmogorov-Smirnov normality test technique at a significant level of 0.05 with the help of SPSS. The following table shows the results of the data normality test for the experimental group and the control group.

Table 7 *Normality Test for Concept Mastery*

	Tests	**Kolmogorov-Smirnov[a]**		
		Statstc	**df**	**Sig.**
Concept Mastery	Experimental pretest	,123	25	,200*
	Experimental posttest	,270	25	,121
	Pretest control	,169	25	,063
	Posttest control	,157	25	,116

*. This is a lower bound of the true significance.
a. Lilliefors Significance Correction

Based on the SPSS 25 Output table, it is known that the significant value (sig) for the concept mastery data for the experimental pretest class is 0.20, more significant than 0.05. The posttest is 0.121, greater than 0.05, so following the basis for decision-making in the Kolmogorov Smirnov normality test above, it can be concluded that the data is normally distributed. While the control class concept mastery data pretest is 0.063, which is greater than 0.05, and the posttest is 0.116 is more significant than 0.05, it can also be concluded that the data is normally distributed. Thus, the assumptions or requirements for normality have been met.

In addition to the normality test for mastery of concepts, a social sensitivity normality test was also conducted in the experimental and control groups. The following data for the normality test of social sensitivity is presented in table 8.

Table 8 *Normality Test for Social Sensitivity*

	Test	**Kolmogorov-Smirnov[a]**		
		Statstc	**df**	**Sig.**
Social sensitivity	Experimental pretest	,125	25	,200
	Experimental posttest	,152	25	,137
	Pretest control	,166	25	,075
	Posttest control	,127	25	,200

*. This is a lower bound of the true significance.
a. Lilliefors Significance Correction

Based on the SPSS 25 Output table, it is known that the significant value (sig) for the social sensitivity data for the experimental pretest class is 0.20, more significant than 0.05. The posttest is 0.137, greater than 0.05, so following the basis of decision-making in the Kolmogorov-Smirnov normality test above, it can be concluded that the data is normally distributed. While the control class concept mastery data is 0.075, which is greater than 0.05, and the posttest is 0.20, more significant than 0.05, so it can be

concluded that the data is normally distributed. Thus, the assumptions or requirements for normality have been met.

Homogeneity Test

A homogeneity test was conducted to determine whether the variables X and Y data are homogeneous. The basis for decision-making is if the significant value is > 0.05, then the data is homogeneous. Meanwhile, the data is not homogeneous if the considerable value <0.05.

Table 9 *Test of Homogeneity of Concept Mastery*

Tests of Homogeneity of Variance				
Concept Mastery	Levene Statistic	df1	df2	Sig.
	2,494	1	48	,121

Table 10 *Test of Homogeneity of Social Sensitivity*

Tests of Homogeneity of Variance				
Social Sensitivity	Levene Statistic	df1	df2	Sig.
	,001	1	48	,978

Based on the test results obtained, sig value data. Mastery of concepts is 0.121, and social sensitivity data has a sig value. Of 0.978. Both values of sig. Is> 0.05, so it can be concluded that the homogeneity assumption has been met. Because the two prerequisite tests have been met, the next step is to test the hypothesis.

Hypothesis testing

Hypothesis testing is done through paired sample t-tests. The first is to see the effect of the concept change model on concept mastery, and the second is to see the effect of the concept change model on students' social sensitivity. The results of hypothesis testing are presented in table 11 and table 12.

Table 11 *Hypothesis Testing Concept Mastery*

Paired Samples Test						
Concept mastery		Paired Differences		t	df	Sig. (2-tailed)
		Mean	Std. Deviation			
Pair 1	experimental pretest - experimental posttest	19,200	13,360	7,185	24	,000
Pair 2	pretest control - posttest control	24,400	12,609	9,675	24	,000

Table 12 *Social Sensitivity Hypothesis Test*

Paired Samples Test						
Social sensitivity		Paired Differences		t	df	Sig. (2-tailed)
		Mean	Std. Deviation			
Pair 1	experimental pretest - experimental posttest	15,200	10,189	7,458	24	,000
Pair 2	pretest control - posttest control	12,200	9,0967	6,706	24	,000

The hypothesis testing the influence of the concept change model on concept mastery obtained a significant (2-tailed) value of 0.00. Furthermore, testing the concept change model on social sensitivity obtained a significant value (2-tailed) of 0.00. The significant value is less than 0.05, so it can be concluded that the conceptual change approach affects students' mastery of concepts and social sensitivity.

Discussion

Based on the research results, it was found that the model of concept change through discussion activities affected students' mastery of concepts and social sensitivity. The results of this study are in line with several previous studies which showed that the conceptual change approach had a positive effect on student learning outcomes (Rapih, & Sutaryanto, 2017;) and students' conceptual understanding (Putra, 2014; Pebriyanti, 20015; Makhrus, M et al., 2014; Mai, 2020; Rohma, 2018; Thomas, B. I, 2012; Baser, 2010, Ardana, et al., 2004).

Several reasons support these results. Namely, from a theoretical basis, the conceptual change approach is a model that can bridge the students' conceptions to a scientific one. Second, empirically the conceptual change approach uses prior knowledge as a benchmark or reference for the acts of learning that will be applied. Teachers can mediate and facilitate students according to the understanding they already have. Third, the stages in the conceptual change approach follow conceptual understanding indicators.

Conceptual change learning also facilitates students to actively participate in constructing their knowledge. Using the conceptual change approach, learning is more interesting because the learning process is no longer teacher-centered but student-centered. It not only familiarizes students to master the learning material but is also sensitive to the surrounding environment. Through discussion, activities help encourage

students to think critically, express their opinions freely, solve problems together, and encourage the involvement and participation of students in the learning process so that the conceptual change approach through discussion activities has a better influence on the social sensitivity of students in social studies learning.

Applying the conceptual change learning model will have implications that teaching is not only transmitting knowledge but facilitating and mediating so that the process of negotiating meaning leads to conceptual change (Hynd et al., 1994). This is in line with the essence of social studies learning, that social studies learning is not just a transmission of knowledge (Muslimin, 2019). The conceptual change learning model is very suitable to be applied in social studies, aiming to provide an in-depth understanding of culture and other social aspects in the Indonesian context (Rapih & Sutaryanto, 2017).

The conceptual change approach is very suitable to be applied in social studies subjects to provide an in-depth understanding of the social aspects of students. This is in line with the results of research conducted (Rapih & Sutaryanto, 2017), which suggests that the conceptual change approach in social studies subjects is not only useful for shaping the social character of students following the initial objectives of social studies learning but is also useful for increasing students' understanding of concepts in social studies learning.

Based on the results obtained and reviewing relevant previous research results, the conceptual change approach is one of the recommended learning models, especially in social studies learning, that aims to build social aspects. However, of course, in its application, the teacher must adapt to the characteristics of students and understand the syntax of the concept change model so that learning takes place effectively and efficiently.

Conclusion

Based on the study's results, it can be concluded that the conceptual change approach through discussion activities affects understanding concepts in social studies learning and students' social sensitivity. The conceptual change approach is very suitable to be applied in social studies because it can provide an in-depth understanding of the social aspects of students. The conceptual change approach in social studies subjects is useful for shaping students' social character following the initial objectives of

social studies learning and increasing students' understanding of concepts in social studies learning.

Reference

Ardhana, W., Purwanto, Kaluge, L., & Santyasa, I W. (2004). Implementasi Pembelajaran Inovatif Untuk Pemahaman Dalam Belajar Fisika di SMU. Jurnal Ilmu Pendidikan. 11(2). (152-168).

Asy'ari, L. (2015). *Pengembangan Model Pembelajaran Investigasi Kelompok Pada Mata Pelajaran Ilmu Pengetahuan Sosial Untuk Meningkatkan Kepekaan Sosial Murid*. Bandung: Universitas Pendidikan Indonesia.

Baser, M. (2006). *Fostering Conceptual Change By Cognitive Conflict Based Instruction On Students' Understanding Of Heat And Temperature Concepts*. Eurasia Journal of Mathematics, Science and Technology Education. 2(2). 96-114.

Hilmi, M. Z. (2017). Implementasi Pendidikan IPS Dalam Pembelajaran IPS Di Sekolah. *Jurnal Ilmiah Mandala Education*, *3*(2), 164-172.

Hynd, C.R., et al. (1994). The Rule of Instructional Variables in Conceptional Change in High School Physics Topics. Journal of Research in Science Teaching. 31(9). Pp 933-946.

Mai, S. (2020). *Pengaruh Model Perubahan Konseptual Menggunakan Media Android Mobile Learning Terintegrasi Al-Qur'an Terhadap Miskonsepsi Dan Self Confidence Biologi Kelas Xi* (Doctoral Dissertation, Uin Raden Intan Lampung).

Makhrus, M., Widodo, W., & Agustini, R. (2018). Efektifitas Model Pembelajaran CCM-CCA untuk Memfasilitasi Perubahan Konsep Gaya Pada Mahasiswa. *Jurnal Pendidikan Fisika dan Teknologi*, *4*(2), 253-261.

Muslimin, A. A., & Mutakallim, M. (2019). Kreativitas dalam Pembelajaran. *TARBAWI: Jurnal Pendidikan Agama Islam*, *4*(01), 72-85.

Nenowati, S., Idawati, I., & Muslimin, A. Validitas Model Pembelajaran Group Investigation Berbantuan Media Film Dokumenter untuk Meningkatkan Sikap Nasionalisme Siswa. *Indonesian Journal of Primary Education*, *5*(2), 10-18.

Pebriyanti, D., Sahidu, H., & Sutrio, S. (2015). Efektifitas Model Pembelajaran Perubahan Konseptual Untuk Mengatasi Miskonsepsi Fisika Pada Siswa Kelas X SMAN 1 Praya Barat tahun pelajaran 2012/2013. *Jurnal Pendidikan Fisika dan Teknologi*, *1*(2), 92-96.

Putra, I. W. E., Sadia, I. W., & Suastra, I. W. (2014). Pengaruh Model Pembelajaran Perubahan Konseptual Terhadap Pemahaman Konsep Siswa Ditinjau Dari Gaya Kognitif. *Jurnal Pendidikan dan Pembelajaran IPA Indonesia*, *4*(1).

Rapih, S., & Sutaryanto, S. (2017). Pengaruh Model Pembelajaran Perubahan Konseptual (MPPK) Terhadap Hasil Belajar IPS dan Sikap Multikultural Siswa Sekolah Dasar Berlatar Belakang Monokultur. *Premiere Educandum: Jurnal Pendidikan Dasar Dan Pembelajaran*, *7*(02), 180-188.

Rohma, E. (2018). *Uapaya Meningkatkan Kepekaan Sosial Melalui Layanan Bimbingan Kelompok Dengan Teknik Diskusi di MAN Pematang Bandar.* Medan: Universitas Islam Negeri Sumatera Utara.

Santyasa, I W. (2004). Pengaruh model dan seting pembelajaran terhadap remediasi miskonsepsi, pemahaman konsep, dan hasil belajar siswa pada siswa SMU. Disertasi (tidak diterbitkan). Universitas Negeri Malang.

Sundari, K., & Andriana, S. (2018). Upaya meningkatkan pemahaman konsep siswa melalui model artikulasi pada mata pelajaran ips di kelas V SDIT An-Nadwah Bekasi. *Pedagogik (Jurnal Pendidikan Sekolah Dasar)*, *6*(2), 109-116.

Suparno, P. (2005). Miskonsepsi dan perubahan konsep dalam pendidikan fisika. Yogyakarta: Gramedia Widiasarana Indonesia.

Thomas, B.I. (2012). Effects Of Conceptual Change Pedagogy On Achievement By High Ability Integrated Science Students On Energy Concepts. International Journal of Research Studies in Educational Technology. 1(1). 1-12