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Profile of Student's Conception in Implementation of Predict-Observe-Explain (POE) Strategy on Thermochemistry Concept

in the International Conference on Environmental and Science Education (ICESE) 2019
held by Department of Integrated Sciences, Faculty of Mathematics and Natural Sciences
Universitas Negeri Semarang, Indonesia
on April 27, 2019

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To cite this article: I Zakiyah *et al* 2020 *J. Phys.: Conf. Ser.* **1567** 032104

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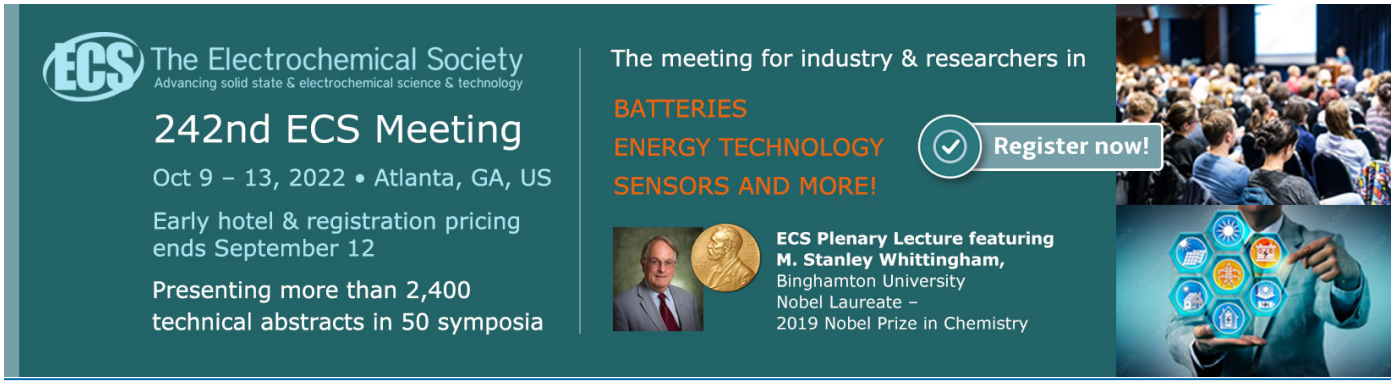

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Profile of student's conception in implementation of predict-observe-explain (POE) strategy on thermochemistry concept

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Abstract. Every student has different understanding of a concept. To achieve expected cognitive abilities, so it needs a good understanding of concept. Based on preliminary research understanding of thermochemistry concept is low. This low ability caused of majority of student still have misconception. This misconception should be removed, one of the way to remove is using predict-observe-explain *(*POE) strategy. The aim of this research is to find out profile of student conception after implementation of POE strategy. The subject was 36 student of science class at 11th grade of SMA Kemala Bhayangkari 3 Porong. This research was using three tier diagnostic test to know student's conception. Generally the result was student's conception changed. It indicated with the result of pre-test, initially 72.80% student have misconception, 15.14% didn't know the concept and 12.78% knew the concept, while the result of post-test changed become 92.78% knew the concept, 3.06% didn't know the concept and left 4.17% with misconception. So it can be concluded that student's conception profile after implementation POE strategy generally changes become knew the concept and student conception who didn't know the concept and misconceptions showed low percentage.

1. Introduction

Chemistry is one of the lessons that has its own characteristics and require special skills in solving problems of theory, concepts, law and facts. However in chemistry there are so many abstract concepts that become difficult for students to understand. This is confirmed by the results of a preliminary research that stated 95% of the students argued that material in chemistry is difficult to learn because many of concepts that should be understood (70%). One of material that is considered difficult by students (75%) in preliminary research is thermochemistry because it has so many concepts. It same with the result of research [1] that 67.72% student has misconception on thermochemistry thermochemistry. Understanding and mastery of concepts is important for students to achieve expected cognitive ability. Based on preliminary research only 35% of students who can answer concept's question correctly. It also can be seen from a research that mastery learning of class in thermochemistry only 42% so it needs to be improved. This research also found several misconception, there are misconception on system and environment, explaining exotherm and endotherm reaction, standard enthalpy formation, and counting the changing of enthalpy in a reaction. [2].

Based on Saricayir et al. research [3] misconception or less understanding about thermochemistry is worrying, there a several concepts that have low understanding are relation between bonding, enthalpy and energy in chemistry reaction and it can be related to disability of student in

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understanding of formation and dissociation reaction. Students also don't have proper conceptual understanding about heat, temperature and enthalpy change during phase change. Result of Sutisna research [4] found that misconception in Thermochemisty on system and environment concept, exothermic and endothermic reaction, enthalpy change and combustion reaction. While according to Febriyanti et al. research [5] found that student has misconception in relation between enthalpy bonding (33.33%) and energy bonding (40.74%). In line with result of preliminary research which found that student has difficulties in determine system and environment, exothermic and endothermic reaction, enthalpy change, and Hess law.

If there is a misconception on student then must be reduced in order to increase understanding and mastery of concepts so that required an improvement in learning process so the concept will be mastery by student good and correct. One of the ways that can be used to reduce the misconception is using Predict-Observe-Explain (POE) strategy. This strategy encourages and supports the conceptual change in students because these strategies can enhance students' conceptual understanding [6].

Predict-Observe-Explain (POE) strategy has three stages as follows: 1) Predict, the teacher gives background of the situation then asked the students to write down their prediction results, along with the reason (why it happens is based on what student belief); 2) Observe, students perform observations, experiments, or learn about how the actual situation; 3) Explain, students are trying to understand why their predictions wrong and formulated a new theory to explain what happened [7]. In the first stages is to reveal profile of students ' conceptions which divided into three i.e. know the concept, don't know the concepts and misconceptions. On the second and third stages, the students through the process of accommodation so that students have the opportunity to experience conceptual change as well as having opportunities to strengthen new concept which students obtained from the previous stages. This strategy will be conduct with direct instruction model because this model support on conceptual attainment.

According to result of Mursalin study [8] that learning with POE strategy better in minimizing the occurrence of student's misconceptions compared with conventional learning model. In addition, according to result of Özdemir et al. study [9] that POE strategy provides better teaching in concepts so it can be help student to achieve better conceptual understanding. Positive effects of POE strategy i.e. students can overcome their misconceptions and improve their learning outcome [10]. POE strategy is one of alternative learning strategies that enable students to construct their own knowledge, enhance understanding and minimizing the misconception. This strategy is used to probe student's initial knowledge, give teacher information about student's thinking skill, motivating students to explore their own concept and evoke students to do investigation so that It can be used by students to find solutions of problems which given by teachers independently [11].

Based on literature review that has been done mostly POE strategy used to reduce misconception in physic and biology concept. While misconception in thermochemistry was reduced using cognitive conflict model [4] and conceptual change strategy [12]. So it will be interesting if this research using POE strategy to reduce misconception that happens to student because there are limited attentions of use POE strategy on student's misconception about thermochemistry. Beside to know profile of student conception, this research hopefully can reveal the effect of learning process using POE strategy to student that has misconception in thermochemistry.

2. Methods

This research is to know the profile of student's conception after the implementation of Predict-Observe-Explain (POE) strategy on thermochemistry concept. This research uses One Group Pretest-Postest Design. This research was conducted in student at grade 11^{th} on science class at senior high school Kemala Bhayangkari 3 Porong. The sample in this research is 36 students. The entire students divided into 6 heterogeneous groups. To know student's profile conception after the implementation POE strategy so will be measured result of pretest's conception and posttest's conception. The procedure is conducting a preliminary study to check student understanding in thermochemistry. After that, students are given a pretest to know initial student's profile conception. If there is misconception

and do not know the concept on the pretest result, then treatment using strategy done to reduce student's misconceptions and do not know the concept. And then posttest was done to know final student's profile conception. The instrument that used in this study is three tier diagnostic test as Pretest and Posttest which contains 20 items and student worksheet. The data obtained from pretest and posttest are analyzed in a descriptive profile and student's profile conception divided in three categories namely know a concept (KC), do not know the concept (DKC) and misconceptions (MC). After that the data also analyze statistically using wilcoxon's signed rank test to know the influence of Predict-Observe-Explain (POE) strategy on student's conception.

3. Results and Discussion

Three tier diagnostic tests that have been created are used as pretest and posttest to know the initial and final student's profile conception. Pretest was conducted after students had learning process at thermochemistry concept. The objective of this identification is to find out percentage of students who know the concept, don't know the concepts and misconceptions. Table below shows student's profile conception before and after implementation of Predict-Observe-Explain (POE) strategy that can be known through a pretest results in Table 1.

Tab1e 1. Percentage of Students's Profile Conception Before and After Implementation of Predict-Observe-Explain (POE) Strategy

Question Number	Concept	Before			After		
		Percentage			Percentage		
		KC	DKC	MC	KC	DCK	MC
1	Exothermic-Endothermic	2.78	0.00	97.22	100.00	0.00	0.00
2		55.56	5.56	38.89	100.00	0.00	0.00
3		19.44	16.67	63.89	88.89	5.56	5.56
4		16.67	13.89	69.44	91.67	2.78	5.56
5		16.67	2.78	80.56	91.67	2.78	5.56
6		5.56	8.33	86.11	94.44	5.56	0.00
7		11.11	22.22	66.67	88.89	5.56	5.56
8		19.44	8.33	72.22	86.11	5.56	8.33
9		2.78	8.33	88.89	86.11	5.56	8.33
	Average	**16.67**	**9.57**	**73.77**	**91.98**	**3.70**	**4.32**
10	Formation and Dissociation Enthalpy Change	8.33	8.33	83.33	88.89	2.78	8.33
11		33.33	36.11	30.56	88.89	5.56	5.56
12		13.89	11.11	75.00	100.00	0.00	0.00
13		0.00	30.56	69.44	91.67	5.56	2.78
	Average	**13.89**	**21.53**	**64.58**	**92.36**	**3.47**	**4.17**
14	Hess Law	8.33	19.44	72.22	97.22	0.00	2.78
15		11.11	13.89	75.00	88.89	2.78	8.33
16		11.11	13.89	75.00	94.44	5.56	0.00
17		5.56	16.67	77.78	91.67	5.56	2.78
18		5.56	22.22	72.22	91.67	0.00	8.33
19		0.00	25.00	75.00	100.00	0.00	0.00
20		8.33	19.44	72.22	94.44	0.00	5.56
	Average	**7.14**	**18.65**	**74.21**	**94.05**	**1.98**	**3.97**

Question Number	Concept	Before			After		
		Percentage			Percentage		
		KC	DKC	MC	KC	DCK	MC
	Average of All Concept	**12.78**	**15.14**	**72.08**	**92.78**	**3.06**	**4.17**

Based on Table 1 show that most of the student experiences do not know concepts and misconceptions on the whole question. The average percentage of students who know the concept (KC) is 12.78% with the highest percentage is 16.67% on the concept of exothermic and endothermic reaction. The average percentage of students who do not know the concept (DKC) of 15.14% with the highest percentage is 21.53% on the concept of formation and dissociation enthalpy change. The average percentage of students that has misconception (MC) is 72.08% with the highest percentage is 74.21% on Hess law. Based on the average percentage indicates that conditions students that has misconception is greater than students who do not know the concept.

After initial student's profile conception has known then treatment i.e. learning process with POE strategy done 3 times. At the last meeting, posttest was carried out to measure the final student's profile conception. Based on Table 1 almost every question indicates student's condition is known the concept has high percentage. Student's understanding in knowing the concept is still quite varied, this shows that student's understanding in know the concept is still not steady. The average percentage of students who know the concept is 92.78% with the highest percentage is 94.05% on Hess law. The average percentage of students who still do not know the concept is 3.06% with the highest percentage is 3.70% on the concept of exothermic and endothermic reaction. The average percentage of students who still has misconception is 4.17% with the highest percentage is 4.32% on the concept of exothermic and endothermic reaction.

After that changing conception analyzed using wilcoxon ranked sign test with $\alpha = 0.05$. This test is to show is there any influence in changing student's conception which caused by implementation Predict-Observe-Explain (POE) strategy on learning process. Table 2 shown the result of Wilcoxon ranked sign test.

Table 2. Result of Wilcoxon Ranked Sign Test

Wilcoxon ranked sign test, $\alpha = 5\%$		
Category	Z	Asymp. Sig. (2-tailed)
TKPOST - TKPRE	-3.928[a]	.000
TTKPOST - TTKPRE	-3.730[a]	.000
MKPOST - MKPRE	-3.929[a]	.000

Based on Table 2 we know that sig. (2-tailed) value of all categories is less than 0.05. It means hypothesis 0 is rejected so there are influences on misconception, do not know the concept and know the concept after implementation of Predict-Observe-Explain (POE) strategy on the all of students.

The condition of the students before the implementation of predict-observe-explain (POE) strategy is used to assign misconception and do not know the concept and know the concept that happens to students and as a reference for implementing a learning process even though it takes quite long process. Because if the misconception is left it will affect to students' understanding in chemistry, we know that concepts in chemistry is largely inter-related. So learning process with POE strategy is done three times, at the last meeting student did a posttest to track down their final conception. Based on the analysis of student's conception status, can be found some of the following statements: (1) from tracking down the final student's conception generally changed become know the concept, (2) student's conception status who do not know the concept and misconception shows low percentage, this indicates that most of the students have already mastered the concept well, (3) some of the

student's misconceptions status cannot be changed become know the concept because students are having resistant misconception.

The results of verification statements above can be written as follows: (a) in final test of student's final conception there are improved significantly, student's initial understanding status of misconceptions and don't know the concept become already understood the concept well and student's conception status become know the concept. The number of students who know the concept overall increased become 92.78%. It means after learning process, student's understanding of a concept increased. It can be happen because student remove cognitive conflict between prediction and observation phase with explanation so POE strategy give deeper conceptual understanding on learning process [13], (b) misconception still found about 4.17%. Question numbers 8, 9, 10, 15, and 18 is question where in general students still experience a misconception despite already done learning process with POE strategy. The existence of this state caused of students still fixated on their first understanding. This statement is supported by result a Ibrahim research [14] that even students have been introduced to the right concept but there is still a chance of returning to the wrong conception itself (misconception).

Indicators of the successful in learning process using POE strategy can be seen with increasing students ' conceptions percentage. This means that the misconception and do not know the concept is decrease and knowing the concept is increase. It supported by a statement from result of research [15-16] that using POE strategy in learning process, misconception that happens to student is decrease. This is supported by activities by students during learning process most of students do positive activities such as giving attention to explanation/phenomenon which presented by teacher, write down predictions/ ideas/questions, reading their worksheet or the other source, conduct experiments, discuss and helping each other, presented the results of their discussion, ask/said their opinions and conclude the learning material. It shows that learning process using POE strategy enhance student activities in learning process.

To strengthen the result, a statistical test was conducted to prove there was influence of POE strategy in changing student conception's category. The statistical was used is wilcoxon ranked sign test using SPSS. The result show that POE strategy has significant influence to reduce misconception and do not know the concept and can make know the concept category increase. In addition, according to result of Kibirige et al. research [10] that learning process with POE strategy can be helpful in tackling misconception that happen to students because POE strategy can develop the ability to track their initial knowledge and they can find out what is lacking and misconception, so that they can fix their misconception or not perfect learning process [9]. Besides that, learning process with POE strategy can improve student understanding [17].

4. Conclusion

The conclusion that can be drawn based on the results of data and analysis that has been done are 1) profile of student's conception before learning process i.e., students who do not know the concept is 15.14%. The average percentage of students that has misconception is 72.08%. The average percentage of students who know the concept is 12.78%. After implementation of learning process with Predict-Observe-Explain (POE) strategy in thermochemistry concept, student's conception turned into a average percentage of who know the concept is 92.78%. The average percentage of students who still do not know the concept is 3.06%. The average percentage of students who still have misconception is 4.17%. 2) POE strategy effective to reduce student's conception of misconception and don't know the concept and increase know the concept category.

References

[1] Rahmayani R F I 2017 *J. Ilm. Mhs. Pendidik. Kim.* **2** 35
[2] Sugiawati V A 2013 *J. Nalar Pendidik.* **1** 26
[3] Saricayir H, Ay S, Comek A, Cansiz G, and Uce M 2016 *J. Educ. Train. Stud.* **4** 69

[4] Sutisna A 2013 *Pengembangan Model Pembelajaran Konflik Kognitif untuk Memfasilitasi Perubahan Konseptual dan Peningkatan Keterampilan Berfikir Kritis Siswa Pada Materi Termokimia* (Thesis) (Universitas Pendidikan Indonesia)
[5] Febriyanti F, Wiji W, and Widhiyanti T 2019 *J. Phys.: Conf. Ser.* **1157** 042042
[6] Anarky V, Syuhendri S, and Akhsan H 2016 *Sriwij. Univ. Learn. Educ. Int. Conf.* **2** 1271
[7] Dalziel J 2010 *Practical E-Teaching Strategies for Predict-Observe-Explain Problem-Based Learning and Role Plays* (Macquarie University, N.S.W.)
[8] Mursalin M 2014 *J. Ilmu Pendidik. Univ. Negeri Malang* **20** 94
[9] Özdemir H, Bağ H, and Bilen K 2011 *West. Anatolia J. Educ. Sci. (WAJES)* 169
[10] Kibirige I, Osodo J, and Tlala K M 2014 *Mediterr. J. Soc. Sci.* **5** 300
[11] Widyaningrum R, Sarwanto S, and Karyanto P 2013 *Bioedukasi: J. Pendidik. Biol.* **6** 100
[12] Ceylan E 2010 *Egit. ve Bilim* **35** 46
[13] Mutlu A and Şeşen B A 2016 *Sak. Univ. J. Educ.* **6** 184
[14] Ibrahim M 2012 *Konsep, Miskonsepsi dan Cara Pembelajarannya* (Surabaya: Unipress Unesa)
[15] Anam A C and Edie S S 2015 *UPEJ Unnes Phys. Educ. J.* **4** 25
[16] Lebdiana R and Hindarto N 2015 *UPEJ Unnes Phys. Educ. J.* **4** 1
[17] Rosdianto H, Murdani E, and Hendra 2017 *J. Pendidik. Fis.* **6** 55