Submission Files

Search

16720-1 Banawi et al; Blinded Manuscript .docx	August 23, 2021	Article Text
16730-1 admin, originality report 24.8.2021 1-10-39 - 4518-Article Text-16720-1-2-20210823.docx.html	August 23, 2021	Plagiat

Download All Files

Pre-Review Discussions

Add discussion

Name	From	Last Reply	Replies	Closed
Comments for the Editor	sulaeman 2021-08-23 01:04 PM	-	0	

Technium
by OJS PKP

Plagiarism Detector v. 1921 - Originality Report 8/24/2021 1:10:38 AM

Analyzed document: 4518-Article Text-16720-1-2-20210823.docx Licensed to: Individual Use Only

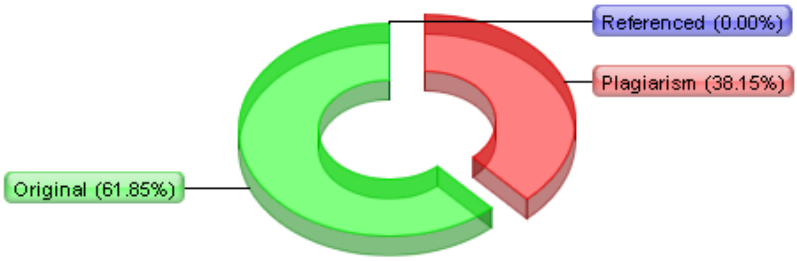
Comparison Preset: Rewrite Detected language: En

Check type: Internet Check

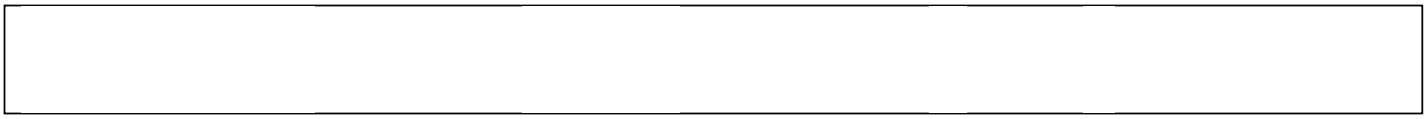
Disclaimer: this report must be correclty interpreted and analyzed by a qualified person who bears the evaluation responsibility!
Any information provided in this report is not final and is a subject for manual review and analisys!

Detailed document body analysis:

Relation chart:



Distribution graph:



Top sources of plagiarism: 6

65%	147	1. https://www.ejmste.com/article/understanding-electrochemistry-concepts-using-the-predict-observe-explain-strategy-4433
62%	149	2. http://e-iji.net/dosyalar/iji_2019_3_22.pdf
22%	49	3. https://www.aare.edu.au/data/publications/2001/mth01583.pdf

Processed resources details: 26 - Ok / 1 - Failed

Important notes:

Wikipedia:	Google Books:	Ghostwriting services:	Anti-cheating:
[not detected]	[not detected]	[not detected]	[not detected]

Active References (Urls Extracted from the Document):

No URLs detected

Excluded Urls:

No URLs detected

Included Urls:

No URLs detected

Detailed document analysis:

The Effects of Using

Plagiarism detected: **18.42%** https://www.ejmste.com/article/understanding-e… + 3 resources! id: **1**

Predict-Observe-Explain Strategy Assisted by Conceptual Change Text towards the Conceptual Mastery of Prospective Primary School Teachers on the Matter and its Changes
Abstract
. This research aims at determining the differences in the increase of conceptual mastery of the matter and its changes between students who study with the Predict-Observe-Explain Strategy

assisted by Conceptual Change Text (POE-ACCT) and students who study with the Expository Strategy. This study involved 63 students who were divided into 2 groups, a control group (33 students) and an experiment (30 students). The research instrument is

Plagiarism detected: **10.9%** http://e-iji.net/dosyalar/iji_2019_3_22.pdf id: **2**

in the form of a five-tier diagnostic test. The instrument has gone through an expert and empirical validation process. The data obtained were analyzed with descriptive and inferential statistics.

The results showed a significant increase in the conceptual mastery of the experimental group (N-gain = 0.26) and in the control group (N-gain = 0.06), which were significant (p .05). The POE-ACCT strategy was found more beneficial compared to the Expository Strategy in increasing the conceptual mastery

Plagiarism detected: **2.26%** https://files.eric.ed.gov/fulltext/EJ1068052.pdf + 3 resources! id: **3**

of the prospective elementary school teachers.

Although the POE-ACCT strategy provided an increase in the conceptual mastery, an increase of 0.26 was categorized in a low category and this

Plagiarism detected: **2.63%** http://e-iji.net/dosyalar/iji_2019_3_22.pdf id: **4**

indicated the need for improvement of the

strategy.Keywords
: POE strategy assisted by text of conceptual change, Conceptual mastery, Matter and its changesIntroduction
O
ne of the very important basic concepts and a prerequisite for understanding other science concepts at the next level is the topic of matter and its changes, which are solids, liquids, and gases, and the changes caused by heat and other forces 2
1

Plagiarism Detector - Your right to know the authenticity! © SkyLine LLC

TECHNIUM

Submissions

Archived Submissions

Search New Submission

4518 **Banawi et al.**
Q The Effects of Using Predict-Observe-Explain Strategy Assisted by Conceptual Change Text towards the Conceptual Mastery of Prospective Primary School Teachers on the Matter and its Changes

Scheduled

0	Production galleys created
0	Open discussions

Last activity recorded on Thursday, August 26, 2021.

View Submission

4056 **Maggalatung et al.**
Reviewing Sepa Language Extinction of the Indigenous Peoples of Amahai, Moluccas, Indonesia

Published 1

2302 **Malawat et al.**
The Ritual Ukuwala Mahiate: The Integration of Tradition and Religion of the Indigenous Community of Moluccas, Indonesia

Published 1

2031 **M. Ridwan et al.**
Revisiting Traditional Communication in Indonesia: Why do Self-Immunity

Published 1

Community, Moluccas

The Effects of Using Predict-Observe-Explain Strategy Assisted by Conceptual Change Text towards the Conceptual Mastery of Prospective Primary School Teachers on the Matter and its Changes

Abstract. This research aims at determining the differences in the increase of conceptual mastery of the matter and its changes between students who study with the Predict-Observe-Explain Strategy assisted by Conceptual Change Text (POE-ACCT) and students who study with the Expository Strategy. This study involved 63 students who were divided into 2 groups, a control group (33 students) and an experiment (30 students). The research instrument is in the form of a five-tier diagnostic test. The instrument has gone through an expert and empirical validation process. The data obtained were analyzed with descriptive and inferential statistics. The results showed a significant increase in the conceptual mastery of the experimental group (*N-gain* = 0.26) and in the control group (*N-gain* = 0.06), which were significant ($p < .05$). The POE-ACCT strategy was found more beneficial compared to the Expository Strategy in increasing the conceptual mastery of the prospective elementary school teachers. Although the POE-ACCT strategy provided an increase in the conceptual mastery, an increase of 0.26 was categorized in a low category and this indicated the need for improvement of the strategy.

Keywords: POE strategy assisted by text of conceptual change, Conceptual mastery, Matter and its changes

Introduction

One of the very important basic concepts and a prerequisite for understanding other science concepts at the next level is the topic of matter and its changes, which are solids, liquids, and gases, and the changes caused by heat and other forces (Howe & Jones, 1993; Johnson, 1998; Snir, Smith & Raz, 2003; Merritt, Shwartz & Kracjik, 2007; Treagust et al., 2010; Ozmen, 2011; Ozmen, 2013; Sopandi, Latip & Sujana, 2017; Banawi et al., 2017). An understanding of objects, substances, and particles is a prerequisite concept for learning science (chemistry) at a higher school level.

However, some research results indicated that teachers' understanding of the basic science concepts to be taught is not optimal and is classified in a sufficient category (Jaelani, 2015). Conceptual understanding of elementary school teacher candidates on the topic of matter and its changes has not been optimal, there are still many who experience misconceptions and do not understand the topic (Sopandi, Latip & Sujana, 2017). The understanding of the students who will be prospective teachers about the presence of particles (solid, liquid, and gas) is good enough. However, most of them do not understand the existence of freeform particles.

At the macroscopic level, most of them understand the concepts of expansion, evaporate, condense, melt, and freeze, but they do not understand the concepts of sublimation and crystallization. In fact, the subjects of the above research have studied the topic of matter and its changes in the previous level (elementary, junior high, and high school) as well as in the subjects of Natural Sciences (Basic Physics, Basic Chemistry, Basic Concepts of Natural Sciences, and Elementary School Science Learning) (Banawi et al., 2017). A recent study showed that prospective elementary school teachers did not develop a strong foundation regarding chemistry during their schooling. Therefore, science teaching methods need to be handled more effectively for prospective teachers in primary schools (Harmala-Brasken, Hemmi & Kurten, 2020).

Solutions for the weaknesses of teachers and prospective teachers need to be sought. It can be done with suitable learning models applied in elementary schools. Provision of lectures with a suitable model applied in elementary schools will be a provision for prospective teachers to teach it to their students later. One strategy that can be tried is the Predict-Observe-Explain (POE) strategy. This strategy is known to improve students' mastery of concepts on certain topics (Cos et al., 2021; Cinici & Demir, 2013; Kibirige, Osodo & Tlala, 2014). This strategy is also seen to increase student understanding (Liew & Treagust, 2004; Adebayo & Olufunke, 2015; Teo, Yan & Goh, 2016; Sreerekha, Arun & Swapna, 2016) and can improve misconceptions of teacher and teacher candidates (Ipek et al., 2010). A laboratory activity with Predict-Observe-Explain (POE) can improve and enhance the understanding and attitudes of prospective teachers compared to traditional learning (Vadapally, 2014; Hilario, 2015; Gernale, Aranes & Duad, 2015; Acarsesen & Mutlu, 2016). This strategy also has limitations, including: (1) for elementary school students, writing answers can be a barrier to communicating the idea, students with limited abilities may have difficulty explaining the reason for their predictions; (2) not suitable for all topics, for example, topics that are not "hands-on"; (3) some demonstrations must be chosen selectively and not repeatedly; and (4) educators need to be careful in making predictive questions (Joyee, 2006).

In order for cognitive conflict to occur based on constructivist understanding as an effort to recognize and minimize the occurrence of misconceptions, the Predict-Observe-Explain (POE) Strategy would be an alternative solution. Even so, the use of POE Strategy still leaves a misconception in students (Theodorakakos, Hatzikraniotis & Psillos, 2010). In addition, this strategy requires a long time for cognitive conflict and concept change. Thus, more efforts related to the concept change activities are needed.

One strategy approach to conceptual change is Conceptual Change Text (CCT). It is a text containing theories to convince students that they have misconceptions related to scientific facts (Hynd, 2001; Ozkan & Selcuk, 2015). It can also identify and analyze misconceptions and is designed based on the process of concept change Kim & Van Duensen (1998), as cited in (Setyaningrum, 2016). In the Conceptual Change Text, students are asked to provide predictions of a situation, a description of misconceptions, and a scientific explanation of the situation presented (Chambers & Andre, 1997; Balci, 2006; Sahin & Cepni, 2011; Aydin, 2012; Özmen & Aseriazar, 2017). In addition, this text determines students' misconceptions, explains their reasons, and explains why they are wrong by using concrete examples (Guzzetti, et al., 1997; Ozkan & Selcuk, 2015). The presentation of a misunderstanding in reading material is important to be conducted because it can help the teacher in planning a better learning process (Keles & Demirel, 2010).

Conceptual Change Text or CCT can be integrated with POE as it starts with prediction questions, students can predict answers with the initial knowledge they already have. To observe scientific explanations related to this case, students can undertake activity to express new knowledge that is reasonable and clear. After that, students can explain scientific answers related to these questions (Ültay, Durukan & Ültay, 2014).

However, the use of POE strategy assisted by Conceptual Change Text (POE-ACCT) to master the topic of matter and its changes has never been raised. Besides, investigations regarding the use of POE strategy assisted by Conceptual Change Text on the understanding of prospective elementary school teachers at

the macroscopic, submicroscopic (verbal and visual), and symbolic levels, and the direction of its effectiveness have not been carried out. Thus, this research used POE strategy assisted by Conceptual Change Text with a learning tool for the topic of matter and its changes that had been developed previously.

Referring to the background above, the proposed research question is "Is there a difference in increasing understanding of the concept of matter and its changes between students who study with the POE Strategy assisted by Conceptual Change Text (POE-ACCT) and students who study with the Expository Strategy? This research is expected to enrich the data of conceptual mastery and strategies that are used so that it becomes an inspiration for improvement and further research.

Method

This research employed quasi-experimental methods. The design used was a non-equivalent pretest-posttest control group design, which aims at comparing two different treatments to the research subjects. The difference between the two measurements is considered to be caused by the treatment. Quasi-experimental design (McMillan & Schumacher, 2001; Cohen, Manion & Morrison, 2007; Sugiyono, 2013; Creswell, 2016; Ridwan et.al., 2020; Malawat et al., 2021; Muhammad et al., 2021) conducted in this research is presented in Figure 1 below:

Experimental Group (A)	:	O_1	———	χ_1	———	O_2
Control Group (B)	:	O_3	———	χ_2	———	O_4

Figure 1. Quasi-Experimental Desig

Description:

χ_1	:	Treatment with POE-ACCT Strategy
χ_2	:	Treatment with Expository Strategy
O_1	:	Pre-test of POE-ACCT group
O_2	:	Post-test of POE-ACCT group
O_3	:	Pre-test of Expository group
O_4	:	Post-test of Expository group
-------	:	Random class

The two classes were given a pre-test, a lecture on the topic of matter and its changes, and a final test (post-test). The initial test and final test are the same.

Instrument

This research used a five-tier diagnostic test instrument in the form of multiple-choices (reliability test, r = 0.774) and non-test instruments in the form of a questionnaire, interview guidelines, and observation sheets. The instrument has been validated by an expert and has been going through an empirical validation process. Expert validation of the test instrument was carried out by three experts (Sugiyono, 2013); a chemistry education expert, a chemist, and a basic education expert. Based on the validity score criteria (Akbar, 2013 in Fatmawati, 2016), in general, the validated instruments belong to the valid category. However, some of the errors contained in the device were corrected. Of the 18 numbers with 81 test instruments, there was one item (Number 3 with 4 items) and 9 other items that were not used, while the other questions were

corrected before use so that the questions used were 17 questions with 68 items (obtained from 17 times 4). The order of the number of questions also had an adjustment.

Research Subject

The subjects were prospective elementary school teachers in one of the Primary School Teacher Education Study Program (PGSD) in Maluku in 2017/2018 Academic Year consisting of two classes. Based on randomization, incidentally, Class A was selected as the experimental group and Class B as the control group with 33 (28 female, 5 male) and 30 (24 female, 6 male) students respectively. They come from high school graduates in natural sciences, social sciences, languages, and vocational high schools and they have attended six semesters in their study programs. Lectures that have been taken include the Basic Concepts of Natural Sciences, Elementary School Science Learning, and Elementary School Science Practicum.

Data Analysis

All answers from 63 subjects were typed in the MS-Excel program, and grouped and scored according to the combination of the Five-tier Diagnostic Test answers (Banawi, et al., 2019). To calculate the magnitude of the increase of students' conceptual understanding based on their pre-test and post-test scores, a normalized gain (N-gain) that was developed by Meltzer (2002) was used. The N-gain calculation results were classified into High ($g \geq 0.70$); Moderate ($0.30 \leq g < 0.70$); and Low ($g < 0.30$) classification. The measurements were based on scores obtained by students based on test results, questionnaires, observations, and interviews. The quantitative data were analyzed with descriptive and inferential statistics. Inferential statistics include the average similarity test (normality and homogeneity) and the average difference test processed with the help of a computer using the SPSS Program 20.0 for Windows (Ghozali, 2006, p. 246).

Results

Some differences in an increase of conceptual understanding of the topic of matter and its changes in the experimental and control groups are presented in the following Tables.

Table 1. Pretest, Posttest, and N-gain Scores of the Students

Student	Experimental Group			Student	Control Group		
	Pretest	*Posttest*	*N-gain*		*Pretest*	*Posttest*	*N-gain*
E-01	8.82	29.41	0.23	C-01	51.47	60.29	0.18
E-02	45.59	73.53	0.51	C-02	40.44	51.47	0.19
E-03	31.62	71.32	0.58	C-03	28.68	34.56	0.08
E-04	0.74	58.09	0.58	C-04	22.79	23.53	0.01
E-05	27.21	72.79	0.63	C-05	20.59	19.12	-0.02
E-06	18.38	11.76	-0.08	C-06	30.88	33.82	0.04
E-07	47.06	62.50	0.29	C-07	20.59	22.06	0.02
E-08	33.82	42.65	0.13	C-08	11.03	4.41	-0.07
E-09	18.38	33.82	0.19	C-09	38.24	47.79	0.15
E-10	60.29	93.38	0.83	C-10	18.38	19.12	0.01
E-11	39.71	32.35	-0.12	C-11	74.26	86.76	0.49
E-12	19.85	20.59	0.01	C-12	17.65	60.29	0.52
E-13	25.00	51.47	0.35	C-13	36.03	46.32	0.16
E-14	12.50	50.00	0.43	C-14	0.74	7.35	0.07

E-15	27.21	20.59	-0.09	C-15	-0.74	7.35	0.08
E-16	80.15	86.76	0.33	C-16	31.62	38.24	0.10
E-17	-6.62	-5.88	0.01	C-17	-1.47	-3.68	-0.02
E-18	25.00	2.94	-0.29	C-18	33.82	29.41	-0.07
E-19	18.38	66.91	0.59	C-19	5.15	31.62	0.28
E-20	11.76	45.59	0.38	C-20	20.59	13.97	-0.08
E-21	25.00	44.85	0.26	C-21	16.18	25.00	0.11
E-22	6.62	27.21	0.22	C-22	30.88	22.79	-0.12
E-23	44.12	88.97	0.80	C-23	-3.68	13.97	0.17
E-24	22.79	20.59	-0.03	C-24	9.56	22.79	0.15
E-25	-5.88	21.32	0.26	C-25	2.94	-8.82	-0.12
E-26	7.35	16.18	0.10	C-26	16.91	0.74	-0.19
E-27	19.12	64.71	0.56	C-27	11.76	4.41	-0.08
E-28	24.26	79.41	0.73	C-28	27.21	27.21	0.00
E-29	34.56	25.00	-0.15	C-29	22.06	38.24	0.21
E-30	27.94	33.82	0.08	C-30	49.26	25.00	-0.48
E-31	28.68	21.32	-0.10				
E-32	2.21	48.53	0.47				
E-33	13.97	9.56	-0.05				
Total	795.59	1422.06	8.65	Total	683.82	805.15	1.74
Average	24.11	43.09	0.26	Average	22.79	26.84	0.06
Std.Dev.	18.22	26.59	0.30	Std. Dev.	17.51	21.03	0.19

Table 1 above presents that the mean pretest scores of the experimental and control groups were not much different (only 1.32 points difference).

Table 2. Summary of Statistical Test Results for Final Pre-test, Post-test, and N-gain of Experimental and Control Groups

Test	Group	Average Score	Average Similarity Test				Conclusion	Average Difference Test		p(sig)
			Normality Test *)		Homogeneity Test**)			t-test		
			Stat Test	p	Stat Test	p		Stat Test	p	
Pretest	Experimental	24.11	0.128	0.184	0.001	0.971	Normal and Homogeneous	0.291	0.772 /2	Not Significantly Different[a)] p = 0.386
	Control	22.79	0.100	0.200						
Posttest	Experimental	43.09	0.121	0.200	3.631	0.061	Normal and Homogeneous	2.673	0.010 /2	Significantly Different[a)] p = 0.005
	Control	26.84	0.101	0.200						
N-gain	Experimental	0.26	0.101	0.200	9.239	0.003	Normal and Not Homogeneous	3.218	0.002 /2	Significantly Different[a)] p = 0.001
	Control	0.06	0.115	0.200						

Description: *) Kolmogorov-Smirnov (Normal: $p > .05$)
**)Levene Statistics (Homogenous: $p > .05$)
a) t-test ($p/2 > .025$), H_o accepted

Table 2 above presents that the initial conceptual understanding of the experimental and control group students on the topic of matter and its changes is the same or not significantly different ($p > .05$). After conducting lectures in the experimental group, there was an increase in conceptual understanding. However, the increase is still in the low category (0.26). The N-gain of the experimental group was 0.20 points greater than the N-gain of the control group.

The final conceptual understanding of the experimental and control group on the topic of matter and its changes was significantly different ($p = .005$). The

increase in conceptual understanding (N-gain) of the experimental group students was significantly different ($p < .05$) with the increase in conceptual understanding of control group students. This means that the POE strategy assisted by Conceptual Change Text (POE-ACCT) can improve the conceptual understanding of elementary school teacher candidates related to the topic of matter and its changes.

Table 3. *Summary of Statistical Test Results of Average Pre-test, Post-test, and N-gain Scores on the Aspect Level of Conceptual Understanding*

Level Score	Group	Average Score	Average Similarity Test				Conclusion	Average Difference Test		Conclusion p(sig)
			Normality Test*)		Homogeneity Test **)					
			Stat Test	P	Stat Test	P		Stat Test	P	
Macroscopic										
Pretest	Experimental	59.00	0.170	0.016	0.537	0.466	Abnormal and Homogeneous	0.0578	0.0578	Not Significantly Different[b], p = 0.0578
	Control	58.04	0.136	0.163						
Posttest	Experimental	66.49	0.155	0.043	0.030	0.863	Abnormal and Homogeneous	0.068	0.068	Not Significantly Different[b], p = 0.068
	Control	58.82	0.096	0.200						
N-gain	Experimental	**0.14**	0.217	0.000	0.054	0.817	Abnormal and Homogeneous	0.081	0.081	Not Significantly Different[b], p = 0.081
	Control	**-0.01**	0.112	0.200						
Verbal Submicroscopic										
Pretest	Experimental	45.81	0.168	0.019	0.461	0.500	Abnormal and Homogeneous	0.332	0.332	Not Significantly Different[b], p = 0.332
	Control	48.63	0.135	0.169						
Posttest	Experimental	60.61	0.146	0.072	1.529	0.221	Normal and Homogeneous	2.533	0.014/2	Significantly Different[a], p = 0.007
	Control	50.20	0.126	0.200						
N-gain	Experimental	**0.26**	0.087	0.200	0.007	0.934	Abnormal and Homogeneous	0.001	0.001	Significantly Different[b], p = 0.001
	Control	**-0.06**	0.178	0.016						
Visual Submicroscopic										
Pretest	Experimental	39.39	0.160	0.032	0.325	0.570	Abnormal and Homogeneous	0.263	0.263	Not Significantly Different[b], p = 0.263
	Control	48.63	0.173	0.023						
Posttest	Experimental	58.47	0.159	0.033	3.591	0.063	Abnormal and Homogeneous	0.141	0.141	Not Significantly Different[b], p = 0.141
	Control	47.45	0.125	0.200						
N-gain	Experimental	**0.33**	0.106	0.200	6.082	0.016	Normal and Homogeneous	3.008	0.004/2	Significantly Different[a], p = 0.002
	Control	**0.10**	0.159	0.051						
Symbolic										
Pretest	Experimental	42.25	0.121	0.200	0.006	0.941	Abnormal and Homogeneous	0.454	0.454	Not Significantly Different[b], p = 0.454
	Control	39.41	0.163	0.040						
Posttest	Experimental	58.29	0.140	0.099	0.427	0.516	Normal and Homogeneous	2.578	0.012/2	Significantly Different[a], p = 0.006
	Control	43.33	0.142	0.127						
N-gain	Experimental	**0.27**	0.108	0.200	2.604	0.112	Normal and Homogeneous	2.344	0.022/2	Significantly Different[a], p = 0.011
	Control	**0.06**	0.079	0.200						

Description: [*)] Kolmogorov-Smirnov (Normal: $p > .05$)
[**)]Levene Statistics (Homogenous: $p > .05$)
[a)] t-test ($p/2 > .025$), H_0 accepted
[b)] Mann-Whitney Test ($p > .05$), H_0 accepted

From Table 3, it appeared that the increase of students' understanding of the verbal submicroscopic, visual submicroscopic, and symbolic level from the experimental and control groups was significantly different (each *p-value* < .05). While the understanding of the macroscopic level was the same or not significantly different ($p > .05$). This means that in general, the POE-ACCT Strategy can improve the understanding level of prospective elementary school teachers regarding the topic of matter and its changes.

The percentage description of the increase in the average score of each level of understanding of the experimental and control groups is presented in Figure 2. From the figure, it appeared that the increase in the average score of each level of understanding of the experimental group is higher compared to the control group.

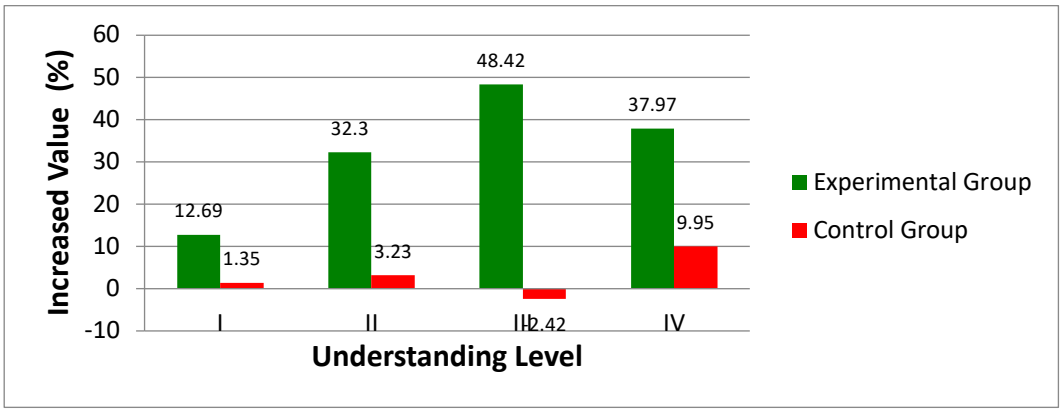


Figure 2. Percentage of Increase in Average Score for Each Understanding Level

To see whether there are significant differences in scores between groups and levels of understanding, the Anova test was used. Anova test is used to measure differences between groups to determine whether there are significant differences or not (Wahyuddin, 2015). In the case of metric dependent variables and two or three categorical independent variables, Two-ways Anova (Ghozali, 2006: 58) is used. Statistical test results are presented in Table 4 below.

Table 4. Summary of Statistical Test Results of Post-test Score with Anova

Source	Type III Sum of Squares	F	Sig.	Conclusion *p(sig)*
Level	5006.975	4.250	0.006	Significantly Different[c)]
Group	7622.024	19.410	0.000	Significantly Different[c)]
Level * Group	426.264	0.362	0.781	Not Significantly Different[c)]

Description: [c)] Two-ways Anova ($p > .05$), H_0 accepted

Table 4 above show that (1) the mean scores of the four levels (Macroscopic, Verbal Submicroscopic, Visual Submicroscopic, and Symbolic) are significantly

different ($p < .05$), (2) the mean scores of the two groups (Experimental and Control) are significantly different ($p < .05$), and (3) there is no interaction between Level and Group (*F count* = 0.362; $p > .05$). This means that the lecture of matter and its changes through the POE-ACCT strategy for prospective elementary school teachers was superior compared to lectures with the Expository Strategy in improving conceptual understanding of elementary school teacher candidates.

Table 5. Percentage of Change in Concept Patterns of Elementary School Teacher Candidates (E-C)

Results	***Post-test***											
Category	Experimental Group						Control Group					
Pre-test	PK	TPSK	MSK	TPK	M	E	PK	TPSK	MSK	TPK	M	E
PK	6.06*	1.78	0.71	0.00	0.36	0.00	2.75*	3.14	0.20	0.00	0.20	0.00
TPSK	14.44	31.19*	8.02	0.00	1.43	0.71	6.47	37.84*	11.96	0.20	4.51	0.98
MSK	4.10	8.20	3.57*	0.18	2.67	0.18	1.76	10.98	4.71*	0.00	1.57	0.98
TPK	0.18	0.36	0.00	0.00	0.18	0.00	0.00	0.59	0.00	0.00	0.00	0.20
M	1.96	3.92	0.89	0.00	1.07*	0.71	0.20	4.12	1.96	0.00	1.96*	0.59
E	0.36	4.46	1.07	0.00	0.53	0.71*	0.00	0.59	0.59	0.00	0.78	0.20*
Total	**27.10**	49.91	**14.26**	0.18	6.24	2.31	11.18	57.26	19.42	0.20	9.02	2.95

Description: PK = *Paham Konsep* (Understand the Concept); TPSK = *Tidak Paham Sebagian Konsep* (Do not Understand Some Concepts); MSK = *Miskonsepsi Sebagian Konsep* (Some Misconceptions); M = *Miskonsepsi* (Misconceptions); TPK = *Tidak Paham Konsep* (Do not Understand the Concept) and E = Error.
* No change in conception.

From Table 5 above, more than half the number of students in the experimental group (57.40%; 100% - 42.60%) experienced a change in conception. The unchanged conceptions that were found is 42.60% (PK-PK: 6.06%; TPSK-TPSK: 31.19%; MSK-MSK: 3.57%; M-M: 1.07%; E-E: 0, 71%). In total, 24 patterns of conception were found.

Discussion

The mean post-test and pre-test showed that the understanding of elementary school teacher candidates (experimental and control groups) at four levels of understanding (macroscopic, verbal submicroscopic, visual submicroscopic, and symbolic) was varied. The percentage of understanding of the symbolic level is smaller than the other three levels. The results of this research are in line with the previous research (Banawi et al., 2019)

The mean score of the experimental group was 24.11 and the control group was 22.79 (Table 1). However, there was an increase in the understanding of the experimental group that is in the low category compared to the control group (Table 2). The students that are categorized in the low category is due to the increase in scores obtained by students is also low. The acquisition of a low final score is allegedly caused by students' lack of understanding in completing the form of test questions used and the doubt in determining the score of Confidence Rating Index (CRI) (Setyaningrum, 2016). Misunderstanding in completing the five-tier diagnostic test caused a lot of students to be included in the error category which subsequently resulted in a low final score. In addition, inaccuracies in determining CRI can impact the final score and the conception category of the students.

Learning with POE-ACCT strategy (or its variants) certainly positions students to solve problems proposed by lecturers through various stages such as

predicting, conducting experiments or observing directly, and giving explanations (Nurmalasari, Jayadinata & Maulana, 2016). Thus, the role of lecturers has changed slightly and is increasingly challenging. One effort to answer this challenge is by changing the role of educators, from providers and suppliers to facilitators so that lecturers can share information and knowledge, and practice problem-solving skills with students (Mayasari et al., 2016).

Changing the role of lecturers is certainly not an easy thing. It requires knowledge, lesson planning, and adequate training. Meanwhile, students also need to adapt to lessons conducted by lecturers. Therefore, it is strongly suspected that another factor that caused the low acquisition of student scores is related to learning adaptation. Students are not yet familiar with the stages used in lectures with the POE-ACCT Strategy. Thus, lecturers need to improve the process or how to present the lecture materials. One alternative is to improve the lecture presentation process, for example, by using the Dual Modes program. Lectures with this program combine a scheduled face-to-face learning system and a self-instruction system by studying printed learning materials (Kadarohman & Nurihsan, 2008).

Self-instruction system is designed for individuals to develop a set of knowledge through cognitive restructuring, problem solving, and self-control. Through the existing process, it is expected that adaptive behavior will occur in the form of changes in individual's self-verbalization from negative to positive. It is believed that independent learning can help students' understanding of learning content (Setiawan, Solehuddin & Hafina, 2019). With the presentation of lectures using the Dual Modes program, it is expected that the effectiveness and efficiency of lectures held can increase. In the end, it can train students to control their academic performance and support the conceptual understanding of the prospective elementary school teacher candidates on the concepts being studied.

When discussing the difference in the average of post-test scores of the experimental and control groups, it was obtained that the understanding of the macroscopic level and the visual submicroscopic level of the experimental and control group students on the topic of matter and its changes were not significantly different ($p > .05$). Meanwhile, the understanding of verbal submicroscopic and symbolic levels of experimental and control group students on the topic of matter and its changes were significantly different ($p < .05$). Most students understand the phenomenon (macroscopic level) of the topic of matter and its changes but they cannot explain it well at the submicroscopic level (verbal and visual) and symbolic level (Banawi et al., 2019).

To test the significant increase of understanding in each level of understanding (Macroscopic, Verbal Submicroscopic, Visual Submicroscopic, and Symbolic) of experimental and control groups, the examination of the N-gain test scores of the two groups (Table 3) was conducted. After that, it was obtained that the understanding of the macroscopic level in both groups is the same or not significantly different ($p > .05$). These results are in line with previous studies (Sopandi, Latip & Sujana, 2017; Banawi, et al., 2017; Banawi, et al., 2018). In the experimental and control groups, the teaching patterns on the surface (listening to lectures and doing exercises) are quite imprinted. The learning experience with conventional learning experienced by students has become the initial knowledge and initial conception of students in both groups.

Based on the results of inferential statistical tests with the Two-ways Anova (Table 4), it can be concluded that the POE-ACCT strategy is more effective than

conventional lecture program (expository) in increasing the conceptual mastery of prospective elementary school teachers at the macroscopic, verbal submicroscopic, visual submicroscopic, and symbolic levels. The experimental group experienced an increase in conceptual mastery and a decrease in misconceptions compared to the control group (Perdana, Suma & Pujani, 2018).

From the pattern of changes in the conception of prospective elementary school teachers that emerged, it is known that there are still misconceptions about the topic of matter and its changes. This topic is indeed one topic or concept where most students have alternative concepts. This finding is in line with previous findings (Bilgin, et al., 2017; Sopandi, 2017; Sopandi et al., 2018). Some misconceptions on the concept (MSK) are indeed different from misconceptions (M). However, an error percentage of more than 10% of the sample (14.26%, see Table 5) can be considered a significant error Caleon & Subramaniam, 2010[a]; Caleon & Subramaniam, 2010[b]; Kaltakci-Gurel, Eryilmaz & McDermott, 2017).

The results of the descriptive analysis and statistical tests above showed that the understanding of prospective elementary school teachers before and after the use of the POE strategy assisted by Conceptual Change Text (POE-ACCT) is different. Lectures on the matter and its changes through the use of POE strategy assisted by Conceptual Change Text (POE-ACCT) for prospective elementary school teachers is superior compared to the conventional lecture program (Expository Strategy) in improving the conceptual understanding of the prospective elementary school teachers. This is in accordance with similar studies conducted by Setyaningrum and Sopandi (2015) that stated that the conceptual change text can have a better influence on students' understanding than traditional text.

The understanding of elementary school teacher candidates related to the topic of matter and its changes at the macroscopic, verbal submicroscopic, visual submicroscopic, and symbolic levels can certainly be influenced by the delivery of the learning material. Learners can easily understand the subject matter with learning methods from educators who are adapted to the material Khausar, 2014). Science lecturers should believe that learning can shape the competencies and behavior of their students according to the strategies and subject matter they provide. The results of this research can be used as diagnostic data for corrective actions in learning. The questions such as "Are the lesson planning, stages of the POE-ACCT strategy, media, and learning resources appropriate?" can improve the lecture process and the learning tools. Evaluation and reflection on the entire learning process that has been carried out is a necessity. By looking at the results of this research, educators and/or educational researchers can see this as educational research results that can be used as a starting point in the context of educational practice and/or further educational studies (Suyitno, 2009; Banawi, 2017).

Conclusions

From the results of this research, it can be concluded that the understanding of elementary student teacher candidates on the topic of matter and its changes at the macroscopic, verbal submicroscopic, visual submicroscopic, and symbolic levels before and after the use of POE strategy assisted by Conceptual Change Text (POE-ACCT) is different. The POE-ACCT strategy can improve the conceptual understanding of elementary school teacher candidates at the verbal

submicroscopic, visual submicroscopic, and symbolic levels. However, the increase is still in the low category. The use of the POE-ACCT strategy has succeeded in increasing the understanding of prospective elementary school teachers to more than a quarter (27.10%) in the 'Understand the Concept' (PK) category. However, there are still many students who are categorized in the TPSK category. The percentage of misconceptions was found more in the control group, so the change in concept in the experimental group students tended to be more positive than the control group. Prospective elementary school teachers tend to change their conception according to existing scientific concepts after they learn with the POE-ACCT strategy.

The results of this research have several implications for classroom practice. Improving the lecture process and learning tools used are necessary. The lecture process improvement is directed towards what students and lecturers must do in class so that the understanding level of prospective teachers can be improved from the 'low category' to the 'high category.' The improvement of the lecture process is directed at the importance of students knowing the learning objectives undertaken and the importance of intrinsic learning motivation. While the Conceptual Change Text used needs to be improved according to the needs and ways to study it in lectures. Another implication of this research is that there is a need for further research to find out the efficient use of the Conceptual Change Text on the topic of matter and its changes in the classroom with a self-instruction system.

References

[1] Acarşeşen, B. and Mutlu, A. (2016). Predict-observe-explain tasks in chemistry laboratory: pre-service elementary teachers' understanding and attitudes. *Sakarya University Journal of Education, 6*(2), 184-208. DOI: 10.19126/suje.46187

[2] Adebayo, F. and Olufunke, B.T. (2015). Generative and predict-observe-explain instructional strategies: towards enhancing basic science practical skills of lower primary school pupils. *International Journal of Elementary Education, 4*(4), 86-92. DOI: 10.11648/j.ijeedu.20150404.12

[3] Aydin, S. (2012). Remediation of misconception about geometric optics using conceptual change text. *Journal of Education Research and Behavioural Sciences*, *1*(1), 001-012. *http://journalcra.com/sites/default/files/issue-pdf/2741.pdf*

[4] Balci, C. (2006). *Conceptual Change Text Oriented Instructions to Facilitate Conceptual Change in Rate of Reaction Concepts*. (Thesis). The Graduate Shool of Natural and Applied Sciences Middle East Tecnical University. Turkey. https://etd.lib.metu.edu.tr/upload/12607815/index.pdf

[5] Banawi, A., Sopandi, W., Kadarohman, A., and Solehuddin, M. (2018). The development of a five-tier multiple–choice diagnostics tests to identify prospective primary school teacher' misconceptions about states of matter and their changes. *Proceedings International Conference on Social Science and Tecnology in Education (ICSATE 2018) Ambon-Indonesia* (hlm. 1-10). Ambon: FITK IAIN Ambon.

[6] Banawi, A., Sopandi, W., Kadarohman, A., and Solehuddin, M. (2019). Prospective primary school teachers' conception change on states of matter and their changes through predict-observe-explain strategy. *International Journal of Instruction*, *12*(3), 359-374. DOI: 10.29333/iji.2019.12322a

[7] Banawi, A., Sopandi, W., Kadarohman, A., dan Solehuddin, M. (2017). Pemahaman wujud zat dan perubahannya mahasiswa calon guru dan solusi reflektif: studi pada salah satu perguruan tinggi di maluku. *Jurnal Inovasi, 11*(2), 147-156.

[8] Bilgin, A.K., Yürükel, F.N.D., and Yiğit, N. (2017). The effect of a developed react strategy on the conceptual understanding of students: "particulate nature of matter". *Journal of Turkish Science Education, 14*(2), 65-81. https://www.tused.org/index.php/tused/article/view/155

[9] Caleon, I. S., and R. Subramaniam. (2010[a]). Development and application of a three-tier diagnostic test to assess secondary students' understanding of waves. *International Journal of Science Education, 32*, 939-961. https://doi.org/10.1080/09500690902890130

[10] Caleon, I.S., Subramaniam, R. (2010[b]). Do Students Know What They Know and What They Don't Know? Using a Four-Tier Diagnostic Test to Assess the Nature of Students' Alternative Conceptions. *Res Sci Educ* 40, 313–337 (2010). https://doi.org/10.1007/s11165-009-9122-4
[11] Chambers, S.K. and Andre, T. (1997). Gender, prior knowledge, interest, and experience in electricity and conceptual change text manipulations in learning about direct current. *Journal of Research in Science Teaching*, *34*(2), 107-123. https://doi.org/10.1002/(SICI)1098-2736(199702)34:2<107::AID-TEA2>3.0.CO;2-X
[12] Cho, H. Carving out a hybrid space: a self-study of contextualizing teaching for social justice in South Korea. *Asia Pacific Educ. Rev.* (2021). https://doi.org/10.1007/s12564-021-09683-z
[13] Ayhan Cinici & Yavuz Demir (2013) Teaching through Cooperative POE Tasks: A Path to Conceptual Change, The Clearing House: A Journal of Educational Strategies, Issues and Ideas, 86:1, 1-10, https://doi.org/10.1080/00098655.2012.712557
[14] Cohen, L., Manion, L., and Morrison, K. (2007). *Research method in education*. Six edition. New York: Madison Avenue. https://uk.sagepub.com/en-gb/asi/research-methods-in-education/book229278
[15] Coştu, B., Ayas, A. & Niaz, M. (2012). Investigating the effectiveness of a POE-based teaching activity on students' understanding of condensation. *Instr Sci* 40, 47–67 (2012). https://doi.org/10.1007/s11251-011-9169-2
[16] Creswell, J.W. (2016). *Research design: pendekatan kualitatif, kuantitatif, dan mixed*. California: Thousand Oaks. https://openlibrary.telkomuniversity.ac.id/pustaka/14172/research-design-pendekatan-kualitatif-kuantitatif-dan-mixed-3-e-.html
[17] Fatmawati, A. (2016). Pengembangan perangkat pembelajaran konsep pencemaran lingkungan menggunakan model pembelajaran berdasarkan masalah untuk sma kelas x. *Edusains*, *4*(2), 94-103. https://e-journal.iain-palangkaraya.ac.id/index.php/edusains/article/view/512
[18] Gernale, J.P., Arañes, F.Q., and Duad, V. (2015). The effects of predict-observe-explain (poe) approach on students' achievement and attitudes towards science. *The Normal Lights,9*(2), 1-23. https://po.pnuresearchportal.org/ejournal/index.php/normallights/article/view/122
[19] Ghozali, I. (2006). *Aplikasi analisis multivariate dengan program spss*. Semarang: Badan Penerbit-Undip. https://books.google.co.id/books?id=JdqJAQAACAAJ
[20] Guzzetti, B. J., Williams, W. O., Skeels, S. A., and Wu, S. M. (1997). Influence of text structure on learning counterintuitive physics concepts. *Journal of Research in Science Teaching*, *34*, 701-719. Doi. 10.1002/(SICI)1098-2736(199709)34:7<701::AID-TEA3>3.0.CO;2-Q
[21] Han, J., Zhao, Y., Liu, M. *et al.* The development of college English teachers' pedagogical content knowledge (PCK): from General English to English for Academic Purposes. *Asia Pacific Educ. Rev.* (2021). https://doi.org/10.1007/s12564-021-09689-7
[22] Härmälä-Braskén, Ann-Sofi, Hemmi, K., and Kurtén, B. (2020). Misconceptions in chemistry among Finnish prospective primary school teachers – a long-term study. *International Journal of Science Education*, 1-18. https://doi.org/10.1080/09500693.2020.1765046
[23] Hilario, J.S. (2015). The use of predict-observe-explain-explore (poee) as a new teaching strategy in general chemistry-laboratory. *International Journal of Education and Research*, *3*(2), 37-48. https://www.ijern.com/journal/2015/February-2015/04.pdf
[24] Howe, A. C. and Jones, L. (1993). *Engaging children in science*. New York: Macmillan Publishing Company. https://www.amazon.com/Engaging-Children-Science-3rd-Howe/dp/0130406740
[25] Hynd, C. R. (2001). Refutational texts and the change process. *International Journal of Educational Research*, *35*(7), 699-714. DOI: 10.1016/S0883-0355(02)00010-1
[26] Ipek, H.; Kala, N.; Yaman, F. &Ayas, A. (2010). Using poe strategy to investigate student teachers' understanding about the effect of substance type on solubility. *Procedia Social and Behavioral Sciences*, *2*, 648-653. DOI: 10.1016/j.sbspro.2010.03.078
[27] Jaelani. (2015). Deskripsi pemahaman sains guru madrasah ibtidaiyah pada diklat teknis substantif peningkatan kompetensi metodologi pembelajaran di kankemenag kota kediri tahun 2015. *Jurnal Inovasi, 9*(3), 273-277.
[28] Johnson, P. (1998). Children's understanding of changes of state involving the gas state, part 2: evaporation and condensation below boiling point. *International Journal of Science Education, 20*(6), 695-709. https://doi.org/10.1080/0950069980200607
[29] Joyce, C. (2006). Predict, observe, explain (poe). Diakses dari https://arbs.nzcer.org.nz/predict-observe-explain-poe
[30] Kadarohman, A. dan Nurihsan, J. (2008). Program *dual modes* sebagai alternative peningkatan kualifikasi akademik guru dalam jabatan. *Makalah*. 1-14.
[31] Kaltakci-Gurel, D., Eryilmaz, A., and McDermott, L.C. (2017). Development and application of a four-tier test to assess pre-service physics teachers' misconceptions about geometrical optics.

Research in Science & Technological Education, 1-23. https://doi.org/10.1080/02635143.2017.1310094

[32] Keles, E. and Demirel, P. (2010). A study towards correcting student misconceptions related to the color issue in light unit with poe technique. *Procedia Social and Behavioral Sciences*, *2*, 3134–3139. https://doi.org/10.1016/j.sbspro.2010.03.477

[33] Khausar. (2014). Pengaruh penerapan metode pembelajaran guru yang bervariasi terhadap peningkatan hasil belajar pada siswa kelas xi sma negeri 1 labuhanhaji timur aceh selatan. *Jurnal Genta Mulia*, *5*(2), 72-85. https://ejournal.stkipbbm.ac.id/index.php/gm/article/view/67

[34] Kibirige, I., Osodo, J., and Tlala, K.M. (2014). The effect of predict-observe-explain strategy on learners' misconceptions about dissolved salts. *Mediterranean Journal of Social Sciences, 5*(4), 300-310. DOI: 10.5901/mjss.2014.v5n4p300

[35] Liew, C. W. and Treagust, D. (2004). *The effectiveness predict – observe – explain (poe) technique in diagnosing student's understanding of science and identifying their level of achievement*. https://espace.curtin.edu.au/bitstream/handle/20.500.11937/2432/15777_LiewScEdD.pdf?sequence=2&isAllowed=y

[36] Mahdi Malawat, M. Ridwan, Sulaeman Sulaeman, Darma Darma (2021). The Ritual Ukuwala Mahiate: The Integration of Tradition and Religion of the Indigenous Community of Moluccas, Indonesia , Technium Social Sciences Journal: Vol. 15: A new decade for social changes. https://techniumscience.com/index.php/socialsciences/article/view/2302

[37] Mayasari, T., Kadarohman, A., Rusdiana, D., dan Kaniawati, I. (2016). Apakah model pembelajaran *problem based learning* dan *project based learning* mampu melatihkan keterampilan abad 21?. *Jurnal Pendidikan Fisika dan Keilmuan*, 2(1), 48-55. DOI: 10.25273/jpfk.v2i1.24

[38] McMillan, J.H. and Schumacher, S. (2001). *Research in education*. New York: Addison Wesley Longman. Inc.

[39] Meltzer, D. E. (2002). The relationship between mathematics preparation and conceptual learning gains in physics: a possible "hidden variable: in diagnostic pretest scores. *American Association of Physics Teachers*, *70*(12), 1259-1268. http://www.physicseducation.net/docs/AJP-Dec-2002-Vol.70-1259-1268.pdf

[40] Merritt, J.D., Shwartz, Y., and Krajcik, J. (2007). Middle school students' development of the particle model of matter. *A Paper Presented at The Annual Meeting of the National Association of Research in Science Teaching, April 2007, New Orleans, LA. pp. 1-29.*

[41] Muhammad Maggalatung, M. Ridwan, Syarifudin Syarifudin, Darma Darma, Sulaeman Sulaeman. (2021). Reviewing Sepa Language Extinction of the Indigenous Peoples of Amahai, Moluccas, Indonesia , Technium Social Sciences Journal: Vol. 22: A new decade for social changes. DOI: https://doi.org/10.47577/tssj.v22i1.4056

[42] M. Ridwan, Sulaeman Sulaeman. (2020). Revisiting Traditional Communication in Indonesia: Why do Self-Immunity Rituals of Pelauw Indigenous Community, Moluccas , Technium Social Sciences Journal: Vol. 14: A new decade for social changes. https://www.techniumscience.com/index.php/socialsciences/article/view/2031

[43] Nurmalasari, A.L., Jayadinata, A.K., dan Maulana. (2016). Pengaruh strategi *predict observe explain* berbantuan permainan tradisional terhadap kemampuan berfikir kritis siswa pada materi gaya. *Jurnal Pena Ilmiah*, *1*(1), 181-190.

[44] Oo, T.Z., Magyar, A. & Habók, A. Effectiveness of the reflection-based reciprocal teaching approach for reading comprehension achievement in upper secondary school in Myanmar. *Asia Pacific Educ. Rev.* (2021). https://doi.org/10.1007/s12564-021-09707-8

[45] Ozkan, G. and Selcuk, G. S. (2015). Effect of technology enhanced conceptual change texts on students' understanding of buoyant force. *Universal Journal of Educational Research, 3*(12), 981-988. DOI: 10.13189/ujer.2015.031205

[46] Özmen, H. (2011). Turkish primary students' conceptions about the particulate nature of matter. *International Journal of Environmental & Science Education*, *6*(1), 99-121.

[47] Özmen, H. (2013). A cross-national review of the studies on the particulate nature of matter and related concepts. *Eurasian J. Physical & Chemical Education,5*(2), 81-110. https://orcid.org/0000-0003-0578-3481

[48] Özmen, H. and Aseriazar, A. (2017). Effect of simulations enhanced with conceptual change texts on university students' understanding of chemical equilibrium. *J. Serb. Chem. Soc*82, 1-16. DOI: 10.2298/JSC161222065O

[49] Perdana, G. P., Suma, K. dan Pujani, N. M. (2018). Pengaruh struktur teks terhadap penguasaan konsep dan penurunan miskonsepsi pada listrik dinamis. *Jurnal Pendidikan (Teoridan Praktik), 3*(1), 13-18. DOI: 10.26740/jp.v3n1.p13-18

[50] Sahin, C. and Cepni, S. (2011). Development of the concept cartoon, animation, an diagnostic branched tree supported conceptual change text: "gas pressure". *Eurasian Journal of Physics and Chemistry Education*, Jan, 25-33. https://orcid.org/0000-0003-2343-8796
[51] Setiawan, B., Solehuddin, M., and Hafina, A. (2019). Bimbingan kelompok dengan teknik *self-instruction* untuk meningkatkan *self-regulation* siswa. *Konseling*, *1*(1), 01-10. DOI: 10.31960/konseling.v1i1.317
[52] Setyaningrum, V. (2016). *Perubahan konseptual siswa smp pada materi suhu dan kalor melalui teks perubahan konseptual berbasis kartun konsep*. (Tesis). Sekolah pascasarjana, Universitas Pendidikan Indonesia, Bandung. http://repository.upi.edu/23356/
[53] Setyaningrum, V. dan Sopandi, W. (2015). Pengaruh teks perubahan konseptual terhadap pemahaman siswa pada materi suhu dan kalor. *Prosiding Seminar Nasional Fisika Mataram-Lombok 14 dan 15 November 2015* (1-6). Mataram: Fakultas MIPA Universitas Mataram.
[54] Snir, J., Smith, C.L., and Raz, G. (2003). Linking phenomena with competing underlying models: a software tool for introducing students to the particulate model of matter. *Science Education, 87*(6), 794-830. https://doi.org/10.1002/sce.10069
[55] Sopandi, W. (2017). Pengenalan sifat diskontinu materi pada peserta didik sekolah dasar kelas tinggi sebagai dasar belajar kimia. Dalam U. S. Saud, W. Sopandi & H. Handayani (Editor), *Bunga Rampai Kajian Pendidikan Dasar: Umum, Matematika, Bahasa, Sosial, dan Sains* (pp. 161-173). Bandung: UPI Press.
[56] Sopandi, W., Kadarohman, A., Rosbiono, M., Latip, A., and Sukardi, R.R. (2018). The courseware of discontinuous nature of matter in teaching the states of matter and their changes. *International Journal of Instruction, 11*, 61-76. DOI: 10.12973/iji.2018.1115a
[57] Sopandi, W., Latip, A., and Sujana, A. (2017). Prospective primary school teachers' understanding on states of matter and their changes. *Journal of Physics,* Conf. Series *812*, pp 1-8. DOI: 10.1088/1742-6596/812/1/012075
[58] Sreerekha, S., Arun, R. R., and Swapna, S. (2016). Effect of predict-observe-explain strategy on achievement in chemistry of secondary school students. *International Journal of Education & Teaching Analytics*, *1*(1), 1-5.
[59] Sugiyono. (2013). *Metode penelitian kuantitatif, kualitatif dan r & d*. Bandung: Alfabeta. https://cvalfabeta.com/product/metode-penelitian-kuantitatif-kualitatif-dan-rd-mpkk/
[60] Suyitno, Y. (2009). *Landasan filosofis pendidikan*. Bandung: UPI-Fakultas Pendidikan.
[61] Teo, T.W., Yan, Y.K., and Goh, M.T. (2016). Using prediction-observation-explanation-revision to structure young children's learning about floating and sinking. *The Journal of Emergent Science, JES, 10*, 12-23.
[62] Theodorakakos, A., Hatzikraniotis, E., and Psillos, D. (2010). Pec task explorer: a tool for ict supported learning in science. *Paper* (pp. 75-83). CBLIS.
[63] Treagust, D.F., Chandrasegaran, A.L., Crowley, J., Yung, B.H.W., Cheong, I.P-A., and Othman, J. (2010). Evaluating students' understanding of kinetic particle theory concepts relating to the states of matter, changes of state and diffusion: a cross-national study. *International Journal of Science and Mathematics Education*, *8*(1), 141-164. https://doi.org/10.1007/s10763-009-9166-y
[64] Ültay, N., Durukan, Ü. G., and Ültay, E. (2014). Evaluation of the effectiveness of conceptual change texts in react startegy. *Chemistry Education Research and Practice*, 1-38. DOI: 10.1039/C4RP00182F
[65] Vadapally, P. (2014). *Exploring students' perceptions and performance on predict-observe-explain tasks in high school chemistry laboratory*. (Disertation). The Graduate School, University of Northern Colorado.
[66] Wahyudin. (2015). *Modul statistika terapan: analisis varians*. Bandung: Mandiri.

[TSSJ] Editor Decision

2021-08-25 09:38 PM

Anasufi Banawi, Sulaeman Sulaeman, Sulaeman Sulaeman, Wahyu Sopandi, Wahyu Sopandi, Asep Kadarohman, Muhammad Solehuddin, M. Ridwan:

We have reached a decision regarding your submission to Technium Social Sciences Journal, "Q The Effects of Using Predict-Observe-Explain Strategy Assisted by Conceptual Change Text towards the Conceptual Mastery of Prospective Primary School Teachers on the Matter and its Changes".

Our decision is to: Accept Submission

ENDORSE TSSJ on Publons

https://publons.com/journal/554323/technium-social-sciences-journal/

Reviewer A:
Recommendation: Accept Submission

The topic of the article is appropriate with the profile of the Technium Social Sciences Journal?

Yes

Text formatting conditions are respected?

Yes

The figures are clear and have an appropriate contrast?

Yes

References, figures, tables and calculus relations are cited in the text of the paper?

Yes

[TSSJ] Editor Decision

2021-08-25 09:38 PM

Anasufi Banawi, Sulaeman Sulaeman, Sulaeman Sulaeman, Wahyu Sopandi, Wahyu Sopandi, Asep Kadarohman, Muhammad Solehuddin, M. Ridwan:

We have reached a decision regarding your submission to Technium Social Sciences Journal, "Q The Effects of Using Predict-Observe-Explain Strategy Assisted by Conceptual Change Text towards the Conceptual Mastery of Prospective Primary School Teachers on the Matter and its Changes".

Our decision is to: Accept Submission

ENDORSE TSSJ on Publons

https://publons.com/journal/554323/technium-social-sciences-journal/

Reviewer A:
Recommendation: Accept Submission

The topic of the article is appropriate with the profile of the Technium Social Sciences Journal?

Yes

Text formatting conditions are respected?

Yes

The figures are clear and have an appropriate contrast?

Yes

References, figures, tables and calculus relations are cited in the text of the paper?

Yes

Sulaeman Man <sulaeman@iainambon.ac.id>

Today: New issue of Technium Social Sciences Journal

1 pesan

Technium Science <office@techniumscience.com> 10 September 2021 07.09
Kepada: Technium Science <socialsciences@techniumscience.com>

Call for papers
Invitation to publish in the next issue of Technium Social Sciences Journal / October 2021

- **Submission deadline:** 10th of October, 2021
- **For Social Sciences, please submit here:** https://techniumscience.com/index.php/socialsciences/about/submissions
- **Publication fee:** 100 Euro (without DOI) or 130 Euro (DOI Included) + Certificate of Publication
- **Google Scholar H-Index:** 9.00

We would like to announce that a number of the Technium Social Sciences Journal has been published. You can access it here - https://doi.org/10.47577/tssj.v23i1
Technium Science Inc. invites you to publish your valuable research in our two journals, indexed in the most important research databases, such as: Google Scholar, CrossRef, DOAJ, Ulrich's, Ebsco, Index Copernicus, WorldCat, Stanford Libraies, Directory of Open Access Scholarly Resources, Directory of Research Journals Indexing, RePEc, Hein Online, Econpapers, Ideas, Journal Factor, Scipio, J-Gate, Scientific Indexing Services, Elektronische Zeitschriftenbibliothek etc.

Technium Social Sciences Journal vol. 23/2020 - September, 2021
Table of contents

1. **The impact of illegal mining on public health: A case study in kenyasi, the Ahafo region of Ghana** (Ebenezer Owusu Mensah, Edward Delali Darku)
2. **Social competence for students with learning disabilities in English** (Mohamad Ahmad Saleem Khasawneh)
3. **How successful is the Higher Institute of Communications and Navigation, Kuwait, in reducing dependence on expatriates** (Salah Al-Ali)
4. **How Successful is Field Training Program offered by the Public Authority for Applied Education and Training, PAAE&T, Kuwait, in Reducing Dependence on Expatriates?** (Salah Al-Ali)
5. **Nutrition in mental and physical health** (Aggeliki Zavitsanou, Athanasios Drigas)
6. **How successful is the Industrial Institutes, Kuwait, in reducing dependence on expatriates?** (Salah Al-Ali)
7. **The Review of Learner's Autonomy towards Learning English as a Foreign Language among College Students in China** (Hui Zhang)
8. **Code – Switching of the Novice Teachers in Filipino** (Ma. Beatriz H. Lazarte)
9. **School dropout in Latin America as a social conflict** (Carrasco Moreno Angel Saturnino)
10. **Analysis Of The Effect Of Knowledge On Entrepreneurship Readiness Using Random Forest Classification Machine Learning** (Ariyono Setiawan)
11. **Application and Development of Big Data in Chinese Business Education** (Zhaowen Yang)
12. **Measuring the Effectiveness of Environmental Education Programmes in Promoting Sustainable Living in Secondary Schools** (Msawenkosi Sandile Mbokazi, Rachel Gugu Mkhasibe, Chinaza Uleanya)
13. **Previous Studies on The Impact of Online Education in EFL and ESL contexts** (Ali Hashemi)
14. **ICT in special education** (Irene Chaidi, Athanasios Drigas, Charalampos Karagiannidis)
15. **Preparedness and challenges of the new normal: perspectives of Filipino students in virtual learning** (Venus A. Vitales, Karen Jann M. Aquino, Emily F. De Leon, Paz P. Lacap, Shiela S. Maranan, Jamaica J. Duldulao)
16. **Use of comics for teaching Medical English Purpose** (Vladimir Román Gutierrez Huancayo)
17. **The Effects of Using Predict-Observe-Explain Strategy Assisted by Conceptual Change Text towards the Conceptual Mastery of Prospective Primary School Teachers on the Matter and its Changes** (Anasufi Banawi, Sulaeman Sulaeman, Wahyu Sopandi, Asep Kadarohman, Muhammad Solehuddin, M. Ridwan)
18. **The Effect of Online Learning on The Academic Achievement Among Students of Jordanian Private Universities in Light of The Covid-19 Pandemic, Based on The Variables of Comprehension and Analysis from The Perspective of Faculty Member** (Ibrahim Ali Al-Bahar, Rawan Fayyad Flouh, Rawan Al-Sulaihat)
19. **How Successful is the Management of Technical and Vocational Institutions, Kuwait, in Reducing Dependence on Expatriates?** (Salah Al-Ali)
20. **The Relationship of Curriculum, Teaching Methods, Assessment Methods, and School and Home Environment with Learning Difficulties in English Language from the Students' Perspectives** (Mohamad

Ahmad Saleem Khasawneh)

21. **Adaptation in the E-learning systems** (Norah Dhafer Alqahtani)
22. **Participatory development communication as a pattern of community empowerment (Study on the Radio of the An-Nur Malang Islamic Dakwah Community)** (Fina Maysaroh Nur Maulidiana, Anang Sujoko, Bambang Dwi Prasetyo)
23. **Texting and Making Calls Whilst Driving: Can Hand-Free Car Kits and Smartphones Speaker Tones Come to the Rescue of Ghanaian Drivers?** (Acheampong Owusu, Daha Tijjani Abdurrahaman, Akeem Soladoye Bakare, Ivy Hawah Taana)
24. **Islamic Branding Strategy Through Audience's Reception** (Rahmania Santoso, Bambang Dwi Prasetyo, Desi Dwi Prianti)
25. **Changing the manner of electing the President of the Republic of Kosovo** (Driola Susuri, Kadri Kryeziu)
26. **The concept of legal protection of children as a narcotics courier** (Martini, Made Warka, Otto Yudianto)
27. **Damage compensation for innocent defendants and Convicts in Iran and the Canadian legal system** (Dr Khanjani, Atoosa Bahadori)
28. **Validity of notary deed based on incorrect documentation data** (David Hardjo, Slamet Suhartono, Endang Prasetyawati, Otto Yudianto)
29. **The Corporate Rescue for Companies during the COVID-19 Pandemic in Indonesia: Prospects for the Concept of Deeds of Arrangement and Administration Order** (F. Yudhi Priyo Amboro)
30. **The effect of sustainability management practice, enterprise risk management, and business strategies on integrated sustainability performance with intellectual capital as a moderating variable** (Hesty Erviani Zulaecha, Yuswar Z. Basri, Yvonne Augustine, Susi Dwi Mulyani)
31. **Supernationalism. Theory of integration** (Nijazi Halili)
32. **Assessing Business Sustainability Level: The Case of BIOMASS Company** (Zahraa Berro)
33. **Islamic financial development, institutional environment and economic growth** (Boubaker Ahlem, Fatma Mrad, Zouhaier Hadhek, Fedya Telmoudi)
34. **Identifying the relationship between self-esteem and satisfaction in a couple** (Mariana Floricica Calin, Mihaela Luminita Sandu, Anca Sabina Miu)
35. **Alcohol Scale, Internet Addiction Scale, E-Victim Scale and E-Bullying Scale in Cigarette Addicted University Students** (Ebru Çetin, Emrah Emiral, Nergis Cantürk, Rukiye Dağalp)
36. **The importance of breastfeeding on the development of the mother-child relationship from an emotional point of view** (Mariana Floricica Calin, Mihaela Luminita Sandu, Verginia Roxana Neagu)
37. **Socio-Cultural Factors Affecting the Performance of Women Entrepreneurs in Adaklu Waya in the Volta Region of Ghana** (Richard Senna, Dela Eyaakor Enuameh Agbolosoo)
38. **Security management of national park security in the border of Indonesia - Malaysia** (Edy Saptono, Ribka Keiza, Joni Wijayanto)
39. **Determination of Base and Non Base Sector of Livestock Commodity Development in Southeast Sulawesi Province, Indonesia** (Natsir Sandiah, Achmad Selamet Aku, La Ode Arsad Sani, La Ode Nafiu, La Ode Muh. Munadi)
40. **Building Green Hotel Image Through Employee's Green Behaviour in Five Star Hotel in Bali** (I Ketut Astawa, I Ketut Budarma, Cokorda Istri Sri Widhari, Anak Agung Putri Suardani)
41. **The from farm to cup speciality coffee trend in Thailand and Vietnam. A major assumption about shortening supply chains disproven?** (Mark Azavedo)
42. **Strengthening the Icon Management of Kampung Kopi Village in Malang of Indonesia by Improving the Quality of Production and Marketing for Farmers** (Agung Winarno, Yuli Agustina, Bagus Shandy Narmaditya, Wiwik Wahyuni)
43. **Underpricing in Indonesia non financial companies** (Nisak Nur Fadillah, Yuyun Isbanah)
44. **Defense sector human resources management as the forefront in Corona Virus Disease (Covid-19) pandemic response** (I Dewa Ketut Kerta Widana -, Adi Subiyanto, Emanuel Ario Bimo)
45. **Performance analysis of Reverse and Frugal Innovations in Nigeria A Case Study of IVM automobile company** (Bridget Chipanje, Dong Ying, Lv Haiping)
46. **The Impact of Bank Behavior, Financial Literacy on Investment Decisions, Mediation of Financial Inclusion and Debt Behavior. Study on Working Capital and Investment Debtors at Regional Development Bank Yogyakarta Indonesia** (Heru Kristanto)
47. **Transformation of The Tourism Business from Competition to Collaboration** (Ni Putu Dyah Krismawintari, I Wayan Susrama, Andiena Nindya Putri, I Gusti Bagus Rai Utama)
48. **Review Study on Health and Wellness Tourism** (I Gusti Bagus Rai Utama, IWK. Teja Sukmana)
49. **Study Review On Cultural Tourism, Participation, And Community Strengthening in Tourism Development** (I Gede Agus Mertayasa, Raden Agus Sarwa Edy, Gede Nyoman Wiratanaya, I Gusti Bagus Rai Utama)
50. **Review Studies of Scope and Measurement of Tourism Activities** (I Gusti Bagus Rai Utama, Tjokorda Bagus Putra Marhaendra, Ni Luh Putu Suarmi Sri Patni)
51. **Ethical and Social Challenges in Research with Children Exposed to Forced labour, Exploitation, and Trafficking** (Patrick Agyare)
52. **The plight of China's journalism education - From the perspective of the sociology of education** (Li Hao)
53. **Political Engagement, Skill Application and Creativity in Social Advocacy** (Qin Wei)

54. **Psychosocial effects of divorce on young women who grew up in divorced families at Rustenburg, Moruleng Village** (N.F. Maforah, F.K. Matlakala, N.E. Mohlatlole)
55. **Experiences and opinions of youth towards alcohol abuse in and out of school in Oshikango, Ohangwena Region, Namibia** (B.N. Chilwalo, J.C. Makhubele, J.A. Ananias, P. Mafa, F.K. Matlakala, M.W. Hasheela, N.H. Tiberia, R.J. Freeman, S.F. Rapholo, A. Svinurai)
56. **Can contactless volunteer activities be an alternative during the COVID-19 pandemic?** (Doyeon Won, Yoonha Chun, Minsuh Savina Kim, Ian Song Kim, Amber Hyunjin Cheun, Alice Hyoeun Lee, Sean Youngjae Choi)
57. **A Comparative Study of Chinese and Myanmar Honorific Titles** (Han Nwe Swe)
58. **Nigerian Mass Media and Cultural Status Inequalities: A Study among Minority Ethnic Groups** (Ayobami Ojebode, Patience Onekutu)
59. **Historical and cultural formation, evolution and ideological direction of Russian emigration literature** (Alish Choban Aghamirzayev)
60. **Theoretical Study: The Diffusion of "Piknet" Innovation Sound Wave Attractor In Bulak District, Surabaya** (Nurul Rosana, Nuddin Harahab, Gatot Ciptadi, Andi Kurniawan)
61. **Community participation cum socio-economic development; in the 21st-century Somopho community. Kwazulu-Natal, South Africa** (Toyin Adetiba)
62. **The Role of the Pastor in Stewardship of the Church during the Covid-19 Pandemic** (Yonathan Salmon Efrayim Ngesthi, Hana Suparti, Muner Daliman, Paulus Sentot Purwoko)
63. **The Just War Doctrine: Has the Catholic Church Abandoned It?** (Henry L. Bernardo)
64. **Linguistic Semiotic Features in Interior Furnishing Design** (Yixuan Xie, Ridzuan bin Hussin)
65. **Indonesia-Germany Defense Diplomacy in Military Education Cooperation** (Rafiq Purnama; Yoedhi Swastanto, Surryanto Djoko Waluyo)

Best regards,
Technium Science
Whatsapp: +447761432201

Sulaeman Man <sulaeman@iainambon.ac.id>

Great news! Your paper was published. Do you need DOI?

1 pesan

Technium Science <office@techniumscience.com> 10 September 2021 07.06
Kepada: Technium – Office of the Publisher <office@techniumscience.com>
Bcc: sulaeman@iainambon.ac.id

Hello,

As we announced in a previous email, your article was published in Volume 23 of the Technium Social Sciences Journal, today, September 10th, 2021. We would like to congratulate you on the quality of your research.

You can find the volume here: https://techniumscience.com/index.php/socialsciences/issue/view/59

Also, as you probably know, the Technium Social Sciences Journal is affiliated with the Crossref database and you can also obtain a DOI identifier for your article. This service costs an extra 30 Euros. We have sent you a Paypal invoice, and if you want to get this DOI for your article, please send us proof of payment by email.

If you fail to pay via Paypal, we offer alternatives: Moneygram or bank transfer.

If you are not interested in obtaining the DOI identifier, please ignore the invoice received.

Regards,
Editor in chief of Technium Social Sciences Journal

Sulaeman Man <sulaeman@iainambon.ac.id>

Faktur dari Technium Social Sciences Journal (8451)

1 pesan

service@intl.paypal.com <service@intl.paypal.com>
Kepada: Ajeng Gelora Mastuti <sulaeman@iainambon.ac.id>

10 September 2021 07.06

Halo, sulaeman@iainambon.ac.id

Anda telah menerima faktur.

Technium Social Sciences Journal telah mengirim faktur kepada Anda sebesar €30,00 EUR

Jumlah minimum jatuh tempo:

Jatuh tempo resi

Lihat dan Bayar Faktur

PayPal berkomitmen untuk mencegah email penipuan. Email dari PayPal akan selalu mencantumkan nama lengkap Anda. Pelajari cara mengenali phishing

Jangan membalas email ini. Untuk menghubungi kami, klik **Bantuan & Hubungi**.

Tidak tahu mengapa Anda menerima email ini? Pelajari lebih lanjut

Hak Cipta © 1999-2021 PayPal. Hak cipta dilindungi oleh undang-undang.

PayPal Pte. Ltd. ("3PL") telah mengajukan permohonan lisensi berdasarkan Singapore Payment Services Act ("PS Act") dengan Monetary Authority of Singapore. Selama periode peralihan berdasar undang-undang ini, 3PL beroperasi berdasarkan pembebasan dari kepemilikan lisensi dan diizinkan untuk terus memberikan layanan pembayaran tertentu.

PayPal RT000238:id_ID(id-ID):1.0.0:f380596ade036

Sulaeman Man <sulaeman@iainambon.ac.id>

10.09.2021: New issue of Technium Social Sciences Journal

1 pesan

Technium Science <office@techniumscience.com> 10 September 2021 06.53
Kepada: Technium Science <tssj@techniumscience.com>

Call for papers
Invitation to publish in the next issue of Technium Social Sciences Journal / October 2021

- **Submission deadline:** 10th of October, 2021
- **For Social Sciences, please submit here:** https://techniumscience.com/index.php/socialsciences/about/submissions
- **Publication fee:** 100 Euro (without DOI) or 130 Euro (DOI Included) + Certificate of Publication
- **Google Scholar H-Index:** 9.00

We would like to announce that a number of the Technium Social Sciences Journal has been published. You can access it here - https://doi.org/10.47577/tssj.v23i1
Technium Science Inc. invites you to publish your valuable research in our two journals, indexed in the most important research databases, such as: Google Scholar, CrossRef, DOAJ, Ulrich's, Ebsco, Index Copernicus, WorldCat, Stanford Libraies, Directory of Open Access Scholarly Resources, Directory of Research Journals Indexing, RePEc, Hein Online, Econpapers, Ideas, Journal Factor, Scipio, J-Gate, Scientific Indexing Services, Elektronische Zeitschriftenbibliothek etc.

Technium Social Sciences Journal vol. 23/2020 - September, 2021
Table of contents

1. **The impact of illegal mining on public health: A case study in kenyasi, the Ahafo region of Ghana** (Ebenezer Owusu Mensah, Edward Delali Darku)
2. **Social competence for students with learning disabilities in English** (Mohamad Ahmad Saleem Khasawneh)
3. **How successful is the Higher Institute of Communications and Navigation, Kuwait, in reducing dependence on expatriates** (Salah Al-Ali)
4. **How Successful is Field Training Program offered by the Public Authority for Applied Education and Training, PAAE&T, Kuwait, in Reducing Dependence on Expatriates?** (Salah Al-Ali)
5. **Nutrition in mental and physical health** (Aggeliki Zavitsanou, Athanasios Drigas)
6. **How successful is the Industrial Institutes, Kuwait, in reducing dependence on expatriates?** (Salah Al-Ali)
7. **The Review of Learner's Autonomy towards Learning English as a Foreign Language among College Students in China** (Hui Zhang)
8. **Code – Switching of the Novice Teachers in Filipino** (Ma. Beatriz H. Lazarte)
9. **School dropout in Latin America as a social conflict** (Carrasco Moreno Angel Saturnino)
10. **Analysis Of The Effect Of Knowledge On Entrepreneurship Readiness Using Random Forest Classification Machine Learning** (Ariyono Setiawan)
11. **Application and Development of Big Data in Chinese Business Education** (Zhaowen Yang)
12. **Measuring the Effectiveness of Environmental Education Programmes in Promoting Sustainable Living in Secondary Schools** (Msawenkosi Sandile Mbokazi, Rachel Gugu Mkhasibe, Chinaza Uleanya)
13. **Previous Studies on The Impact of Online Education in EFL and ESL contexts** (Ali Hashemi)
14. **ICT in special education** (Irene Chaidi, Athanasios Drigas, Charalampos Karagiannidis)
15. **Preparedness and challenges of the new normal: perspectives of Filipino students in virtual learning** (Venus A. Vitales, Karen Jann M. Aquino, Emily F. De Leon, Paz P. Lacap, Shiela S. Maranan, Jamaica J. Duldulao)
16. **Use of comics for teaching Medical English Purpose** (Vladimir Román Gutierrez Huancayo)
17. **The Effects of Using Predict-Observe-Explain Strategy Assisted by Conceptual Change Text towards the Conceptual Mastery of Prospective Primary School Teachers on the Matter and its Changes** (Anasufi Banawi, Sulaeman Sulaeman, Wahyu Sopandi, Asep Kadarohman, Muhammad Solehuddin, M. Ridwan)
18. **The Effect of Online Learning on The Academic Achievement Among Students of Jordanian Private Universities in Light of The Covid-19 Pandemic, Based on The Variables of Comprehension and Analysis from The Perspective of Faculty Member** (Ibrahim Ali Al-Bahar, Rawan Fayyad Flouh, Rawan Al-Sulaihat)
19. **How Successful is the Management of Technical and Vocational Institutions, Kuwait, in Reducing Dependence on Expatriates?** (Salah Al-Ali)
20. **The Relationship of Curriculum, Teaching Methods, Assessment Methods, and School and Home Environment with Learning Difficulties in English Language from the Students' Perspectives** (Mohamad

Ahmad Saleem Khasawneh)

21. **Adaptation in the E-learning systems** (Norah Dhafer Alqahtani)
22. **Participatory development communication as a pattern of community empowerment (Study on the Radio of the An-Nur Malang Islamic Dakwah Community)** (Fina Maysaroh Nur Maulidiana, Anang Sujoko, Bambang Dwi Prasetyo)
23. **Texting and Making Calls Whilst Driving: Can Hand-Free Car Kits and Smartphones Speaker Tones Come to the Rescue of Ghanaian Drivers?** (Acheampong Owusu, Daha Tijjani Abdurrahaman, Akeem Soladoye Bakare, Ivy Hawah Taana)
24. **Islamic Branding Strategy Through Audience's Reception** (Rahmania Santoso, Bambang Dwi Prasetyo, Desi Dwi Prianti)
25. **Changing the manner of electing the President of the Republic of Kosovo** (Driola Susuri, Kadri Kryeziu)
26. **The concept of legal protection of children as a narcotics courier** (Martini, Made Warka, Otto Yudianto)
27. **Damage compensation for innocent defendants and Convicts in Iran and the Canadian legal system** (Dr Khanjani, Atoosa Bahadori)
28. **Validity of notary deed based on incorrect documentation data** (David Hardjo, Slamet Suhartono, Endang Prasetyawati, Otto Yudianto)
29. **The Corporate Rescue for Companies during the COVID-19 Pandemic in Indonesia: Prospects for the Concept of Deeds of Arrangement and Administration Order** (F. Yudhi Priyo Amboro)
30. **The effect of sustainability management practice, enterprise risk management, and business strategies on integrated sustainability performance with intellectual capital as a moderating variable** (Hesty Erviani Zulaecha, Yuswar Z. Basri, Yvonne Augustine, Susi Dwi Mulyani)
31. **Supernationalism. Theory of integration** (Nijazi Halili)
32. **Assessing Business Sustainability Level: The Case of BIOMASS Company** (Zahraa Berro)
33. **Islamic financial development, institutional environment and economic growth** (Boubaker Ahlem, Fatma Mrad, Zouhaier Hadhek, Fedya Telmoudi)
34. **Identifying the relationship between self-esteem and satisfaction in a couple** (Mariana Floricica Calin, Mihaela Luminita Sandu, Anca Sabina Miu)
35. **Alcohol Scale, Internet Addiction Scale, E-Victim Scale and E-Bullying Scale in Cigarette Addicted University Students** (Ebru Çetin, Emrah Emiral, Nergis Cantürk, Rukiye Dağalp)
36. **The importance of breastfeeding on the development of the mother-child relationship from an emotional point of view** (Mariana Floricica Calin, Mihaela Luminita Sandu, Verginia Roxana Neagu)
37. **Socio-Cultural Factors Affecting the Performance of Women Entrepreneurs in Adaklu Waya in the Volta Region of Ghana** (Richard Senna, Dela Eyaakor Enuameh Agbolosoo)
38. **Security management of national park security in the border of Indonesia - Malaysia** (Edy Saptono, Ribka Keiza, Joni Wijayanto)
39. **Determination of Base and Non Base Sector of Livestock Commodity Development in Southeast Sulawesi Province, Indonesia** (Natsir Sandiah, Achmad Selamet Aku, La Ode Arsad Sani, La Ode Nafiu, La Ode Muh. Munadi)
40. **Building Green Hotel Image Through Employee's Green Behaviour in Five Star Hotel in Bali** (I Ketut Astawa, I Ketut Budarma, Cokorda Istri Sri Widhari, Anak Agung Putri Suardani)
41. **The from farm to cup speciality coffee trend in Thailand and Vietnam. A major assumption about shortening supply chains disproven?** (Mark Azavedo)
42. **Strengthening the Icon Management of Kampung Kopi Village in Malang of Indonesia by Improving the Quality of Production and Marketing for Farmers** (Agung Winarno, Yuli Agustina, Bagus Shandy Narmaditya, Wiwik Wahyuni)
43. **Underpricing in Indonesia non financial companies** (Nisak Nur Fadillah, Yuyun Isbanah)
44. **Defense sector human resources management as the forefront in Corona Virus Disease (Covid-19) pandemic response** (I Dewa Ketut Kerta Widana -, Adi Subiyanto, Emanuel Ario Bimo)
45. **Performance analysis of Reverse and Frugal Innovations in Nigeria A Case Study of IVM automobile company** (Bridget Chipanje, Dong Ying, Lv Haiping)
46. **The Impact of Bank Behavior, Financial Literacy on Investment Decisions, Mediation of Financial Inclusion and Debt Behavior. Study on Working Capital and Investment Debtors at Regional Development Bank Yogyakarta Indonesia** (Heru Kristanto)
47. **Transformation of The Tourism Business from Competition to Collaboration** (Ni Putu Dyah Krismawintari, I Wayan Susrama, Andiena Nindya Putri, I Gusti Bagus Rai Utama)
48. **Review Study on Health and Wellness Tourism** (I Gusti Bagus Rai Utama, IWK. Teja Sukmana)
49. **Study Review On Cultural Tourism, Participation, And Community Strengthening in Tourism Development** (I Gede Agus Mertayasa, Raden Agus Sarwa Edy, Gede Nyoman Wiratanaya, I Gusti Bagus Rai Utama)
50. **Review Studies of Scope and Measurement of Tourism Activities** (I Gusti Bagus Rai Utama, Tjokorda Bagus Putra Marhaendra, Ni Luh Putu Suarmi Sri Patni)
51. **Ethical and Social Challenges in Research with Children Exposed to Forced labour, Exploitation, and Trafficking** (Patrick Agyare)
52. **The plight of China's journalism education - From the perspective of the sociology of education** (Li Hao)
53. **Political Engagement, Skill Application and Creativity in Social Advocacy** (Qin Wei)

54. **Psychosocial effects of divorce on young women who grew up in divorced families at Rustenburg, Moruleng Village** (N.F. Maforah, F.K. Matlakala, N.E. Mohlatlole)
55. **Experiences and opinions of youth towards alcohol abuse in and out of school in Oshikango, Ohangwena Region, Namibia** (B.N. Chilwalo, J.C. Makhubele, J.A. Ananias, P. Mafa, F.K. Matlakala, M.W. Hasheela, N.H. Tiberia, R.J. Freeman, S.F. Rapholo, A. Svinurai)
56. **Can contactless volunteer activities be an alternative during the COVID-19 pandemic?** (Doyeon Won, Yoonha Chun, Minsuh Savina Kim, Ian Song Kim, Amber Hyunjin Cheun, Alice Hyoeun Lee, Sean Youngjae Choi)
57. **A Comparative Study of Chinese and Myanmar Honorific Titles** (Han Nwe Swe)
58. **Nigerian Mass Media and Cultural Status Inequalities: A Study among Minority Ethnic Groups** (Ayobami Ojebode, Patience Onekutu)
59. **Historical and cultural formation, evolution and ideological direction of Russian emigration literature** (Alish Choban Aghamirzayev)
60. **Theoretical Study: The Diffusion of "Piknet" Innovation Sound Wave Attractor In Bulak District, Surabaya** (Nurul Rosana, Nuddin Harahab, Gatot Ciptadi, Andi Kurniawan)
61. **Community participation cum socio-economic development; in the 21st-century Somopho community. Kwazulu-Natal, South Africa** (Toyin Adetiba)
62. **The Role of the Pastor in Stewardship of the Church during the Covid-19 Pandemic** (Yonathan Salmon Efrayim Ngesthi, Hana Suparti, Muner Daliman, Paulus Sentot Purwoko)
63. **The Just War Doctrine: Has the Catholic Church Abandoned It?** (Henry L. Bernardo)
64. **Linguistic Semiotic Features in Interior Furnishing Design** (Yixuan Xie, Ridzuan bin Hussin)
65. **Indonesia-Germany Defense Diplomacy in Military Education Cooperation** (Rafiq Purnama; Yoedhi Swastanto, Surryanto Djoko Waluyo)

Best regards,
Technium Science
Whatsapp: +447761432201

--
You received this message because you are subscribed to the Google Groups "Technium Science" group.
To unsubscribe from this group and stop receiving emails from it, send an email to tssj+unsubscribe@techniumscience.com.

FAKTUR

Lunas

Nomor Faktur: 8348
Tanggal Faktur: 25 Agt 2021
Tanggal jatuh tempo: 25 Agt 2021

Technium Social Sciences Journal

http://www.techniumscience.com

Jumlah jatuh tempo:
€0,00

Pindai. Bayar. Mulai

Tagih ke:

sulaeman@iainambon.ac.id

Uraian	Kuantitas	Harga	Jumlah
Publication Fee - Technium Social Sciences Journal (ISSN: 2668-7798) The Effects of Using Predict-Observe-Explain Strategy Assisted by Conceptual Change Text towards the Conceptual Mastery of Prospective Primary School Teachers on the Matter and its Changes	1	€100,00	€100,00

Subtotal	€100,00
Diskon (€0,00)	€0,00
Total	€100,00
Jumlah yang dibayar	-€100,00
Jumlah jatuh tempo	**€0,00 EUR**

Catatan

The Effects of Using Predict-Observe-Explain Strategy Assisted by Conceptual Change Text towards the Conceptual Mastery of Prospective Primary School Teachers on the Matter and its Changes

TECHNIUM
SOCIAL SCIENCES JOURNAL

Vol. 23, 2021

A new decade for social changes

www.techniumscience.com

ISSN 2668-7798

TECHNIUM SOCIAL SCIENCES JOURNAL

Technium Social Sciences Journal
Vol. 23, 226-241, September, 2021
ISSN: 2668-7798
www.techniumscience.com

The Effects of Using Predict-Observe-Explain Strategy Assisted by Conceptual Change Text towards the Conceptual Mastery of Prospective Primary School Teachers on the Matter and its Changes

Anasufi Banawi[1], Sulaeman Sulaeman[2], Wahyu Sopandi[3], Asep Kadarohman[4], Muhammad Solehuddin[5], M. Ridwan[6]

[1]Madrasah Ibtidaiyah Teacher Education Study Program, Institut Agama Islam Negeri Ambon, Ambon, Indonesia, [2 6]State Islamic Institute Ambon, Indonesia, [3 5]Elementary Education Study Program and Chemistry Education Study Program, Universitas Pendidikan Indonesia, Bandung, Indonesia, [4]Chemistry Study Program, Universitas Pendidikan Indonesia, Bandung, Indonesia

a.banawi@iainambon.ac.id[1], sulaeman@iainambon.ac.id[2], wsopandi@upi.edu[3], kadar@upi.edu[4], msolehuddin@upi.edu[5], ridwaniain1968@gmail.com[6]

Abstract. This research aims at determining the differences in the increase of conceptual mastery of the matter and its changes between students who study with the Predict-Observe-Explain Strategy assisted by Conceptual Change Text (POE-ACCT) and students who study with the Expository Strategy. This study involved 63 students who were divided into 2 groups, a control group (33 students) and an experiment (30 students). The research instrument is in the form of a five-tier diagnostic test. The instrument has gone through an expert and empirical validation process. The data obtained were analyzed with descriptive and inferential statistics. The results showed a significant increase in the conceptual mastery of the experimental group (*N-gain* = 0.26) and in the control group (*N-gain* = 0.06), which were significant ($p < .05$). The POE-ACCT strategy was found more beneficial compared to the Expository Strategy in increasing the conceptual mastery of the prospective elementary school teachers. Although the POE-ACCT strategy provided an increase in the conceptual mastery, an increase of 0.26 was categorized in a low category and this indicated the need for improvement of the strategy.

Keywords. POE strategy assisted by text of conceptual change, Conceptual mastery, Matter and its changes

Introduction

One of the very important basic concepts and a prerequisite for understanding other science concepts at the next level is the topic of matter and its changes, which are solids, liquids, and gases, and the changes caused by heat and other forces (Howe & Jones, 1993; Johnson, 1998; Snir, Smith & Raz, 2003; Merritt, Shwartz & Kracjik, 2007; Treagust et al., 2010; Ozmen, 2011; Ozmen, 2013; Sopandi, Latip & Sujana, 2017; Banawi et al., 2017). An understanding of objects, substances, and particles is a prerequisite concept for learning science (chemistry) at a higher school level.

However, some research results indicated that teachers' understanding of the basic science concepts to be taught is not optimal and is classified in a sufficient category (Jaelani, 2015). Conceptual understanding of elementary school teacher candidates on the topic of matter and its changes has not been optimal, there are still many who experience misconceptions and do not understand the topic (Sopandi, Latip & Sujana, 2017). The understanding of the students who will be prospective teachers about the presence of particles (solid, liquid, and gas) is good enough. However, most of them do not understand the existence of freeform particles.

At the macroscopic level, most of them understand the concepts of expansion, evaporate, condense, melt, and freeze, but they do not understand the concepts of sublimation and crystallization. In fact, the subjects of the above research have studied the topic of matter and its changes in the previous level (elementary, junior high, and high school) as well as in the subjects of Natural Sciences (Basic Physics, Basic Chemistry, Basic Concepts of Natural Sciences, and Elementary School Science Learning) (Banawi et al., 2017). A recent study showed that prospective elementary school teachers did not develop a strong foundation regarding chemistry during their schooling. Therefore, science teaching methods need to be handled more effectively for prospective teachers in primary schools (Harmala-Brasken, Hemmi & Kurten, 2020).

Solutions for the weaknesses of teachers and prospective teachers need to be sought. It can be done with suitable learning models applied in elementary schools. Provision of lectures with a suitable model applied in elementary schools will be a provision for prospective teachers to teach it to their students later. One strategy that can be tried is the Predict-Observe-Explain (POE) strategy. This strategy is known to improve students' mastery of concepts on certain topics (Cos et al., 2021; Cinici & Demir, 2013; Kibirige, Osodo & Tlala, 2014). This strategy is also seen to increase student understanding (Liew & Treagust, 2004; Adebayo & Olufunke, 2015; Teo, Yan & Goh, 2016; Sreerekha, Arun & Swapna, 2016) and can improve misconceptions of teacher and teacher candidates (Ipek et al., 2010). A laboratory activity with Predict-Observe-Explain (POE) can improve and enhance the understanding and attitudes of prospective teachers compared to traditional learning (Vadapally, 2014; Hilario, 2015; Gernale, Aranes & Duad, 2015; Acarsesen & Mutlu, 2016). This strategy also has limitations, including: (1) for elementary school students, writing answers can be a barrier to communicating the idea, students with limited abilities may have difficulty explaining the reason for their predictions; (2) not suitable for all topics, for example, topics that are not "hands-on"; (3) some demonstrations must be chosen selectively and not repeatedly; and (4) educators need to be careful in making predictive questions (Joyee, 2006).

In order for cognitive conflict to occur based on constructivist understanding as an effort to recognize and minimize the occurrence of misconceptions, the Predict-Observe-Explain (POE) Strategy would be an alternative solution. Even so, the use of POE Strategy still leaves a misconception in students (Theodorakakos, Hatzikraniotis & Psillos, 2010). In addition, this strategy requires a long time for cognitive conflict and concept change. Thus, more efforts related to the concept change activities are needed.

One strategy approach to conceptual change is Conceptual Change Text (CCT). It is a text containing theories to convince students that they have misconceptions related to scientific facts (Hynd, 2001; Ozkan & Selcuk, 2015). It can also identify and analyze misconceptions and is designed based on the process of concept change Kim & Van Duensen (1998), as cited in (Setyaningrum, 2016). In the Conceptual Change Text, students are asked to provide predictions of a situation, a description of misconceptions, and a scientific explanation of the situation presented (Chambers & Andre, 1997; Balci, 2006; Sahin & Cepni, 2011; Aydin, 2012; Özmen & Aseriazar, 2017). In addition, this text determines students' misconceptions, explains their

Technium Social Sciences Journal
Vol. 23, 226-241, September, 2021
ISSN: 2668-7798
www.techniumscience.com

reasons, and explains why they are wrong by using concrete examples (Guzzetti, et al., 1997; Ozkan & Selcuk, 2015). The presentation of a misunderstanding in reading material is important to be conducted because it can help the teacher in planning a better learning process (Keles & Demirel, 2010).

Conceptual Change Text or CCT can be integrated with POE as it starts with prediction questions, students can predict answers with the initial knowledge they already have. To observe scientific explanations related to this case, students can undertake activity to express new knowledge that is reasonable and clear. After that, students can explain scientific answers related to these questions (Ültay, Durukan & Ültay, 2014).

However, the use of POE strategy assisted by Conceptual Change Text (POE-ACCT) to master the topic of matter and its changes has never been raised. Besides, investigations regarding the use of POE strategy assisted by Conceptual Change Text on the understanding of prospective elementary school teachers at the macroscopic, submicroscopic (verbal and visual), and symbolic levels, and the direction of its effectiveness have not been carried out. Thus, this research used POE strategy assisted by Conceptual Change Text with a learning tool for the topic of matter and its changes that had been developed previously.

Referring to the background above, the proposed research question is "Is there a difference in increasing understanding of the concept of matter and its changes between students who study with the POE Strategy assisted by Conceptual Change Text (POE-ACCT) and students who study with the Expository Strategy? This research is expected to enrich the data of conceptual mastery and strategies that are used so that it becomes an inspiration for improvement and further research.

Method

This research employed quasi-experimental methods. The design used was a non-equivalent pretest-posttest control group design, which aims at comparing two different treatments to the research subjects. The difference between the two measurements is considered to be caused by the treatment. Quasi-experimental design (McMillan & Schumacher, 2001; Cohen, Manion & Morrison, 2007; Sugiyono, 2013; Creswell, 2016; Ridwan et.al., 2020; Malawat et al., 2021; Muhammad et al., 2021) conducted in this research is presented in Figure 1 below:

Experimental Group (A)	:	O_1	————	χ_1	————	O_2
Control Group (B)	:	O_3	————	χ_2	————	O_4

Figure 1. Quasi-Experimental Design

Description:

χ_1	:	Treatment with POE-ACCT Strategy
χ_2	:	Treatment with Expository Strategy
O_1	:	Pre-test of POE-ACCT group
O_2	:	Post-test of POE-ACCT group
O_3	:	Pre-test of Expository group
O_4	:	Post-test of Expository group
-------	:	Random class

Technium Social Sciences Journal
Vol. 23, 226-241, September, 2021
ISSN: 2668-7798
www.techniumscience.com

The two classes were given a pre-test, a lecture on the topic of matter and its changes, and a final test (post-test). The initial test and final test are the same.

Instrument

This research used a five-tier diagnostic test instrument in the form of multiple-choices (reliability test, r = 0.774) and non-test instruments in the form of a questionnaire, interview guidelines, and observation sheets. The instrument has been validated by an expert and has been going through an empirical validation process. Expert validation of the test instrument was carried out by three experts (Sugiyono, 2013); a chemistry education expert, a chemist, and a basic education expert. Based on the validity score criteria (Akbar, 2013 in Fatmawati, 2016), in general, the validated instruments belong to the valid category. However, some of the errors contained in the device were corrected. Of the 18 numbers with 81 test instruments, there was one item (Number 3 with 4 items) and 9 other items that were not used, while the other questions were corrected before use so that the questions used were 17 questions with 68 items (obtained from 17 times 4). The order of the number of questions also had an adjustment.

Research Subject

The subjects were prospective elementary school teachers in one of the Primary School Teacher Education Study Program (PGSD) in Maluku in 2017/2018 Academic Year consisting of two classes. Based on randomization, incidentally, Class A was selected as the experimental group and Class B as the control group with 33 (28 female, 5 male) and 30 (24 female, 6 male) students respectively. They come from high school graduates in natural sciences, social sciences, languages, and vocational high schools and they have attended six semesters in their study programs. Lectures that have been taken include the Basic Concepts of Natural Sciences, Elementary School Science Learning, and Elementary School Science Practicum.

Data Analysis

All answers from 63 subjects were typed in the MS-Excel program, and grouped and scored according to the combination of the Five-tier Diagnostic Test answers (Banawi, et al., 2019). To calculate the magnitude of the increase of students' conceptual understanding based on their pre-test and post-test scores, a normalized gain (N-gain) that was developed by Meltzer (2002) was used. The N-gain calculation results were classified into High ($g \geq 0.70$); Moderate ($0.30 \leq g < 0.70$); and Low ($g < 0.30$) classification. The measurements were based on scores obtained by students based on test results, questionnaires, observations, and interviews. The quantitative data were analyzed with descriptive and inferential statistics. Inferential statistics include the average similarity test (normality and homogeneity) and the average difference test processed with the help of a computer using the SPSS Program 20.0 for Windows (Ghozali, 2006, p. 246).

Results

Some differences in an increase of conceptual understanding of the topic of matter and its changes in the experimental and control groups are presented in the following Tables.

Table 1. Pretest, Posttest, and N-gain Scores of the Students

Student	Experimental Group			Student	Control Group		
	Pretest	*Posttest*	*N-gain*		*Pretest*	*Posttest*	*N-gain*
E-01	8.82	29.41	0.23	C-01	51.47	60.29	0.18
E-02	45.59	73.53	0.51	C-02	40.44	51.47	0.19

TECHNIUM SOCIAL SCIENCES JOURNAL

Technium Social Sciences Journal
Vol. 23, 226-241, September, 2021
ISSN: 2668-7798
www.techniumscience.com

E-03	31.62	71.32	0.58	C-03	28.68	34.56	0.08
E-04	0.74	58.09	0.58	C-04	22.79	23.53	0.01
E-05	27.21	72.79	0.63	C-05	20.59	19.12	-0.02
E-06	18.38	11.76	-0.08	C-06	30.88	33.82	0.04
E-07	47.06	62.50	0.29	C-07	20.59	22.06	0.02
E-08	33.82	42.65	0.13	C-08	11.03	4.41	-0.07
E-09	18.38	33.82	0.19	C-09	38.24	47.79	0.15
E-10	60.29	93.38	0.83	C-10	18.38	19.12	0.01
E-11	39.71	32.35	-0.12	C-11	74.26	86.76	0.49
E-12	19.85	20.59	0.01	C-12	17.65	60.29	0.52
E-13	25.00	51.47	0.35	C-13	36.03	46.32	0.16
E-14	12.50	50.00	0.43	C-14	0.74	7.35	0.07
E-15	27.21	20.59	-0.09	C-15	-0.74	7.35	0.08
E-16	80.15	86.76	0.33	C-16	31.62	38.24	0.10
E-17	-6.62	-5.88	0.01	C-17	-1.47	-3.68	-0.02
E-18	25.00	2.94	-0.29	C-18	33.82	29.41	-0.07
E-19	18.38	66.91	0.59	C-19	5.15	31.62	0.28
E-20	11.76	45.59	0.38	C-20	20.59	13.97	-0.08
E-21	25.00	44.85	0.26	C-21	16.18	25.00	0.11
E-22	6.62	27.21	0.22	C-22	30.88	22.79	-0.12
E-23	44.12	88.97	0.80	C-23	-3.68	13.97	0.17
E-24	22.79	20.59	-0.03	C-24	9.56	22.79	0.15
E-25	-5.88	21.32	0.26	C-25	2.94	-8.82	-0.12
E-26	7.35	16.18	0.10	C-26	16.91	0.74	-0.19
E-27	19.12	64.71	0.56	C-27	11.76	4.41	-0.08
E-28	24.26	79.41	0.73	C-28	27.21	27.21	0.00
E-29	34.56	25.00	-0.15	C-29	22.06	38.24	0.21
E-30	27.94	33.82	0.08	C-30	49.26	25.00	-0.48
E-31	28.68	21.32	-0.10				
E-32	2.21	48.53	0.47				
E-33	13.97	9.56	-0.05				
Total	795.59	1422.06	8.65	Total	683.82	805.15	1.74
Average	24.11	43.09	0.26	Average	22.79	26.84	0.06
Std.Dev.	18.22	26.59	0.30	Std. Dev.	17.51	21.03	0.19

Table 1 above presents that the mean pretest scores of the experimental and control groups were not much different (only 1.32 points difference).

Table 2. Summary of Statistical Test Results for Final Pre-test, Post-test, and N-gain of Experimental and Control Groups

Test	Group	Average Score	Average Similarity Test				Conclusion	Average Difference Test		p(sig)
			Normality Test *)		Homogeneity Test**)			t-test		
			Stat Test	p	Stat Test	p		Stat Test	p	
Pretest	Experimental	24.11	0.128	0.184	0.001	0.971	Normal and Homogeneous	0.291	0.772/2	Not Significantly Different [a)] p = 0.386
	Control	22.79	0.100	0.200						
Posttest	Experimental	43.09	0.121	0.200	3.631	0.061	Normal and	2.673	0.010/2	Significantly

TECHNIUM SOCIAL SCIENCES JOURNAL

Technium Social Sciences Journal
Vol. 23, 226-241, September, 2021
ISSN: 2668-7798
www.techniumscience.com

	Control	26.84	0.101	0.200			Homogeneous			Different [a)] p = 0.005
N-gain	Experimental	0.26	0.101	0.200	9.239	0.003	Normal and Not	3.218	0.002/2	Significantly
	Control	0.06	0.115	0.200			Homogeneous			Different [a)] p = 0.001

Description: [*)] Kolmogorov-Smirnov (Normal: $p > .05$)
[**)] Levene Statistics (Homogenous: $p > .05$)
[a)] t-test ($p/2 > .025$), H_0 accepted

Table 2 above presents that the initial conceptual understanding of the experimental and control group students on the topic of matter and its changes is the same or not significantly different ($p > .05$). After conducting lectures in the experimental group, there was an increase in conceptual understanding. However, the increase is still in the low category (0.26). The N-gain of the experimental group was 0.20 points greater than the N-gain of the control group.

The final conceptual understanding of the experimental and control group on the topic of matter and its changes was significantly different ($p = .005$). The increase in conceptual understanding (N-gain) of the experimental group students was significantly different ($p < .05$) with the increase in conceptual understanding of control group students. This means that the POE strategy assisted by Conceptual Change Text (POE-ACCT) can improve the conceptual understanding of elementary school teacher candidates related to the topic of matter and its changes.

Table 3. *Summary of Statistical Test Results of Average Pre-test, Post-test, and N-gain Scores on the Aspect Level of Conceptual Understanding*

Level Score	Group	Average Score	Average Similarity Test: Normality Test*) Stat Test	Normality Test*) P	Homogeneity Test **) Stat Test	Homogeneity Test **) P	Conclusion	Average Difference Test Stat Test	Average Difference Test P	Conclusion p(sig)
Macroscopic										
Pretest	Experimental	59.00	0.170	0.016	0.537	0.466	Abnormal and Homogeneous	0.0578	0.0578	Not Significantly Different[b)], p = 0.0578
	Control	58.04	0.136	0.163						
Posttest	Experimental	66.49	0.155	0.043	0.030	0.863	Abnormal and Homogeneous	0.068	0.068	Not Significantly Different[b)], p = 0.068
	Control	58.82	0.096	0.200						
N-gain	Experimental	**0.14**	0.217	0.000	0.054	0.817	Abnormal and Homogeneous	0.081	0.081	Not Significantly
	Control	**-0.01**	0.112	0.200						

										Different[b], p = 0.081
Verbal Submicroscopic										
Pretest	Experimental	45.81	0.168	0.019	0.461	0.500	Abnormal and Homogeneous	0.332	0.332	Not Significantly Different[b], p = 0.332
	Control	48.63	0.135	0.169						
Posttest	Experimental	60.61	0.146	0.072	1.529	0.221	Normal and Homogeneous	2.533	0.014/2	Significantly Different[a], p = 0.007
	Control	50.20	0.126	0.200						
N-gain	Experimental	**0.26**	0.087	0.200	0.007	0.934	Abnormal and Homogeneous	0.001	0.001	Significantly Different[b], p = 0.001
	Control	**-0.06**	0.178	0.016						
Visual Submicroscopic										
Pretest	Experimental	39.39	0.160	0.032	0.325	0.570	Abnormal and Homogeneous	0.263	0.263	Not Significantly Different[b], p = 0.263
	Control	48.63	0.173	0.023						
Posttest	Experimental	58.47	0.159	0.033	3.591	0.063	Abnormal and Homogeneous	0.141	0.141	Not Significantly Different[b], p = 0.141
	Control	47.45	0.125	0.200						
N-gain	Experimental	**0.33**	0.106	0.200	6.082	0.016	Normal and Homogeneous	3.008	0.004/2	Significantly Different[a], p = 0.002
	Control	**0.10**	0.159	0.051						
Symbolic										
Pretest	Experimental	42.25	0.121	0.200	0.006	0.941	Abnormal and Homogeneous	0.454	0.454	Not Significantly Different[b], p = 0.454
	Control	39.41	0.163	0.040						
Posttest	Experimental	58.29	0.140	0.099	0.427	0.516	Normal and	2.578	0.012/2	Significantly

Technium Social Sciences Journal
Vol. 23, 226-241, September, 2021
ISSN: 2668-7798
www.techniumscience.com

	Control	43.33	0.142	0.127			Homogeneous			Different[a], p = 0.006
N-gain	Experimental	**0.27**	0.108	0.200	2.604	0.112	Normal and Homogeneous	2.344	0.022/2	Significantly Different[a], p = 0.011
	Control	**0.06**	0.079	0.200						

Description: *) Kolmogorov-Smirnov (Normal: $p > .05$)
**)Levene Statistics (Homogenous: $p > .05$)
a) t-test ($p/2 > .025$), H_0 accepted
b) Mann-Whitney Test ($p > .05$), H_0 accepted

From Table 3, it appeared that the increase of students' understanding of the verbal submicroscopic, visual submicroscopic, and symbolic level from the experimental and control groups was significantly different (each *p-value* < .05). While the understanding of the macroscopic level was the same or not significantly different ($p > .05$). This means that in general, the POE-ACCT Strategy can improve the understanding level of prospective elementary school teachers regarding the topic of matter and its changes.

The percentage description of the increase in the average score of each level of understanding of the experimental and control groups is presented in Figure 2. From the figure, it appeared that the increase in the average score of each level of understanding of the experimental group is higher compared to the control group.

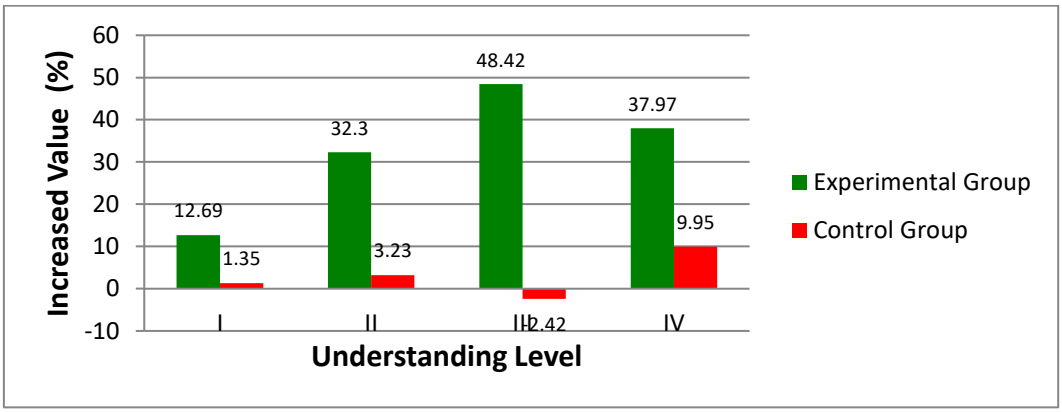


Figure 2**.** Percentage of Increase in Average Score for Each Understanding Level

To see whether there are significant differences in scores between groups and levels of understanding, the Anova test was used. Anova test is used to measure differences between groups to determine whether there are significant differences or not (Wahyuddin, 2015). In the case of metric dependent variables and two or three categorical independent variables, Two-ways Anova (Ghozali, 2006: 58) is used. Statistical test results are presented in Table 4 below.

Technium Social Sciences Journal
Vol. 23, 226-241, September, 2021
ISSN: 2668-7798
www.techniumscience.com

Table 4. Summary of Statistical Test Results of Post-test Score with Anova

Source	Type III Sum of Squares	F	Sig.	Conclusion *p(sig)*
Level	5006.975	4.250	0.006	Significantly Different[c)]
Group	7622.024	19.410	0.000	Significantly Different[c)]
Level * Group	426.264	0.362	0.781	Not Significantly Different[c)]

Description: [c)] Two-ways Anova ($p > .05$), H_0 accepted

Table 4 above show that (1) the mean scores of the four levels (Macroscopic, Verbal Submicroscopic, Visual Submicroscopic, and Symbolic) are significantly different ($p < .05$), (2) the mean scores of the two groups (Experimental and Control) are significantly different ($p < .05$), and (3) there is no interaction between Level and Group (F *count* = 0.362; $p > .05$). This means that the lecture of matter and its changes through the POE-ACCT strategy for prospective elementary school teachers was superior compared to lectures with the Expository Strategy in improving conceptual understanding of elementary school teacher candidates.

Table 5. Percentage of Change in Concept Patterns of Elementary School Teacher Candidates (E-C)

Results	***Post-test***											
Category	Experimental Group						Control Group					
Pre-test	PK	TPSK	MSK	TPK	M	E	PK	TPSK	MSK	TPK	M	E
PK	6.06*	1.78	0.71	0.00	0.36	0.00	2.75*	3.14	0.20	0.00	0.20	0.00
TPSK	14.44	31.19*	8.02	0.00	1.43	0.71	6.47	37.84*	11.96	0.20	4.51	0.98
MSK	4.10	8.20	3.57*	0.18	2.67	0.18	1.76	10.98	4.71*	0.00	1.57	0.98
TPK	0.18	0.36	0.00	0.00	0.18	0.00	0.00	0.59	0.00	0.00	0.00	0.20
M	1.96	3.92	0.89	0.00	1.07*	0.71	0.20	4.12	1.96	0.00	1.96*	0.59
E	0.36	4.46	1.07	0.00	0.53	0.71*	0.00	0.59	0.59	0.00	0.78	0.20*
Total	**27.10**	49.91	**14.26**	0.18	6.24	2.31	11.18	57.26	19.42	0.20	9.02	2.95

Description: PK = *Paham Konsep* (Understand the Concept); TPSK = *Tidak Paham Sebagian Konsep* (Do not Understand Some Concepts); MSK = *Miskonsepsi Sebagian Konsep* (Some Misconceptions); M = *Miskonsepsi* (Misconceptions); TPK = *Tidak Paham Konsep* (Do not Understand the Concept) and E = Error.
* No change in conception.

From Table 5 above, more than half the number of students in the experimental group (57.40%; 100% - 42.60%) experienced a change in conception. The unchanged conceptions that were found is 42.60% (PK-PK: 6.06%; TPSK-TPSK: 31.19%; MSK-MSK: 3.57%; M-M: 1.07%; E-E: 0, 71%). In total, 24 patterns of conception were found.

Discussion

The mean post-test and pre-test showed that the understanding of elementary school teacher candidates (experimental and control groups) at four levels of understanding (macroscopic, verbal submicroscopic, visual submicroscopic, and symbolic) was varied. The percentage of understanding of the symbolic level is smaller than the other three levels. The results of this research are in line with the previous research (Banawi et al., 2019)

The mean score of the experimental group was 24.11 and the control group was 22.79 (Table 1). However, there was an increase in the understanding of the experimental group that is in the low category compared to the control group (Table 2). The students that are categorized in the

low category is due to the increase in scores obtained by students is also low. The acquisition of a low final score is allegedly caused by students' lack of understanding in completing the form of test questions used and the doubt in determining the score of Confidence Rating Index (CRI) (Setyaningrum, 2016). Misunderstanding in completing the five-tier diagnostic test caused a lot of students to be included in the error category which subsequently resulted in a low final score. In addition, inaccuracies in determining CRI can impact the final score and the conception category of the students.

Learning with POE-ACCT strategy (or its variants) certainly positions students to solve problems proposed by lecturers through various stages such as predicting, conducting experiments or observing directly, and giving explanations (Nurmalasari, Jayadinata & Maulana, 2016). Thus, the role of lecturers has changed slightly and is increasingly challenging. One effort to answer this challenge is by changing the role of educators, from providers and suppliers to facilitators so that lecturers can share information and knowledge, and practice problem-solving skills with students (Mayasari et al., 2016).

Changing the role of lecturers is certainly not an easy thing. It requires knowledge, lesson planning, and adequate training. Meanwhile, students also need to adapt to lessons conducted by lecturers. Therefore, it is strongly suspected that another factor that caused the low acquisition of student scores is related to learning adaptation. Students are not yet familiar with the stages used in lectures with the POE-ACCT Strategy. Thus, lecturers need to improve the process or how to present the lecture materials. One alternative is to improve the lecture presentation process, for example, by using the Dual Modes program. Lectures with this program combine a scheduled face-to-face learning system and a self-instruction system by studying printed learning materials (Kadarohman & Nurihsan, 2008).

Self-instruction system is designed for individuals to develop a set of knowledge through cognitive restructuring, problem solving, and self-control. Through the existing process, it is expected that adaptive behavior will occur in the form of changes in individual's self-verbalization from negative to positive. It is believed that independent learning can help students' understanding of learning content (Setiawan, Solehuddin & Hafina, 2019). With the presentation of lectures using the Dual Modes program, it is expected that the effectiveness and efficiency of lectures held can increase. In the end, it can train students to control their academic performance and support the conceptual understanding of the prospective elementary school teacher candidates on the concepts being studied.

When discussing the difference in the average of post-test scores of the experimental and control groups, it was obtained that the understanding of the macroscopic level and the visual submicroscopic level of the experimental and control group students on the topic of matter and its changes were not significantly different ($p > .05$). Meanwhile, the understanding of verbal submicroscopic and symbolic levels of experimental and control group students on the topic of matter and its changes were significantly different ($p < .05$). Most students understand the phenomenon (macroscopic level) of the topic of matter and its changes but they cannot explain it well at the submicroscopic level (verbal and visual) and symbolic level (Banawi et al., 2019).

To test the significant increase of understanding in each level of understanding (Macroscopic, Verbal Submicroscopic, Visual Submicroscopic, and Symbolic) of experimental and control groups, the examination of the N-gain test scores of the two groups (Table 3) was conducted. After that, it was obtained that the understanding of the macroscopic level in both groups is the same or not significantly different ($p > .05$). These results are in line with previous studies (Sopandi, Latip & Sujana, 2017; Banawi, et al., 2017; Banawi, et al., 2018). In the experimental and control groups, the teaching patterns on the surface (listening to lectures and doing exercises) are quite imprinted. The learning experience with conventional learning

experienced by students has become the initial knowledge and initial conception of students in both groups.

Based on the results of inferential statistical tests with the Two-ways Anova (Table 4), it can be concluded that the POE-ACCT strategy is more effective than conventional lecture program (expository) in increasing the conceptual mastery of prospective elementary school teachers at the macroscopic, verbal submicroscopic, visual submicroscopic, and symbolic levels. The experimental group experienced an increase in conceptual mastery and a decrease in misconceptions compared to the control group (Perdana, Suma & Pujani, 2018).

From the pattern of changes in the conception of prospective elementary school teachers that emerged, it is known that there are still misconceptions about the topic of matter and its changes. This topic is indeed one topic or concept where most students have alternative concepts. This finding is in line with previous findings (Bilgin, et al., 2017; Sopandi, 2017; Sopandi et al., 2018). Some misconceptions on the concept (MSK) are indeed different from misconceptions (M). However, an error percentage of more than 10% of the sample (14.26%, see Table 5) can be considered a significant error Caleon & Subramaniam, 2010[a]; Caleon & Subramaniam, 2010[b]; Kaltakci-Gurel, Eryilmaz & McDermott, 2017).

The results of the descriptive analysis and statistical tests above showed that the understanding of prospective elementary school teachers before and after the use of the POE strategy assisted by Conceptual Change Text (POE-ACCT) is different. Lectures on the matter and its changes through the use of POE strategy assisted by Conceptual Change Text (POE-ACCT) for prospective elementary school teachers is superior compared to the conventional lecture program (Expository Strategy) in improving the conceptual understanding of the prospective elementary school teachers. This is in accordance with similar studies conducted by Setyaningrum and Sopandi (2015) that stated that the conceptual change text can have a better influence on students' understanding than traditional text.

The understanding of elementary school teacher candidates related to the topic of matter and its changes at the macroscopic, verbal submicroscopic, visual submicroscopic, and symbolic levels can certainly be influenced by the delivery of the learning material. Learners can easily understand the subject matter with learning methods from educators who are adapted to the material Khausar, 2014). Science lecturers should believe that learning can shape the competencies and behavior of their students according to the strategies and subject matter they provide. The results of this research can be used as diagnostic data for corrective actions in learning. The questions such as "Are the lesson planning, stages of the POE-ACCT strategy, media, and learning resources appropriate?" can improve the lecture process and the learning tools. Evaluation and reflection on the entire learning process that has been carried out is a necessity. By looking at the results of this research, educators and/or educational researchers can see this as educational research results that can be used as a starting point in the context of educational practice and/or further educational studies (Suyitno, 2009; Banawi, 2017).

Conclusions

From the results of this research, it can be concluded that the understanding of elementary student teacher candidates on the topic of matter and its changes at the macroscopic, verbal submicroscopic, visual submicroscopic, and symbolic levels before and after the use of POE strategy assisted by Conceptual Change Text (POE-ACCT) is different. The POE-ACCT strategy can improve the conceptual understanding of elementary school teacher candidates at the verbal submicroscopic, visual submicroscopic, and symbolic levels. However, the increase is still in the low category. The use of the POE-ACCT strategy has succeeded in increasing the understanding of prospective elementary school teachers to more than a quarter (27.10%) in the

'Understand the Concept' (PK) category. However, there are still many students who are categorized in the TPSK category. The percentage of misconceptions was found more in the control group, so the change in concept in the experimental group students tended to be more positive than the control group. Prospective elementary school teachers tend to change their conception according to existing scientific concepts after they learn with the POE-ACCT strategy.

The results of this research have several implications for classroom practice. Improving the lecture process and learning tools used are necessary. The lecture process improvement is directed towards what students and lecturers must do in class so that the understanding level of prospective teachers can be improved from the 'low category' to the 'high category.' The improvement of the lecture process is directed at the importance of students knowing the learning objectives undertaken and the importance of intrinsic learning motivation. While the Conceptual Change Text used needs to be improved according to the needs and ways to study it in lectures. Another implication of this research is that there is a need for further research to find out the efficient use of the Conceptual Change Text on the topic of matter and its changes in the classroom with a self-instruction system.

References

[1] Acarşeşen, B. and Mutlu, A. (2016). Predict-observe-explain tasks in chemistry laboratory: pre-service elementary teachers' understanding and attitudes. *Sakarya University Journal of Education, 6*(2), 184-208. DOI: 10.19126/suje.46187

[2] Adebayo, F. and Olufunke, B.T. (2015). Generative and predict-observe-explain instructional strategies: towards enhancing basic science practical skills of lower primary school pupils. *International Journal of Elementary Education, 4*(4), 86-92. DOI: 10.11648/j.ijeedu.20150404.12

[3] Aydin, S. (2012). Remediation of misconception about geometric optics using conceptual change text. *Journal of Education Research and Behavioural Sciences, 1*(1), 001-012. *http://journalcra.com/sites/default/files/issue-pdf/2741.pdf*

[4] Balci, C. (2006). *Conceptual Change Text Oriented Instructions to Facilitate Conceptual Change in Rate of Reaction Concepts*. (Thesis). The Graduate Shool of Natural and Applied Sciences Middle East Tecnical University. Turkey. https://etd.lib.metu.edu.tr/upload/12607815/index.pdf

[5] Banawi, A., Sopandi, W., Kadarohman, A., and Solehuddin, M. (2018). The development of a five-tier multiple–choice diagnostics tests to identify prospective primary school teacher' misconceptions about states of matter and their changes. *Proceedings International Conference on Social Science and Tecnology in Education (ICSATE 2018) Ambon-Indonesia* (hlm. 1-10). Ambon: FITK IAIN Ambon.

[6] Banawi, A., Sopandi, W., Kadarohman, A., and Solehuddin, M. (2019). Prospective primary school teachers' conception change on states of matter and their changes through predict-observe-explain strategy. *International Journal of Instruction, 12*(3), 359-374. DOI: 10.29333/iji.2019.12322a

[7] Banawi, A., Sopandi, W., Kadarohman, A., dan Solehuddin, M. (2017). Pemahaman wujud zat dan perubahannya mahasiswa calon guru dan solusi reflektif: studi pada salah satu perguruan tinggi di maluku. *Jurnal Inovasi, 11*(2), 147-156.

[8] Bilgin, A.K., Yürükel, F.N.D., and Yiğit, N. (2017). The effect of a developed react strategy on the conceptual understanding of students: "particulate nature of matter". *Journal of Turkish Science Education, 14*(2), 65-81. https://www.tused.org/index.php/tused/article/view/155

[9] Caleon, I. S., and R. Subramaniam. (2010[a]). Development and application of a three-tier diagnostic test to assess secondary students' understanding of waves. *International Journal of Science Education, 32*, 939-961. https://doi.org/10.1080/09500690902890130

[10] Caleon, I.S., Subramaniam, R. (2010[b]). Do Students Know What They Know and What They Don't Know? Using a Four-Tier Diagnostic Test to Assess the Nature of Students' Alternative Conceptions. *Res Sci Educ* 40, 313–337 (2010). https://doi.org/10.1007/s11165-009-9122-4

[11] Chambers, S.K. and Andre, T. (1997). Gender, prior knowledge, interest, and experience in electricity and conceptual change text manipulations in learning about direct current. *Journal of Research in Science Teaching*, *34*(2), 107-123. https://doi.org/10.1002/(SICI)1098-2736(199702)34:2<107::AID-TEA2>3.0.CO;2-X

[12] Cho, H. Carving out a hybrid space: a self-study of contextualizing teaching for social justice in South Korea. *Asia Pacific Educ. Rev.* (2021). https://doi.org/10.1007/s12564-021-09683-z

[13] Ayhan Cinici & Yavuz Demir (2013) Teaching through Cooperative POE Tasks: A Path to Conceptual Change, The Clearing House: A Journal of Educational Strategies, Issues and Ideas, 86:1, 1-10, https://doi.org/10.1080/00098655.2012.712557

[14] Cohen, L., Manion, L., and Morrison, K. (2007). *Research method in education*. Six edition. New York: Madison Avenue. https://uk.sagepub.com/en-gb/asi/research-methods-in-education/book229278

[15] Coştu, B., Ayas, A. & Niaz, M. (2012). Investigating the effectiveness of a POE-based teaching activity on students' understanding of condensation. *Instr Sci* 40, 47–67 (2012). https://doi.org/10.1007/s11251-011-9169-2

[16] Creswell, J.W. (2016). *Research design: pendekatan kualitatif, kuantitatif, dan mixed.* California: Thousand Oaks. https://openlibrary.telkomuniversity.ac.id/pustaka/14172/research-design-pendekatan-kualitatif-kuantitatif-dan-mixed-3-e-.html

[17] Fatmawati, A. (2016). Pengembangan perangkat pembelajaran konsep pencemaran lingkungan menggunakan model pembelajaran berdasarkan masalah untuk sma kelas x. *Edusains*, *4*(2), 94-103. https://e-journal.iain-palangkaraya.ac.id/index.php/edusains/article/view/512

[18] Gernale, J.P., Arañes, F.Q., and Duad, V. (2015). The effects of predict-observe-explain (poe) approach on students' achievement and attitudes towards science. *The Normal Lights,9*(2), 1-23. https://po.pnuresearchportal.org/ejournal/index.php/normallights/article/view/122

[19] Ghozali, I. (2006). *Aplikasi analisis multivariate dengan program spss*. Semarang: Badan Penerbit-Undip. https://books.google.co.id/books?id=JdqJAQAACAAJ

[20] Guzzetti, B. J., Williams, W. O., Skeels, S. A., and Wu, S. M. (1997). Influence of text structure on learning counterintuitive physics concepts. *Journal of Research in Science Teaching*, *34*, 701-719. Doi. 10.1002/(SICI)1098-2736(199709)34:7<701::AID-TEA3>3.0.CO;2-Q

[21] Han, J., Zhao, Y., Liu, M. *et al.* The development of college English teachers' pedagogical content knowledge (PCK): from General English to English for Academic Purposes. *Asia Pacific Educ. Rev.* (2021). https://doi.org/10.1007/s12564-021-09689-7

[22] Härmälä-Braskén, Ann-Sofi, Hemmi, K., and Kurtén, B. (2020). Misconceptions in chemistry among Finnish prospective primary school teachers – a long-term study. *International Journal of Science Education*, 1-18. https://doi.org/10.1080/09500693.2020.1765046

[23] Hilario, J.S. (2015). The use of predict-observe-explain-explore (poee) as a new teaching strategy in general chemistry-laboratory. *International Journal of Education and Research*, *3*(2), 37-48. https://www.ijern.com/journal/2015/February-2015/04.pdf

[24] Howe, A. C. and Jones, L. (1993). *Engaging children in science*. New York: Macmillan Publishing Company. https://www.amazon.com/Engaging-Children-Science-3rd-Howe/dp/0130406740

[25] Hynd, C. R. (2001). Refutational texts and the change process. *International Journal of Educational Research, 35*(7), 699-714. DOI: 10.1016/S0883-0355(02)00010-1

[26] Ipek, H.; Kala, N.; Yaman, F. &Ayas, A. (2010). Using poe strategy to investigate student teachers' understanding about the effect of substance type on solubility. *Procedia Social and Behavioral Sciences, 2*, 648-653. DOI: 10.1016/j.sbspro.2010.03.078

[27] Jaelani. (2015). Deskripsi pemahaman sains guru madrasah ibtidaiyah pada diklat teknis substantif peningkatan kompetensi metodologi pembelajaran di kankemenag kota kediri tahun 2015. *Jurnal Inovasi, 9*(3), 273-277.

[28] Johnson, P. (1998). Children's understanding of changes of state involving the gas state, part 2: evaporation and condensation below boiling point. *International Journal of Science Education, 20*(6), 695-709. https://doi.org/10.1080/0950069980200607

[29] Joyce, C. (2006). Predict, observe, explain (poe). Diakses dari https://arbs.nzcer.org.nz/predict-observe-explain-poe

[30] Kadarohman, A. dan Nurihsan, J. (2008). Program *dual modes* sebagai alternative peningkatan kualifikasi akademik guru dalam jabatan. *Makalah*. 1-14.

[31] Kaltakci-Gurel, D., Eryilmaz, A., and McDermott, L.C. (2017). Development and application of a four-tier test to assess pre-service physics teachers' misconceptions about geometrical optics. *Research in Science & Technological Education*, 1-23. https://doi.org/10.1080/ 02635143.2017.1310094

[32] Keles, E. and Demirel, P. (2010). A study towards correcting student misconceptions related to the color issue in light unit with poe technique. *Procedia Social and Behavioral Sciences, 2*, 3134–3139. https://doi.org/10.1016/j.sbspro.2010.03.477

[33] Khausar. (2014). Pengaruh penerapan metode pembelajaran guru yang bervariasi terhadap peningkatan hasil belajar pada siswa kelas xi sma negeri 1 labuhanhaji timur aceh selatan. *Jurnal Genta Mulia, 5*(2), 72-85. https://ejournal.stkipbbm.ac.id/index.php/gm/article/view/67

[34] Kibirige, I., Osodo, J., and Tlala, K.M. (2014). The effect of predict-observe-explain strategy on learners' misconceptions about dissolved salts. *Mediterranean Journal of Social Sciences, 5*(4), 300-310. DOI: 10.5901/mjss.2014.v5n4p300

[35] Liew, C. W. and Treagust, D. (2004). *The effectiveness predict – observe – explain (poe) technique in diagnosing student's understanding of science and identifying their level of achievement.* https://espace.curtin.edu.au/bitstream/handle/20.500.11937/2432/15777_LiewScEdD.pdf?sequence=2&isAllowed=y

[36] Mahdi Malawat, M. Ridwan, Sulaeman Sulaeman, Darma Darma (2021). The Ritual Ukuwala Mahiate: The Integration of Tradition and Religion of the Indigenous Community of Moluccas, Indonesia , Technium Social Sciences Journal: Vol. 15: A new decade for social changes. https://techniumscience.com/index.php/socialsciences/article/view/2302

[37] Mayasari, T., Kadarohman, A., Rusdiana, D., dan Kaniawati, I. (2016). Apakah model pembelajaran *problem based learning* dan *project based learning* mampu melatihkan keterampilan abad 21?. *Jurnal Pendidikan Fisika dan Keilmuan*, 2(1), 48-55. DOI: 10.25273/jpfk.v2i1.24

[38] McMillan, J.H. and Schumacher, S. (2001). *Research in education*. New York: Addison Wesley Longman. Inc.
[39] Meltzer, D. E. (2002). The relationship between mathematics preparation and conceptual learning gains in physics: a possible "hidden variable: in diagnostic pretest scores. *American Association of Physics Teachers*, *70*(12), 1259-1268. http://www.physicseducation.net/docs/ AJP-Dec-2002-Vol.70-1259-1268.pdf
[40] Merritt, J.D., Shwartz, Y., and Krajcik, J. (2007). Middle school students' development of the particle model of matter. *A Paper Presented at The Annual Meeting of the National Association of Research in Science Teaching, April 2007, New Orleans, LA. pp. 1-29.*
[41] Muhammad Maggalatung, M. Ridwan, Syarifudin Syarifudin, Darma Darma, Sulaeman Sulaeman. (2021). Reviewing Sepa Language Extinction of the Indigenous Peoples of Amahai, Moluccas, Indonesia , Technium Social Sciences Journal: Vol. 22: A new decade for social changes. DOI: https://doi.org/10.47577/tssj.v22i1.4056
[42] M. Ridwan, Sulaeman Sulaeman. (2020). Revisiting Traditional Communication in Indonesia: Why do Self-Immunity Rituals of Pelauw Indigenous Community, Moluccas , Technium Social Sciences Journal: Vol. 14: A new decade for social changes. https://www.techniumscience.com/index.php/socialsciences/article/view/2031
[43] Nurmalasari, A.L., Jayadinata, A.K., dan Maulana. (2016). Pengaruh strategi *predict observe explain* berbantuan permainan tradisional terhadap kemampuan berfikir kritis siswa pada materi gaya. *Jurnal Pena Ilmiah*, *1*(1), 181-190.
[44] Oo, T.Z., Magyar, A. & Habók, A. Effectiveness of the reflection-based reciprocal teaching approach for reading comprehension achievement in upper secondary school in Myanmar. *Asia Pacific Educ. Rev.* (2021). https://doi.org/10.1007/s12564-021-09707-8
[45] Ozkan, G. and Selcuk, G. S. (2015). Effect of technology enhanced conceptual change texts on students' understanding of buoyant force. *Universal Journal of Educational Research, 3*(12), 981-988. DOI: 10.13189/ujer.2015.031205
[46] Özmen, H. (2011). Turkish primary students' conceptions about the particulate nature of matter. *International Journal of Environmental & Science Education*, *6*(1), 99-121.
[47] Özmen, H. (2013). A cross-national review of the studies on the particulate nature of matter and related concepts. *Eurasian J. Physical & Chemical Education,5*(2), 81-110. https://orcid.org/0000-0003-0578-3481
[48] Özmen, H. and Aseriazar, A. (2017). Effect of simulations enhanced with conceptual change texts on university students' understanding of chemical equilibrium. *J. Serb. Chem. Soc*82, 1-16. DOI: 10.2298/JSC161222065O
[49] Perdana, G. P., Suma, K. dan Pujani, N. M. (2018). Pengaruh struktur teks terhadap penguasaan konsep dan penurunan miskonsepsi pada listrik dinamis. *Jurnal Pendidikan (Teoridan Praktik)*, *3*(1), 13-18. DOI: 10.26740/jp.v3n1.p13-18
[50] Sahin, C. and Cepni, S. (2011). Development of the concept cartoon, animation, an diagnostic branched tree supported conceptual change text: "gas pressure". *Eurasian Journal of Physics and Chemistry Education*, Jan, 25-33. https://orcid.org/0000-0003-2343-8796
[51] Setiawan, B., Solehuddin, M., and Hafina, A. (2019). Bimbingan kelompok dengan teknik *self-instruction* untuk meningkatkan *self-regulation* siswa. *Konseling*, *1*(1), 01-10. DOI: 10.31960/konseling.v1i1.317
[52] Setyaningrum, V. (2016). *Perubahan konseptual siswa smp pada materi suhu dan kalor melalui teks perubahan konseptual berbasis kartun konsep*. (Tesis). Sekolah pascasarjana, Universitas Pendidikan Indonesia, Bandung. http://repository.upi.edu/23356/

[53] Setyaningrum, V. dan Sopandi, W. (2015). Pengaruh teks perubahan konseptual terhadap pemahaman siswa pada materi suhu dan kalor. *Prosiding Seminar Nasional Fisika Mataram-Lombok 14 dan 15 November 2015* (1-6). Mataram: Fakultas MIPA Universitas Mataram.
[54] Snir, J., Smith, C.L., and Raz, G. (2003). Linking phenomena with competing underlying models: a software tool for introducing students to the particulate model of matter. *Science Education, 87*(6), 794-830. https://doi.org/10.1002/sce.10069
[55] Sopandi, W. (2017). Pengenalan sifat diskontinu materi pada peserta didik sekolah dasar kelas tinggi sebagai dasar belajar kimia. Dalam U. S. Saud, W. Sopandi & H. Handayani (Editor), *Bunga Rampai Kajian Pendidikan Dasar: Umum, Matematika, Bahasa, Sosial, dan Sains* (pp. 161-173). Bandung: UPI Press.
[56] Sopandi, W., Kadarohman, A., Rosbiono, M., Latip, A., and Sukardi, R.R. (2018). The courseware of discontinuous nature of matter in teaching the states of matter and their changes. *International Journal of Instruction, 11*, 61-76. DOI: 10.12973/iji.2018.1115a
[57] Sopandi, W., Latip, A., and Sujana, A. (2017). Prospective primary school teachers' understanding on states of matter and their changes. *Journal of Physics,* Conf. Series *812,* pp 1-8. DOI: 10.1088/1742-6596/812/1/012075
[58] Sreerekha, S., Arun, R. R., and Swapna, S. (2016). Effect of predict-observe-explain strategy on achievement in chemistry of secondary school students. *International Journal of Education & Teaching Analytics, 1*(1), 1-5.
[59] Sugiyono. (2013). *Metode penelitian kuantitatif, kualitatif dan r & d*. Bandung: Alfabeta. https://cvalfabeta.com/product/metode-penelitian-kuantitatif-kualitatif-dan-rd-mpkk/
[60] Suyitno, Y. (2009). *Landasan filosofis pendidikan*. Bandung: UPI-Fakultas Pendidikan.
[61] Teo, T.W., Yan, Y.K., and Goh, M.T. (2016). Using prediction-observation-explanation-revision to structure young children's learning about floating and sinking. *The Journal of Emergent Science, JES, 10*, 12-23.
[62] Theodorakakos, A., Hatzikraniotis, E., and Psillos, D. (2010). Pec task explorer: a tool for ict supported learning in science. *Paper* (pp. 75-83). CBLIS.
[63] Treagust, D.F., Chandrasegaran, A.L., Crowley, J., Yung, B.H.W., Cheong, I.P-A., and Othman, J. (2010). Evaluating students' understanding of kinetic particle theory concepts relating to the states of matter, changes of state and diffusion: a cross-national study. *International Journal of Science and Mathematics Education, 8*(1), 141-164. https://doi.org/10.1007/s10763-009-9166-y
[64] Ültay, N., Durukan, Ü. G., and Ültay, E. (2014). Evaluation of the effectiveness of conceptual change texts in react startegy. *Chemistry Education Research and Practice*, 1-38. DOI: 10.1039/C4RP00182F
[65] Vadapally, P. (2014). *Exploring students' perceptions and performance on predict-observe-explain tasks in high school chemistry laboratory*. (Disertation). The Graduate School, University of Northern Colorado.
[66] Wahyudin. (2015). *Modul statistika terapan: analisis varians*. Bandung: Mandiri.

Technium Science
www.techniumscience.com

CERTIFICATE

OF PUBLICATION

Manuscript title: The Effects of Using Predict-Observe-Explain Strategy Assisted by Conceptual Change Text towards the Conceptual Mastery of Prospective Primary School Teachers on the Matter and its Changes

Anasufi Banawi

Herewith, we are pleased to inform you that your manuscript mentioned above has been accepted and published by Technium Social Sciences Journal (ISSN 2668-7798). Your paper is available on www.techniumscience.com, Volume 23, September, 2021

September, 2021

ROMÂNIA PLUS COMMUNICATION CONSULTING S.R.L. CONSTANȚA