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Investigating the effects of worksheets supported with prediction-observation-explanation method on high school students opinions

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Abstract

The purpose of this study was to investigate the effect of 'Predict-Observe-Explain' (POE) activities which is carried out with the help of the POE method worksheets on 'States of Matter' in the ninth-grade chemistry course curriculum, on students' metacognitive awareness. The focus group interview held in this study was conducted with eight students selected from the experimental group on a voluntary basis. Twelve questions were asked to the students. This research is a mixed-method study. While the quantitative part of the research was carried out using the pretest and posttest model with the control group, the qualitative part was conducted with the focus group interview technique. A focus group discussion was held to obtain the opinions of the experimental group students on the subjects of Gases and States of Matter taught with worksheets prepared with POE support. The findings obtained as a result of these interviews and the study of student worksheets show that students find POE-supported worksheets fun and they increase their interest and curiosity towards the chemistry class.

Keywords: POE, high school students, states of matters, worksheets.

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1. Introduction

Most of the techniques, methods and strategies used in chemistry classes today are based on the constructivist approach. The constructivist approach avoids students memorising basic information by taking it in pill form. In this approach, the students try to obtain the information about the subjects that they will learn by using standard and new ways and see the learning process as a problem to be solved and try to acquire the information in environments they design in line with this outlook (Alkan & Altundag, 2017). In this research, a study was conducted with the designing of teaching environments that employ the Predict-Observe-Explain (POE) method, which is based on the constructivist approach. The POE method, described in detail by White and Gunstone (1992), includes the principles of the constructivist approach. In addition to that, in this research, worksheets, an auxiliary material frequently used in constructivism-based studies, were designed and applied. Worksheets can be defined as papers containing explanations that guide the activities of students during the implementation of a topic (Yagdiran, 2005). According to Tan (2008), worksheets are written and visual materials that assure the active participation of the student in the lesson and consist of the steps that must be followed to reach the information and instructions explaining the activities to be carried out in these steps. Worksheets enrich the learning experiences of the learners and they also have the mission of enriching the learning-teaching environment during the application of a method in line with its goal and can support the course depending on the method applied (Ozdemir, 2006).

Worksheets, which can be designed for almost every grade level, are a preferred material because they are a good measurement tool and are very convenient to attract students' attention. It has been established that worksheets, which can be presented in an entertaining way, and visually appeal to students, create an environment where students learn with more fun compared to standard class environments (Alkan, 2016; Er-Nas, Cepni, Yildirim & Senel, 2007; Redfield, 1981; Ulusoy, 2013). Worksheets help students develop their creative thinking skills and allow them to develop different strategies to access information. There are some points to consider when designing worksheets. The instructions in the worksheets should be simple and understandable. Important words should be underlined, different fonts should be used and pictures and cartoons should be used depending on the grade level (Bakac, 2011). Although worksheets do not provide full learning when used alone, they can be used as important materials that help learning in line with education goals. (Kurt, 2002).

2. Method

The population of this study is ninth-grade students of high schools in Ankara. The sample of the study consisted of 99 students studying at a Vocational Anatolian High School. This study was conducted with students studying in the ninth grade and 52 of 99 students were in the experimental group and 47 were in the control group. The sample of the research was determined by simple random sampling method.

This study was designed as a mixed-method research and exploratory sequential pattern of the mixed method was used. This research was started with the quantitative dimension of the research as required by the method, and a semi experimental pattern with pretest–posttest experimental and control groups was preferred. Instruction of the topics chosen from the units of the ninth-grade chemistry textbook in the experimental group was carried out with worksheets structured according to the POE method.

The worksheets are designed in accordance with the steps of the POE Method. In this respect, worksheets contributed to the research as an auxiliary material in the course of the lecture. In the control group, the traditional method supported by question and answer technique was used to explain the same topics. In both groups, the class subjects were carried out by the teacher of the class within the framework of a program drawn by the researcher. The qualitative dimension of the study

was conducted by the researcher based on the results obtained in the process after the use of quantitative data analysis (pretest-posttest control group design). The data (focus group interviews) collected by qualitative data analysis were evaluated. This research is a thesis study, and the qualitative dimension of the research is summarised in this study.

3. Findings

The focus group interview held in this study was conducted with eight students selected from the experimental group on a voluntary basis. Twelve questions were asked to the students. The questions prepared according to the principles of focus group interview technique are:

1. Were the worksheets you worked with in the lessons interesting? What are your opinions?
2. Did you have any difficulty filling the worksheets during activity?
3. Would you like the worksheets to be easier or harder?
4. Are there similar activities in other classes to our activities?
5. Do you think that you have gained new information as a result of the activities we did?
6. Do you think that you can find different ways to solve a problem with the help of the activities carried out?
7. Did the activities help you organise the information?
8. Did the activities help you to realise your mental strengths and weaknesses?
9. When you have prior knowledge about the subject in a class, how does this information affect your attitude towards the class?
10. Did the things you learned at the end of the lesson meet your expectations at the beginning of the lesson?
11. How did this method used in class affect you, whether positively or negatively?
12. Do you think that the activities made a positive effect on your success?

3.1. Findings on students' attitudes and opinions regarding the presentation of the POE method with worksheets

This subsection contains the analysis of the answers to questions 1, 9 and 10 in the focus group discussion. The questions are as follows:

1. Were the worksheets you worked with in the lessons interesting? What are your opinions?
2. Did you have any difficulty filling the worksheets during activity?
3. Would you like the worksheets to be easier or harder?
4. Are there similar activities in other classes to our activities?
5. Do you think that you have gained new information as a result of the activities we did?
6. Do you think that you can find different ways to solve a problem with the help of the activities carried out?
7. Did the activities help you organise the information?
8. Did the activities help you to realise your mental strengths and weaknesses?
9. When you have prior knowledge about the subject in a class, how does this information affect your attitude towards the class?
10. Did the things you learned at the end of the lesson meet your expectations at the beginning of the lesson?

Students named as S1, S3 and S4 stated that they liked the worksheets prepared with the POE method. Students numbered S3 and S5 stated that it is very enjoyable to process the course this way and that such activities take place in other lessons from time to time. S4 and S8 are of the opinion that the visuals in the activities are interesting.

Table 1. Opinions about the presentation of the POE method with worksheets

Categories	f	Students
Worksheets are fun.	3	S3, S5, S6
The visuals in worksheets are interesting.	3	S2, S4, S8
We liked the worksheets.	5	S1, S3, S4, S5, S6

Examples of answers to the questions are:

S1: In our previous lessons, we did one of these, though not like this ... But we did something with pictures like this for the first time in this way and I liked it very much. I would like it to be always this way.

S3:… As my friend said, we made these types of form filling in other lessons. I really liked the visuals made in this lesson, especially the first one was the most enjoyable…. It made the lesson better.

S4: When the papers were distributed, I first looked at the pictures and wondered what we'd be doing… I would like to do more if our other lessons are like this too.

S8: In the first study we did, I was surprised when I saw how the water was regained in the world… With our experiment, I saw that it was very easy. I am curious what other things in nature we can see with experiments… It was not quite the same with the other activities we did. Because I didn't know much about them. That is why the first one was most interesting to me, I would like it to be the same in every lesson.

3.2. Findings regarding students' attitudes towards the POE method and opinions

This subsection includes the analysis of the answers to questions 1, 2, 3 and 5 in the focus group interview. The questions are as follows:

1. Were the worksheets you worked with in the lessons interesting? What are your opinions?
2. Did you have any difficulty filling the worksheets during activity?
3. Would you like the worksheets to be easier or harder?
4. Do you think that you have gained new information as a result of the activities we did?

S1 and S6 stated that they had not encountered the POE method in their previous classes and that they adapted easily even though they did not know what to do, and they thought that the method was suitable for this class. While S1, S4 and S7 stated that they found the prediction and explanation sections more boring than the stages of observation and experiment, S2 and S6 consider the prediction stage also to be fun. S4 and S6 stated that they think that the things they predict are consolidated better because they contain visuals and because they learn by doing things themselves.

Table 2. Opinions regarding the POE method

Categories	*f*	Students
POE is suitable for this course.	3	S1, S6, S7
POE is fun.	5	S2, S3, S5, S6, S8
POE ensures the persistence of information.	4	S3, S4, S6, S7

Examples of answers to the questions are:

S1:… When the activity papers were distributed, I thought that we would start immediately because we had done these types of activities before. When I looked inside, I realised that I did not know what to do. When I read what our teacher said and what was written at the event, I immediately understood and easily did what was expected.

S4: I had a hard time doing the final parts of the activities and frankly I was bored while doing them… but the experiment parts were quite fun. Especially the first thing we did… yes, the water cycle, I really enjoyed and liked it.

S6: I found the experiments we did very enjoyable and educational. It is very nice to do activities and experiments like this in the chemistry class…

S7:… Yes, it should be applied. It would be nice if we do these in other lessons as well. I can remember what I learned even now ... Yes, it's more persistent this way. I think I can do it if it asked in the exam.

4. Discussion

A focus group discussion was held to obtain the opinions of the experimental group students on the subjects of Gases and States of Matter taught with worksheets prepared with POE support. The findings obtained as a result of these interviews and the study of student worksheets show that students find POE-supported worksheets fun and they increase their interest and curiosity towards the chemistry class. When literature review is conducted, these results are in parallel with the conclusion that POE-supported learning activities affect students' views on science and chemistry course positively (Altinok, 2017; Bilen & Aydogdu, 2012; Whitelegg & Parry, 1999). In addition, the students of the experimental group who were interviewed stated that they liked the visuals on the worksheets they worked with in the lesson. The students emphasised that the activities implemented were simple and understandable, so they could easily follow the instructions in the activities.

In line with the opinions received from the students in the focus group interview dimension, it was determined that the class instruction with worksheets prepared with POE support was more beneficial in terms of the teaching of concepts and the outlook of the students towards the class, compared to the traditional methods in the classroom. Numerable studies show students find teaching environments that instruct theoretically and lack experimentality boring and compared to traditional teaching environments where their participation is limited, they prefer POE-supported teaching environments (Chew, 2008; Palmer, 1995; Keeratichamroen, Penijpan & Dahsah, 2007; Wu & Tsai, 2005; Yavuz, 2009).

In the focus group interview, when asked the question 'How did you find the course to be taught with the POE method as we implemented, instead of the traditional method?', the students stated that they thought that the teaching of the course in this way contributed positively to their success in chemistry, and that it was fun to process the course with the POE method. When the literature is examined, it is seen that the POE method positively affects students' success in science classes. (Chew, 2008; Evans, 2004; Kearney, 2004; McGregor & Hargra, 2008). In addition, when asked the question 'Do you think that the teaching of the class according to POE method, which is different from traditional methods, affect your success in class?', the students answered yes and said that it affects their success positively.

References

Alkan, F. (2016). Interrelations between high school students' academic motivation and metacognitive awareness. *Conference of the International Journal of Arts andSciences, 9*(03), 129–136.

Alkan, F. & Altundag, C. (2017, October 26–29). *Examination of students' attitudes towards chemistry lessons accoring to metacognitive awarenes*. International Conference on Science and Education (IConSE), Antalya, Turkey. Proceeding book 180–189.

Altinok, O. (2017). TGA teknigine dayalilaboratuvar etkinliklerinin fen bilgisi ogretmen adaylarinin arguman olusturma becerilerine etkisinin incelenmesi. (Yuksek lisans tezi). Rize, Turkey:Recep Tayyip Erdogan Universitesi.

Bakac, E. (2011). *Calisma yapraklarinin erisi ve kalicilik duzeyine etkisi.* (Yuksek lisans tezi). Edirne, Turkey: Trakya Universitesi.

Bilen, K. & Aydogdu, M. (2012). Tahmin et-gozle-acikla (TGA) stratejisine dayali laboratuvar uygulamalarinin ogrencilerin bilimsel surecbecerileri ve bilimin dogasihakkindaki dusunceleri uzerine etkisi. *Gaziantep Universitesi Sosyal Bilimler Dergisi, 11*(1), 49–69.

Chew, C. (2008). Effects of biology infused demonstrations on achievement and attitudes in junior college. Perth:Australia:The University of Western Australian.

Er-Nas, S., Cepni, S., Yildirim, N. & Senel, T. (2007). Calisma yapraklarinin ogrenci basarisiuzerine etkisi: asit baz ornegi. *Yeditepe Universitesi Egitim Fakultesi Dergisi* (EDU 7), *2*(2).

Evans, C. (2004). Learning with inquiring minds. *The Science Teacher*, 27–30.

Kearney, M. (2004). Classroom use of multimedia-supported predict-observe-explain tasks in a social constructivist learning environment. *Research in Science Education, 34*(4), 427–453.

Keeratichamroen, W., Panijpan, P. & Dahsah, C. (2007). *Using the predict-observe-explain (POE) to promote students' learning of tapioca bomb and chemical reaction***.** Pattaya, Thailand: Proceedings ICASE Asian Symposium.

Kurt, S. (2002). Fizik ogretiminde butunlestirici ogrenme kuramina uygun calisma yapraklarinin gelistirilmesi (Yuksek lisans tezi).Trabzon, Turkey:Karadeniz Teknik Universitesi.

McGregor, L. & Hargrave, C. (2008). The use of predict-observe-explain with online discussion boards to promote conceptual change in the science laboratory learning environment. In K. McFerrin et al. (Eds.), Proceedings of Society for Information Technology and Teacher Education International Conference (pp. 4735–4740). Chesapeake, VA: AACE.

Ozdemir, O. (2006). Ilkogretim 8. sinif turun devamliliginisaglayan canlilik olayi(ureme) konusunun calisma yapraklariile ogretiminin ogrenci erisisine ve kaliciliga etkisi (YayinlanmamisYuksek Lisans Tezi). Izmir, Turkey: Dokuz Eylul Universitesi.

Palmer, D. H. (1995). The poe in the primary school: an evaluation. Research in Science Education, 25(3), 323–332.

Redfield, D. R. (1981). A comparison of the effects of using various types pf worksheets on pupil achievement. Paper Presented at the Annual Meeting of the American Educational Research Association. Los Angeles, CA.

Tan, E. (2008). Ilkogretim 7. sinif dil bilgisi ogretiminde zarflar konusuyla ilgili yapilandirmaciyaklasima gore hazirlanmiscalisma yapraklarinin ogrenci basarisina etkisi (YayinlanmamisYuksek Lisans Tezi). Erzurum, Turkey:Ataturk Universitesi.

White, R. & Gunstone, R. F. (1992). *Prediction-observation-explanation*. In R. White & R. F. Gunstone (Eds.), Probing understand (pp.44–64). London, UK: The Falmer Press.

Whitelegg, E. & Parry, M. (1999). Real life context for learning physics: meaning issues and practice. *Physics Education, 34*(2), 6.

Yagdiran, E. (2005). Ortaogretim 9. sinif fonksiyonlar unitesinin calisma yapraklari, Vee diyagramlarive kavram hartasikullanilarak ogretilmesi. Balikesir, Turkey: (YayinlanmamisYuksek Lisans Tezi) Balikesir Universitesi.

Yavuz, D. (2009). Ogretmen adaylarinin oz-yeterlik algilarive ust bilissel farkindaliklarinin cesitli degiskenler acisindan incelenmesi (Yuksek lisans tezi). Zonguldak, Turkey:Zonguldak Karaelmas Universitesi.