Implementation of fun science learning to increase elementary school students’ skill in science and technology

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Abstract. The purpose of this study is to provide an alternative practice in learning for science teachers in elementary schools in order to increase student interest in science and technology. In the implementation of science practicum in elementary school, teachers and students are actively invited to practice with tools and materials that are easy to obtain and use. The method used in this research is by field study with workshop activities for students and elementary school teachers. The implementation of science fun learning is able to increase students' interest in science and technology and motivate teachers to be creative and apply the concept of fun science learning in guiding the science subject practice in the classroom.

1. Introduction

Many teachers who carry out learning only transfer knowledge without developing science process skills. This type of learning has a lack of patterns of interaction between students and teachers. Often learning like this is also known as teaching by telling. This pattern is not successful and no longer matches the educational needs of students [1]. Another reality about science learning is that learning tends to be cognitive-oriented such as calculation and memorization. In addition, the education system that is too cognitive is too abstract (not concrete), with a passive and rigid learning process, making the learning process very unpleasant and full load [2]. This will not shape the character of students who are creative, confident, and only produce a stressful and stressful learning atmosphere, if it continues to occur it will be difficult to build a human who is a long-life learner and characterized [3].

Likewise, what was seen from the results of the analysis of the target audience was the students of SD Negeri Sukapura 247, Jl. Manglangyang I No. 1 Cilengkrang. They still get a conventional science learning process so that the science learning process does not run optimally in improving students' understanding and attitudes. One of the science learning that can improve students' understanding and
attitude is by developing science process skills, the goal is to develop other skills in students. One of the science learning that requires the science process is the chemistry learning method, especially the practicum method which can produce several basic skills in life such as improving critical thinking skills, scientific literacy skills, communication and science process skills so that learning is more meaningful [4]. Learning science cannot be separated from the practicum, one of the most efficient practicum methods is guided inquiry practicum which involves teachers to facilitate students in finding concepts. The guided inquiry process became one of the basic Process Oriented Guided Inquiry Learning (POGIL) emerging, a model that can facilitate the implementation of inquiry learning both in the classroom and in the laboratory [5]. Based on this description, it is felt necessary to conduct guided science demonstration training for students and teachers of Elementary School Sukapura 247 to see the effect on students' interest in science and technology.

2. Method
This research method uses descriptive method and field study, which is a research design that aims to determine the relationship between variables with research objectives based on aspects that are specifically observed [6]. In carrying out the demonstration of science the method used is to use design-based research which is a research design that aims to produce a particular product, and test the effectiveness of the product [7]. Logical framework of reliability analysis in this research, it is used: analytical, logical, conceptual, and operational verification by an expert [8]. This research is divided into 2 parts, namely:

a. Implementation phase and application of Fun Science Learning.
b. Evaluation phase.

The subjects of this study were teachers and students of elementry school Sukapura 247 as participants who took part in the science demonstration.

3. Results and discussion

3.1. Stage of implementation and application of fun science learning
The implementation stage of the science demonstration begins by introducing the purpose of the science demonstration, then introducing simple tools and materials that can be obtained in everyday life:

a. Bottle of genie. The concept of this experiment is to introduce changes in physics, namely the appearance of gas from two compounds when mixed, the color of the gas can be observed clearly.
b. Sexy Egg. The concept of this experiment explains that the acidic properties of a solution can erode eggshells, this is the same as the nature of acid rain which can change the physical properties of metals to rust.
c. Coquettish eggs. The concept of this experiment introduces how an object can float, sink and float with just the difference in salt composition, resulting in the mass of each egg as if changing.
d. Natural Colors. The concept of this experiment is to introduce the properties of the inner solution which can change with some addition of substances, this proves that the material can change fikia or chemically, and from these changes can be observed for acid-base or neutral properties [9].
e. Secret message. The concept of this practicum is that it introduces the physical properties of iodine solution which cannot coat the surface of the wax due to the soft and oily physical properties of the wax while iodine is more watery, while the blue color changes on the paper are caused by paper being cellulose and can react with iodine.
f. Chemical warfare. This simple experiment explains that with gunpowder friction from matches can produce loud sounds like firecrackers, but do not cause serious harm, this is overcome by the amount of gunpowder from reduced matches.
g. Draw a book. This experiment is the basis of the use of frictional forces, this experiment is done by stacking several pieces of paper alternately from two books, so that when drawn in opposite directions, the two books cannot be separated.
h. Separation of mixtures. The concept of this experiment is to separate the mixture of two solids physically carried out, yellow sulfur powder and mixed iron powder then put it on the glass and under the glass placed magnetically, so that when the magnet is moved in all directions the iron powder mixed with sulfur will be attracted by magnet.

i. Pulling water with wax. This experiment explains that the nature of fire that requires oxygen as the main ingredient to ignite the fire, when the flame of the candle is closed with a glass of glass, the candle flame will immediately extinguish. This is caused by the presence of oxygen around the wax decreases and the smoke from the candle which goes out to produce CO gas that can attract water from outside into a glass.

j. Magic balloon blower. This experiment explains how the properties of gases can move in all directions in a room, hydrogen gas produced from the reaction between aluminum and sodium hydroxide.

k. Chemical bursts. This experiment explains the nature of gases in soft drinks that can push hard to the surface when mixed with glucose and peppermint so that there will be a fairly high burst of water [10].

The application of science demo activities can be seen in Table 1.

Table 1. Demonstration of application of chemistry fun learning.

| No | Game                              | Requirements                                                                 | Activity                                               | Duration (minutes) |
|----|-----------------------------------|------------------------------------------------------------------------------|--------------------------------------------------------|--------------------|
| 1  | Bottle of genie                   | Erlenmeyer 250 ml (2) Spatula Aluminum Foil H2O2 25%, MnO2                  | Opening Make smoke to start a chemical game demonstration | 10                 |
| 2  | Sexy Egg                          | Beaker Glass 250 ml (2) acetate, boiled chicken eggs                         | Shows some chemical phenomena such as Weathering Chemistry | 10                 |
| 3  | Coquettish Eggs                   | Measuring Glass 100 ml (3) dye, distilled water, saturated salt solution, poached quail Eggs (3) | Shows some phenomena of physics such as mass of type | 10                 |
| 4  | Natural Color                     | Beaker Glass 100 ml (3) distilled water, orange solution, soap solution, purple cabbage solution iodine solution | Shows Color changes                                    | 10                 |
| 5  | Secret Message                    | Candle A5 paper (20)                                                         | Make Each Name                                         | 10                 |
| 6  | Chemical warfare                  | Mortar Pestle (3) Cutter (3)                                                | Show Sound Because of friction                        | 10                 |
| 7  | Attract Books                     | Used books (6)                                                               | Showing as a result of Swings                          | 10                 |
| 8  | Mixed Separation                  | Petri dish Magnet (4) Iron powder, sulfur powder distilled water, dye        | Show Magnetic Properties                               | 10                 |
| 9  | Pulling Water with Candles        | Glass Plates (3) Candle (3) Matches Coins (3) 100 ml Beaker Glass (3)       | Interactive Game: Take coins in the Water Pool         | 10                 |
| 10 | Magic Balloon Blower              | Glass Bottle Balloon bucket Scoop                                          | Make Gas Balloons                                      | 20                 |
| 11 | Chemical Bursts                   | Needle Mattress Thread soft drink, candy                                     | Make a simple fountain                                 | 10                 |

At the implementation stage of the Fun Science Learning implementation, it was shown that these activities would provide opportunities for students to develop a scientific attitude in obtaining their
knowledge and students actively involved in these activities so that the goals and learning process went well. By using the right equipment to do a practicum it will make learning more effective and efficient so that the target of learning achievement that is expected to be fulfilled optimally [11,12]. Furthermore, implementation of fun science learning to increase elementary school students’ skill in science and technology can using e-learning based on multimedia. Multimedia is a digital product that presents and combines text, sound, images, animation, audio and video, implemented with tools and connection so that users can navigate, interact, work, and communicate [13]. In the world of education, multimedia is used as a teaching medium, either in classroom or self learning [14]. In learning process, multimedia has proven to be able to create a fun learning atmosphere [15], increase the effectiveness of learning [7], improve the level of understanding [16], enhance learning motivation [17], create student-centered learning [18], and make efficient investment of learning means [19].

3.2. Evaluation stage
Generally, evaluation has two main functions: to identify students learning outcome and teacher’s assessment result. This goes hand in hand with the learning process in elementary school which endeavors to identify at which level the students have achieved learning outcome or determined competencies [20].

To determine the level of achievement of the implementation of this Fun Science Learning activity, an evaluation process is carried out by filling out the questionnaire before and after the activity to the teachers and students.

| Class | Category | Number of Students |
|-------|----------|--------------------|
| 5th   | Very Good | 5                  |
|       | Good      | 3                  |
|       | Standard  | 6                  |
|       | Weak      | 1                  |
| 6th   | Very Good | 6                  |
|       | Good      | 4                  |
|       | Standard  | 3                  |
|       | Weak      | 0                  |

Table 2. Results of analysis of students’ understanding before applying fun science learning.

Table 3. Results of analysis of students’ understanding after applying fun science learning.

Table 2 shows the data from the analysis of students’ understanding of science lessons when the Fun Science Learning model has not been applied. The majority of students have a standard understanding even there are still very few. While in Table 3 shows the data from the analysis of students’ understanding of science lessons when after applying the Fun Science Learning model. There was an increase in students' understanding of science lessons after the learning model was applied.

Based on data analysis on the achievement scores of students 'analytical thinking skills, it can be seen that the Fun Science Learning learning model has a positive influence on students' analytical thinking skills. The analytical thinking skills of students who are accompanied by an experimental process are better than those that apply conventional methods with lectures. Based on the description of the results of the study shows that the Fun Science Learning model can improve students' analytical thinking skills. Thus, it is quite effective for the achievement of students' analytical thinking abilities [21].

This can increase student interest and motivation, students also respond positively to the learning process that takes place. Learning by using an experimental demonstration model provides an opportunity for students to find their own knowledge and encourage students to make connections between the knowledge they have with the application in everyday life. The involvement of students in constructing knowledge can also increase self-confidence so that the experimental class affective learning outcomes are better than the control class using conventional methods [21].
4. Conclusion

The application of Chemistry Fun Learning through science demonstrations to increase interest in science and technology has two general stages, namely the implementation stage of science demonstration includes a series of activities to introduce the purpose of conducting scientific demonstrations, introduction of tools and materials, and an explanation of the science concept to participants (students and teachers). In general, the results of the implementation of Chemistry Fun Learning through Science Demo to Increase Interest in Science and Technology are able to add insight into basic school materials that are able to do practicum in a simple way, increase skills in practicum, and increase student and teacher interest in science and technology in 247 Sukapura elementary school.

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References
[1] R Rizawati, S Sulaiman, and A Syafrina 2017 Hubungan Antara Interaksi Edukatif Guru dengan Hasil Belajar Siswa Kelas VI SD Negeri 18 Banda Aceh, J Ilm Mhs Pendidik Guru Sekol Dasar 2(1) pp 113–120.
[2] N Rustaman 2008 Kemampuan Proses Ilmiah dalam Pembelajaran Sains (Bandung: Universitas Pendidikan Indonesia).
[3] P Hollingsworth and G Lewis 2008 Pembelajaran Aktif: Meningkatkan Keasyikan Kegiatan di Kelas (Jakarta: Indeks).
[4] J Juhi 2016 Peningkatan Keterampilan Proses Sains Siswa Melalui Pendekatan Inkuiri Terbimbing J Penelit dan Pembelajaran IPA 2(1) 58–70.
[5] P Bandu 2006 Penilaian Keterampilan Proses dan Sikap Ilmiah dalam Pembelajaran Sains Sekolah Dasar (Jakarta: Departemen Pendidikan Nasional).
[6] S Sugiyono 2015 Metode Penelitian Kombinasi (Mixed Methods) (Bandung: Alfabeta).
[7] F S Irwansyah, Y M Yusuf, I Farida, and M A Ramdhani 2018 Augmented Reality (AR) Technology on the Android Operating System in Chemistry Learning, IOP Conf Ser Mater Sci Eng, 288(1) p 012068.
[8] H Y Suhendi, M A Ramdhani, and F S Irwansyah 2018 Verification Concept of Assesment for Physics Education Student Learning Outcome Int J Eng Technol 7(321) 321–325.
[9] Y Yunita 2009 Bahan Ajar Kimia: Kapita Selekta II Bandung: UIN Sunan Gunung Djati Bandung
[10] Y Yunita 2007 Panduan Demonstrasi dan Percobaan Permaianan Kimia untuk SD, SMP dan SMA (Bandung: Pudak Scientific).
[11] F S Irwansyah, C Slamet, and M A Ramdhani 2018 Analysis of Determinant Factors in Selecting Laboratory Equipment in Chemistry Education Experiment Chem Eng Trans 63 793–798.
[12] B W Nuryadin, A Y Nuryantini, and M A Ramdhani 2018 A solar simulator using a LCD projector for students’ laboratory Phys Educ 53(5) 55021.
[13] S Sari, D M Aryana, C Z Subarkah, and M A Ramdhani 2018 Multimedia Based on Scientific Approach for Periodic System of Element IOP Conf Ser Mater Sci Eng 288(1) 012137.
[14] I Farida, I Helsy, I Fitriani, and M A Ramdhani 2018 Learning Material of Chemistry in High School Using Multiple Representations IOP Conf Ser Mater Sci Eng 288(1) 012078.
[15] R Aisyah, I A Zakiah, I Farida, and M A Ramdhani 2017 Learning Crude Oil by Using Scientific Literacy Comics, J Phys Conf Ser 895(1) p 012011.
[16] I Helsy, M Maryamah, I Farida, and M A Ramdhani 2017 Volta-Based Cells Materials Chemical Multiple Representation to Improve Ability of Student Representation J Phys Conf Ser 895(1) p 012010.
[17] S Sari, F S Irwansyah, I Farida, and M A Ramdhani 2017 Using Android-Based Educational Game for Learning Colloid Material Using Android-Based Educational Game for Learning Colloid Material J Phys Conf Ser 895(1) 012012.
[18] M A Ramdhani and E R Wulan 2012 The Analysis of Determinant Factors In Software Design For Computer Assisted Instruction Int J Sci Technol Res 1(8) 69–73, 2012.

[19] F S Irwansyah, I Lubab, I Farida, and M A Ramdhani 2017 Designing Interactive Electronic Module in Chemistry Lessons J Phys Conf Ser 895(1) 012009.

[20] H Y Suhendi, M A Ramdhani, and F S Irwansyah 2018 Verification Concept of Assesment for Physics Education Student Learning Outcome International Journal of Engineering & Technology (UEA) 7(321) 321-325.

[21] K Ware and E Rohaeti 2018 Penerapan Model Problem Based Learning dalam Meningkatkan Kemampuan Berpikir Analitis dan Keterampilan Proses Sains Peserta Didik SMA, J Tadris Kim 3(1) 217–226.