Jurnal Akademika Kimia, 10(4): 247-253, November 2021
ISSN (online) 2477-5185 | ISSN (print) 2302-6030
http://jurnal.fkip.untad.ac.id/index.php/jak/

OPEN ACCESS

Analysis of Students' Skills through Practicum on Reaction Rate Topic

Hayatul Islam & *Ratman
Program Studi Pendidikan Kimia/FKIP – Universitas Tadulako, Palu – Indonesia 94119

Received 13 September 2021, Revised 07 October 2021, Accepted 15 November 2021
doi: 10.22487/j24775185.2021.v10.i4.pp247-253

Abstract

National education emphasizes learning on assessing students' knowledge, attitudes, and skills. The development of skills aspect is not enough only relying on the learning in the classroom, but also necessary doing understanding outside the classroom such as practicum in the laboratory. The implementation of training allows students to practice their skills and help students understand the material taught in the class. This study aimed to describe the quality of students' skills on reaction rate topics through a practicum in grade XI at SMA Negeri 5 Palu. This type of research was a quantitative descriptive study with a one-shot case study design. Sampling was conducted by purposive sampling. The sample was Class XI Science 2 as the experimental class 1 with 23 students and Class XI Science 3 as the experimental class 2 with 25 students. The quality skill of students was measured by instruments in the form of observation sheets as the primary data. The data obtained through the observation sheet showed that the average percentage of all aspects of student skills in experimental class 1 was 74.81%, and in experimental class 2 was 74.05%. It indicates that the ten skills elements have emerged in the learning activities with a good category. This study concludes that the quality skill of grade XI students at SMA Negeri 5 Palu on learning reaction rate topic through practicum is a good category.

Keywords: Practicum, skill, the reaction rate

Introduction

Education is the main factor in making a better life. Education is done not only formally but also informally and non-formally. In formal education activities, education according to the Law of the Republic of Indonesia No. 20 of 2003 concerning the national education system Chapter 1 article 1 states that education is a conscious and planned effort to realize the learning process so that students can actively develop their potential to have religious-spiritual strength, self-control, personality, intelligence, noble character, and skills that needed by himself, society, nation, and state.). Based on the law, it can be said that education will be centered on developing the potential of children through the learning provided (Nisa, 2017).

Learning in national education emphasizes knowledge, attitudes, and basic abilities students possess. By learning that emphasizes students' skills, it can develop psychomotor aspects. One way to develop student's basic abilities in finding facts and concepts can be done in chemistry learning (Angela, 2017).

Chemistry subjects in high school generally learn everything about substances, including the composition, structure, and properties of substances that involve skills and reasoning, and most of the chemistry is abstract.

One of the materials studied in chemistry is the rate of reaction. The reaction rate is a material that discusses how fast or slowly a reactant is used up or a product is formed. The concepts in this material cannot be explained only by using the lecture method. Still, students must be directly involved in the learning process to develop their potential intelligence and skills (Sudarsana, 2016).

Learning chemistry is not enough if you only rely on learning in class, but it is also necessary to do learning outside the classroom, such as practicum in the laboratory. Student activities in the laboratory are more effective in training their process skills, developing students' scientific attitudes, and increasing understanding of science material. According to Zeidan & Jayoshi (2015), emphasizing skills in science learning means providing opportunities for students to solve problems themselves. Learning topics, namely by conducting a series of practical activities in the laboratory.

Rahmawati (2015) states that the chemistry laboratory is a particular special room limited by a wall and broader to include an open laboratory in the universe. According to Akinbobola & Olufunminiyi (2015), good laboratory facilities can improve understanding and scientific knowledge. The methods of inquiry and learning in scientific

*Correspondence:
Ratman
e-mail: ratmanut@gmail.com

laboratories allow students to experience firsthand scientific phenomena.

Based on the results of an interview with one of the teachers at SMA Negeri 5 Palu, the facilities in the school laboratory are pretty complete, but learning using practicum methods is rarely carried out. Practical activities are seldom carried out because there are no laboratory assistants at school to make solutions and the teacher's limited time. The usual practicums are only on materials that are already available, and the procedures are easy to implement, such as acid-base and thermochemical materials. Meanwhile, practical activities are rarely carried out in other chemistry materials, such as the reaction rate material, due to the teacher's limited time to make the required solutions. This thing causes students' skills in the scientific process to be still low.

Wati (2016) states that science process skills are students' ability to apply scientific methods in understanding, developing, and discovering knowledge. According to Nendrasari (2015), science process skills are all directed scientific skills (cognitive and psychomotor) that can find a problem. Concept, principle, or theory to develop a pre-existing idea or deny an invention. Process skills can also be interpreted as a learning approach that emphasizes students' learning process, activities, and creativity in acquiring knowledge, values, and attitudes and applying them in everyday life. Since birth, students have had basic abilities, although they are still simple and need to be developed more optimally.

Science process skills are one of the essential process skills to be possessed by students. The learning steps include observing, asking, trying, reasoning, and communicating. At the observing stage, students can attend pictures and read discourses based on phenomena in everyday life. Students are asked to identify and determine the variables involved and formulate the problem at the questioning stage. At the trial stage, before designing the experiment, students were asked to make hypotheses, control the variables, then determine the tools and materials, and develop a table of observations. The students did a practicum using the procedures they had designed. In the reasoning stage, students are asked to identify, analyze the practicum results, and interpret the data based on the results of observations. The next activity is communicating; students can write and tell them results can be found on the level of reasoning (Chan &Morales, 2017).

According to Suryaningsih (2017), learning with a process skills approach allows students to understand the concepts that are the goal of learning science and, at the same time, can develop basic science skills, scientific attitudes, and critical attitudes. Meikapasa (2017) states that learning with a process skills approach is ideal for meeting the demands of students' application of the scientific process. In general, learning with this process skills approach can be done through practicum-based learning. Rakhmi (2017) also stated that one of the learning methods that can equip students with science process skills is the practicum method in the laboratory because, with practicum, students can develop basic experimental skills.

Muharomah (2017) stated that science education emphasizes providing direct experience in the learning process, this is expected to be a vehicle for students to learn about themselves and their natural surroundings. Experience can be obtained, among others, through practical activities. Practical activities are a form of learning strategy that requires students to be able to apply the knowledge they have acquired in a process of scientific activity.

Learning with practicum is an important part that cannot be separated from chemistry teaching and learning activities. Practicum is the best means to develop science process skills. Learning with practicum can allow students to experience or carry out their own experiences, which will be processed according to their cognitive abilities (Arifin, 2015).

Learning with practicum activities allows students to master science concepts, facts, and processes to improve students' understanding of concepts, interests, and scientific attitudes. Practical exercises will arouse students' curiosity and scientific attitude towards natural phenomena and challenge them to think critically in finding alternative solutions to a problem (Liandari, 2017).

Laboratory practicum activities can improve the critical attitude of science process skills or students' scientific attitude. Usually, the practicum material carried out by students aims to reveal scientific factors or to verify scientific theories. Thus, the teacher must be able to develop practical activities in the laboratory effectively to generate motivation to learn to develop basic skills of conducting experiments. Practicum becomes a vehicle for learning scientific approaches; practicum can support the subject matter itself (Muamar, 2017).

This paper is intended to describe the analysis of student skills through the practical method on the reaction rate material in class XI of SMA Negeri 5 Palu.

Methods

Extreme care should be taken in preparing mathematical the research design used is quantitative research that uses descriptive (quantitative descriptive) methods, namely study whose descriptions use size, number, or frequency. The collection and processing of research data are done by presenting the data as it is. The research conducted does not provide treatment, manipulation, or modification of the independent variables but describes a condition as it is (Wulandari, 2016).

The design used in this research is a one-shot case study. This study uses two experimental classes; the treatment or treatment given is in practicum activities assessed through observation sheets. The

treatment carried out affects the subject under study (Sugiyono, 2017). In general, this design is described in **Table 1**.

Table 1. Scheme *one-shot case study*

Group	Treatment	Observation
K1	X	O
K2	X	O

K1 is experimental class 1, K2 is experimental class 2, X is treatment in practicum activities, and O is observation to assess students' science process skills.

The population in this study were students of class XI IPA SMA Negeri 5 Palu totaling 180 students, with six classes registered in the 2019/2020 school year. In comparison, the samples in this study were students of class XI IPA 2 as experimental class 1 with a total of 23 students and class XI IPA 3 as experimental class 2 as many as 25 students with a total sample of 48 students.

Sampling technique

This study was determined using a purposive sampling technique, namely, resolving the sample with specific considerations from the chemistry subject teacher in both classes at the school. The two classes selected were classes that were considered homogeneous in their skills.

The data in this study are primary data obtained through observing student activities during practicum on the reaction rate material in the form of an observation sheet with ten indicators skills. An expert has validated the observation sheet to determine each aspect's validity category in the observation sheet. It has been declared feasible to be used to identify student skills.

Data analysis technique

The data analysis technique used in this study was observational data analysis on the management of cooperative learning models used to determine the implementation of learning (Avianti & Yonata, 2015). By looking for the percentage of each criterion using the formula:

$$Average = \frac{gain\ score}{maximum\ score} x\ 100\%$$

Table 2. Measurement scale calculation (%)

Scale	Mastery Level (%)	Category
4	86-100	Very good
3	76-85	Good
2	60-75	Enough
1	55-59	Not enough
0	≤ 54	Not much

Descriptive analysis is used to calculate the percentage of student learning outcomes. The measurement of learning outcomes is described through students' answers to the problems in the questions (Ruli, 2019). The data obtained is then analyzed using the following percentage formula:

$$NP = \frac{R}{SM} x100\%$$

NP is the desired or expected % value, R is the students' raw score, and SM is the maximum score.

Results and Discussion

This research is a quantitative descriptive study to obtain the data needed by the authors to conduct research directly to the location. The way to get data is by observing student activities through observation sheets on practical exercises carried out in class XI IPA 2 and XI IPA 3 at SMA Negeri 5 Palu. The score obtained through the observation sheet is processed in the form of the average of each indicator then converted into a percent value (%). The student's abilities can be categorized based on the scores obtained from that value. The primary material presented in the two experimental classes is the same, namely the factors that affect the reaction rate with the same order of delivery of the material and the same treatment.

Results of student skills analysis

The data from this study were obtained from observations of student activities during practicum conducted by the teacher as an observer by assessing ten skill indicators. The results of data analysis showed that the ten skills of students had appeared in learning activities based on observation sheets with good categories. They were briefly presented in **Tables 3** and **4**.

Table 3. The percentage of the analysis results of students' skills in the experimental class 1.

Skills	Percentage (%)	Category
Asking question	73.23	Enough
Formulating a Hypothesis	72.96	Enough
Planning an Experiment	71.06	Enough
Using Tools and Materials	74.31	Enough
Observation	75.26	Enough
Classify	77.03	Good
Predict	80.70	Good
Interpretation	76.76	Good
Applying the concept	72	Enough
Communicating	74.85	Enough
Total	**74.81**	**Enough**

Table 4. The percentage of the analysis results of students' skills in the experimental class 2.

Skills	Percentage (%)	Category
Asking question	67.38	Enough
Formulating a Hypothesis	74.50	Enough
Planning an experiment	69.38	Enough
Using Tools and Materials	69.00	Enough
Observation	78.75	Good
Classify	82.50	Good
Predict	79.75	Good
Interpretation	72.50	Enough
Applying the concept	73.75	Enough
Communication	73	Enough
Total	**74.05**	**Enough**

The highest average percentage score for experimental class 1 is in predicting skills with a percentage of 80.70%, while the lowest average rate is in experimental planning skills with an average percentage of 71.06%. The average value of all aspects of students' science process skills in experimental class 1 is 74.81%, with a good category. For experimental class 2, the highest average percentage is in classifying skills with 82.50%, while the lowest average percentage is in questioning skills with 67.38%. The average value of the science process skills aspect results of students in experimental class 2 is 74.05%, with a good category. The percentage of these values can be seen in **Figure 1**.

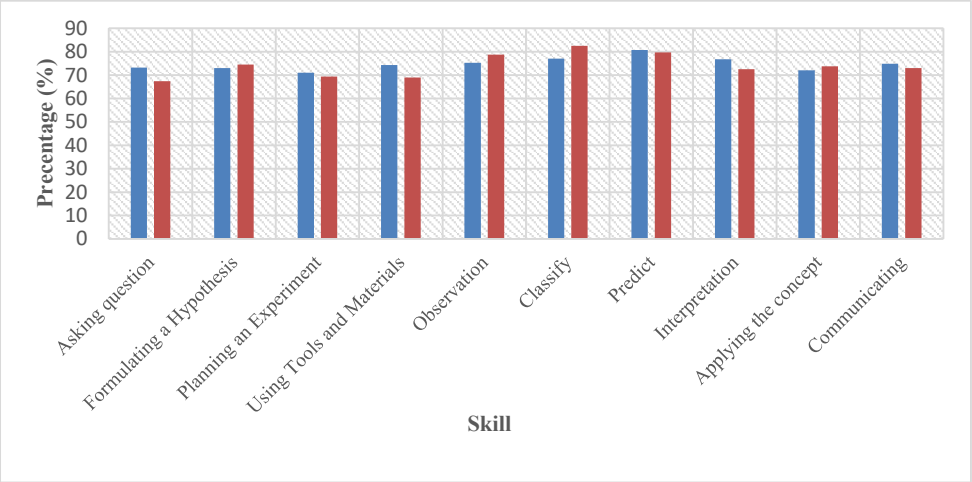

Figure 1. Graph of student skill percentage (experimental class 1 and experimental class 2)

The overall question-asking skills appear in the good category; for experimental class 1, students get an average score of 73.23% and experimental class 2 of 67.38%. This shows that students have not been able to make good questions. Practical activities should bring students to ask many questions about things related to practicum and the reaction rate material. Still, at the time of learning, there are not many questions that arise. Students due to the low curiosity of students about problems and ongoing learning. In addition, some students are still hesitant and embarrassed to ask because students still feel awkward to ask for fear of being wrong.

The skill in formulating hypotheses appeared in the good category in both experimental classes; for experimental class, student 1 obtained an average score of 72.96%, and experimental class 2 was 74.50%. The questions on the LKPD asked students to propose hypotheses on the experiment of the effect of concentration, area surface, temperature, and catalyst on the reaction rate. Based on the answers to the test results, most of the students answered incorrectly. This is because proposing or formulating a hypothesis is not easy because students need basic knowledge about the thing to be studied in hypothesizing. Therefore, this hypothesis skill is not in the good category but is still sufficient. This is because students are not accustomed to formulating hypotheses at the beginning of learning. Students still do not understand how to develop an idea properly.

Experiment planning skills appear in the good category; for experimental class 1, the score is 71.06%, and for experimental class 2, it is 69.38%. The ability of students assessed in this aspect

includes students' ability to determine the tools and materials needed for the experiment. Used in practicum, this is due to a lack of basic knowledge about the functions and uses of chemical tools and materials.

The results of data analysis showed the average value of students' skills in using tools and materials for the experimental class 1 was 74.31% and for the experimental class 2 was 69%, this shows that the skills in using tools and materials appeared in the good category. This skill is measured by observing how students take a solution with a dropper, measure the volume of the solution with a measuring cup, pour the solution into a dropper. They are measuring cups and using a timer or stopwatch. The observations through the observation sheet show that not all students understand how to use tools and materials well, and there are even students who have difficulty using a dropper, especially in transferring the solution from the solution bottle into the measuring cup. Factors that affect the value achieved by students are not maximized because of the rarity of learning with the practicum method. Students still do not master the skills of using tools and materials.

Students' skills in observing are assessed from the way students write down the results of observations and explain what they keep. The percentage of students' skills in following experimental class 1 is 75.26% with good category, and for experimental class 2 is 78.55 % with good category. These results indicate a difference, for the skill of observing the experimental class 1 only appears in the good category. The influencing factor is that some students are still wrong in writing their observations. As for the experimental class 2, the students' skills in observing have emerged in a good category; this is supported by the results of observations which show that almost all students attend well during the practicum.

Students' skills in classifying have emerged with good categories in both classes. The percentage of students' skills in organizing practicum activities in experimental class 1 is 77.03% and for experimental class 2 is 82.50%. Classification skills are shown by student data comparing observational data between several test tubes. This is done to test the theory that has been learned during the learning activity process. Based on the results of observations, students can group the data from the observations and record them separately. Students can use their classification skills in practical activities well. This is supported because students are required to collect information about the reaction rate material before carrying out practical activities.

Students' predictive skills in experimental class 1 obtained an average score of 80.70% in the good category, and for experimental class 2, it was 79.75% in the good category. In this aspect, most students predict based on the results of observations and group discussions so that the practicum carried out can run smoothly. Students estimate reaction to a time when the solution is given conditions for concentration, temperature, surface area, and catalyst. Students evaluate the reaction time that occurs based on the theory they learn; this makes it easier for students to understand the practicum they are doing quickly. At this stage, accuracy is needed when observing, distinguishing, and comparing the results of practicums carried out by students during practicum in the laboratory. In this aspect, students can use their predictive skills in practical activities well.

Students' skills in interpretation are shown by the results that students have observed during the practicum, namely by writing down the conclusions based on the data obtained during the practicum. Students' skills in interpretation for the experimental class 1 appear in a good category, with an average value of 76.76%. Students can make reasonable conclusions, compare the observations, and conclude based on the experimental data obtained. Meanwhile, experimental class 2 got an average value of 72.50%, with a good category. From the results of data processing, it shows that the data obtained are not good because students in making conclusions have not been able to relate the data obtained from the practicum with the material that has been studied, so the ability to create student conclusions is not in good category but is still in the good category.

Students' skills in applying concepts in practicum activities appear in the good category; the average percentage of students' ability to apply concepts in practical activities in experimental class 1 is 72%, and for experimental class 2 is 73.75%. In this study, the skills to apply concepts were assessed from the way students explain the effect of concentration, temperature, surface area, and catalyst on the reaction rate from the observations obtained and examples of reaction rate factors in everyday life. Most of the students' answers are correct but incomplete. Some students are still confused about why concentration, temperature, surface area, and catalyst can speed up the reaction rate and are still wrong to mention examples in everyday life. This shows that student's skills in applying the concepts they have learned are not good.

The students' communication skills were average for the experimental class 1 of 74.85% with a good category. For experimental class 2, it is 73.75% with good variety. Student skills in using are it is shown by the way students discuss with groups, namely the activeness of students in examining the data obtained during the practicum, discussing the results of observations, making observations, of observations, and presenting them in them of the class. And data processing of practical effects. From the results of data analysis, students' communication skills are still in the good category because students in conducting discussions have not been able to play an active role in discussing the data obtained from the practicum so students' ability to communicate data is not as expected.

Based on the description above, it can be seen that in the two experimental classes, three skills are included in the excellent category, and seven skills are included in the excellent category. This shows that students' skills must be trained and used more often in learning activities to have all the abilities needed to acquire, develop, and apply concepts, principles, laws, or scientific theories. This is in line with the idea of learning psychology, which states that skills should be developed and trained continuously to increase one's abilities to become experts or professionals in specific fields (Fitriana, 2019).

Conclusions

Based on the research data analysis results, it can be concluded that the average value of the percentage results of all aspects of students' science process skills in experimental class 1 is 74.81% with good category, and the experimental class 2 is 74.05% with sufficient category. This shows that the ten students' science process skills appear in learning activities based on observation sheets with good categories. The quality of students' skills on the average reaction rate material is sufficientrestating your significant findings and contributions to your study.

Acknowledgment

The author would like to thank the SMA Negeri 5 Palu school and those who have helped the author complete this research.

References

Akinbobola, & Olufunminiyi, K. (2015). Evaluating science laboratory classroom learning environment in the Osun State of Nigeria for National Development. *Journal of Resources Development and Management*, *9*, 14-19.

Angela, S. P. (2017). *Penerapan metode praktikum untuk meningkatkan hasil belajar dan nilai karakter peserta didik pada materi pokok gaya kelas VIII SMP Negeri I Wanukaka*. Unpublish Undergraduate Thesis. Yogyakarta: Universitas Sanata Dharma.

Arifin, F. U., Hadisaputro, S., & Susilaningsih E. (2015). Pengembangan lembar kerja praktikum siswa terintegrasi guided inquiry untuk keterampilan proses sains. *Chemistry in Education*, *4*(1), 54-60.

Avianti, R., & Yonata, B. (2015). Keterampilan proses sains siswa melalui penerapan model pembelajaran kooperatif materi asam basa kelas XI SMAN 8 Surabaya. *UNESA Journal of Chemical Education*, *4*(2), 224-231.

Chan, R. J., & Morales, M. P. E. (2017). Investigating the effects of customized cognitive fitness classroom on students' physics achievement and integrated science process skills. *International Journal of Research Studies in Education*, *6*(3), 81-95.

Fitriana., Kurniawati, Y., & Utami, L. (2019). Analisis keterampilan proses sains peserta didik pada materi laju reaksi melalui model pembelajaran bounded inquiry laboratory. *Jurnal Tadris Kimiya, 4*(2), 226-236.

Liandari, E., Siahaan, P., Kaniawati, I., & Isnaini. (2017). Upaya meningkatkan kemampuan merumuskan dan menguji hipotesis melalui pendekatan keterampilan proses sains dengan metode praktikum. *Jurnal Wahana Pendidikan Fisika*, *2*(1), 50-55.

Meikapasa, N. W. P. (2017). Peningkatan keterampilan proses sains siswa kelas XI Melalui penerapan asesmen kinerja dalam kegiatan praktikum pembelajaran biologi pada siswa kelas XI IPA 2 SMA Negeri 6 Bandung. *GaneÇ Swara*, *11*(1), 96-101.

Muamar, M. R., & Rahmi. (2017). Analisis keterampilan proses sains dan keterampilan kognitif siswa melalui metode praktikum biologi pada sub materi schizophyta dan thallophyta. *Jurnal Pendidikan Almuslim, 5*(1), 1-10.

Muharomah, N., Saptorini., & Kasmui. (2017). Implementasi performance assessment terhadap aktivitas belajar siswa kelas XI melalui kegiatan praktikum. *Chemistry in Education, 6*(2), 42-48.

Nendrasari, L. S., Sriyono., & Kurniawan, E. S. (2015). Analisis kemampuan dasar keterampilan proses siswa kelas XI IPA melalui metode eksperimen pada pokok bahasan elastisitas Madrasah Aliyah Negeri se-Kabupaten Kebumen tahun pelajaran 2014/2015. *Radiasi: Jurnal Berkala Pendidikan Fisika, 6*(1), 82-85.

Nisa, M. U. (2017). Metode praktikum untuk meningkatkan pemahaman dan hasil belajar siswa kelas V MI YPPI 1945 Babat pada materi zat tunggal dan campuran. *Proceeding Biology Education Conference* (pp 62-68). Surakarta: Universitas Sebelas Maret.

Rahmawati, Yusrizal., & Hasan M. (2015). Penerapan pembelajaran kooperatif tipe number head together berbasis metode praktikum untuk meningkatkan pemahaman konsep dan keterampilan proses sains siswa pada pokok bahan asam basa. *Jurnal Pendidikan Sains Indonesia*, *3*(1), 169-180.

Rakhmi, A. N. (2017). *Pengembangan lembar kegiatan siswa berbasis keterampilan proses sains untuk siswa kelas XI materi sistem reproduksi manusia di SMA Negeri 1 Kaishan Bantul*. Unpublished Undergraduate Thesis. Yogyakarta: Universitas Negeri Yogyakarta.

Ruli, F. F., Hala, Y., & Syamsiah. (2019). Pengaruh penerapan model pembelajaran inkuiri terbimbing terhadap motivasi dan hasil belajar siswa pada mata pelajaran biologi kelas X SMA Negeri 3 Tana Toraja. *Jurnal BiologiTeaching and Learning, 1*(2), 151-159.

Sudarsana, I. K. (2016). Pemikiran tokoh pendidikan dalam buku lifelong learning: Policies, practices, and programs (perspektif peningkatan mutu pendidikan di Indonesia). *Jurnal Penjaminan Mutu, 2*(2), 44-53.

Sugiyono. (2017). *Metode penelitian pendidikan (pendekatan kuantitatif, kualitatif, dan R&D).* Bandung: Alfabeta.

Suryaningsih, Y. (2017). Pembelajaran berbasis praktikum sebagai sarana siswa untuk berlatih menerapkan keterampilan proses sains dalam materi biologi. *Jurnal Bio Education*, *2*(2), 49-57.

Wati, W., & Novianti. (2016). Pengembangan rubrik asesmen keterampilan proses sains pada pembelajaran IPA SMP. *Jurnal Ilmiah Pendidikan Fisika Al-Biruni, 5*(1), 131-140.

Wulandari, N., & Sholihin, H. (2016). Analisis kemampuan literasi sains pada aspek pengetahuan dan kompetensi sains siswa SMP pada materi kalor. *EDUSAINS, 8*(1), 66-73.

Zeidan, H. A., & Jayosi, R. M. (2015). Science process skills and attitudes toward science among Palestinian Secondary School Students. *World Journal of Education, 5*(1), 13-24.