QUANTUM: Jurnal Inovasi Pendidikan Sains, Vol. 15, No. 2, 239-247
p-ISSN : 2086-7328 e-ISSN : 2550-0716
Website: https://ppjp.ulm.ac.id/journal/index.php/quantum/index
DOI: http://dx.doi.org/10.20527/quantum.v15i2

APPLICATION OF GUIDED INQUIRY-BASED WORKSHEETS IN UTILIZING SUGARCANE BAGASSE WASTE AS AN ADSORBENT Fe

Yunis Naini Hafsari Maulina[1]*, Yulia Sukmawardani[2], Saepudin Rahmatullah[1]
[1]Chemistry Education Study Program, Faculty of Education and Teaching,
Universitas Islam Negeri Sunan Gunung Djati Bandung
Jl. Cimencrang, Kec. Gedebage, Kota Bandung 40292, Jawa Barat, Indonesia
[2]Master of Science Study Program, Postgraduate
Universitas Islam Negeri Sunan Gunung Djati Bandung
Jl. Cimencrang, Kec. Gedebage, Kota Bandung 40292, Jawa Barat, Indonesia
*corresponding author: yunisnaini13@gmail.com

Abstract. This study aims to describe the application of guided inquiry-based worksheets, describe students' scientific performance in learning, and analyze the effectiveness of using bagasse adsorbents in reducing Fe levels. The method used is a pre-experiment with the One Shoot Case Study design. The research subjects were students majoring in Chemistry Education at UIN Sunan Gunung Djati Bandung in the Separation Chemistry course with 15 students. The instruments used are worksheets and student scientific performance observation sheets. The ability of students to complete worksheets based on data obtained an average score of 92.5 in the very good category. While the scientific performance of students gets an average score of 89 in the very good category. Using sugarcane bagasse adsorbents in drilled wellwater samples also decreased Fe levels in samples taken from drilled well water at Al Ihsan Islamic boarding school by 34.2% and on campus II samples by 28.1%. This shows that the application of the worksheets on the use of bagasse waste as an Fe adsorbent can measure student scientific performance.

Keywords: adsorbent, bagasse, based guided inquiry, scientific performance, worksheet

INTRODUCTION

In chemistry learning, practical work is needed so that students can answer problems that have abstract concepts and make them real (Emda, 2017). Practical work is one of the important supports in learning chemistry; with practice, students will find it easier to remember and connect theory with its application (Lukum & Paratama, 2015). In practical work, learning media is usually used in the form of worksheets as a support, which is used to measure students' scientific performance.

Worksheets have become a source and learning medium that helps students in practical activities. Worksheet contains a guide that students use to solve a problem (Nurafiah, 2017). A worksheet contains directions and methods for completing tasks and the basic competencies to be achieved. Worksheets are used to provide guidance so that students are active in practical activities in the learning process (Primary, 2018).

Learning with a guided inquiry model involves students actively in the learning process. If worksheet guided inquiry-based learning is applied in learning, so students are expected to be able to master the material better and be able to apply the concepts learned after carrying out the practicum (Ni'mah, 2016). The guided inquiry stages are divided into several stages, starting from observation, formulating problems, making hypotheses, designing experiments, conducting experiments, analyzing data, and

Published by: Program Studi Pendidikan Kimia FKIP Universitas Lambung Mangkurat
How to Cite: Maulina, Y. N. H., Sukmawardani, S., Rahmatullah, S. (2024). APPLICATION OF GUIDED INQUIRY-BASED WORKSHEETS IN UTILIZING SUGARCANE BAGASSE WASTE AS AN ADSORBENT Fe. *QUANTUM: Jurnal Inovasi Pendidikan Sains*, 15(2), 236–247 http://dx.doi.org/10.20527/quantum.v15i2.19472.

Article History:
Received : 07-06-2024, *Accepted* : 20-10-2024, *Published* : 14-12-2024

making conclusions. By implementing a worksheet based on guided inquiry, it is hoped that it can enable students to understand the mastery of the concepts of the material being studied (Primary, 2018).

According to Saija & Beay's research (2022), using worksheet guided inquiry-based students makes students more active in carrying out chemistry learning. This is because the students' attention is centered on the problems provided in the worksheet. The problems provided must of course be solved by students with their own abilities. The students' abilities here are not only mastery of concepts but also their ability to do practicums. The practicums carried out are closely related to the students' scientific performance abilities.

According to Uray's research (2020), scientific performance in chemistry education students can be measured based on the scientific performance indicators used. Each performance indicator achieved has a different category, including whether or not they are skilled in carrying out performance on each indicator. In addition, according to Diyah (2019), the use of the worksheet based on guided inquiry can improve students' scientific performance abilities because the guided inquiry method is a depiction of the scientific method. Therefore, a worksheet based on guided inquiry to measure scientific performance is considered appropriate to be applied to chemistry practicums, one of which is in the case of water pollution.

Water pollution is a change in the condition of water in lakes, rivers, oceans and groundwater caused by human activities (Sylvia Dianti, 2023). Such as industry, agriculture, mining, and livestock. The main causes of water pollution can be viruses, bacteria, parasites, pesticides, fertilizers, nitrates, phosphates, plastics, pharmaceutical products, even radioactive substances, fecal waste, and also metals (Sylvia Dianti, 2023). Based on Hendrawani's research (2019), there are several areas in Indonesia that have water sources that are polluted by heavy metals. Chemical substances in the form of metals that dissolve in water include magnesium, aluminum, arsenic, copper, iron, lead, and mercury (Iskandar, 2017).

One of the metals commonly found in water is iron. The presence of iron in water is indicated by the yellow-brown color of the water. To make the water drinkable or reusable, the water needs to be treated to make it clean again. Chemical adsorption is one of the treatment methods that can be used to clean water from impurities and pollutants (Beautiful DR, 2019). Adsorption is the process of absorption of a solute in a solution into a substance that is able to make the solute stick to the surface of the absorbent. Adsorption occurs physically or chemically on a surface that is influenced by a chemical reaction between the adsorbent and adsorbate (Merpiseldin, 2023). Adsorbent is an absorbent substance while adsorbate is a substance that is absorbed (Assyifa, 2023).

For the purposes of metal adsorption from water systems, the adsorbent used is mostly activated carbon (Santosa, 2014). Activated carbon can be used as a good natural adsorbent when made with materials that have a lot of carbon sources. Materials that contain cellulose and lignin compounds that have the ability to adsorb, one of the ingredients is sugarcane pulp. The use of sugarcane bagasse as an adsorbent can be used to absorb metals such as Fe. One method that can be used to analyze Fe levels is using permanganometric titration (Thaib, 2019). The adsorbent from sugarcane pulp used to analyze Fe levels is made into the worksheet based on guided inquiry applied to learning. Previously, no one had conducted and applied this research to learning. It is hoped that the implementation of this research would make students more active in carrying out practical work and solve problems in learning independently. Referring to the explanation above, the author conducted research to

create and implement a worksheet regarding the utilization of sugarcane waste as an Fe adsorbent.

RESEARCH METHOD

The research was conducted at the Integrated Laboratory of Chemistry Education, UIN Sunan Gunung Djati Bandung in the Chemistry Separation course. This research was conducted on May 16, 2023. This research uses a qualitative and quantitative approach. The method used is pre-experiment with a One-Shot Case Study designnamely a group that is given treatment and then the results are observed (Sugiyono, 2015). Use of design One shot case study because this design is used to research the learning process and outcomes of students during the learning process. In this research design, there is one class that is given treatment and then the results are observed (Bambang, 2017). There are three stages used, namely the preparation stage by creating the research instrument that was used in the form of the worksheet and also observation sheets. Then the implementation stage of conducting research in the form of implementing a worksheet in the chemical separation practicum. Then, the final stage was carried out by processing each data obtained and described and analyzed so that conclusions can be drawn.

The data generated from this study are qualitative and quantitative data. Qualitative data are obtained from the description of students' scientific performance abilities. While quantitative data were obtained from the application of worksheet based on guided inquiry. The data sources used are primary data involving subjects. Primary data are in the form of work results worksheets, scientific performance observation sheets, and calculation results.

Data collection techniques are carried out to obtain data that is processed in accordance with the research data obtained. There are two data obtained in this study, namely qualitative and quantitative data. To obtain the value, the calculation formula is used by dividing the value obtained by the total value multiplied by one hundred.

$$Value = \frac{Score\ obtained}{Maximum\ score} \text{ x } 100\%$$

The data analysis technique in this study used descriptive data which is an analysis of the results of observations of scientific performance and resolution worksheet. To find out whether the inquiry stages have been implemented and the scientific performance of students in implementing these stages, the number of each criterion in the activities carried out was measured (Farida, 2017). Scientific performance assessment refers to the criteria seen in Table 1.

Table 1. Scientific performance assessment criteria

Category Percentage (%)	Interpretation
80-100	Very good
70-79	Good
60-69	Enough
50-49	Not enough
≤49	Very less

Analysis worksheet conducted using a questionnaire containing predetermined criteria such as identifying the worksheet which has been filled in, giving a score based on the assessment rubric, adding up the scores obtained, assessing the content, format, language and illustrations and interpreting the value categories (Sukmawardani, 2017). Range of value categories onworksheetcan be seen in the Table 2.

Table 2. Value range worksheet

Category Percentage (%)	Interpretation
80-100	Very good
66-79	Good
56-65	Enough
40-55	Not enough
30-39	Fail

RESULTS AND DISCUSSION

Implementation analysis worksheet guided inquiry based on utilization of sugarcane bagasse waste as adsorbent

The application of guided inquiry-based worksheets on the use of sugarcane bagasse waste as an adsorbent begins with the manufacture of activated carbon which acts as an Fe adsorbent. The process of making activated carbon is carried out by means of washing and waste drying sugarcane pulp until completely dry. After that, the sugarcane pulp is ovened at a temperature of 105˚C for 24 hours to remove the water content in the bagasse. Then, the bagasse is ground and the carbonization process is carried out by inserting it into a furnace at a temperature of 400˚C for 2 hours, then cooled in a desiccator. After completion, the bagasse has changed into carbon which is activated using H2SO4 solution 9% for 24 hours. Then, it is stirred using a magnetic stirrerfor 2 hours. The activated and stirred bagasse carbon are washed using aquades until the pH is neutral. After neutral, the activated carbon is dried in an oven for 3 hours at a temperature of 105˚C then the activated carbon is ready for use.

The finished activated carbon can be used to adsorb the Fe content contained in well water samples. The adsorption process is carried out by inserting 6 grams of activated carbon from sugarcane bagasse into 50 ml of sample. Then stirred using a magnetic stirrer for 2 hours and then filtered to obtain a sample of the adsorbed well water. To find out the decrease in Fe levels contained in well water samples, it cannot be done with the naked eye. Therefore, Fe content analysis was carried out using the permanganometric titration method, using inlet and outlet samples.Inlet samples are samples that do not go through the adsorption process, while outlet samples are samples that must be adsorbed. The use of inlet and outlet samples aims to determine the decrease that occurs in well water samples after using activated carbon from sugarcane bagasse as an Fe adsorbent. The process of reducing Fe levels into a worksheet guided inquiry-based is applied in learning.

The worksheets that are created must go through a validation process by experts first. This study was validated by three validators. The validation results carried out by validator I provide suggestions for improving the commands in the problem formulation worksheet and correcting inappropriate wording. Then correcting the concept analysis and suggesting to change the value range in the assessment rubric so that it is not too large. The value range suggested by the validator for the assessment rubric is 0-3. Validator II suggests correcting the wording of the questions used with the material and information needed to complete the questions. Clarity of the wording of the questions and command words in the questions so that the commands are relevant to use. Validator III suggests correcting the concept map and concept analysis to be adjusted to the material taken in the study. In addition, the validator also suggests adding course learning outcomes (CPMK) and Sub-CPMK to the learning description.

Implementation worksheet adjusted to the stages in the guided inquiry approach used. The stages of inquiry used start from observation, formulating problems, making hypotheses, designing experiments, conducting experiments, analyzing data, and making conclusions (Apriani, Rizkiana, & Khairunnisa, 2020). Besides that worksheet also designed according to the material that must be done during the practicum with the aim of overcoming time constraints and the tools and materials used. Values are obtained by assessing the results worksheet which has been done by students in groups. The assessment results obtained from the workworksheet by students are presented in Table 3.

Table 3. **Evaluation worksheet guided inquiry based**

Group	Mark	Category
5	86	Very good
6	99	Very good
7	93	Very good
8	92	Very good
Average	92	Very good

Based on Table 3, the results of data processing in the application worksheet based on guided inquiry students in completing worksheet get an average score for each group of 92 with a very good category. This proves that the implementation of worksheet. This guided inquiry-based learning is running well and is suitable for application in learning. In line with Adelliani's research (2022), use worksheet based on guided inquiry can help the learning process and trigger students to be able to solve their own problems. In his research, it showed the teacher's response to worksheet by 83% with a very high category.

Implementation process worksheet guided inquiry-based learning can improve student achievement in line with research conducted by Margunayasa (2019) that by applying the guided inquiry learning method, students' achievements can be better compared to using conventional methods. Implementation worksheet This guided inquiry-based learning is carried out based on the stages of guided inquiry learning itself, namely observation, formulating problems, making hypotheses, designing experiments, conducting experiments, analyzing data, and making conclusions. In addition, the application of worksheet This guided inquiry-based learning also refers to the stages of scientific performance.

Analysis of students' scientific performance ability after implementation worksheet inquiry-based on the utilization of sugarcane bagasse waste

Scientific performance skills refer to the skills that students perform while working. Such as when observing phenomena, formulating problems, formulating hypotheses, designing experiments, presenting experimental data, interpreting data, and drawing conclusions (Sudrajat, 2011). The results of the analysis of scientific performance capabilities through scientific performance observation sheets, which are used as a measuring tool to assess student performance when carrying out practical application worksheets based on inquiry on the utilization of sugarcane bagasse waste to reduce iron content in well water. The assessment was carried out by four observers, each of whom assessed 1 group.

Student activities were observed by observers when conducting experiments objectively. Each stage was observed in detail and assessed using the assessment sheet. This assessment aims to measure students' ability to conduct experiments in

detail. The assessment was carried out based on aspects that have been determined by the researcher. The results of the assessment of students' scientific performance are shown in Table 4.

Table 4. Assessment of students' scientific performance

Group	Mark	Category
5	85	Very good
6	87	Very good
7	88	Very good
8	97	Very good
Average	**89**	**Very good**

Based on the table above, scientific performance which has been measured using a scientific performance observation sheet,each group has an average of 89 with a very good category. Scientific performance skills can be applied in chemistry learning. Because chemistry learning itself has a meaning as a process which is a regular and organized scientific work to create novelty. Chemistry learning is not only understanding concepts but also teaching to apply concepts and generalize them based on existing symptoms, and providing solutions to these scientific performance skills refer to the skills that students do when working. In line with Diyah's research (2019) which states that using worksheet guided inquiry-based learning can improve students' scientific performance abilities because the guided inquiry method reflects the scientific method.

The assessment of students' scientific performance ability can be assessed using a scientific performance observation sheet. The observation sheet contains assessment criteria when students conduct experiments. The average scientific performance ability of students based on scientific performance criteria gets a score of 89. The results obtained are categorized as very good; this is in line with research conducted by Ayu (2019) that using the practical book or worksheet based on guided inquiry is able to improve students' scientific work abilities with an increase of 52.62%.

The development of students' scientific performance provides experience in the affective, psychomotor, and cognitive domains. The cognitive domain is able to make students understand the material being taught. The affective domain is able to train students' scientific attitudes in practical activities. The psychomotor domain trains students' skills in working using practical tools and materials. Practical activities also facilitate students in achieving the expected competencies (Suryawan, 2015).

Results of utilization of sugarcane bagasse as activated carbon to reduce iron content in well water

Utilization of sugarcane bagasse waste is done by first turning the sugarcane bagasse waste into activated carbon.then adsorption is carried out on the samples used. There are two samples used, namely well water taken at the Islamic boarding school Al Ihsan and Well water from campus II UIN Sunan Gunung Djati Bandung. After the adsorption process is complete, to determine the decrease in Fe levels that occurs, an analysis is needed using the permanganometric titration method.

Permanganometric titration analysis using $KMnO_4$ as a titrant in titrating samples. The samples used consisted of inlet and outlet samples. Based on the experiments conducted, there was a decrease from the inlet to outlet samples from

both Al Ihsan well water and Campus II well water. The decrease in Fe levels that occurred in Al Ihsan well water samples decreased by 826 ppm or 34.3% with a good category. While the decrease that occurred in Campus II well water samples was 602 ppm or 28.1% with a sufficient category.

The decrease in iron levels occurs due to the adsorption capacity of the adsorbent supported by Annisa (2023) that the lignin and cellulose content in bagasse has the potential as a carbon source that can be utilized in the adsorption process. Both well samples showed a decrease that was not much different. This is also in accordance with research conducted by Hayati (2015), that the use of activated carbon from sugarcane bagasse can reduce Fe levels by 88%.

The adsorption process is described as a process when molecules leave the solution and then stick to the surface of the adsorbent due to chemical and physical reactions (Karim, 2018). In the process of Fe adsorption in well water that has been mixed with activated sugarcane bagasse adsorbent then stirred using a magnetic stirrer. In this process, Fe ions contained in the well water are absorbed into the surface of the adsorbent. Through this absorption, the Fe content in the well water can be reduced.

CONCLUSION

Implementation worksheet inquiry-based on the utilization of sugarcane waste as an iron adsorbent to measure students' scientific performance went well, which is indicated by the average very good value from each group worksheet. Implementation worksheet This inquiry-based approach is able to measure students' scientific performance. Students' performance in solving problems is so good that they get very good grades. Based on the experiments that have been carried out, this sugarcane bagasse adsorbent is able to reduce the iron content in the two samples used, namely Al-Ihsan well water and Kampus Dua well water. The caster worksheet This inquiry-based learning can be applied to improve students' scientific performance. If similar research is conducted in the future, the practical process can be supplemented by students making adsorbents directly, so that students can better understand how to make adsorbents directly not only their utilization.

REFERENCES

Adelliani, D. N., Ernamaty, E., Sahputra, R., Hairida, & Hadi, L. (2022). Pengembangan Lembar Kerja Peserta didik Berbasis Inkuiri Terbimbing Pada Materi Larutan Elektrolit dan Nonelektrolit. *Jurnal Education and Development Institut Pendidikan Tapanuli Selatan*, *10*(1), 60-67. https://doi.org/10.37081/ed.v10i1.3232

Annisa, N. M. (2023). Pemanfaatan Limbah Ampas Tebu Sebagai Adsorben Penyerapan Logam dan Kesadahan Pada Air Sumur. *Chemical Engineering Journal Storage, 3*(1), 139. https://doi.org/10.29103/cejs.v3i1.8013

Apriani, H., Rizkiana, F., & Khairunnisa, Y. (2020). PENGEMBANGAN LEMBAR KERJA SISWA IPA SMP BERBASIS INKUIRI TERBIMBING PADA MATERI ZAT DAN KARAKTERISTIKNYA. *QUANTUM*, *11*(2), 135-148. http://dx.doi.org/10.20527/quantum.v11i2.8656

Assyifa, N. Y. (2023). Efektivitas Penggunaan Abu Sekam Padi (Oryza Sativa) Sebagai Adsorben Terhadap KAdar Besi (Fe) Pada Pengolahan Air Baku. *Jurnal TechLINK*, *7*(1), 40-48. https://doi.org/10.59134/jtnk.v7i01.320

Bambang, A. A. (2017). Desain Alat Peraga Digital Image Creator For Optical Microscope (DIgiCOM) dalam Pembelajaran IPA untuk Menumbuhkan

Motivasi Belajar Siswa. *UPEJ Unnes Physiscs Education Journal*, *6*(3), 32-37. https://doi.org/10.15294/UPEJ.V6I3.19312

Emda, A. (2017). Laboratorium sebagai Sarana Pembelajaran Kimia dalam Meningkatkan Pengetahuan dan Keterampilan Kerja Ilmiah. *Lantanida Journal*, *5*(1). https://doi.org/10.22373/lj.v5i1.2061

Farida, I. (2017). *Evaluasi Pembelajaran.* Bandung: PT. Remaja Rosdakarya.

Hayati, I. N. (2015). Arang Aktif Ampas Tebu Sebagai Media Adsorpsi Untuk Meningkatkan Kualitas Air Sumur Gali. *Jurnal Teknik UNIPA*, *13*(2), 9-18. https://doi.org/10.36456/waktu.v13i2.61

Indah, D. R. (2019). Upaya Menurunkan Kadar Ion Logam Besi Pada Air Sumur dengan Memanfaatkan Arang Ampas Tebu. *Jurnal Kependidikan Kimia*, *5*(2), 58-66. https://doi.org/10.33394/hjkk.v5i2.1590

Iskandar, B. D. (2017). Validasi Metode Penentuan Arsenik Pada Sampel Air Sumur Bor Dengan Menggunakan Spektrofotometer Serapan Atom Di PT. Geoservice Balikpapan. *Prosiding Seminar Nasional Kimia*, 34-39.

Karim, M. A. (2018). Adsorpsi Ion Logam Fe Dalam Limbah Tekstil Sintesis dengan Menggunakan Metode Batch. *Jurnal Distilasi*, *2*(2), 68-81. https://doi.org/10.32502/jd.v2i2.1205

Lukum, A., & Paratama, Y. (2015). Student's Satisfaction toward the Services of the Chemical Laboratory. *International Journal of Evaluation and Research in Education (IJRE)*, *IV*(1), 22-29. https://doi.org/10.11591/IJERE.V4I1.4488

Margunayasa, I. G. (2019). The Effect of Guided Inquiry Learning and Cognitive Style on Science Learning Achievement. *International Journal of Instruction*, *12*(1), 737-750. https://doi.org/10.29333/iji.2019.12147a

Saija, M., & Beay, L. K. (2022). LKM Berbasis Inkuiri Terbimbing Untuk Meningkatkan Pemahaman Konseptual dan Motivasi Belajar Kimia. *Jambura Journal of Educational Chemistry*, *4*(1), 1-7. https://doi.org/10.34312/jjec.v4i1.13492

Merpiseldin, N. A. (2023). Pemanfaatan Arang Aktif Tempurung Borassus Flabellifer L, untuk Adsorpsi Logam Fe (III) Pada Air Sumur di Kota Kupang. *Jurnal Agrotekma*, *7*(2), 7-14. https://doi.org/10.31289/agr.v7i2.9690

Ni'mah, S. (2016). Lembar Kerja Mahasiswa Berbasis Inkuiri Terbimbing Untuk Meningkatkan Keterampilan Proses Sains Mahasiswa. *Jurnal Ilmiah Kependidikan*, *11*(2), 60-65. https://doi.org/10.33654/jpl.v11i2.414

Nurafiah, I. (2017). Pengembangan Lembar Kerja Mahasiswa Berbasis Inkuiri Terbimbing Pada Identifikasi Senyawa Alkaloid dalam Ekstrak Kulit Pisang.

Pratama, A., Kurniati, T., Sa'adah, S. (2018). Pengembangan Lembar Kerja Berbasis Inkuiri Terbimbing Pada Pembuatan Tempe Daun Singkong. *Jurnal BioEdUin*, *9*(2), 44-52. https://doi.org/10.15575/bioeduin.v9i2.5889

Santosa, S. J. (2014). Dekontaminasi Ion Logam dengan Biosorben Berbasis Bahan Asam Hurmat, Kitin, dan Kitosan. *Gadjah Mada University Press*.

Sudrajat, A. A. (2011). Pengembangan Rubrik Asesmen Kinerja untuk Mengukur Kompetensi Mahasiswa Melakukan Praktikum Kimia Analiis Volumetri. *Jurnal Chemica*, *12*(1), 1-8. https://doi.org/10.35580/chemica.v12i1.124

Sugiyono. (2015). *Metode Penelitian Kuantitatif, Kualitatif, dan R&D.* Bandung: Alfabeta.

Sukmawardani, Y. R. (2017). Pengembangan Lembar Kerja Berbasis Inkuiri Untuk Analisis Kualitatif Logam Berat Pada Limbah Laboratorium. *Jurnal Tadris Kimya*, 153-158. https://doi.org/10.15575/jtk.v2i2.1880

Suryawan, A. A. (2015). Pengembangan Instrumen Performance Assesment Praktikum. *Journal of Primary Education*, *4*(1), 1-9. https://doi.org/10.15294/jpe.v4i1

Sylviadianti, A. F. (2023). Limbah Penyebab Pencemaran Air Pada Lingkungan. *Universitas Sebelas Maret*.

Thaib, C. M., Sinaga, E. M., Purba, D. R. (2019). Penentuan Kadar Besi di Dalam Air Sumur Gali Penduduk di Desa Kampung Lalang Secara Spektrofotometri Sinar Tampak. *Farmanesia*, *6*(1), 27-30. https://doi.org/10.51544/jf.v6i1.2743

Uray, R. S. (2020). Keterampilan Kinerja Ilmiah Mahasiswa Pendidikan Kimia FKIP Universitas Tanjungpura Kalimantan Barat. *Orbital : Jurnal Pendidikan Kimia*, *4*(2), 122-124. https://doi.org/10.19109/ojpk.v412.6538

Widyaningrum, D. A. (2019). Implementasi Buku Petunjuk Praktikum Biokimia Berbasis Inkuiri Terbimbing Untuk Meningkatkan Kemampuan Kerja Ilmiah. *Jurnal Pendidikan, Biologi, dan Terapan*, *4*(2), 58-67. https://doi.org/10.33503/ebio.v4i02.437