



Utilization of Seconhand into Chemical Props with a Service-Learning Approach

Nur Azzanizawaty Binti Yahya¹, Ratna Kumala Dewi²

¹Department of Chemistry, Faculty of Science, Universiti Teknologi Malaysia

²Department of Chemistry, Faculty of Education and Teacher Training, UIN Sayyid Ali

Rahmatullah Tulungagung

E-mail: nazzanizawaty2@graduate.utm.my , ratnakumaladewi@uinsatu.ac.id

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Abstract: Chemistry learning is currently related to contextual or learning associated with everyday life. Many secondhand can be used in the surrounding environment as learning resources. Learning resources that can be made from secondhand is chemical property. This service focuses on high school /MA chemistry teachers in Tulungagung. This service aims to increase chemistry teachers' knowledge about the importance of using secondhand as chemical property. The method used Service Learning. The results of chemical property that can be made with secondhand are periodic systems of elements, hydrocarbons, electrolytes, colloids, pop-up books, molecular shapes, acids and bases, Thomson atomic models, Rutherford atomic models, monopoly reaction rates, chemical bonds, reaction rate madding, electron configuration magic box, and redox light. Based on the results and discussion, it can be concluded that chemical property can be made from secondhand with a Service-Learning approach to increase creative and innovative learning for teachers and students high school/MA in Tulungagung, Indonesia.

Keywords: Second hand, Chemical property, Service Learning

Introduction

The existence of teaching aids greatly helps the teaching and learning process in schools¹. In general, teaching aids are tools in the learning process². Teaching aids are a type of learning media that visualize the real thing, that is, the topic of the subject matter³.

¹ Ratna Kumala Dewi et al., "Demand of ICT-Based Chemistry Learning Media in the Disruptive Era," *International Journal of Evaluation and Research in Education (IJERE)* 8, no. 2 (2019): 265–270.

² Mega Suliani, "Persepsi Siswa Terhadap Penggunaan Alat Peraga Dalam Pembelajaran Matematika," *SJME (Supremum Journal of Mathematics Education)* 4, no. 1 (2020): 92.

³ Fransina Thresiana Nomleni and Theodora Sarlotha Nirmala Manu, "Pengembangan Media Audio Visual Dan Alat Peraga Dalam Meningkatkan Pemahaman Konsep Dan Pemecahan Masalah," *Scholaria: Jurnal Pendidikan dan Kebudayaan* 8, no. 3 (2018): 219–230.

The purpose of using teaching aids is to facilitate the teaching and learning process, increase the creativity of teachers and students, and increase student concentration in learning⁴. Teaching aids can be made in each subject, such as mathematics, physics, biology, chemistry, social studies, etc. The use of teaching aids is still not optimal due to the limited facilities and infrastructure in schools. Various types of props on the market or shop are quite expensive. Teachers or students at schools may object to having to buy their own to develop learning innovations⁵. The independent learning curriculum now requires teachers and students to create active and innovative learning, one of which is the use of teaching aids⁶.

Many alternatives can be used to get cost-effective props, one of which is using secondhand⁷. Secondhand used as props are found in every residence and the surrounding environment⁸. Secondhand are goods that the owner does not operate. Secondhand may be considered trash for some people because they are deemed useless and do not have a high selling value. There is a lot of potential that can develop by utilizing secondhand that many people don't know, one of which is props⁹. Types of secondhand used as props can be cardboard, bottles, cloth, paper, children's toys, used batteries, styrofoam, plastic, lamps, food wrappers, colors, etc.

The secondhand can be used to make chemical props¹⁰. Lecturers and students can jointly design and create designs to make chemical teaching aids using secondhand. Many activities can be done to get references, namely by observing teaching aid media activities at school, looking at shops, seeing examples on the internet, or watching how to make props on YouTube videos. Lecturers can teach the manufacture of chemical props using secondhand with a service learning approach.

Service learning is a student learning experience that integrates community service and learning on campus. Service learning is done by learning to do community service¹¹. Service learning uses a certain concept in courses that can be applied in the

⁴ Nurdyansyah, Bahak Udin, and Mochammad Alfian Rosid, "Pengembangan Media Alat Peraga Edukatif Interaktif (APEI) Laboratorium Bengkel Belajar Berbasis Custom By User," *Jurnal Teknologi Pendidikan* 6, no. 1 (2021): 54-71, <http://150.107.142.43/index.php/EDUCATE/article/viewFile/4047/2416>.

⁵ Ratna Kumala Dewi, "Innovation of Biochemistry Learning in Welcoming the Super Smart Society 5.0," *Insecta: Integrative Science Education and Teaching Activity Journal* 2, no. 2 (2021): 197-208.

⁶ Azmil Abidah et al., "The Impact of Covid-19 to Indonesian Education and Its Relation to the Philosophy of 'Merdeka Belajar,'" *Studies in Philosophy of Science and Education* 1, no. 1 (2020): 38-49.

⁷ Ayu Sulistiyowati, Siti Nur Afifah, and Tia Dwi Riskiyanti, "Student Response to the Effectiveness of Simple Props as a Physics Learning Media In Charles Law Materials At SMA Unggulan BPPT Darus Sholah Jember," *Jurnal Pendidikan Fisika* 10, no. 2 (2017): 88-93.

⁸ Syubhan Annur et al., "Development of Simple Machines Props Using Environmentally Friendly Materials for Junior High School," *Social Science, Education and Humanities Research (ASSEHR)* 330, no. Iceri 2018 (2019): 91-95.

⁹ Nurul Hidayah and Witri Anisa, "Peningkatan Motivasi Belajar Dan Kemampuan Berpikir Kritis Peserta Didik Menggunakan Model Think Pair Share Berbantuan Alat Peraga Bahan Bekas," *AR-RIAYAH: Jurnal Pendidikan Dasar* 3, no. 2 (2019): 165.

¹⁰ Wahyu Kurniawati and Setyo Eko Atmojo, "Pembelajaran Sains Bermuatan Karakter Ilmiah Dengan Alat Peraga Barang Bekas Dan Asesmen Kinerja," *JPI (Jurnal Pendidikan Indonesia)* 6, no. 1 (2017): 49-59.

¹¹ St. Syamsudduha St. Syamsudduha and Nurjannah Yunus Tekeng, "Penerapan Service Learning Dalam Pembelajaran Matakuliah Pedagogik Pada Kurikulum Pendidikan Calon Guru," *Lentera Pendidikan : Jurnal Ilmu Tarbiyah dan Keguruan* 20, no. 1 (2017): 1-17.

community or school¹². Service learning will connect students with the community or teachers in complex and directed situations¹³. In addition, service learning can help students improve critical and creative thinking and deepen and expand collaborative skills¹⁴. Service learning is one of the teaching approaches that combines learning objectives and efforts to solve problems in the community directly¹⁵. The aim is to enrich the lecture material.

Community service activities are not only carried out by lecturers, but students can also carry out the same activities. Students can do community service, with or not related to certain subjects. Service learning activities have never been carried out in the chemistry department of UIN Sayyid Ali Rahmatullah Tulungagung. Students do not know what is meant by a service learning approach. Lectures are carried out using the usual methods: presentations, questions and answers, and discussions. This service learning is carried out in the sixth semester of the Chemistry Learning Media course. This is done to develop students' socializing skills and collaboration with high school /MA Chemistry teachers in Tulungagung by making teaching aids. Activities began to be designed jointly by lecturers and students related to readiness, materials, and practical learning in the Chemistry Learning Media course with a service learning approach.

To increase the innovation and creativity of chemistry students and teachers, it is necessary to use a service learning-based approach¹⁶. This service aims to explain theory and practice in applying the service learning approach in the sixth-semester Chemistry Learning Media course to high school /MA chemistry students and teachers in Tulungagung to improve creative and innovative learning by using secondhand as chemical props.

Method

The service method focuses on developing the Chemistry Learning Media course with a service learning approach for high school/MA chemistry teachers in Tulungagung Regency. This service activity hopes to establish cooperation between teachers and students majoring in chemistry as an alternative learning method in higher education. This service activity is carried out on a participatory basis by involving the community (teachers in schools) to do things together with students to improve more creative and innovative learning. Service Learning activities can be shown in *Figure 1*.

¹² Iulia A. Copaci and Alina S. Rusu, "Trends in Higher Education Service-Learning Courses for Pre-Service Teachers: A Systematic Review," *The European Proceeding of Social & Behavioral Sciences* (2016): 1–11.

¹³ Irene Nusanti, "Strategi Service Learning Sebuah Kajian Untuk Mengembangkan Kegiatan Pembelajaran," *Jurnal Pendidikan dan Kebudayaan* 20, no. 2 (2014): 251.

¹⁴ Kristina Kasi, Sumarmi, and Komang Astina, "Pengaruh Model Pembelajaran Service Learning Terhadap Sikap Peduli Lingkungan Dan Kemampuan Menulis Karya Ilmiah Siswa SMA," *Jurnal Pendidikan:Teori, Penelitian, dan Pengembangan* 4, no. 3 (2018): 437–440.

¹⁵ Cathryn Berger Kaye, *The Process of Service Learning: The Big Picture, The Complete Guide to Service Learning* (Free Spirit, 2014).

¹⁶ Riza Faishol et al., "Pendampingan Kegiatan Pembelajaran Siswa Dengan Memanfaatkan Barang Bekas Untuk Meningkatkan Minat Dan Kreativitas Belajar Pada Masa Pandemi Covid-19," *ABDI KAMI: Jurnal Pengabdian Kepada Masyarakat* 4, no. 1 (2021): 092.

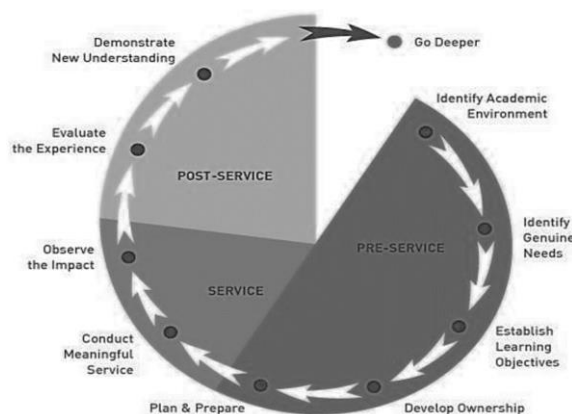


Figure 1. Service Learning Cycle

The method is carried out as follows:

First, Needs analysis/initial asset mapping. These initial assets include UIN Sayyid Ali Rahmatullah Tulungagung as a university that provides service-learning activities and assets of high school /MA in Tulungagung as a location for service activities. This activity can be described as follows:

- Analysis of the implementation of service learning by reviewing the service learning module and collecting data related to the performance of service learning.
- Analysis related to the Chemistry Learning Media course will be developed using a service learning approach. This Analysis is carried out by mapping the principles, characteristics, and media needs that will focus on course assignments with a service learning approach.
- Mapping school assets, including observations, document analysis, and teacher discussions.

Second, Service-Learning Implementation Design. This activity is carried out by planning the learning of Chemistry Learning Media courses in the form of assignments and assessments. Designing an orientation pattern aimed at high school/MA chemistry teachers in Tulungagung Regency, related to implementing learning with a service-learning approach. Design an orientation pattern for students regarding case studies, interest in observing, mentoring techniques, and ethics in social interaction.

Third, Implementation of Service Learning.

The orientation of service learning activities is carried out by high school/MA chemistry teachers and students. This activity involved six chemistry teachers, one lecturer, and 34 chemistry students at UIN Sayyid Ali Rahmatullah Tulungagung. In this activity, the lecturer explained the focus and purpose of service and introduced the concept of service learning in Chemistry Learning Media lectures. In this activity, students, lecturers, and chemistry teachers follow the stages of learning services in the Chemistry Learning Media course. Lecturers provide training in observing, observing, reflecting, and assessing skills.

Fourth, Preparation at the beginning of Chemistry Learning Media Lecture. In this stage several activities are carried out, including:

- a. Introducing the concept of service-learning to chemistry students.
Before entering into service activities, lecturers must first explain to students what service-learning means, why this course uses service learning and the relationship between service learning and community service. Lecturers must also clarify that service-learning can help enrich students' understanding of Chemistry Learning Media materials, hone skills in making chemical teaching aids using used materials, and increase social interaction with teachers. Students will know the form of assignments at the end of the lecture and the assessment criteria through the lecturer's explanation.
- b. Orientation and preparation of tools and materials.
Orientation is related to the selection of chemical materials that can be made as teaching aids, then the group determination of each group consists of two students. The next step is to prepare tools and materials from secondhand at home or in the environment around the student's residence.
- c. Make study contracts with students.
The learning contract contains students' duties and responsibilities in the Chemistry Learning Media course.
- d. Student data collection.
Student data collection in one class consists of the student group's name, the assisted school's name, the chemistry teacher's name, the product of teaching aids produced, and the number that can be contacted.

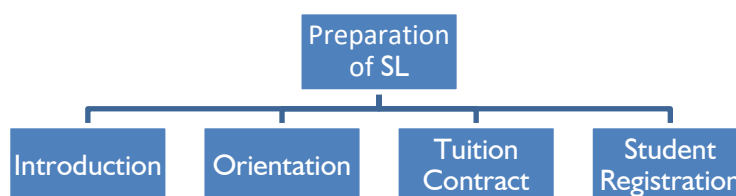


Figure 2. Service-Learning Preparation

Fifth, During Service-Learning Implementation. In this stage several activities are carried out, including:

- a. Maintain communication with school. Lecturers can monitor student involvement in activities with teachers in making chemical teaching aids made from used materials. Lecturers receive complaints, criticisms, and constructive suggestions from service schools by visiting the school directly;
- b. Lecturers monitor student activities. Lecturers must continue to monitor student activities so that they are in the service learning stages. This activity is carried out so that service learning can be successful by its main objectives, and the school is also satisfied with the service activities.
- c. Reflection. Lecturers can facilitate students to connect service-learning activities with theory in Chemistry Learning Media lectures. Feedback from students can be used for service-learning approach lecture strategies in the next semester.

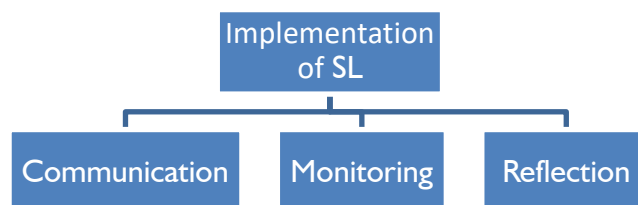


Figure 3. Implementation of Service-Learning

Sixth, End of Service-Learning Implementation. This stage is carried out through Closing of service-learning activities, collection of student activity assignments, carry out the assessment, and receive feedback from schools.

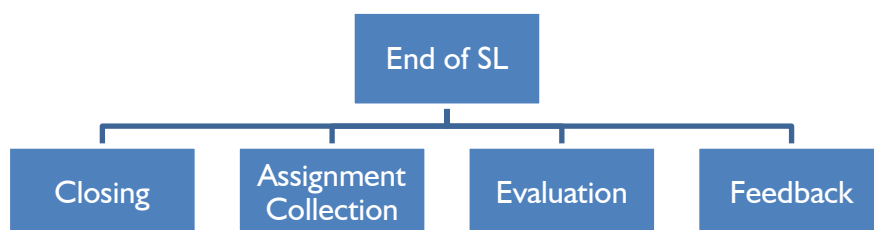


Figure 4. End of Service-Learning

Result

Service learning is a combination of service and learning activities¹⁷. Every lecturer who plans a learning method using a service learning approach must consider the learning objectives and the community's needs or assisted objects¹⁸. Competencies expected to be developed in the learning process and service learning from service learning are critical, creative, collaborative, and innovative thinking skills¹⁹. Lecture activities for Chemistry Learning Media with a service learning approach require a cooperative relationship between chemistry students at UIN Sayyid Ali Rahmatullah Tulungagung and high school/MA teachers in Tulungagung Regency.

Teachers in schools should also benefit from service learning activities carried out by chemistry students. The benefits of service learning activities include: (a) Establishing cooperation between high school/MA chemistry teachers and students and chemistry lecturers; (b) Influencing each other in terms of developing media products to be much better, and (c) Sharing resources for creative and innovative learning collaborations. The benefits of service learning are shown in Figure 5.

¹⁷ Nives Mikelic Preradovic, "Service Learning," *Encyclopedia of Educational Philosophy and Theory* (2016): 1–5.

¹⁸ Esrher Kuntjara et al., *Panduan Pelaksanaan Service Learning Di Universitas Kristen Petra* (Surabaya: Petra Cristian University, 2013).

¹⁹ Nusanti, "Strategi Service Learning Sebuah Kajian Untuk Mengembangkan Kegiatan Pembelajaran."

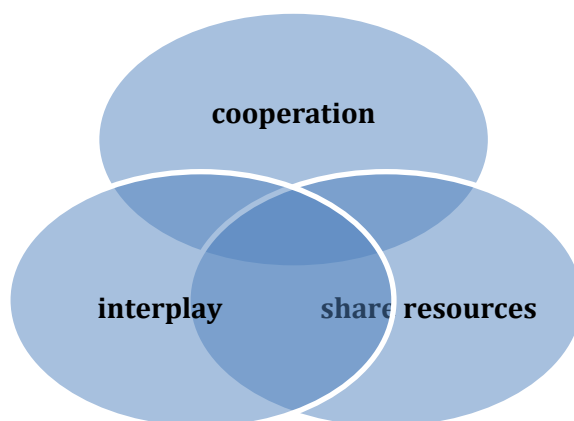


Figure 5. Benefits of Service-Learning

The description of the Process of Learning Activities with Service Learning is as follows:

Course Determination

When determining the courses that are the subject of service learning, the lecturer must consider many things, including the type of subject, the relationship with learning in school, the number of credits, and the product produced. Based on the selection and consideration of various courses in the chemistry department of UIN Sayyid Ali Rahmatullah Tulungagung, the Chemistry Learning Media course was chosen as the service learning subject.

This course was chosen because it is of the learning outcomes of the study program, namely being able to apply critical, logical, systematic, and innovative student thinking in the context of developing or implementing science and technology by paying attention to and using humanities values according to the field of expertise. This course consists of 3 credits and is taught to sixth-semester students in the Department of Chemistry at UIN Sayyid Ali Rahmatullah Tulungagung.

Determination of High School /MA Schools and Needs Analysis

As a religious higher education institution, UIN Sayyid Ali Rahmatullah Tulungagung has collaborated with various schools. The school that is used as a service learning partner is a high school/MA school where student internships are located in Tulungagung Regency. Each year the campus has an internship program with partner schools to conduct teaching practices. The school can be a location for holding service learning, both public schools (SMAN) or Madrasah Aliyah (MA).

Lecture Design and Supporting Instruments

The next activity is to develop a design for Chemistry Learning Media lecture activities with a service learning approach by providing understanding to students directly during lectures and by virtual (zoom). At the beginning of the training, the lecturer gave an overview to the students about the service learning approach and what

to do in this activity. Lecturers and students will jointly design lectures with a service learning approach with the final product of chemical teaching aids made from used materials.



Figure 6. Lecture Design and Service Learning Supporting Instruments

At the next meeting, the lecturer made group divisions and explained several chemical props that can be made using used materials. This activity has included service learning elements in the description of the Chemistry Learning Media course and learning objectives, then includes reflection activities. This activity is carried out virtually through media zoom. Lecturers display various examples of teaching aids that can later be used as references in determining the chemical teaching aids to be made. Lecturers and students can jointly prepare supporting instruments to collaborate with chemistry teachers in high school/MA.

The task of students in Chemistry Learning Media lectures with a service learning approach is to design chemical teaching aids using used materials. The first activity carried out by students is to look for Chemistry Learning Media references by observing or searching for ideas from various sources. The lecturer then prepares assignments for students as product designs for chemical teaching aids.

In this assignment, students were asked to describe the props made, their purpose, tools and materials, and the workings of making chemical teaching aids made from used materials. This task is completed in groups and can be discussed with the chemistry teacher at the school as the object of service learning assistance. Assignments are collected into a single file in Google Drive, making it easier for lecturers to correct student work. A picture of the collection of teaching aids product design tasks is shown in Figure 7.

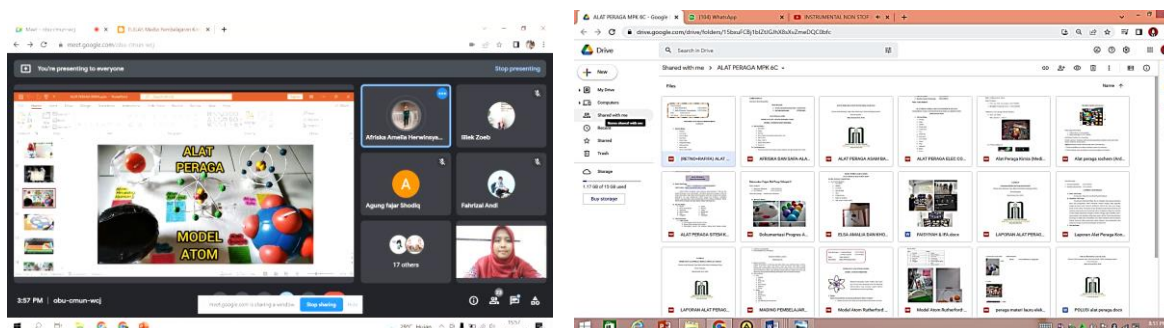


Figure 7. Introduction to Chemistry Teaching Aids and Service-Learning Supporting Instruments (left) and The Tasks for Designing Props (right)

Implementation of Orientation, Chemistry Learning Media Lectures with a Service-Learning Approach

The process of service activities with a service learning approach is carried out by orientation or providing an introduction to chemistry teachers and students. This is in the form of introducing the concept of service learning and learning objectives to the products' results. The students who carried out service learning activities were students of class VI C majoring in chemistry at UIN Sayyid Ali Rahmatullah Tulungagung, which consisted of 36 students. This activity was carried out in early May when sixth-semester students were doing internships.

Lecture activities are carried out by integrating the Chemistry Learning Media course with a service learning approach. Lecturers will teach students to reflect on learning, listening, observing, and problem-solving skills. The lecturer then determines the time to be able to collaborate in making chemical teaching aids at school. Students and teachers can work together in making chemical teaching aids made from used materials. This activity involves discussions, presentations, and joint exhibitions in class. Teachers and students can watch all media together so that each can reflect on the results of products made with the results of other groups.



Figure 8. Assistance in Making Teaching Aids for Teachers and Students

Teachers, students, and lecturers can provide input, criticism, and suggestions in improving chemical teaching aid products made from used materials before being exhibited in seminars so that the products displayed later are as expected.



Figure 9. Collaboration of Chemistry Teaching Aids between Teachers and Students

Produced Products

First, Chemistry Props. The work of students and chemistry teachers is the final product of learning with a service learning approach. This product is a chemical teaching aid using used raw materials to support the chemistry learning process in schools. Some types of props made are periodic systems of elements, hydrocarbons, electrolytes,

colloids, pop-up books, molecular shapes, acids and bases, Thomson atomic model, Rutherford atomic model, monopoly reaction rate, chemical bonds, reaction rate madding, electron configuration magic box, redox lights, etc.



Figure 10. Examples of Chemical Teaching Aid Products Made from Used Materials

Second, Video Props uploaded on Youtube. In addition to chemical teaching aids, students and teachers also make learning videos on how to make chemical teaching aids using used materials. What is conveyed in the learning video is related to the title of teaching aids, objectives, supporting theories, tools, and materials, the process of making teaching aids, and conclusions. The results of the learning video are uploaded on the YouTube page to be a reference in making chemical teaching aids.

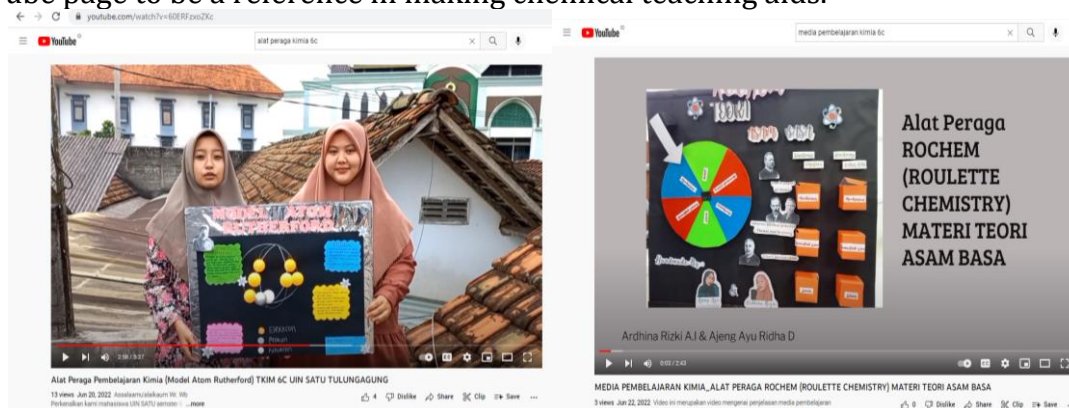


Figure 11. Video Props uploaded on Youtube

Exhibition of Chemical Aid Media Results

The exhibition of the results of chemical teaching aids made from used materials was carried out at the end of the lecture process, which was held on June 21, 2022, to coincide with a workshop on guidance for making play store chemistry on Android as a learning medium. This exhibition is a form of student appreciation of the results of teaching aid products made with a service-learning approach. The teachers also witnessed the exhibition of props created by chemistry students.

This chemistry teaching aid was developed with a service-learning approach. Its function is to combine theoretical and practical learning, as well as to provide students with experience in collaborating with teachers at school. Service-learning development is done through a needs analysis process (asset map), media design, media testing,

reflection, and product revision. Things that are developed are media packaging, media presentation, media assignments, and assessments. The exhibition of student chemistry teaching aids was displayed around the hall of the Arief Mustakhim building.



Figure 12. Chemistry Aid Workshop and Exhibition of Chemical Aids Made from Used Materials

End of Service-Learning Implementation

First, Orientation material. Orientation material is material that course lecturers prepare as a requirement in the implementation of learning with a service-learning approach. The orientation material contains concepts in service learning, service-learning skills such as interaction patterns of chemistry teachers, lecturers, and students, and an overview of the Chemistry Learning Media course. In this orientation activity, chemistry teachers and students were given training and the opportunity to simulate making chemical teaching aids together.

Second, Assignment format. Assignments are given to support the achievement of learning objectives with a service-learning approach. Projects are also carried out with collaboration between students and chemistry teachers. Chemistry students and teachers design chemical teaching aid products made from used materials from the beginning to the end. In addition, students also have to present the development of products made every week. Students must show the progress of making media uploaded to Google Drive. Students also make learning videos for making props from beginning to end. The last student activity is an exhibition of chemical teaching aids' results using a service-learning approach with chemistry teachers.

Third, Reflection. Reflection activities in service learning are carried out by students visiting schools, observing, asking questions, looking for theories, planning actions, and creating ideas in making media with chemistry teachers. Chemistry teachers can provide input, criticism, and suggestions and jointly design the manufacture of chemical teaching aids using used materials that are more creative and innovative. Students listen to information from the chemistry teacher and relate it to existing theory.

Students can learn the advantages and disadvantages of learning with a service learning approach. Students can connect the service carried out with learning activities in the Chemistry Learning Media course through reflection activities. In addition, students will understand that the school where the service learning service is located is a relevant place for learning. Students can also take valuable lessons from the service activity of making teaching aids made from used materials with a service learning approach in collaboration with chemistry teachers at schools.

Chemistry teachers also get new knowledge from service activities about making chemical teaching aids made from used materials with a service learning approach. This will certainly overcome the problem of the limitations of chemical teaching aids in schools, and with this service, learning will become more creative and innovative.



Figure 13. Reflection of Teaching Aids with Chemistry Teachers with the SL

Fourth, Rating Format. The assessment of chemistry students of class VI C was carried out with three criteria, namely cognitive assessment (final media project, consistency in the design of teaching aids from beginning to end, and the ability to collaborate basic knowledge of media theory with the product made), affective (attitude during lectures, action at school, attitude with fellow students, chemistry teachers, supervisors, students at school, the seriousness of the investigation, and responsibility for completing assignments), and psychomotor (process skills, compiling reports, presentations, and making videos of the results of chemical teaching aid products. The evaluation of teaching aid products was carried out during service-learning seminars at schools and campuses. Students with chemistry teachers carry out process assessments during the reflection process.

Discussion

Service Learning

The teaching and learning process in the campus environment can not only be done in the classroom, but students can also apply their knowledge outside the classroom, namely in the community²⁰. Service Learning is a learning method approach that connects the theories that students get to be used or practiced into real actions, namely partnership activities in the community. Through service learning activities, students will be able to learn to pay special attention to the environment, try to solve problems that occur in society, develop collaboration skills, work together, communicate, negotiate, and other practical learning to improve students' interpersonal skills²¹.

²⁰ Kathleen Flecky and Lynn Gitlow, *Foundations of Service-Learning, Service Learning in Occupational Therapy Education*, 2009.

²¹ Endah Setyowati and Alviani Permata, "Service Learning: Mengintegrasikan Tujuan Akademik Dan Pendidikan Karakter Peserta Didik Melalui Pengabdian Kepada Masyarakat," *Bakti Budaya* 1, no. 2 (2018): 143.

Service learning will train students' sensitivity to society and their environment. Students must have compassion for fellow human beings and think critically in facing societal challenges and needs. Service-Learning can be done in certain subjects according to the field of expertise, especially in education. This activity is the same as research involving partnerships between universities and the community. Still, it differs from the Real Work Lecture (KKN) activities, which affect the community. Service-Learning activities can simultaneously carry out three main functions in the Tri Dharma of higher education: the fields of education, teaching, and community service²². Service learning provides an opportunity to shape students' character from the services offered to the community²³. Lecturers can provide opportunities for students to create research programs in the community as a form of university partnership with the district.

Chemistry Props

Learning media is very varied, one of which is teaching aids. Chemistry teaching aids are teaching aids with a chemical concept approach as a form of visualization of the material being taught to make it look accurate and easy to understand²⁴. Chemistry learning will also be more effective and efficient if using teaching aids. Teaching aids have a vital role in the chemistry learning process in schools. Teaching aids can be interpreted as media used by teachers in terms of helping students improve their knowledge and skills, illustrating, conveying lesson messages, providing information, and increasing student creativity²⁵. Teaching aids are used as teaching aids so that students more easily understand the material taught by the teacher²⁶.

Chemistry learning by utilizing teaching aids will make students' knowledge more meaningful, innovative, creative, engaging, and fun and make it easier for students to understand chemistry well²⁷. The steps in making chemical teaching aids are starting by thinking about topics or chemical materials that can be made teaching aids, designing teaching aids, collecting tools and materials, assembling teaching aids, completing chemical props until they are ready for use, and documenting each activity carried out. When designing teaching aids, attention must be paid to the selection of materials, suitability to the materials, goals, and time allocation provided. Props made must also be by the development of the digital era now, meaning that they are not the same as examples of props that have been made before but can be improved with the creativity of teachers or students, such as making SPU with a shape like a ball, madding includes

²² Ridwan Andi et al., *Panduan Implementasi Service-Learning Di UIN Alauddin Makassar*, vol. 1 (Makassar: Nur Khairunnisa Press, 2016), <http://litapdimas.kemenag.go.id/publication>.

²³ Copaci and Rusu, "Trends in Higher Education Service-Learning Courses for Pre-Service Teachers: A Systematic Review."

²⁴ D. Mayangsari, F. S. Irwansyah, and I. Farida, "The Making of Metal Coating Props Oriented Chemical Representation," *Journal of Physics: Conference Series* 1402, no. 5 (2019).

²⁵ Khoirul Anwar and Jurotun Jurotun, "Peningkatan Aktivitas Dan Hasil Belajar Siswa SMA Pada Dimensi Tiga Melalui Model Pembelajaran PBL Berbantuan Alat Peraga," *Kreano, Jurnal Matematika Kreatif-Inovatif* 10, no. 1 (2019): 94-104.

²⁶ Kurniawati and Atmojo, "Pembelajaran Sains Bermuatan Karakter Ilmiah Dengan Alat Peraga Barang Bekas Dan Asesmen Kinerja."

²⁷ Cindi Patika Sari, Raudhatul Fadhillah, and Dedeh Kurniasih, "Validitas Alat Praktikum Kimia Berbasis Bahan Bekas Pada Materi Termokimia," *Jurnal IPA dan Pembelajaran IPA* 6, no. 2 (2022): 130-144.

barcodes so that more detailed material can be obtained. Known by students, the use of LED lights in the development of atomic theory so that it can be seen the difference between each of the atomic theories of Dalton, Thomson, Rutherford, and modern atomic theory as well as many more props that can be made to be different from the existing ones.

Chemistry teaching aids made by high school/MA chemistry students and teachers in Tulungagung with a service learning approach are the periodic system of elements, hydrocarbons, electrolytes, colloids, pop-up books, molecular shapes, acids and bases, Thomson atomic model, Rutherford atomic model, rate monopoly reactions, chemical bonds, reaction rate madding, electron configuration magic boxes, and redox lights.

Used Items for Making Props

Using secondhand can reduce the waste around us and create something of value in education, namely teaching aids²⁸. The manufacture of chemical teaching aids using secondhand is expected to overcome the limitations of chemical teaching aids in schools as a source of student learning²⁹. Making chemical teaching aids using secondhand can increase the creativity of high school/MA students and teachers in honing their potential according to their talents and interests. Chemistry teaching aids with used materials can increase students' motivation and understanding at school³⁰. Chemical props can be made with various tools and materials around us, including secondhand³¹. Many used items can be used to make props, including cardboard, bottles, cloth, paper, children's toys, used batteries, styrofoam, plastic, lamps, food wrappers, colors, etc.

Using used bottles is an example of using secondhand as props for hydrocarbons. Used bottles can be used as items of economic value with a service learning approach³². Tools and materials used to make hydrocarbon props include bottle caps, plastic straws, styrofoam, folding paper, manila paper, glue, and colored pencils. How to make it by cutting used manila paper according to the size of styrofoam, pasting it using a double type, cutting plastic straws by differentiating the size of the bond between C-H elements and C-C elements, cutting folded paper according to bottle caps, distinguishing colors between C and H atoms, joining bottle caps with straws according to the bonds in methane and ethane compounds using hot glue, then be a prop for chemical bonds in hydrocarbon compounds.

In addition to the hydraulics, there are other teaching aids, namely the Configuration Magic Box, which uses used materials in the form of used cardboard, zinc, magnets, manila paper, and markers. This teaching aid uses electron configuration

²⁸ Nahed Nuwairah, Zainuddin Zainuddin, and Mastuang Mastuang, "Pemanfaatan Barang Bekas Dalam Pembuatan Alat Peraga Dengan Menggunakan Model Inquiry Discovery Learning Terbimbing," *Jurnal Ilmiah Pendidikan Fisika 2*, no. 2 (2018): 98.

²⁹ Hidayah and Anisa, "Peningkatan Motivasi Belajar Dan Kemampuan Berpikir Kritis Peserta Didik Menggunakan Model Think Pair Share Berbantuan Alat Peraga Bahan Bekas."

³⁰ Bayu Pambudi et al., "Pengembangan Alat Peraga IPA Dari Barang Bekas Untuk Meningkatkan Motivasi Belajar Dan Pemahaman Siswa Sekolah Dasar," *Indonesian Journal of Primary Education 2*, no. 2 (2019): 28.

³¹ Ratna Dewi Masturoh, Marmi Sudarmi, and Diane Noviandini, "Barang Bekas Di Sekitarku (BARBEKU) Sebagai Alat Peraga Sederhana Untuk Meningkatkan Pemahaman Hukum III Newton," *Jurnal Sains dan Edukasi Sains 2*, no. 1 (2019): 16–25.

³² Shania Stacey Sengkey et al., "Pemanfaatan Sampah Bekas Botol Plastik Sebagai Bahan Kursi Untuk Aktivitas Service Learning Mata Kuliah Creative Preneurship," *SHARE "SHaring - Action - REflection" 6*, no. 2 (2020): 99–104.

chemistry by making a game of arranging the electron configuration of an element with the principle of Aufbau's Rule. This teaching aid is also equipped with game rules and examples according to the theory of the Aufbau principle. The Configuration Magic Box has two columns where the electron configuration can be arranged so that it can be played by two people at once or used as a game between 2 players. This teaching aid makes it easier for students to understand electron configuration material, especially in the arrangement of orbitals, and provides students with a more enjoyable learning experience in class.

The task of making chemical teaching aids using used materials with a service learning approach is documented in the form of a props-making report uploaded on the google drive link, as well as a video of making props on youtube. Chemistry teaching aids are needed in learning activities, but their manufacture does not have to be expensive, and there is no need to use high-quality material³³. Props can be made from secondhand that are around the neighborhood³⁴. This service learning activity is expected to increase the innovation and creativity of students and high school chemistry teachers in utilizing used materials as chemical teaching aids.

Conclusion

The learning method with a service learning approach can be applied to the Chemistry Learning Media course. Service activities that provide direct experience for students to collaborate directly with high school/MA chemistry teachers positively impact student learning outcomes. Students will be more familiar with the need for learning media in schools, supervisors will gain experience with problems that exist in schools related to media, and chemistry teachers will gain new knowledge about service learning activities for making teaching aids using secondhand. The experience of reflecting with high school/MA chemistry teachers in Tulungagung provides meaningful and meaningful lessons for chemistry students and lecturers.

It is hoped that other courses can also apply learning methods with a service learning approach to establish collaboration and cooperation with various community partners. Service learning can improve students' ability to interact in specific communities or societies. Over time, it is hoped that future service activities can be refined and continuous improvements made so that the UIN Sayyid Ali Rahmatullah Tulungagung campus can build qualified, superior human resources and be ready to serve in the community.

³³ Nur Roikhatul Jannah and Wiwied Pratiwi, "Pendampingan Kegiatan Belajar Siswa Dengan Memanfaatkan Barang Bekas Untuk Meningkatkan Minat Dan Kreativitas Belajar Siswa Pada Era Covid-19," *Bulletin of Community Engagement* 1, no. 2 (2021), <https://www.attractivejournal.com/index.php/bce//index>.

³⁴ Faishol et al., "Pendampingan Kegiatan Pembelajaran Siswa Dengan Memanfaatkan Barang Bekas Untuk Meningkatkan Minat Dan Kreativitas Belajar Pada Masa Pandemi Covid-19."

References

- Abidah, Azmil, Hasan Nuurul Hidaayatullaah, Roy Martin Simamora, Daliana Fehabutar, and Lely Mutakinati. "The Impact of Covid-19 to Indonesian Education and Its Relation to the Philosophy of 'Merdeka Belajar.'" *Studies in Philosophy of Science and Education* 1, no. 1 (2020): 38–49.
- Andi, Ridwan, Kambau Nurhira, Abdul Kadir, Mutmainnah Jamilah, Aisyah Rahman, Editor : Sitti, Saleha Konsultan, et al. *Panduan Implementasi Service-Learning Di UIN Alauddin Makassar*. Vol. 1. Makassar: Nur Khairunnisa Press, 2016. <http://litapdimas.kemenag.go.id/publication>.
- Annur, Syubhan, Mustika Wati, Veronika Wahyuni, and Dewi Dewantara. "Development of Simple Machines Props Using Environmentally Friendly Materials for Junior High School." *Social Science, Education and Humanities Research (ASSEHR)* 330, no. Iceri 2018 (2019): 91–95.
- Anwar, Khoirul, and Jurotun Jurotun. "Peningkatan Aktivitas Dan Hasil Belajar Siswa SMA Pada Dimensi Tiga Melalui Model Pembelajaran PBL Berbantuan Alat Peraga." *Kreano, Jurnal Matematika Kreatif-Inovatif* 10, no. 1 (2019): 94–104.
- Copaci, Iulia A., and Alina S. Rusu. "Trends in Higher Education Service-Learning Courses for Pre-Service Teachers: A Systematic Review." *The European Proceeding of Social & Behavioral Sciences* (2016): 1–11.
- Dewi, Ratna Kumala. "Innovation of Biochemistry Learning in Welcoming the Super Smart Society 5.0." *Insecta: Integrative Science Education and Teaching Activity Journal* 2, no. 2 (2021): 197–208.
- Dewi, Ratna Kumala, Sri Wardani, Nanik Wijayati, and Woro Sumarni. "Demand of ICT-Based Chemistry Learning Media in the Disruptive Era." *International Journal of Evaluation and Research in Education (IJERE)* 8, no. 2 (2019): 265–270.
- Faishol, Riza, Meliantina Meliantina, Eka Ramianti, Ellyana Ilsan Eka Putri, and Syu'adah Murni Rahayu. "Pendampingan Kegiatan Pembelajaran Siswa Dengan Memanfaatkan Barang Bekas Untuk Meningkatkan Minat Dan Kreativitas Belajar Pada Masa Pandemi Covid-19." *ABDI KAMI: Jurnal Pengabdian Kepada Masyarakat* 4, no. 1 (2021): 092.
- Flecky, Kathleen, and Lynn Gitlow. *Foundations of Service-Learning. Service Learning in Occupational Therapy Education*, 2009.
- Hidayah, Nurul, and Witri Anisa. "Peningkatan Motivasi Belajar Dan Kemampuan Berpikir Kritis Peserta Didik Menggunakan Model Think Pair Share Berbantuan Alat Peraga Bahan Bekas." *AR-RIAYAH: Jurnal Pendidikan Dasar* 3, no. 2 (2019): 165.
- Kasi, Kristina, Sumarmi, and Komang Astina. "Pengaruh Model Pembelajaran Service Learning Terhadap Sikap Peduli Lingkungan Dan Kemampuan Menulis Karya Ilmiah Siswa SMA." *Jurnal Pendidikan:Teori, Penelitian, dan Pengembangan* 4, no. 3 (2018): 437–440.
- Kaye, Cathryn Berger. *The Process of Service Learning: The Big Picture. The Complete Guide to Service Learning*. Free Spirit, 2014.

- Kuntjara, Esrher, Herry Palit, Lilianny Sigit Arifin, Listia Natadjaja, and Yohanes Budi Cahyono. *Panduan Pelaksanaan Service Learning Di Universitas Kristen Petra*. Surabaya: Petra Cristian University, 2013.
- Kurniawati, Wahyu, and Setyo Eko Atmojo. "Pembelajaran Sains Bermuatan Karakter Ilmiah Dengan Alat Peraga Barang Bekas Dan Asesmen Kinerja." *JPI (Jurnal Pendidikan Indonesia)* 6, no. 1 (2017): 49–59.
- Masturoh, Ratna Dewi, Marmi Sudarmi, and Diane Noviandini. "Barang Bekas Di Sekitarku (BARBEKU) Sebagai Alat Peraga Sederhana Untuk Meningkatkan Pemahaman Hukum III Newton." *Jurnal Sains dan Edukasi Sains* 2, no. 1 (2019): 16–25.
- Mayangsari, D., F. S. Irwansyah, and I. Farida. "The Making of Metal Coating Props Oriented Chemical Representation." *Journal of Physics: Conference Series* 1402, no. 5 (2019).
- Nomleni, Fransina Thresiana, and Theodora Sarlotha Nirmala Manu. "Pengembangan Media Audio Visual Dan Alat Peraga Dalam Meningkatkan Pemahaman Konsep Dan Pemecahan Masalah." *Scholaria: Jurnal Pendidikan dan Kebudayaan* 8, no. 3 (2018): 219–230.
- Nurdyansyah, Bahak Udin, and Mochammad Alfian Rosid. "Pengembangan Media Alat Peraga Edukatif Interaktif (APEI) Laboratorium Bengkel Belajar Berbasis Custom By User." *Jurnal Teknologi Pendidikan* 6, no. 1 (2021): 54–71. <http://150.107.142.43/index.php/EDUCATE/article/viewFile/4047/2416>.
- Nusanti, Irene. "Strategi Service Learning Sebuah Kajian Untuk Mengembangkan Kegiatan Pembelajaran." *Jurnal Pendidikan dan Kebudayaan* 20, no. 2 (2014): 251.
- Nuwairah, Nahed, Zainuddin Zainuddin, and Mastuang Mastuang. "Pemanfaatan Barang Bekas Dalam Pembuatan Alat Peraga Dengan Menggunakan Model Inquiry Discovery Learning Terbimbing." *Jurnal Ilmiah Pendidikan Fisika* 2, no. 2 (2018): 98.
- Pambudi, Bayu, Riza Bahtiar Efendi, Lia Ayu Novianti, Dwi Novitasari, and Nur Ngazizah. "Pengembangan Alat Peraga IPA Dari Barang Bekas Untuk Meningkatkan Motivasi Belajar Dan Pemahaman Siswa Sekolah Dasar." *Indonesian Journal of Primary Education* 2, no. 2 (2019): 28.
- Preradovic, Nives Mikelic. "Service Learning." *Encyclopedia of Educational Philosophy and Theory* (2016): 1–5.
- Roikhatul Jannah, Nur, and Wiwied Pratiwi. "Pendampingan Kegiatan Belajar Siswa Dengan Memanfaatkan Barang Bekas Untuk Meningkatkan Minat Dan Kreativitas Belajar Siswa Pada Era Covid-19." *Bulletin of Community Engagement* 1, no. 2 (2021). <https://www.attractivejournal.com/index.php/bce//index>.
- Sari, Cindi Patika, Raudhatul Fadhillah, and Dedeh Kurniasih. "Validitas Alat Praktikum Kimia Berbasis Bahan Bekas Pada Materi Termokimia." *Jurnal IPA dan Pembelajaran IPA* 6, no. 2 (2022): 130–144.
- Sengkey, Shania Stacey, Devina Rosy Sutiono, Jennifer Gunawan, and Yusita Kusumarini. "Pemanfaatan Sampah Bekas Botol Plastik Sebagai Bahan Kursi Untuk Aktivitas Service Learning Mata Kuliah Creative Preneurship." *SHARE "SHaring - Action -*

Reflection 6, no. 2 (2020): 99–104.

Setyowati, Endah, and Alviani Permata. "Service Learning: Mengintegrasikan Tujuan Akademik Dan Pendidikan Karakter Peserta Didik Melalui Pengabdian Kepada Masyarakat." *Bakti Budaya* 1, no. 2 (2018): 143.

Suliani, Mega. "Persepsi Siswa Terhadap Penggunaan Alat Peraga Dalam Pembelajaran Matematika." *SJME (Supremum Journal of Mathematics Education)* 4, no. 1 (2020): 92.

Sulistiyowati, Ayu, Siti Nur Afitah, and Tia Dwi Riskiyanti. "Student Response to the Effectiveness of Simple Props as a Physics Learning Media In Charles Law Materials At SMA Unggulan BPPT Darus Sholah Jember." *Jurnal Pendidikan Fisika* 10, no. 2 (2017): 88–93.

St. Syamsudduha, St. Syamsudduha, and Nurjannah Yunus Tekeng. "Penerapan Service Learning Dalam Pembelajaran Matakuliah Pedagogik Pada Kurikulum Pendidikan Calon Guru." *Lentera Pendidikan : Jurnal Ilmu Tarbiyah dan Keguruan* 20, no. 1 (2017): 1–17.