Jurnal Pendidikan Kimia Indonesia
Volume 7, Issue 2, 2023, pp. 69-78
p-ISSN: 2087-9040 e-ISSN: 2613-9537
Open Access: https://doi.org/10.23887/jpki.v7i2.69256

Inquiry-Based E-Worksheet with Local Wisdom of Brebes Central Java for High School Students' Understanding of Reaction Rates

Elfina Salsabila[1*], Eli Rohaeti[2]

[1,2] Chemistry Education, Yogyakarta State University, Yogyakarta, Indonesia

ARTICLE INFO

Article history:
Received November 6, 2023
Revised November 27, 2023
Accepted February 7, 2024
Available online February 15, 2024

Kata Kunci:
E-LKPD, Inkuiri, Kearifan Lokal, Laju Reaksi

Keywords:
E-Worksheet, Inquiry, Local Wisdom, Reaction Rates

ABSTRAK

Bahan ajar memiliki peran penting dalam mendukung pembelajaran yang efektif, terutama melalui penerapan pendekatan inkuiri dan pemahaman kearifan lokal. Penelitian ini bertujuan untuk mengembangkan E-LKPD berbasis inkuiri dan bermuatan kearifan lokal Brebes Jawa Tengah pada materi laju reaksi. Metode penelitian yang digunakan adalah penelitian dan pengembangan (R&D) dengan model pengembangan 4D. E-LKPD yang dikembangkan melibatkan enam kegiatan pembelajaran sesuai dengan sintaks model inkuiri terbimbing, dengan dukungan program Flip PDF Professional. Kualitas E-LKPD dinilai oleh sejumlah pakar, seperti ahli materi, ahli media, peer reviewer, guru kimia, dan peserta didik SMA. Hasil penilaian menunjukkan tingkat validitas yang tinggi, dengan penilaian oleh peer reviewer mencapai 88,56% (Sangat Baik), penilaian oleh reviewer mencapai 92,05% (Sangat Praktis), dan penilaian oleh peserta didik mencapai 91,37% (Sangat Baik) dalam hal keterbacaan. Dengan demikian, E-LKPD ini dianggap sebagai sumber belajar yang efektif dalam pembelajaran kimia, memungkinkan peserta didik untuk terlibat aktif dalam proses pembelajaran sekaligus menghargai kearifan lokal.

ABSTRACT

Teaching materials play a significant role in facilitating effective learning, particularly when utilizing inquiry-based approaches and incorporating an appreciation of local wisdom. This research has the purpose to create an E-Worksheet based on inquiry and enriched with local wisdom from Brebes, Central Java, specifically designed for the topic of reaction rates. The research method employed is Research and Development (R&D) utilizing a 4D development model. The developed E-Worksheet encompasses six learning activities that align with the guided inquiry model, with support from the Flip PDF Professional program. The quality of the E-Worksheet is evaluated by a variety of experts, such as subject matter experts, media experts, peer reviewers, chemistry teachers, and high school students. The assessment results reveal a high degree of validity, with peer reviewers assigning a rating of 88.56% (Very Good), reviewers evaluating it as 92.05% (Very Practical), and students rating it at 91.37% (Very Good) in terms of readability. Hence, this E-Worksheet is regarded as an effective learning tool in the field of chemistry education, enabling students to actively participate in the learning process while also gaining an appreciation for indigenous knowledge.

1. INTRODUCTION

Education represents a fundamental response to the challenges of the future, serves as a cornerstone of societal progress, and stands as a fundamental human necessity. In Indonesia's National Education System, as outlined in Law No. 20 of 2003, education is defined as a deliberate and organized effort to create an environment where students actively nurture their potential, which encompasses spiritual strength, self-discipline, personality, intellect, moral character, and essential skills for personal, societal, national, and state needs. The 21st century is characterized by the widespread influence of information and communication technology in all domains, including education (Trisdiono & Muda, 2013). In this context, education plays a crucial role in providing 21st-century learners with essential skills such

*Corresponding author
E-mail addresses: salsabilaelfina@gmail.com (Elfina Salsabila)

as adaptability, technological literacy, information management, and life skills. This ensures their ability to thrive and contribute effectively to society (Murti, 2015). The 21st-century learning paradigm signifies an adaptation in response to societal shifts, moving from an industrial society to an information-based one marked by digital advancement. As a result, educational practices in Indonesia must align with the swift progress in digitization (Syahputra, 2018).

Effective and efficient learning depends on the accessibility of supportive teaching materials, which play a crucial role in the educational process. One widely acknowledged type of instructional material on a global scale is Student Worksheets. These are carefully crafted printed educational resources used by educators in conjunction with the teaching process (Riyadi et al., 2018). It is important to acknowledge that the distribution of worksheets extends beyond the limitations of traditional print media; it has smoothly transitioned into the digital domain. Student worksheet instructional materials can be effortlessly transformed into an electronic format known as an E-Worksheet. This electronic version utilizes computer-assisted technology, incorporating elements such as images, animations, and videos, to actively engage students and prevent boredom (Hafsah et al., 2016). The availability of electronic resources enables flexible learning opportunities for students and can function as a way to improve their mastery of the subject matter (Haryanto et al., 2020; Sujatmika, et al.,2019).

Teaching materials originate from a carefully designed lesson plan created by educators. While, in theory, any book can serve as a learning resource for students, what distinguishes instructional materials is their customized organization. They are structured according to the particular learning requirements of students, focusing on areas where students have not yet attained proficiency (Yuberti, 2014). These materials seamlessly integrate into the learning process when paired with a suitable instructional model. One such model is guided inquiry, which is supported by a variety of studies (Marto, et al., 2023; Nurdyansyah & Fahyuni, 2016; Mellyzar, 2021; Zuhro et al., 2017). Inquiry-based learning, at its essence, centers on students and encompasses several stages, which include problem identification, question formulation, hypothesis development, data collection, hypothesis testing, and conclusion drawing (Sanjaya, 2016). During the implementation of guided inquiry learning, teachers take on the role of mentors and actively engage students in the decision-making process. Initially, teachers offer significant guidance, gradually decreasing the frequency of their support as time goes on. This approach helps students develop into skilled investigators, effectively fostering their scientific knowledge and aiding them in improving their text comprehension skills (Ristanto et al., 2018; Yunus et al., 2013).

Local wisdom can be regarded as a social and communicative system that engenders a mode of self-organization within a culture (Pesurnay, 2018). Local wisdom can serve as a reflection of a community's cultural identity, enabling individuals to cultivate well-being in alignment with local necessities. (Pornpimon et al., 2014). Nevertheless, a substantial segment of society, particularly the younger generation, is progressively forgetting the culture and local wisdom of their region. They have become more acquainted with fast food rather than local cuisine, and they increasingly prefer to emulate the lifestyles and cultures of other countries, such as K-Pop, Punk, Hip-Hop, and so forth (Suprapto et al., 2021). The incorporation of local wisdom into the learning process is deemed essential for mitigating the moral and spiritual crises that emerge as adverse outcomes of the globalization era (Asmani, 2012; Suyitno, 2012).

Education and culture share a profound connection, and to ensure the lasting relevance of local wisdom in a constantly changing world, it is imperative to incorporate it into the realm of education (Suherman et al., 2022; Zakiyah, 2022). Local wisdom-based learning entails utilizing elements of a community's culture that are intertwined with the community itself. Teachers play a crucial role in shaping these learning approaches by tapping into the local wisdom of a particular region. This effort introduces students to the unique aspects, culture, traditions, and community initiatives related to environmental issues within that region. As a result, teachers can utilize the natural environment and local phenomena as valuable resources for science education, including chemistry (Riza et al., 2020). In practice, numerous teachers have not yet incorporated local wisdom into their teaching, which hinders the complete achievement of educational objectives. A needs analysis, which involved five high school chemistry teachers in Brebes Regency, Central Java Province, unveiled that not all teachers integrate local wisdom into chemistry education. Surprisingly, 92.3% of students were not acquainted with the term 'local wisdom.

The capability of students to preserve their culture and local wisdom is intricately connected to a teacher's competence in overseeing learning activities (Pamenang, 2021). Through the integration of local wisdom into education, students' comprehension of local values is revitalized from a young age. This approach fosters a sense of culture, offers behavioral guidance, and ensures that students maintain a strong foundation in their actions and conduct, facilitating both the acquisition of knowledge and the cultivation of noble character (Uge & Neolaka, 2019). To implement learning models based on local wisdom, one can initiate the process by observing the prevailing culture within the community. Subsequently, this acquired knowledge can be employed to reconstruct scientific concepts that ultimately contribute to students'

character development (Setiawan et al., 2017). The research outcomes on the 'Development of a Local Wisdom-based Educational Tourism Model' conclude that the local wisdom of South Brebes holds potential for educational tourism and can be employed as a valuable learning resource, presented within an enjoyable and interactive learning environment. This model is well-suited as an alternative and highly engaging educational approach (Winarto, 2016).

In South Brebes, there are several tourist attractions that are based on local wisdom, including Kaligua Agrotourism in Pandansari Village, Hot Springs in Pakujati Village, Potato Plantation in Dawuan Village, Ranto Canyon in Salem, Petuguran Reservoir in Winduaji Village, Rebana Home Industry in Kaliwadas Village, Salted Egg Home Industry in Karangjongkeng Village, Sundanese Culture in Jipang Village, and Pangkuan Temple in Cilibur Village (Winarto, 2016). Some of the local wisdom from the Brebes region can be connected to the subject of reaction rates in chemistry education. For example, employing the context of Salted Eggs, Dawuan Potatoes, and Kaligua Tea to elucidate the factors that affect reaction rates, such as concentration, temperature, and surface area. Through the incorporation of the local wisdom from Brebes into the topic of reaction rates, it is anticipated that students' enthusiasm for learning chemistry will grow. Furthermore, this integration can contribute to the preservation of Brebes' culture and raise students' awareness that chemistry is intricately linked to their daily lives.

Reaction rate is defined as the rate at which a chemical reaction takes place. It is commonly expressed in relation to the concentration (amount per unit volume) of products formed or the concentration of reactants consumed per unit of time (Laidler, 2020). Chemical reaction rate, also known as chemical kinetics, has been recognized as one of the most formidable subjects in chemistry for students because it entails mathematical calculations and a multitude of factors that affect reaction rates. The term 'reaction rate' is not an inherent property of the chemical species itself, but it can only be defined as a reaction rate constant. (Supasorn & Promarak, 2015). Learners of varying ages in different countries often perceive topics related to reaction rates as being filled with numerous abstract and complex concepts, involving both qualitative and quantitative variables. (Karsli & Ayas, 2014). Reaction rates are a segment of chemical education that often presents challenges to students when it comes to grasping various associated concepts. The factors affecting reaction rates pertain to materials that require empirical evidence through experimentation, demanding that students investigate, analyze, and derive conclusions from experimental results. (Khasanah & Azizah, 2018).

This research concentrates on the challenging subject of reaction rates in chemistry education. Despite students' interest in chemistry, 86.2% of them encounter difficulties in comprehending chemistry concepts, particularly those related to everyday life. They struggle to relate their understanding of reaction rates to real-world applications. Furthermore, 86.2% of students have never been exposed to the local wisdom of Central Java regarding reaction rates. To tackle these challenges, high-quality teaching materials have been created to assist both teachers and students in integrated chemistry education. These materials, presented as Student Worksheets, are in accordance with the 2013 revised curriculum and integrate local wisdom from Brebes, Central Java, with a specific emphasis on reaction rates. As a result, this research involves the development of an inquiry-based E-Worksheet that incorporates Brebes' local wisdom to enhance students' understanding of reaction rates.

2. METHOD

This is a Research and Development (R&D) project that adheres to the 4D model, comprising four stages: define, design, develop, and disseminate. The main emphasis of this research is on the development phase. The E-Worksheet created in this research is inquiry-based and enriched with local wisdom, specifically focusing on the topic of reaction rates. The local wisdom incorporated is derived from the Brebes region in Central Java. The assessment process includes the participation of a subject matter expert lecturer, a media expert lecturer, three peer reviewers, five additional reviewers (chemistry teachers), and feedback gathered from twenty high school students specializing in Mathematics and Natural Sciences (MIPA). The data analysis in this research involves the conversion of qualitative data, comprising product quality assessments from media experts, subject matter experts, peer reviewers, and additional reviewers, into quantitative data using a Likert scale. This process involves the conversion of qualitative data into quantitative data using the Likert scale, computing the overall average score using a specific formula, transforming the average score for all aspects and each aspect of the assessment into qualitative data based on an ideal score, and determining the ideal percentage for the entire evaluation and each individual aspect. The collected data includes needs assessment data and product validation data, which incorporates suggestions and input from subject matter expert lecturers, media expert lecturers, peer reviewers, and additional reviewers. Furthermore, data on the assessment of product quality is gathered from subject matter experts, media experts, and reviewers, employing both quantitative and qualitative methods.

Qualitative data is classified into categories such as SB (Very Good), B (Good), C (Sufficient), K (Poor), and SK (Very Poor). Quantitative data is presented as assessment scores, where SB=5, B=4, C=3, K=2, and SK=1 for the product quality assessment.

3. RESULT AND DISCUSSION

Result

The inquiry-based E-Worksheet, enriched with the local wisdom of Brebes, Central Java, with a focus on the topic of reaction rates, was developed utilizing the 4-D development model, which consists of three stages: define, design, and development. However, this research primarily emphasized the development stage. The dissemination stage entails a thorough field test, which was not carried out in this research. The initial stage of product development is the 'Define' stage, which encompasses preliminary analysis, analysis of student characteristics, task and concept analysis, and analysis of learning objectives. The preliminary analysis regarding the curriculum indicates that the curriculum in use is the 2013 curriculum. An analysis of student characteristics was carried out to comprehend their learning requirements and preferences in chemistry education. The majority of students face challenges in learning chemistry, especially in the subject of reaction rates. Additionally, the data revealed that students had never encountered the term 'local wisdom' within the context of chemistry education.

The initial analysis results suggest that certain chemistry teachers have not integrated the local wisdom context into their teaching practices, and there is a dependence on government-issued textbooks. The absence of integration of real-life contexts, such as local wisdom from Brebes, Central Java, into the teaching of chemistry, could be a factor contributing to the challenges students encounter when researching reaction rates. The outcomes emphasize an opportunity to address this gap by integrating local wisdom into the chemistry curriculum. The development of supplementary teaching materials that incorporate local wisdom can improve students' comprehension of reaction rates, offering more relatable and engaging content. This, in turn, can help address the challenges that students currently face in this area. The task and concept analysis is conducted to achieve a more profound comprehension of the reaction rate material specified in the 2013 revised curriculum. The analysis process entails identifying chemistry topics relevant to daily life that can be linked to various aspects of local wisdom in Brebes, Central Java.

The second stage is the 'Design' stage. The 'Design' stage encompasses the creation of instruments, the selection of media and format, and the generation of the initial design. The development of instruments is employed to assess the evolving product. The development of research instruments for the product adheres to the feasibility standards established by the National Education Standards Agency (BNSP) for educational materials. Several assessment aspects encompass material feasibility, language feasibility, graphic elements, construction elements, specificity, practicality, and readability In this research, the chosen media is the E-Worksheet created using the Flip PDF Professional program. Software tools employed in crafting the E-Worksheet comprise CorelDRAW and Microsoft Word. The format is customized to align with the selected media, which is the E-Worksheet.

The components of the developed E-Worksheet include the front cover, introduction, table of contents, user instructions, laboratory rules and safety guidelines, competency coverage, competency achievement indicators, learning objectives, content coverage, information about the E-Worksheet, core activities, evaluation, bibliography, developer profile, and back cover. The central activities within the E-Worksheet comprise six subsections, covering concepts related to reaction rates, collision theory, and the impact of factors such as concentration, temperature, surface area, and catalysts on reaction rates. The initial design phase commences with the creation of activities and designs that align with the predetermined components of the E-Worksheet. The initial design is crafted using CorelDRAW for the book cover and layout, which is subsequently converted to PNG format and further processed using Microsoft Word 2016. The initial product design then undergoes expert consultation for feedback and recommendations, followed by subsequent revisions.

The third stage is the 'Develop' stage. The objective of the 'Develop' stage is to further enhance the prototype of the inquiry-based E-Worksheet enriched with the local wisdom of Brebes, Central Java, which was created in the preceding stage. During this stage, the assembled prototype undergoes validation by expert validators in both content and media to determine its suitability for chemistry education. Subsequently, the product is revised based on the feedback and suggestions provided by these validators. Following this, the first revised product is evaluated by three peer reviewers, and its practicality is tested by five reviewers. Peer reviewers are chemistry teachers who are currently pursuing a master's degree in chemistry and are actively engaged in research and development activities. On the other hand, reviewers are chemistry teachers working in high schools located in Brebes. The suggestions for improvement and feedback gathered are utilized to enhance the product during a second revision stage. Subsequently, the revised product undergoes limited testing among students to evaluate its readability. The ratings provided

by the reviewers were from five high school chemistry teachers in Brebes Regency, while the student response data was collected from SMAN 1 Bumiayu. The assessment of E-Worksheet quality by peer reviewers and reviewers is presented in Table 1 and Table 2.

Table 1. Peer Reviewer's Assessment Data

Aspect	Number of Indicators	Average Score	Percentage of Ideal	Category
Content Feasibility	4	18.33	91.67%	Very Good
Graphics Design	6	25.33	84.33%	Very Good
Construction Feasibility	5	22.33	89.33%	Very Good
Language Feasibility	6	27.00	90.00%	Very Good
Innovation	9	39.33	87.40%	Very Good
Overall Score	**30**	**132.33**	**88.56%**	**Very Good**

Based on the data gathered from Table 1, it is evident that the aspects of content feasibility, graphic presentation, construction feasibility, language feasibility, and innovation of the E-Worksheet achieved ideal percentages of 91.67%, 84.33%, 89.33%, 90.00%, and 87.40%, respectively. The calculation results from the evaluation by three peer reviewers yielded an average score of 132.33 out of a maximum score of 150, resulting in an ideal percentage of 88.56%. As a result, it qualifies for the 'Very Good' category for utilization in chemistry education. Additionally, the practicality of the developed E-Worksheet was evaluated by five chemistry teachers acting as reviewers, as indicated in Table 2.

Table 2. Reviewer's Assessment Data

Aspect	Number of Indicators	Average Score	Percentage of Ideal	Category
Content Feasibility	9	42.00	93.33%	Very Good
Construction Feasibility	6	28.00	83.33%	Very Good
Language Feasibility	9	40.20	89.33%	Very Good
Graphics Design	6	27.20	90.67%	Very Good
Practicality	15	70.20	93.60%	Very Good
Overall Score	**45**	**207.6**	**92.05%**	**Very Good**

Based on the data gathered from Table 2, it is evident that the aspects of content feasibility, construction feasibility, language feasibility, graphics design, and practicality of the E-Worksheet received ideal percentages of 93.33%, 83.33%, 89.33%, 90.67%, and 93.60%, respectively. The calculation results from the assessment by five reviewers yielded an average score of 207.6 out of a maximum score of 225, with an ideal percentage of 92.05%, classifying it in the "Very Good" category, which makes it highly practical for use in chemistry education. The developed E-Worksheet received responses and feedback from twenty students, as depicted in Table 3.

Table 3. Student Response Data

Aspect	Number of Indicators	Average Score	Percentage of Ideal	Category
Graphics Design	5	22.75	91.00%	Very Good
Construction Feasibility	7	32.10	91.71%	Very Good
Language Feasibility	3	13.90	92.67%	Very Good
Readability	10	45.05	90.10%	Very Good
Overall Score	**25**	**113.80**	**91.37%**	**Very Good**

Table 3 displays response data from twenty students who achieved an average score of 113.80 out of an ideal maximum score of 125, yielding an ideal percentage of 91.37%, placing them in the 'Very Good' category. The validation and assessment results of this E-Worksheet, conducted by material experts, media experts, peer reviewers, and twenty students, indicate that the developed product falls within the "Very Good" category and is deemed suitable for use in chemistry education.

The ultimate outcome of this research and development is an E-Worksheet founded on inquiry and enriched with the local wisdom of Brebes, Central Java. This E-Worksheet possesses several unique characteristics. It was created with the assistance of Flip Professional PDF software, ensuring a user-friendly digital format. The E-Worksheet adheres to the structured approach of a guided inquiry learning model, comprising six well-defined steps in the learning activity: formulating problems, generating

hypotheses, designing experiments, carrying out experiments, analyzing data, and drawing conclusions. The cover of the E-Worksheet was meticulously crafted using CorelDRAW, incorporating complementary images that represent different aspects of Brebes' local wisdom. The cover is designed with a balanced blue color scheme, measuring 21.0 cm x 29.7 cm to align with the standard A4 paper size. Moreover, the back cover features a brief summary of the E-Worksheet's contents. The front cover and back cover of the E-Worksheet are illustrated in Figure 1 and Figure 2, respectively.

Figure 1. Front cover

Figure 2. Back cover

The Core Competencies and Basic Competencies employed in the development of the E-Worksheet are based on the 2013 revised curriculum for topics related to reaction rates. Competency Achievement Indicators are formulated as a means of assessing the degree to which students have effectively grasped the content covered in the E-Worksheet. Learning objectives are crafted to offer clear direction regarding what is anticipated of students to accomplish during the learning process of reaction rates. Additionally, the E-Worksheet also offers a concept map designed to aid learners in building their comprehension of the chemical reaction rate concept while incorporating the cultural elements and local wisdom of Brebes, Central Java, that are part of their surroundings. In this concept map, essential concepts related to reaction rates, such as chemical reactions, collision theory, and factors affecting reaction rates, are illustrated as interconnected with elements of Brebes' local wisdom, including local cuisine, cultural heritage, or local traditions, as presented in Table 4.

Table 4. List of Local Wisdom from Brebes in the Material on Reaction Rates

Reaction Rates Concepts	Integration of Local Wisdom Brebes
Chemical Reactions	Producing boiled salt from Kaliwlingi, exploring the Lawa Songgom Cave in Brebes, and utilizing shallots.
Collision Theory	Making melinjo chips
Factors Influencing Reaction Rates	Creating salted eggs, visiting the Kaligua tea plantation tourist destination, preparing Blengong satay, and baking Blusder cake.

The scope of competencies, Competency Achievement Indicators, learning objectives, and concept maps can be observed in Figure 3, and Figure 4.

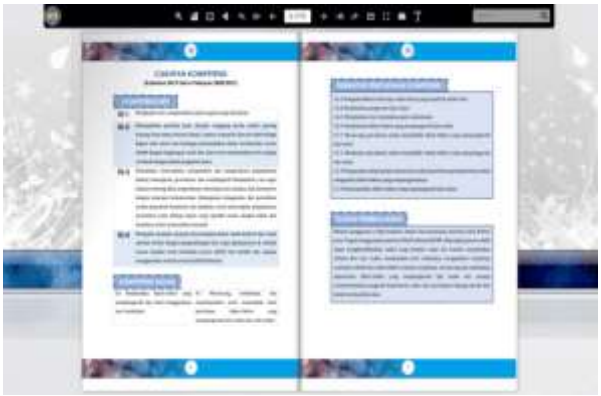

Figure 3. The coverage of competencies, competency achievement indicators, and learning objectives

Figure 4. The concept maps

A set of E-Worksheets consists of six subtopics of learning activities that students must engage in, encompassing concepts related to reaction rates, collision theory, the impact of concentration on reaction rates, the effect of temperature on reaction rates, the influence of surface area on reaction rates, and the role of catalysts in reaction rates. To enhance the engagement and relevance of the E-Worksheet, it is enriched with discussions on the local wisdom of Brebes, Central Java. This encompasses discussions on the production of boiled salt from Kaliwlingi, the Lawa Songgom cave in Brebes, and the utilization of shallots in the practical application of the reaction rate concept (E-Worksheet 1). It also includes discussions on Emping Melinjo production related to collision theory (E-Worksheet 2), discussions on salted eggs related to the concentration factor in reaction rates (E-Worksheet 3), discussions on Kaligua tea related to the temperature factor in reaction rates (E-Worksheet 4), discussions on Blengong satay related to the surface area factor in reaction rates (E-Worksheet 5), and discussions on Blusder cake related to the catalyst factor in reaction rates (E-Worksheet 6). An example of a fundamental learning activity in the E-Worksheet is depicted in Figure 5 and Figure 6.

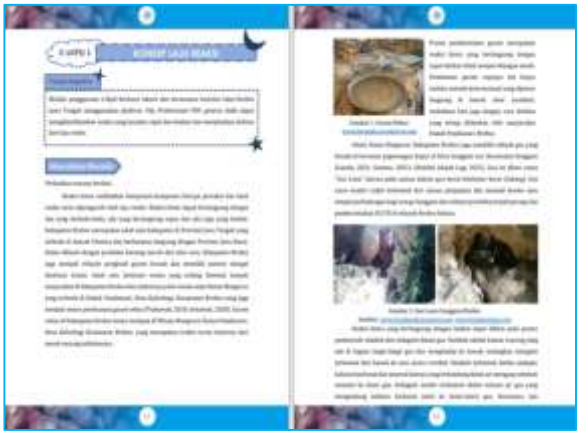

Figure 5. On of the core learning activity in the e-worksheet

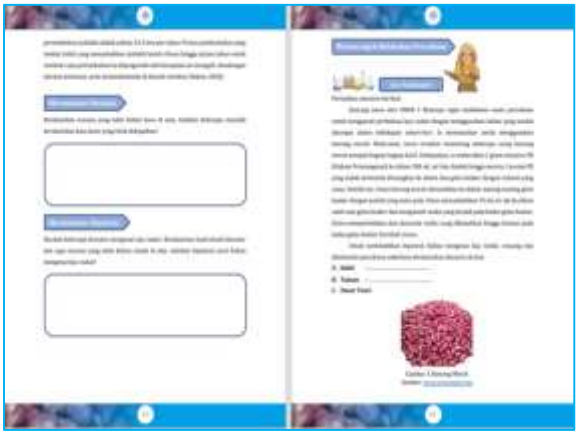

Figure 6. One of the practicum based on local wisdom of brebes central java

Discussion

The inquiry-based E-Worksheet enriched with the local wisdom of Brebes, Central Java, has been created using a 4-D development model that encompasses three stages: the definition stage, the design stage, and the development stage. The research outcomes suggest that the developed product is classified as either suitable or very good for use in chemistry education. The inquiry-based E-Worksheet, enriched with the local wisdom of Brebes, Central Java, based on assessments by subject matter experts, media experts, three peer reviewers, five chemistry teachers as reviewers, and twenty students, received a rating of "Very Good." This outcome is supported by previous research suggesting that teaching materials enriched with local content can be effectively utilized in the learning process (Asrial et al., 2021; Irmalia, et al., 2023). An E-Worksheet that receives positive scores or responses is suitable for use as a learning tool (Apriyani et al., 2022; Dewi & Muna, 2022; Felitasari & Rusmini, 2022). The inquiry-based E-Worksheet, enriched with the local wisdom of Brebes, Central Java, is suitable for the learning process due to several factors.

Firstly, the student worksheet is fashioned in an electronic format, systematically structured, and comprises images, animations, and videos, rendering it more engaging for student learning (Marwan Pulungan et al., 2022) . The student worksheet is created with the aid of the Flip PDF Professional program, allowing access through electronic devices. The availability of the worksheet in an electronic format that can be accessed through various electronic devices like laptops, personal computers, and smartphones offers substantial flexibility to students. This implies that they can learn based on their own timetables and preferences, optimizing their time for comprehending essential concepts within the subject matter (Mahromah et al., 2022; Rr Tasya Noor Nabila & Agus Kamaludin, 2023). As a result, the student worksheet evolves into an exceptionally effective tool in facilitating the contemporary student-centered learning approach.

Secondly, the E-Worksheet is created utilizing a guided inquiry model. This model offers a structured framework for students to investigate and grasp the learning materials. Through the guided inquiry approach, students are encouraged to pose inquiries, gather data, and construct their own comprehension of the instructed concepts. Therefore, the student worksheet not only conveys information

but also nurtures active student participation in the learning process, enriching their critical thinking capabilities and valuable research skills (Arafah et al., 2020; Pratiwi et al., 2022; Wahyuni & Sulisworo, 2020). Moreover, the guided inquiry model integrated into the e-worksheet fosters a higher degree of involvement with the subject matter. By urging students to pose questions and independently seek solutions, it cultivates a sense of intellectual curiosity and self-reliance in their educational voyage. This approach not only provides students with vital critical thinking skills but also nurtures a lifelong passion for learning and a preparedness to confront complex challenges with confidence (Gholam, 2019; Ula & Mariyani, 2021).

Thirdly, the e-worksheet is designed with a local wisdom context. The incorporation of local wisdom into learning facilitates students' ability to relate the subject matter to their everyday lives (Hastuti et al., 2020). Teaching and learning materials based on local wisdom can be employed by educators to instruct participants in conserving the potential of natural resources that have been inherited through generations, as well as in addressing everyday life challenges (Irmalia, et al., 2023). Teachers have the opportunity to create educational materials by integrating local wisdom, such as student worksheets. By developing this worksheet, it is expected that students will retain the values of their community's local wisdom. The preservation of local wisdom is crucial because these values have begun to diminish, receive limited attention, are no longer being introduced to students, and are seldom evident in their daily routines (Hairida & Setyaningrum, 2020). The inquiry-based E-Worksheet, enriched with various facets of Brebes' culture applied in real-life contexts, becomes a valuable resource for students to link chemistry concepts with their daily lives (Winarto, 2016). When combined with local wisdom and the guided inquiry model, the e-worksheet transforms into a potent tool for facilitating engaging and meaningful learning experiences for students.

4. CONCLUSION

The research has produced an inquiry-based E-Worksheet enhanced with the indigenous knowledge of Brebes, Central Java, centered on the subject of reaction rates. It is delivered with the support of Flip PDF Professional and is accessible through electronic devices. This E-Worksheet encompasses a discussion of chemistry reaction rates integrated with the cultural and local wisdom content of Brebes, Central Java. The E-Worksheet comprises six sections containing learning activities that are customized to align with the guided inquiry learning process. Subject matter expert professors, media expert professors, peer reviewers, high school chemistry teachers, and students have assessed the inquiry-based E-Worksheet, infused with the local wisdom of Brebes in Central Java, in terms of its effectiveness in enhancing high school students' comprehension of reaction rates. The outcomes suggest that the E-Worksheet is suitable for serving as a support tool in the context of chemistry education. Additionally, the inquiry-based E-Worksheet, infused with the local wisdom of Brebes, Central Java, is regarded as "highly practical" for incorporation into chemistry education and is considered to have "excellent" readability.

5. REFERENCES

Apriyani, L., Distrik, I. W., & Rosidin, U. (2022). Creative Inquiry-Based E-Worksheet: A Way to Improve Student's Self-Efficiency and Scientific Communication Skills. *Indonesian Journal of Science and Mathematics Education*, *5*(1), 53–64. https://doi.org/10.24042/ijsme.v5i1.10269.

Arafah, K., Sutiawati, M. D., Sudirman, R., & Arafah, B. (2020). The Development of Guided Inquiry-based Learning Worksheet Assisted by Livewire Simulations in Alternating Current. *International Journal of Advanced Science and Technology*, *29*(June), 13243–13252. https://www.researchgate.net/publication/342392088

Asrial, A., Syahrial, S., Maison, M., Kurniawan, D. A., & Putri, E. (2021). Fostering Students' Environmental Care Characters Through Local Wisdom-Based Teaching Materials. *JPI (Jurnal Pendidikan Indonesia)*, *10*(1), 152. https://doi.org/10.23887/jpi-undiksha.v10i1.27744

Dewi, L., & Muna, L. N. (2022). Chemistry Craft and Entrepreneurship Practicum Module Based on Semi-Solid Preparations as a Learning Resource for High School Students. *Jurnal Pendidikan Kimia Indonesia*, *6*(2), 107–115. https://doi.org/10.23887/jpki.v6i2.44325

Felitasari, A., & Rusmini, R. (2022). Development of E-Worksheet Assisted by Liveworksheets to Improve Science Process Skills and Collaboration on Chemical Equilibrium Materials. *Scientiae Educatia*, *11*(1), 10. https://doi.org/10.24235/sc.educatia.v11i1.10235

Gholam, A. (2019). Inquiry-Based Learning: Student Teachers' Challenges and Perceptions. *Journal of Inquiry & Action in Education*, *10*(2), 112–133.

Hafsah, N. R., Rohendi, D., & Purnawan, P. (2016). Penerapan Media Pembelajaran Modul Elektronik Untuk Meningkatkan Hasil Belajar Siswa Pada Mata Pelajaran Teknologi Mekanik. *Journal of Mechanical Engineering Education*, *3*(1), 106. https://doi.org/10.17509/jmee.v3i1.3200

Hairida, H., & Setyaningrum, V. (2020). The Development of Students Worksheets Based on Local Wisdom in Substances and Their Characteristics. *Journal of Educational Science and Technology (EST)*, *6*(2), 106–116. https://doi.org/10.26858/est.v6i2.12358

Haryanto, Asrial, & Ernawati, M. D. W. (2020). E-worksheet Haryanto, Asrial, & Ernawati, M. D. W. (2020). E-worksheet for science processing skills using kvisoft flipbook. International Journal of Online and Biomedical Engineering, 16(3), 46–58. https://doi.org/10.3991/IJOE.V16I03.12381

Hastuti, P. W., Setianingsih, W., & Anjarsari, P. (2020). How to develop students' scientific literacy through integration of local wisdom in Yogyakarta on science learning? *Journal of Physics: Conference Series*, *1440*(1). https://doi.org/10.1088/1742-6596/1440/1/012108

Karsli, F., & Ayas, A. (2014). Developing a Laboratory Activity by Using 5e Learning Model on Student Learning of Factors Affecting the Reaction Rate and Improving Scientific Process Skills. *Procedia - Social and Behavioral Sciences*, *143*, 663–668. https://doi.org/10.1016/j.sbspro.2014.07.460

Khasanah, N., & Azizah, U. (2018). Train Students' Critical Thinking Skill Through the Implementation of Cooperative Learning Model Type Group Investigation (Gi) on Matter of Reaction Rate in Sma Negeri 1 Manyar. *Unesa Journal of Chemical Education*, *7*(1), 81–86.

Laidler, K. J., (2020). *Reaction Rate.* [Online] Available at: https://www.britannica.com/science/reaction-rate.
[Diakses 19 February 2022].

Mahromah, S., Dian, S., & Prajanti, W. (2022). *Effectiveness of Learning Media With Flip PDF Application in Improving Economic Learning Outcomes*. *11*(1), 168–178.

Marto, H., Ruknan & Insiano, D. A., (2023). *Model Pembelajaran Guided-Inquiry dalam Meningkatkan Keterampilan Proses Sains Dasar Siswa SMA.* Pekalongan: Penerbit NEM.

Marwan Pulungan, Siti Dewi Maharani, Evy Ratna Kartika Waty, Mazda Leva Okta Safitri, Vina Amalia Suganda, & Fadhilah Tu Husni. (2022). Development of E-Student Worksheets in the form of Picture Stories Using Live Worksheets in Primary Schools. *Jurnal Iqra' : Kajian Ilmu Pendidikan*, *7*(2), 157–167. https://doi.org/10.25217/ji.v7i2.1759

Mellyzar, M. (2021). Persepsi Guru Dan Siswa Terhadap Modul Kimia Berbasis Inkuiri Terbimbing Pada Materi Reaksi Redoks Dan Tatanama Senyawa. *Jurnal Pendidikan Dan Pembelajaran Sains Indonesia (JPPSI)*, *4*(1), 81–89. https://doi.org/10.23887/jppsi.v4i1.31677

Murti, K. S., (2015). *Pendidikan Abad 21 dan Aplikasinya Dalam Pembelajaran di SMK.* [Online] Available at: https://docplayer.info/67762023-Pendidikan-abad-21-dan-aplikasinya-dalam-pembelajaran-di-smk.html
[Diakses 29 September 2023].

Nurdyansyah & Fahyuni, E. F., (2016). *Inovasi Model Pembelajaran Sesuai Kurikulum 2013.* Sidoarjo: Nizamia Learning Center.

Pamenang, F. D. N. (2021). Local Wisdomin Learning As an Effort To Increase Cultural. *International Journal of Indonesian Education and Teaching*, *5*(1), 93–101.

Pesurnay, A. J. (2018). Local Wisdom in a New Paradigm: Applying System Theory to the Study of Local Culture in Indonesia. *IOP Conference Series: Earth and Environmental Science*, *175*(1). https://doi.org/10.1088/1755-1315/175/1/012037

Pornpimon, C., Wallapha, A., & Prayuth, C. (2014). Strategy Challenges the Local Wisdom Applications Sustainability in Schools. *Procedia - Social and Behavioral Sciences*, *112*(Iceepsy 2013), 626–634. https://doi.org/10.1016/j.sbspro.2014.01.1210

Pratiwi, P., Hidayat, T., & Amprasto, A. (2022). Analysis of Guided Inquiry-Based Cladistic E-Worksheet Development to Improve Critical Thinking in High School. *Jurnal Kependidikan: Jurnal Hasil Penelitian Dan Kajian Kepustakaan Di Bidang Pendidikan, Pengajaran Dan Pembelajaran*, *8*(3), 776. https://doi.org/10.33394/jk.v8i3.5359

Ristanto, R. H., Zubaidah, S., Amin, M., & Rohman, F. (2018). Scientific Literacy of Students Learned. *International Journal of Research & Review*, *6*(3), 357–367. https://www.ijrrjournal.com/IJRR_Vol.4_Issue.5_May2017/IJRR004.pdf

Riyadi, B., Ertikanto, C., & Suyatna, A. (2018). the Analysis and Design of Guided Inquiry E-Worksheet Based To Develop High Order Thinking Skills. *International Journal of Research -GRANTHAALAYAH*, *6*(7), 223–233. https://doi.org/10.29121/granthaalayah.v6.i7.2018.1302

Riza, M., Firmansyah, R. A., Zammi, M., & Djuniadi, D. (2020). Pengembangan Modul Kimia Berbasis Kearifan Lokal Kota Semarang Pada Materi Larutan Asam dan Basa. *JIPVA (Jurnal Pendidikan IPA Veteran)*, *4*(1), 25–38. https://e-journal.ivet.ac.id/index.php/jipva/article/view/1025

Rr Tasya Noor Nabila, & Agus Kamaludin. (2023). Development of E-Worksheet Based on STEAM-PjBL in Reaction Rate Material to Improve Creative Thinking Skills High School Student. *Jurnal Iqra' : Kajian Ilmu Pendidikan*, *8*(1), 299–317. https://doi.org/10.25217/ji.v8i1.3540

Sanjaya, W., 2016. *Strategi Pembelajaran Berorientasi Standar Proses Pendidikan.* Bandung: Kencana.

Setiawan, B., Innatesari, D. K., Sabtiawan, W. B., & Sudarmin, S. (2017). The development of local wisdom-based natural science module to improve science literation of students. *Jurnal Pendidikan IPA Indonesia*, *6*(1), 49–54. https://doi.org/10.15294/jpii.v6i1.9595

Suherman, S., Syarif, I., Elihami, E., & Melbourne (2022). Local Wisdom in the Era of Industrial Revolution 4.0 in the Context of Art Education. *Edumaspul: Jurnal Pendidikan*, *6*(2), 2035–2042. https://ummaspul.e-journal.id/maspuljr/article/view/4507%0A

Sujatmika, S. et al., (2019). *Designing E-Worksheet Based On Problem-Based Learning To Improve Critical Thinking*. Yogyakarta, ICTSI.

Supasorn, S., & Promarak, V. (2015). Implementation of 5E inquiry incorporated with analogy learning approach to enhance conceptual understanding of chemical reaction rate for grade 11 students. *Chemistry Education Research and Practice*, *16*(1), 121–132. https://doi.org/10.1039/c4rp00190g

Suprapto, N., Prahani, B. K., & Cheng, T. H. (2021). Indonesian curriculum reform in policy and local wisdom: Perspectives from science education. *Jurnal Pendidikan IPA Indonesia*, *10*(1), 69–80. https://doi.org/10.15294/jpii.v10i1.28438

Syahputra, E., (2018). *Pembelajaran Abad 21 dan Penerapannya di Indonesia.* Medan: Pendidikan Matematika Universitas Negeri Medan.

Trisdiono, H. & Muda, W., (2013). *Strategi Pembelajaran Abad 21.* Yogyakarta: Lembaga Penjaminan Mutu Pendidikan Prov. D.I. Yogyakarta.

Uge, S., & Neolaka, A. (2019). *Development of Social Studies Learning Model Based on Local Wisdom in Improving Students ' Knowledge and Social Attitude*. *12*(3), 375–388.

Ula, W. R. R., & Mariyani, A. (2021). The Development of Guided Inquiry Based Science Basic Concept Teaching Materials. *Journal of Physics: Conference Series*, *1842*(1). https://doi.org/10.1088/1742-6596/1842/1/012079

Wahyuni, M. E., & Sulisworo, D. (2020). *Developing the Guided Inquiry-Based Worksheet to Support Experiment in Physics Learning*. *477*(Iccd), 431–435. https://doi.org/10.2991/assehr.k.201017.095

Winarto. (2016). Pengembangan Model Wisata Pendidikan Berbasis Kearifan Lokal Dengan Pendekatan Saintifik Di Brebes Selatan Sebagai Alternatif Model Belajar Siswa Sekolah Dasar. *Jurnal Pemikiran Dan Penelitian Pendidikan Dasar*, *6*(2), 32–48. https://journal.peradaban.ac.id/index.php/jdpgsd/article/view/6

Yuberti, (2014). *Teori Pembelajaran dan Pengembangan Bahan Ajar dalam Pendidikan.* Bandar Lampung: Aura.

Yunus, S. R., Sanjaya, I. G. M., & Jatmiko, B. (2013). Implementasi pembelajaran fisika berbasis guided inquiry untuk meningkatkan hasil belajar siswa auditorik. *Jurnal Pendidikan IPA Indonesia*, *2*(1), 48–52. https://doi.org/10.15294/jpii.v2i1.2509

Zakiyah, S. (2022). Contribution of local wisdom values to education. *International Journal Social Science and Education*. *3*(2), 37–48.

Zuhro, A., Nawangati, I., & Dwiningsih, K. (2017). Pengembangan Lembar Kegiatan Siswa (Lks) Berorientasi Inkuiri Terbimbing Untuk Melatihkan Kemampuan Literasi Sains Pada Materi Kesetimbangan Kimia Development of Student Worksheet Oriented Guided Inquiry Model To Practice Science Literacy Skill in Matter . *UNESA Journal of Chemical Education*, *6*(2), 334–338.