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Magnitude and Measurement Module Through Learning Cycle 7E: Innovation Based on Local Potential of Sago Plants for Critical Thinking

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Critical thinking skills are essential for solving problems in everyday life. However, these skills are still lacking in physics learning at school. Therefore, this study analyzes the feasibility of the magnitude and measurement module with the learning cycle 7E based on the local potential of sago plants to improve students' critical thinking skills. This research is a development research with a 4D model. The subjects of the limited trial were 10 students, and the field trial was 16 students from one of the MAN's in Barito Kuala Regency, South Kalimantan. The research data were obtained through module validation sheets, critical thinking tests, and learner response questionnaires. The results showed that the content and construct validation of modules and essential thinking tests were highly valid. In addition, students' responses in terms of ease of use of the module, the attractiveness, and the benefits of the module in physics learning in the practical category. It is concluded that the module of magnitude and measurement with learning cycle 7E, based on the local potential of sago plants developed, is feasible to improve students' critical thinking skills.

Keywords: Critical Thinking Skills; Learning Cycle 7E; Teaching Module; Local Potential; Sago Plant

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INTRODUCTION

The rapid development of science and technology characterizes life in the 21st century. Alongside advances in technology and information, educational practices must also undergo continuous improvement. The National Educational Association (Thornhill-Miller et al., 2023) Emphasizes that 21st century learning must fully integrate classroom instruction with the “Four Cs” competencies, one of which is critical thinking skills. Critical thinking is a high-level cognitive skill crucial in learning, particularly science education. (Utami & Aznam, 2020). It is essential for preparing students to become effective problem solvers who can make thoughtful, academically sound, and responsible decisions and conclusions. (Bangun & Pragholapati, 2021; Pnevmatikos et al., 2023).

Students in Indonesia demonstrate low critical thinking skills, primarily because learning activities remain teacher-centered, with students often limited to memorizing formulas and concepts. (Irhasyuarna et al., 2022; Santosa et al., 2021; Solehudin et al., 2021; Suyitno et al., 2024). Teachers have not widely adopted innovative media in the learning process. Many teachers rely solely on the limited textbooks available in the school library. This situation is due mainly to teachers’ lack of creativity and competence. (Facer & Selwyn, 2021; Kamil Budiarto, 2021) Teachers’ inability to develop engaging learning media negatively affects students’ critical thinking skills and learning outcomes. (Boari et al., 2021; Sulthon et al., 2021) These findings are supported by the results of the researchers’ preliminary study, which involved observing classroom learning activities. The observations revealed that the low level of students’ critical thinking skills can be attributed to several factors: learning remains teacher-centered, students are rarely engaged in investigative activities, and inquiry-based physics learning modules are absent. This is further confirmed by pre-test results, which show that students’ abilities in interpreting, explaining, evaluating, inferring, and self-regulation fall into the low category.

Developing appropriate learning media can enhance students’ critical thinking skills (Sulthon et al., 2021). In this study, the learning media developed was a learning module. The module was designed to align with a specific learning model, namely the 7E learning cycle model, which consists of seven stages: Elicit, Engage, Explore, Explain, Elaborate, Evaluate, and Extend. (Ilhami & Laksono, 2022; Musfiroh et al., 2024). The primary goal of the 7E model is to emphasize the importance of eliciting students’ prior knowledge and extending the application of concepts across different contexts. (Adam et al., 2022) This approach actively involves learners in discovering concepts and making sense of what they learn, making it more effective in developing their critical thinking skills. (Nusantari et al., 2020; Rini & Aldila, 2023; Uliyandari et al., 2021).

The developed learning module is also based on local potential. Learners feel more engaged and comfortable with the material because it is connected to familiar concepts and contexts they encounter daily, drawing upon local potential and the unique characteristics of their community (Boz et al., 2025). Local potential offers an interesting theme for science learning, as it emphasizes direct experiences that enable students to explore and understand their natural surroundings (local potential) scientifically through inquiry, investigation, and hands-on interaction (Dini & Rini, 2024; Rini & Aldila, 2023).

Learning media that integrate local potential can enhance students’ critical thinking skills and provide meaningful, authentic learning experiences. (Setiyanika et al., 2023) Several studies, showing the effectiveness of the 7E learning cycle model when integrated with local contexts, such as Gumbaan, further support this. (Navisah et al., 2021), mangrove ecosystems (Raisa et al., 2022), and Grobogan Regency (Setiyanika et al., 2023) In developing students’ critical thinking skills. Learning that leverages the natural conditions of the local environment has also been shown to improve students’ cognitive outcomes. (Asis et al., 2023; Hardiansyah et al., 2024; Topano et al., 2021). One of the unique local potentials of South Kalimantan that can be incorporated into the learning process is the sago plant (*rumbia* tree), particularly in Barito Kuala Regency.

Based on the above description, this study aims to analyze the feasibility of a **magnitude and measurement module** designed with the 7E learning cycle model and incorporate sago plants’ local potential to enhance students’ critical thinking skills. The feasibility analysis focuses on three key aspects: the validity of the module, essential critical thinking assessments, and students’ responses to using the module in physics learning. The developed magnitude and measurement module is expected to improve students’ critical thinking skills in physics learning at school.

METHOD

This research and development (R&D) study adopts the 3D model, consisting of the stages Define, Design, Develop, and Disseminate. In the **Define** stage, a needs analysis was carried out, including an analysis of student characteristics, learning tasks, and instructional content on quantities and units contextualized with the local potential of the sago plant. During the **Design** stage, activities included developing research instruments, selecting appropriate media, and determining the format of the teaching module to be developed. In the **Develop** stage, an initial draft of the quantities and units module based on the sago plant was produced. The module contains general information, core content, and an appendix section. Five expert validators reviewed it, and the validation results were analyzed using descriptive quantitative methods. The average validation scores were classified into five categories: $3.3 \leq X \leq 4.0$ (very valid); $2.5 \leq X \leq 3.2$ (valid); $1.7 \leq X \leq 2.4$ (moderately valid); $0.9 \leq X \leq 1.6$ (less valid); and $0.1 \leq X \leq 0.8$ (invalid). The module was considered valid if the average validator score fell within the "valid" category. After incorporating revisions based on the validators' feedback, the study proceeded to the **Dissemination** stage.

Dissemination was carried out on a limited basis through a practicality test involving 10 students in a small-group trial and 16 students in a field trial. These trials were conducted at an Islamic Senior High School (MAN) in Barito Kuala Regency, South Kalimantan. The learning process was implemented over three meetings, each incorporating the stages of the learning cycle and integrating the local context of the sago plant. At the end of the learning process, the module's practicality was evaluated through a student response questionnaire, which assessed the module's ease of use, attractiveness, and usefulness in supporting physics learning in the classroom. The data from student responses were analyzed using descriptive quantitative methods, with the following classification: $86 \leq p \leq 100$ (very practical); $76 \leq p \leq 85$ (practical); $66 \leq p \leq 75$ (fairly practical); $56 \leq p \leq 65$ (less practical); and $0 \leq p \leq 55$ (not practical). The module was deemed feasible if it met the following three criteria: (1) validation results falling at least in the "valid" category, (2) student critical thinking test results reaching at least the "valid" category, and (3) student response results falling at least in the "practical" category.

RESULT AND DISCUSSION

Research Product

This study resulted in developing a learning module on **magnitude and measurement**, utilizing the **7E learning cycle model** and integrating the **local potential of sago plants** to enhance students' critical thinking skills. The module includes several key components: a cover, preface, table of contents, general information, core content, and appendices. The **cover** (Figure 1) features visuals related to quantities and measurements, including illustrations of measurement activities using a meter. It also displays an image of sago flour to reflect the integration of local potential, as the module is contextualized around the use of sago plants. The **preface** (Figure 1) provides an introductory note from the author, outlining the purpose and significance of the module. The **table of contents** lists the module's sections and the corresponding page numbers for each title and subtitle. The **general information** section (Figure 2) presents the school identity, initial competencies to be achieved, alignment with the Pancasila Student Profile, required facilities and infrastructure, target learners, and the learning models and methods applied in the module.

[Figure 1 about here.]

[Figure 2 about here.]

The core component (Figure 3) contains learning outcomes, the flow of learning objectives, meaningful comprehension, triggering questions, learning preparation, learning activities, assessment, enrichment, and remediation. The module appendix contains reading or teaching materials, student worksheets, critical thinking skills tests, assessments, and a bibliography.

[Figure 3 about here.]

Learning activities are designed with a 7E learning cycle, namely in the introduction there are elicit and engagement phases, in the core activities there are explore, explain, elaborate, evaluate phases, and in the closing activities there is an extend phase as shown in Figure 3. The material contains the material to be studied, namely quantities and measurements, which consist of quantities, units, dimensions, measurements, significant figures, and scientific notation. The material presented is also associated with the local potential of sago plants. The teaching material also contains the phases of the learning cycle 7E, which can be seen in Figure 4.

[Figure 4 about here.]

The preparation of teaching materials is adjusted to the learning objectives, oriented to the 7E learning cycle, and the local potential of sago plants. The concept map contained in the teaching materials is also adjusted to the material studied. The teaching materials are arranged systematically according to the material taught, namely quantities, units, and dimensions (meeting I), measurement (meeting II), significant figures, and scientific notation (meeting III). They are relevant to the learning cycle 7E based on the local potential of sago plants. In addition, the teaching material is equipped with a summary of the material, examples, and evaluation questions to train students' critical thinking skills. In the worksheet (Figure 5), students are directly embroiled in the learning process by measuring the stems of sago plants in groups to be more active in learning.

[Figure 5 about here.]

In this module, three worksheets have been prepared: Worksheet I (Magnitude, units, and dimensions), Worksheet II (Measurement), and Worksheet III (significant figures and scientific notation). The worksheets are prepared based on the learning objectives. They are relevant to the 7E learning cycle based on the local potential of sago plants to train students' critical thinking skills. They are designed with language easily understood by students and does not cause multiple interpretations. In addition, students can learn independently in the investigation, develop an attitude of cooperation in groups, and reason critically by answering questions in the worksheet.

Module Validity

The validation test determines the expert's assessment of the quality of the magnitude and measurement module with learning cycle 7e in content and construct. The module validation results are presented in Table 1.

[Table 1 about here.]

Based on Table 1, the teaching module's overall validity value is 3.5, which is a very valid category. It has met the standards of a good module content component. The suitability of the module, designed with learning objectives and the material's scope, supports the validity level of this highly valid material. In addition to conformity with curriculum demands, material based on learning outcomes and learning objectives certainly affects the feasibility of material content in valid modules. (Firdaus & Pahlevi, 2022; Husnadi et al., 2024). Good learning media convey the material studied in a way that will help students achieve the expected goals. (Boari et al., 2023; Rahim et al., 2022; Wayan Kandia et al., 2023).

In addition, the results of the critical thinking skills test validation (9 questions) on the indicators of interpretation, inference, evaluation, explanation, and self-regulation are valid, because all items have met the general construction, language, and critical thinking skills. The critical thinking skills test compiled has clear instructions for completing the questions. The mechanism for making good and correct questions must contain instructions for working on questions (Rivas et al., 2022). The question instructions contain several things, namely students must write their identity in the form of name and class, ask them to read the questions correctly and carefully, let them answer the questions that are considered the easiest first, answer the questions on the sheet provided and there is a time limit for working on the questions. The instructions for working on questions aim to enable students to answer questions carefully and thoroughly (Hardiansyah et al., 2024; Shoufan, 2023). The instructions for working on the problem show a working time of 135 minutes. It is intended that students pay more attention to time and develop strategies to work on easier issues first, so they do not run out of time. The students' abilities will improve optimally when answering questions calmly and unhurriedly (Faruga-Lewicka et al., 2024). Also, the processing time must be adjusted to the number of questions so that students can answer with an appropriate and proportional time allocation. So that you know, the questions are based on the learning objectives. Formulating learning objectives is the first step to compiling and developing a good test (Adri et al., 2022). The principle of test preparation must be integrated, namely referring to learning objectives (Hamzah et al., 2022; Harefa et al., 2021). A valid question can measure whether or not the objectives have been formulated and achieved (Arafah et al., 2021). The tests are prepared using good and correct Indonesian language. The questions are easy to understand because they use simple language, and the question sentences are in PUEBI. The questions are made using simple language and are easy to understand (Inganah et al., 2023). This is in line with the principle that test preparation must use clear sentences so as not to cause multiple interpretations. In addition, the test is prepared by aspects of content, context, and indicators of critical thinking skills (Ramdani et al., 2021; Sutiani et al., 2021). The tests compiled are expected to cover the entire content or population of the material being taught.

Tests are made by indicators of critical thinking skills so that teachers can measure the improvement of students' critical thinking before and after the test. (Chusni et al., 2020, 2022; Irhasyuarna et al., 2022; Saepuloh et al., 2021; Sutiani et al., 2021). This shows that the essential skills of the thinking test prepared have met the standards of a good test. A good instrument can accurately measure data by its function, with good characteristics on a valid basis. (Adri et al., 2022; Arafah et al., 2021; Supena et al., 2021).

Module Practicality

After using it in the limited and field trials, the module's practicality was measured based on the students' response questionnaire. Table 2 recapitulates the module practicality results.

[Table 2 about here.]

Based on Table 2, the module developed as a whole has a practical category with an average value of 76.17 (limited trial) and 81.20 (field trial). The ease of use aspect in the limited trial, 75.63, was categorised as reasonably practical, and in the field trial, 79.30, was classified as practical. This shows that the learning cycle 7E module that was developed is easy to use. Practicality refers to the ease of use and accessibility of media in teaching and learning. (Boari et al., 2023; Yanto et al., 2024). Practical media uses language or sentences that are easy for educators and students to understand and use. (Boari et al., 2023; Darmayanti & Sugianto, 2022; Inganah et al., 2023). The attractiveness aspect in the limited trial of 77.50 was categorised as practical, and in the field trial of 81.25, it was classified as practical. This shows that the developed module can attract students' interest in learning through media design and applying the 7E learning cycle.

The visual media influences students' motivation and interest in learning subjects. (Agustin & Riyanti, 2021; Elsayed & Al-Najrani, 2021; Luh Andriyani & Wayan Suniasih, 2021; Ratri Mayarita et al., 2023). The benefit aspect in the limited trial, 75.38, was categorised as reasonably practical, and in the field trial, 83.05, it was classified as practical. This shows that the developed module provides benefits for students. The benefits of learning media can also make it easier for teachers to convey the material to be studied. (Dita et al., 2021; Puspitasari & Nugroho, 2020; Rachmatullah & Ha, 2018; Rahim et al., 2022). Learning modules also make it easy for students to understand material about quantities and measurements. (Ayado & Berame, 2022; Syahrial et al., 2021). This is because the material in the learning module is explained and presented systematically. (Yuliani et al., 2021).

CONCLUSION

Based on the local potential of sago plants, the magnitude and measurement module with learning cycle 7E is feasible for improving students' critical thinking skills in physics at school. By integrating sago plants into the 7E learning cycle, students can develop critical thinking in building knowledge through scientific investigations and interacting with local potential around them. Further research recommendations are needed to test the effectiveness of the module in physics learning at school.

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Conflict of Interest Statement: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

LIST OF TABLES

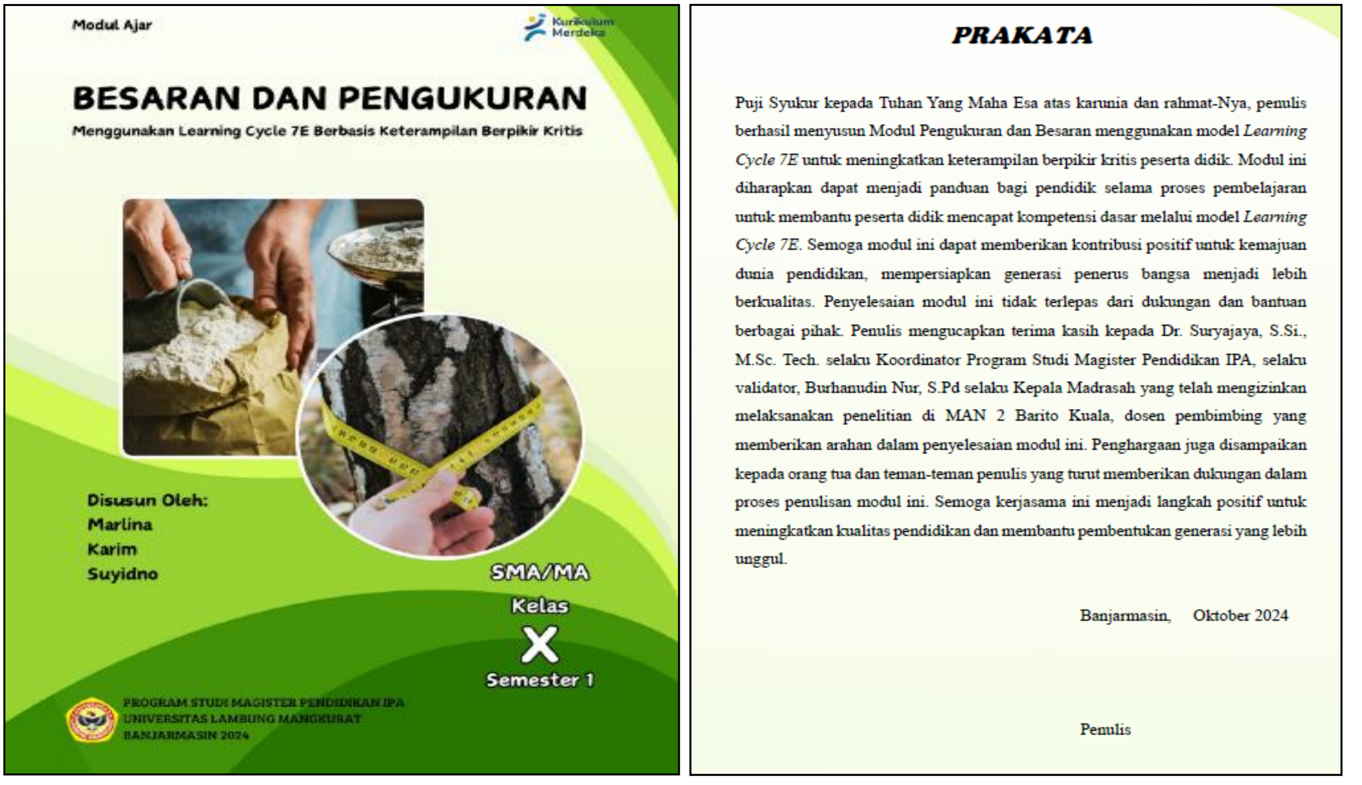
TABLE 1 / The Validity Results of the Magnitude and Measurement Module with Learning Cycle 7E

Aspek	Rata-rata	Kategori
Cover design	3.9	Very valid
General information	3.6	Very valid
Core component	3.3	Very valid
Meeting list details	3.3	Very valid
Attachment details (teaching materials)	3.4	Very valid
Attachment details (worksheets)	3.3	Very valid
Critical thinking test details (construction, language, content)	3.5	Very valid
Overall average	**3.5**	**Very valid**

TABLE 2 / Practicality of the Learning Cycle 7E Module

Aspek	Limited trial		Field Trial	
	Value	Categori	Value	Categori
Ease of use	75.63	Practical enough	79.30	Practical
Attractiveness	77.50	Practical	81.25	Practical
Benefits	75.38	Practical enough	83.05	Practical
Average	**76.17**	**Practical**	**81.20**	**Practical**

LIST OF FIGURES



PRAKATA

Puji Syukur kepada Tuhan Yang Maha Esa atas karunia dan rahmat-Nya, penulis berhasil menyusun Modul Pengukuran dan Besaran menggunakan model *Learning Cycle 7E* untuk meningkatkan keterampilan berpikir kritis peserta didik. Modul ini diharapkan dapat menjadi panduan bagi pendidik selama proses pembelajaran untuk membantu peserta didik mencapat kompetensi dasar melalui model *Learning Cycle 7E*. Semoga modul ini dapat memberikan kontribusi positif untuk kemajuan dunia pendidikan, mempersiapkan generasi penerus bangsa menjadi lebih berkualitas. Penyelesaian modul ini tidak terlepas dari dukungan dan bantuan berbagai pihak. Penulis mengucapkan terima kasih kepada Dr. Suryajaya, S.Si., M.Sc. Tech. selaku Koordinator Program Studi Magister Pendidikan IPA, selaku validator, Burhanudin Nur, S.Pd selaku Kepala Madrasah yang telah mengizinkan melaksanakan penelitian di MAN 2 Barito Kuala, dosen pembimbing yang memberikan arahan dalam penyelesaian modul ini. Penghargaan juga disampaikan kepada orang tua dan teman-teman penulis yang turut memberikan dukungan dalam proses penulisan modul ini. Semoga kerjasama ini menjadi langkah positif untuk meningkatkan kualitas pendidikan dan membantu pembentukan generasi yang lebih unggul.

Banjarmasin, Oktober 2024

Penulis

FIGURE 1 / Module Cover and Preface

DAFTAR ISI

Program Studi Magister Pendidikan Ipa
Universitas Lambung Mangkurat
Banjarmasin 2024

Modul Ajar Besaran dan Pengukuran

A. Informasi Umum

1. Identitas

Nama	: Marlina
Institusi	: MAN 2 Barito Kuala
Tahun	: 2024
Jenjang Sekolah	: MAN
Fase/Kelas	: E/X
Topik	: Besaran dan Pengukuran
Alokasi Waktu	: 9 JP (9 × 45 menit)

2. Kompetensi Awal

Kompetensi awal yang harus dimiliki peserta didik sebagai pengetahuan prasyarat untuk belajar topik ini adalah peserta didik mampu:

D.1. Mengidentifikasi perubahan suhu yang diakibatkan adanya perpindahan energi kalor.

D.2 Melakukan pengukuran aspek fisis gerak dan gaya dari suatu objek yang sering dijumpai dalam kehidupan sehari-hari.

D.3 Mengidentifikasi pemanfaatan ragam gerak dan gaya dalam aktivitas kehidupan sehari-hari.

D.4 Menggabungkan pemahaman mengenai hubungan antara usaha, energi dan pesawat sederhana dari suatu fenomena yang ditemui dalam kehidupan sehari-hari.

D.5 Mengidentifikasi penerapan gaya dan tekanan dalam kehidupan sehari-hari.

3. Profil Pelajar Pancasila

Melalui pengembangan sejumlah pengetahuan dan keterampilan, pelajat menjadi pribadi yang memiliki profil pelajar Pancasila sebagai berikut:

- Mandiri
  Peserta didik mengembangkan kemampuan mandiri saat melakukan diskusi terbuka dan penyelidikan dalam kelompok.
- Gotong royong
  Peserta didik mengembangkan kemampuan bergotong royong saat mengerjakan tugas dalam kelompok.
- Bernalar Kritis
  Peserta didik mampu memperoleh dan memproses informasi dari berbagai sumber literasi kemudian menganalisis konsep fisika di dalamnya serta menyimpulkannya.

4. Sarana dan Prasarana

Laptop, proyektor, *handphone*, *powerpoint*, alat tulis, modul ajar besaran dan pengukuran, dan materi pembelajaran.

FIGURE 2 / Table of Contents and General Module Information

B. Komponen Inti

1. Capaian Pembelajaran

Capaian Pembelajaran	
Fisika Fase E: SMA Kelas X	
Pada akhir fase E, peserta didik memiliki kemampuan untuk responsif terhadap isu-isu global dan berperan aktif dalam memberikan penyelesaian masalah. Kemampuan tersebut antara lain mengamati, mempertanyakan dan memprediksi, merencanakan dan melakukan penyelidikan, memproses dan menganalisis data dan informasi, mengevaluasi dan refleksi, mengkomunikasikan hasil dalam bentuk projek sederhana atau simulasi visual menggunakan aplikasi teknologi yang tersedia terkait dengan energi alternatif, pemanasan global, pencemaran lingkungan, nano teknologi, bioteknologi, kimia dalam kehidupan sehari-hari, pemanfaatan limbah dan bahan alam, pandemi akibat infeksi virus. Semua upaya tersebut diarahkan pada pencapaian tujuan pembangunan yang berkelanjutan (*Sustainable Development Goals/SDGs*). Melalui pengembangan sejumlah pengetahuan tersebut dibangun pula berakhlak mulia dan sikap ilmiah seperti jujur, obyektif, bernalar kritis, kreatif, mandiri, inovatif, bergotong royong dan berkebhinekaan global.	
Pemahaman Fisika	**Keterampilan Proses**
Peserta didik mampu mendeskripsikan gejala alam dalam cakupan keterampilan proses dalam pengukuran, perubahan iklim dan pemanasan global, pencemaran lingkungan, energi alternatif, dan pemanfaatannya.	Peserta didik mampu mengamati, mempertanyakan dan memprediksi, merencanakan dan melakukan penyelidikan, memproses, menganalisis data dan informasi, mencipta, mengevaluasi dan refleksi, serta mengomunikasikan hasil.

2. Alur Tujuan Pembelajaran

E.1 Memahami konsep pengukuran dan penerapannya dalam kehidupan sehari-hari.

3. Tujuan Pembelajaran

Tujuan Pembelajaran	Elemen CP	Indikator Pencapaian Tujuan Pembelajaran
E.1 Memahami konsep pengukuran dan penerapannya dalam kehidupan sehari-hari	Pemahaman Fisika	**Pertemuan 1** 1.1 Peserta didik dapat mengklasifikasikan besaran pokok dan besaran turunan beserta satuannya. 1.2 Peserta didik dapat membedakan besaran pokok dan besaran turunan berdasarkan satuannya. 1.3 Peserta didik mampu berpikir kritis (interpretasi, inferensi, evaluasi, eksplanasi dan *self-regulation*) dalam mempelajari besaran, satuan, dan dimensinya. **Pertemuan 2** 2.1 Peserta didik dapat membaca hasil pengukuran panjang menggunakan alat ukur mistar. 2.2 Peserta didik dapat melakukan pengukuran panjang menggunakan alat ukur. 2.3 Peserta didik dapat menghitung besaran turunan dari hasil pengukuran besaran pokok (misalnya luas, volume, massa jenis, kecepatan, percepatan, gaya, dan usaha). 2.4 Peserta didik mampu berpikir kritis (interpretasi, inferensi, evaluasi, eksplanasi dan *self-regulation*) dalam mempelajari pengukuran. **Pertemuan 3** 3.1 Peserta didik dapat menentukan jumlah angka penting pada hasil pengukuran/hitungan matematis. 3.2 Peserta didik dapat menggunakan notasi ilmiah pada hasil pengukuran/hitungan matematis. 3.3 Peserta didik mampu berpikir kritis (interpretasi, inferensi, evaluasi, eksplanasi dan *self-regulation*) dalam mempelajari angka penting dan notasi ilmiah.
	Keterampilan Proses	Peserta didik mampu: 1. Peserta didik dapat membaca hasil pengukuran panjang menggunakan alat ukur mistar. 2. Peserta didik dapat melakukan pengukuran panjang menggunakan alat ukur.

Modul Ajar Besaran dan Pengukuran

4. Pemahaman Bermakna

- Besaran
- Satuan
- Dimensi
- Pengukuran
- Angka penting
- Notasi ilmiah

5. Pertanyaan Pemantik

- *Apa saja besaran dan satuan-satuan yang sering kamu temui dalam kehidupan sehari-hari?*
- *Alat ukur apa saja yang sering kamu gunakan dalam kehidupan sehari-hari, khususnya dalam pemanfaatan tanaman sagu?*
- *Tahukah kamu bagaimana sagu dihasilkan dan diukur untuk keperluan industri? Bagaimana agar data-data yang diperoleh dari hasil industri bisa dipahami dengan baik dan ditulis dengan nilai yang akurat?*

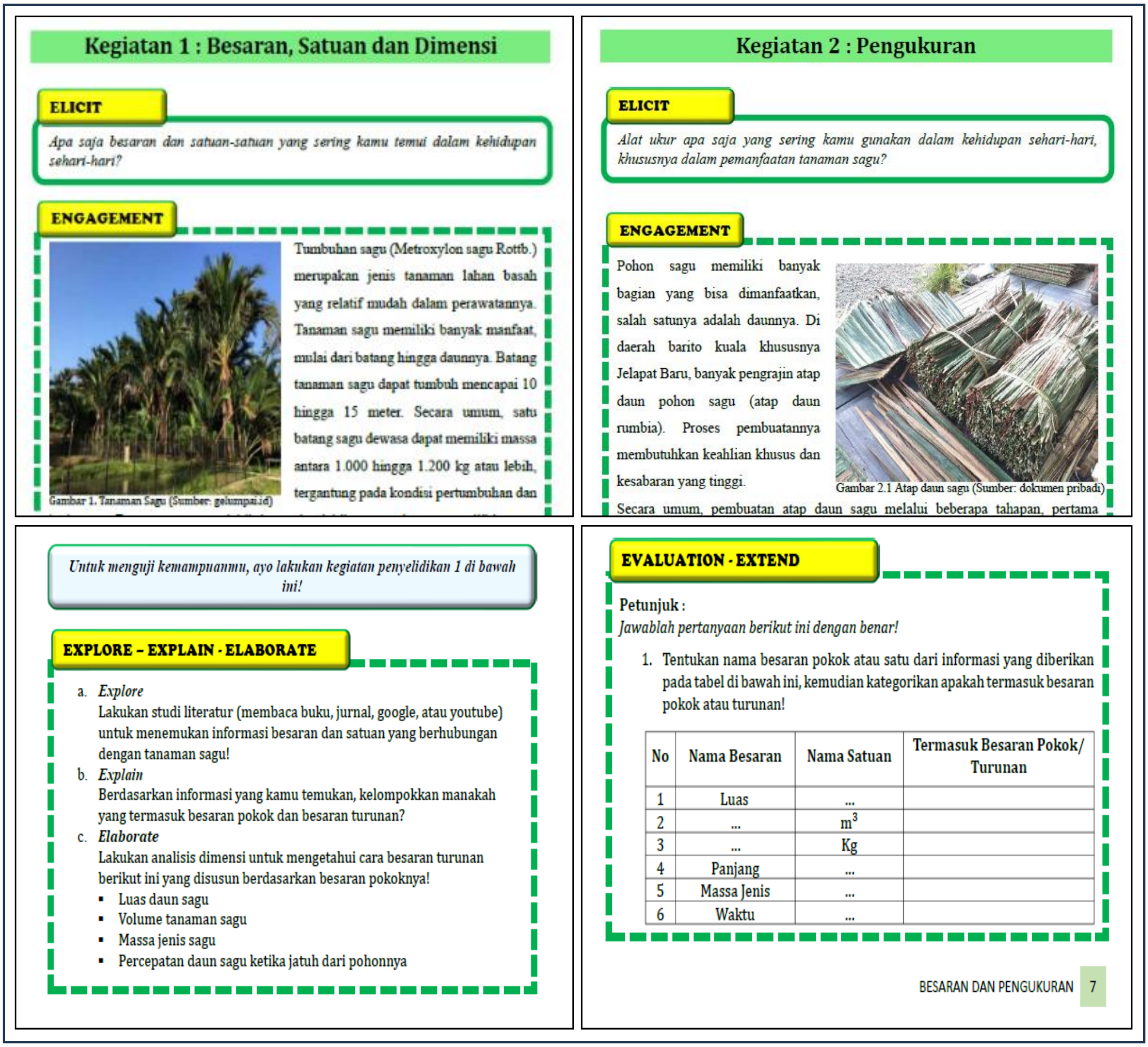
6. Persiapan Pembelajaran

- Mempersiapkan materi ajar
- Mempersiapkan sarana pembelajaran
- Mempersiapkan sumber belajar tentang materi besaran dan pengukuran
- Mempersiapkan LKPD dan Tes Kemampuan Berpikir Kritis

7. Kegiatan Pembelajaran

Pertemuan 1
Pendahuluan (± 5 menit)
1. Membuka pembelajaran dengan mengucapkan salam, menanyakan kabar, dan berdoa sebelum melakukan kegiatan belajar mengajar serta memeriksa kehadiran peserta didik.
2. **Elicit (Apersepsi):** Guru memberikan pertanyaan kepada peserta didik "Apa saja besaran dan satuan-satuan yang sering kamu temui dalam kehidupan sehari-hari?"
3. **Engagement (Motivasi):** Guru menyajikan informasi tanaman sagu sebagai berikut! Tumbuhan sagu (Metroxylon sagu Rottb.) merupakan jenis tanaman lahan basah yang relatif mudah dalam perawatannya. Tanaman sagu memiliki banyak manfaat, mulai dari batang hingga daunnya. Batang tanaman sagu dapat tumbuh mencapai 10 hingga 15 meter. Secara umum, satu batang sagu dewasa dapat memiliki massa antara 1.000 hingga 1.200 kg atau lebih, tergantung pada kondisi pertumbuhan dan jenis sagu. Batang sagu yang lebih besar dan lebih tua cenderung memiliki massa yang lebih tinggi karena kandungan air dan pati yang lebih banyak (Istikowati, 2021).  Gambar 1. Tanaman Sagu (Sumber: gelumpai.id) Berdasarkan informasi tersebut, siswa diminta mengintepretasi dengan menanyakan apa saja besaran dan satuan yang berhubungan dengan tanaman sagu.
4. Menyampaikan tujuan dan manfaat pembelajaran pada *powerpoint*.
5. Menjelaskan uraian proses pembelajaran yang akan dilakukan, mulai *elicit, engagement, explore, explain, elaborate, evaluate* dan *extend* untuk melatihkan berpikir kritis.
Kegiatan Inti (± 120 menit)
6. **Explore:** Guru membagikan **LKPD 1 Besaran, Satuan, dan Dimensi**; kemudian meminta peserta didik melakukan studi literatur (membaca buku, jurnal, google, atau youtube) untuk menemukan informasi besaran dan satuan yang berhubungan dengan tanaman sagu mengacu pada LKPD 1.
7. **Explain:** Berdasarkan informasi yang ditemukan, peserta didik diminta mengelompokkan besaran pokok atau besaran turunan.
8. **Elaborate:** Peserta didik didorong melakukan analisis dimensi untuk mengetahui cara besaran turunan disusun berdasar besaran pokoknya, yaitu: ▪ Luas daun sagu ▪ Volume tanaman sagu ▪ Massa jenis sagu ▪ Percepatan daun sagu ketika jatuh dari pohonnya
9. **Evaluate:** Guru mengecek pemahaman peserta didik dengan meminta mereka mengerjakan soal evaluasi di LKPD 1 Bagian G.
Penutup (± 10 menit)
10. Membimbing peserta membuat kesimpulan hasil pembelajaran dan refleksi proses pembelajaran yang telah dilakukan

FIGURE 3 / Core Components of the Module



Kegiatan 1 : Besaran, Satuan dan Dimensi

ELICIT

Apa saja besaran dan satuan-satuan yang sering kamu temui dalam kehidupan sehari-hari?

ENGAGEMENT

Gambar 1. Tanaman Sagu (Sumber: gelumpai.id)

Tumbuhan sagu (Metroxylon sagu Rottb.) merupakan jenis tanaman lahan basah yang relatif mudah dalam perawatannya. Tanaman sagu memiliki banyak manfaat, mulai dari batang hingga daunnya. Batang tanaman sagu dapat tumbuh mencapai 10 hingga 15 meter. Secara umum, satu batang sagu dewasa dapat memiliki massa antara 1.000 hingga 1.200 kg atau lebih, tergantung pada kondisi pertumbuhan dan

Kegiatan 2 : Pengukuran

ELICIT

Alat ukur apa saja yang sering kamu gunakan dalam kehidupan sehari-hari, khususnya dalam pemanfaatan tanaman sagu?

ENGAGEMENT

Pohon sagu memiliki banyak bagian yang bisa dimanfaatkan, salah satunya adalah daunnya. Di daerah barito kuala khususnya Jelapat Baru, banyak pengrajin atap daun pohon sagu (atap daun rumbia). Proses pembuatannya membutuhkan keahlian khusus dan kesabaran yang tinggi.

Gambar 2.1 Atap daun sagu (Sumber: dokumen pribadi)

Secara umum, pembuatan atap daun sagu melalui beberapa tahapan, pertama

Untuk menguji kemampuanmu, ayo lakukan kegiatan penyelidikan 1 di bawah ini!

EXPLORE – EXPLAIN - ELABORATE

a. *Explore*
Lakukan studi literatur (membaca buku, jurnal, google, atau youtube) untuk menemukan informasi besaran dan satuan yang berhubungan dengan tanaman sagu!

b. *Explain*
Berdasarkan informasi yang kamu temukan, kelompokkan manakah yang termasuk besaran pokok dan besaran turunan?

c. *Elaborate*
Lakukan analisis dimensi untuk mengetahui cara besaran turunan berikut ini yang disusun berdasarkan besaran pokoknya!

- Luas daun sagu
- Volume tanaman sagu
- Massa jenis sagu
- Percepatan daun sagu ketika jatuh dari pohonnya

EVALUATION - EXTEND

Petunjuk :
Jawablah pertanyaan berikut ini dengan benar!

1. Tentukan nama besaran pokok atau satu dari informasi yang diberikan pada tabel di bawah ini, kemudian kategorikan apakah termasuk besaran pokok atau turunan!

No	Nama Besaran	Nama Satuan	Termasuk Besaran Pokok/ Turunan
1	Luas	...	
2	...	m^3	
3	...	Kg	
4	Panjang	...	
5	Massa Jenis	...	
6	Waktu	...	

BESARAN DAN PENGUKURAN 7

FIGURE 4 / Learning Cycle 7E Activities on Teaching Materials

LKPD I BESARAN, SATUAN, DAN DIMENSI

A. TUJUAN PEMBELAJARAN

1. Peserta didik dapat mengklasifikasikan besaran pokok dan besaran turunan beserta satuannya
2. Peserta didik dapat membedakan besaran pokok dan besaran turunan berdasarkan satuannya.
3. Peserta didik mampu berpikir kritis (interpretasi, inferensi, evaluasi, eksplanasi dan *self-regulation*) dalam mempelajari besaran, satuan, dan dimensinya.

B. ELICIT

Apa saja besaran dan satuan-satuan yang sering kamu temui dalam kehidupan sehari-hari?

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C. ENGAGEMENT

Tumbuhan sagu (Metroxylon sagu Rottb.) merupakan jenis tanaman lahan basah yang relatif mudah dalam perawatannya. Tanaman sagu memiliki banyak manfaat, mulai dari batang hingga daunnya. Batang tanaman sagu dapat tumbuh mencapai 10 hingga 15 meter. Secara umum, satu batang sagu dewasa dapat memiliki massa antara 1.000 hingga 1.200 kg atau lebih, tergantung pada kondisi pertumbuhan dan jenis sagu. Batang sagu yang lebih besar dan lebih tua cenderung memiliki massa yang lebih tinggi karena kandungan air dan pati yang lebih banyak (Istikowati, 2021).

Gambar 1. Tanaman Sagu (Sumber: gelumpai.id)

Kabupaten Barito Kuala adalah 256 hektar. Sagu siap dipanen pada umur 5 hingga 7 tahun, dengan ciri diameter batang 60–70 cm, tinggi pohon 10–15 m, dan tebal kulit luar sagu sekitar 10 cm. Pada umur sekitar 10 tahun, ujung batang mulai membengkak, diikuti keluarnya selubung bunga dan pelepah daun putih, terutama pada bagian luar. Perbedaan kuantitas produksi tepung sagu dapat dipengaruhi oleh kondisi tanah dan iklim (habitat) (Saputra, 2022). Sagu tumbuh baik di daerah tropis dengan suhu antara 24°–30°C (Prasetyo, 2023).

Interpretasi:
Tuliskan apa saja besaran dan satuan yang berhubungan dengan tanaman sagu pada informasi tersebut?

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D. EXPLORE

Lakukan studi literatur (membaca buku, jurnal, google, atau youtube) untuk menemukan informasi besaran dan satuan yang berhubungan dengan tanaman sagu!

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E. EXPLAIN

Berdasarkan informasi yang kamu temukan, kelompokkan manakah yang termasuk besaran pokok dan besaran turunan?

Besaran	Hasil Identifikasi
Pokok	
Turunan	

F. ELABORATE

Dimensi merupakan cara suatu besaran turunan disusun berdasarkan besaran pokoknya. semua besaran fisika dapat ditulis dalam dimensi-dimensi panjang [L], massa [M], dan waktu [T]. Sebagai contoh, luas suatu benda dinyatakan sebagai panjang × lebar, maka dimensinya adalah $[L] \times [L] = [L]^2$

Lakukan analisis dimensi untuk mengetahui cara besaran turunan berikut ini yang disusun berdasarkan besaran pokoknya.

1. Luas daun sagu
2. Volume tanaman sagu
3. Massa jenis sagu
4. Percepatan daun sagu ketika jatuh dari pohonnya

Jawaban

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G. EVALUATE

1. Tentukan nama besaran pokok atau satu dari informasi yang diberikan pada tabel di bawah ini, kemudian kategorikan apakah termasuk besaran pokok atau turunan!

No	Nama Besaran	Nama Satuan	Termasuk Besaran Pokok/ Turunan
1	Luas	...	
2	...	m^3	
3	...	Kg	
4	Panjang	...	
5	Massa Jenis	...	
6	Waktu	...	

H. EXTEND

Renungkan apa yang sudah kamu pelajari hari ini, kemudian jelaskan apa yang bisa kamu lakukan untuk meningkatkan pemahaman materi hari ini di masa mendatang!
Jawab:

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I. DAFTAR PUSTAKA

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FIGURE 5 / Worksheet