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Developing a Local Wisdom-Based Bamboo Carving Module for Visual Arts Education

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ABSTRACT

This study aims to develop and determine the feasibility of a contextualized teaching materials specifically a bamboo-carving instructional module titled "*Carving with Bamboo Media*" for eighth-grade students in lower secondary schools. Grounded in the implementation demands of Indonesia's *Kurikulum Merdeka* (Independent Curriculum) and its emphasis on deep learning and local wisdom integration, this research addresses the scarcity of systematic, curriculum-aligned learning resources for traditional craft education and the financial barriers associated with imported or wood-based carving media. Employing a Research and Development (R&D) approach based on the 4D model (Define, Design, Develop, and Disseminate) by Thiagarajan et al., the study proceeded through the first three stages, with the dissemination stage set aside for future research. Data were gathered through expert appraisal using a five-point Likert scale and evaluated via the Criterion-Referenced Assessment Approach (*Pendekatan Acuan Patokan* / PAP). The results indicate that the developed instructional module achieved exceptionally high feasibility ratings: the material-content expert evaluated the product at 4.65 out of 5 (categorized as "Very Good"), while the media expert rated its visual and technical layout at 4.00 out of 5 (categorized as "Good"). These findings confirm that the bamboo-carving module meets rigorous validity standards and serves as an effective, economical supplementary learning resource for contextualized visual arts instruction. Future research should pursue the dissemination stage through classroom empirical trials to measure its direct impact on students' creative psychomotor competencies and learning outcomes.

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1. INTRODUCTION

The holistic development of learners' attitudes, cognitive knowledge, and motor skills remains a foundational objective of modern secondary education (Miglani et al.,

2026; Sposab & Rieckmann, 2024). In Indonesia, the recent educational transformation initiated through *Ministry Regulation Permendikbudristek No. 53 of 2023* mandates that classroom instruction must be inspiring, interactive, challenging, and contextualized, providing adequate space for student autonomy, creativity, and psychological development (Hasanah et al., 2022). This regulatory pivot reflects an international pedagogical consensus that contemporary schooling must extend beyond rote memorization to foster critical thinking and authentic skill acquisition.

Within this progressive framework, Cultural Arts (*Seni Budaya*) plays a pivotal role in cultivating aesthetic sensitivity, creative expression, and cultural appreciation among adolescents (Martadi & Sampurno, 2025; Putra et al., 2024). Craft instruction, particularly carving (*mengukir*), serves as a core domain for fostering fine motor control, spatial reasoning, and artistic identity (Lin et al., 2026; Ojala et al., 2022). Through tactile engagement with shaping materials, students learn to bridge conceptual design with physical execution, which is vital for holistic psychomotor development in secondary classrooms (Beutin et al., 2025; Strand & Lutnæs, 2022).

However, a critical gap persists between macro-level curricular aspirations and micro-level classroom realities. Field observations and preliminary needs assessments in lower secondary schools reveal that Cultural Arts teachers predominantly rely on generic, commercially published textbooks. These mass-market resources frequently fail to reflect local socio-ecological potentials, forcing reliance on expensive or environmentally impractical media such as imported wooden cutting boards (*talenan kayu*). This creates both financial barriers for economically diverse student bodies and a disconnect from students' immediate cultural environments. In regions abundantly endowed with natural resources—such as Pangkep Regency, South Sulawesi, where bamboo grows profusely—the failure to harness local materials represents an untapped pedagogical opportunity.

A growing body of literature emphasizes the efficacy of integrating local wisdom and indigenous materials into art education. Local-wisdom-based instructional materials significantly enhance contextual relevance and student engagement in junior secondary schools (Fathurrochman et al., 2026; Hamid et al., 2026; Marwan et al., 2026). Similarly, Dai and Hwang (2019) highlighted that bamboo-based carving modules improved students' practical craft competencies while offering a sustainable, cost-effective alternative to wood. Furthermore, Owusu-Ansah et al. (2026) noted that tactile engagement with bamboo stimulates imaginative problem-solving and technical dexterity.

Despite these valuable contributions, existing studies exhibit a notable limitation: they rarely provide a systematic, highly structured instructional resource explicitly mapped onto the Learning Outcomes (*Capaian Pembelajaran*/CP) and Learning-Flow Objectives (*Alur Tujuan Pembelajaran*/ATP) mandated by the Kurikulum Merdeka. Most prior modules lack a comprehensive grounding in deep learning principles, structured task analyses, and rigorous expert-validated formatting. This methodological and curricular disconnection underscores the urgent need for a systematic instructional design tailored to contemporary national standards.

To bridge this theoretical and practical gap, the present study developed and validated a specialized instructional module entitled *"Bamboo-Carving: Carving with Bamboo Media"* tailored for eighth-grade visual arts education. By transforming an abundant regional commodity (bamboo) into a structured curricular medium, this research bridges local ecological wealth with modern pedagogical standards. Specifically, this study aims to: (1) describe the systematic development process of the bamboo-carving teaching material through the Define, Design, and Develop stages of the 4D model, and (2) evaluate the psychometric and technical feasibility of the product based on rigorous expert validation of its content and media quality.

2. METHOD

This study adopted a Research and Development (R&D) design, aimed at creating and validating an operational educational product. The development procedure followed the 4D model established by Thiagarajan, Semmel, and Semmel (Supartini et al., 2020), which comprises four recursive phases: Define, Design, Develop, and Disseminate. Due to time and resource constraints inherent in the initial production cycle, the scope of this study was restricted to the first three stages (Define, Design, and Develop). The fourth stage (Disseminate) is identified as an essential agenda for subsequent large-scale empirical research.

The development study was contextualized for eighth-grade students (Phase D) taking Cultural Arts (*Seni Budaya*) at lower secondary schools in South Sulawesi, Indonesia. Baseline empirical data regarding instructional hurdles, student demographics, and curriculum constraints were gathered through structured classroom observations and interviews with arts educators. The evaluation and validation of the prototype were conducted by two independent, highly qualified domain experts:

- Material-Content Expert: M.S, an academic specialist in visual arts curriculum and instructional content.
- Media Expert: A.M, a senior specialist in visual communication design, typography, and educational media technology.

Development Procedures (3D of the 4D Model)

1. **Define Stage:** Conducted to establish instructional parameters through five analytical steps:
    - *Front-end analysis:* Identifying core pedagogical gaps and over-reliance on non-contextual textbooks under the *Kurikulum Merdeka*.
    - *Learner analysis:* Examining cognitive and psychomotor readiness, socio-economic diversity, and students' high affinity for hands-on making.
    - *Concept analysis:* Hierarchically mapping core concepts in alignment with official Grade VIII Visual Arts Teacher Guidebooks and national CP/ATP standards.
    - *Task analysis:* Deconstructing required carving competencies into sequential operational steps.

- *Instructional objectives specification:* Formulating precise behavioral and competency-based learning targets.

2. **Design Stage:** Focused on prototyping the instructional artifact through:
   - *Criterion-referenced test construction:* Developing test blueprints to measure cognitive mastery.
   - *Media selection:* Justifying bamboo as the ideal low-cost, structurally sound organic medium.
   - *Format selection:* Choosing an A4 booklet layout optimized for readability, physical handling, and digital (PDF) distribution.
   - *Initial design:* Drafting content and executing layout design via Canva, incorporating pedagogical modules (objectives, instructions, worksheets, evaluation banks, answer keys, and glossaries) styled with professional typography (Open Sans and Times New Roman).
3. **Develop Stage:** Focused on formative evaluation and product refinement through expert appraisal. The initial 49-page prototype was subjected to rigorous content and media scrutiny using standardized rating instruments. Revisions were executed based on expert feedback prior to finalizing the product's feasibility status.

Data were collected using a quantitative-qualitative rating instrument formatted as a five-point Likert scale (ranging from 1 = Very Poor to 5 = Very Good). The quantitative evaluation scores obtained from the validators were compiled and converted into qualitative categories using the Criterion-Referenced Assessment Approach (*Pendekatan Acuan Patokan*/PAP), as detailed in Table 1.

Table 1. Criterion-referenced conversion guidelines for expert validation scores

Mean Score Range (x)	Category
$x > 4.2$	Very Good
$3.4 < x \leq 4.2$	Good
$2.6 < x \leq 3.4$	Fair
$1.8 < x \leq 2.6$	Poor
$x \leq 1.8$	Very Poor

The threshold for product feasibility was established at a minimum overall mean score of $x > 3.4$. Products scoring at or below this threshold required mandatory structural revision.

3. RESULTS AND DISCUSSION

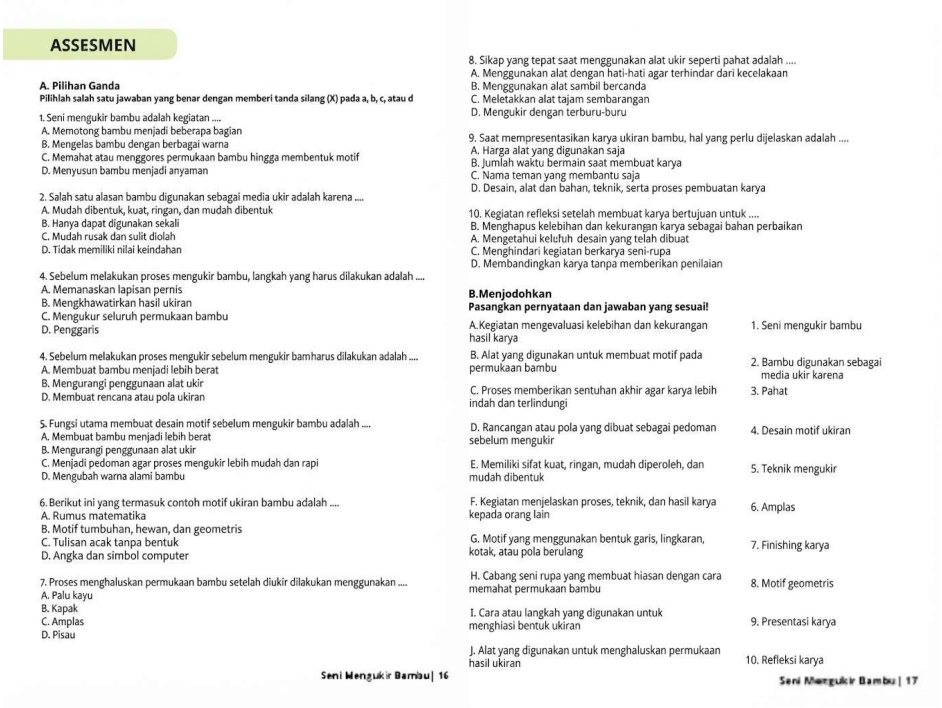
Results

Define Stage Findings

The front-end analysis revealed that the transition to the *Kurikulum Merdeka*—with its emphasis on deep learning and student-centered inquiry—was hindered by a heavy dependence on a single commercial textbook (*Jana Kusnidar, Grafindo Media Pratama*). This lack of diversified resources created instructional bottlenecks that impeded both pedagogical flexibility and contextualized learning in the classroom.

Consequently, identifying these systemic limitations underscored an urgent necessity to design alternative learning tools capable of supporting modern educational standards and fostering independent student engagement.

Furthermore, the learner analysis confirmed that eighth-grade students possessed strong tactile engagement and enthusiasm for creative arts practice. Given the regional abundance of bamboo in the Labakkang sub-district, utilizing bamboo successfully solved economic accessibility barriers for economically diverse learners while simultaneously reinforcing cultural identity and local wisdom. This alignment between student characteristics and regional ecological potential provides a robust foundation for developing sustainable, practice-based instructional media.



ASSESMEN

A. Pilihan Ganda
Pilihlah salah satu jawaban yang benar dengan memberi tanda silang (X) pada a, b, c, atau d

1. Seni mengukir bambu adalah kegiatan ....
A. Memotong bambu menjadi beberapa bagian
B. Mengelas bambu dengan berbagai warna
C. Memahat atau menggores permukaan bambu hingga membentuk motif
D. Menyusun bambu menjadi anyaman

2. Salah satu alasan bambu digunakan sebagai media ukir adalah karena ....
A. Mudah dibentuk, kuat, ringan, dan mudah dibentuk
B. Hanya dapat digunakan sekali
C. Mudah rusak dan sulit diolah
D. Tidak memiliki nilai keindahan

4. Sebelum melakukan proses mengukir bambu, langkah yang harus dilakukan adalah ....
A. Memanaskan lapisan pernis
B. Mengkhawatirkan hasil ukiran
C. Mengukur seluruh permukaan bambu
D. Penggaris

4. Sebelum melakukan proses mengukir sebelum mengukir bamharus dilakukan adalah ....
A. Membuat bambu menjadi lebih berat
B. Mengurangi penggunaan alat ukir
D. Membuat rencana atau pola ukiran

5. Fungsi utama membuat desain motif sebelum mengukir bambu adalah ....
A. Membuat bambu menjadi lebih berat
B. Mengurangi penggunaan alat ukir
C. Menjadi pedoman agar proses mengukir lebih mudah dan rapi
D. Mengubah warna alami bambu

6. Berikut ini yang termasuk contoh motif ukiran bambu adalah ....
A. Rumus matematika
B. Motif tumbuhan, hewan, dan geometris
C. Tulisan acak tanpa bentuk
D. Angka dan simbol computer

7. Proses menghaluskan permukaan bambu setelah diukir dilakukan menggunakan ....
A. Palu kayu
B. Kapak
C. Amplas
D. Pisau

Seni Mengukir Bambu| 16

8. Sikap yang tepat saat menggunakan alat ukir seperti pahat adalah ....
A. Menggunakan alat dengan hati-hati agar terhindar dari kecelakaan
B. Menggunakan alat sambil bercanda
C. Meletakkan alat tajam sembarangan
D. Mengukir dengan terburu-buru

9. Saat mempresentasikan karya ukiran bambu, hal yang perlu dijelaskan adalah ....
A. Harga alat yang digunakan saja
B. Jumlah waktu bermain saat membuat karya
C. Nama teman yang membantu saja
D. Desain, alat dan bahan, teknik, serta proses pembuatan karya

10. Kegiatan refleksi setelah membuat karya bertujuan untuk ....
B. Menghapus kelebihan dan kekurangan karya sebagai bahan perbaikan
A. Mengetahui keluhuh desain yang telah dibuat
C. Menghindari kegiatan berkarya seni-rupa
D. Membandingkan karya tanpa memberikan penilaian

B.Menjodohkan
Pasangkan pernyataan dan jawaban yang sesuai!

A.Kegiatan mengevaluasi kelebihan dan kekurangan hasil karya	1. Seni mengukir bambu
B. Alat yang digunakan untuk membuat motif pada permukaan bambu	2. Bambu digunakan sebagai media ukir karena
C. Proses memberikan sentuhan akhir agar karya lebih indah dan terlindungi	3. Pahat
D. Rancangan atau pola yang dibuat sebagai pedoman sebelum mengukir	4. Desain motif ukiran
E. Memiliki sifat kuat, ringan, mudah diperoleh, dan mudah dibentuk	5. Teknik mengukir
F. Kegiatan menjelaskan proses, teknik, dan hasil karya kepada orang lain	6. Amplas
G. Motif yang menggunakan bentuk garis, lingkaran, kotak, atau pola berulang	7. Finishing karya
H. Cabang seni rupa yang membuat hiasan dengan cara memahat permukaan bambu	8. Motif geometris
I. Cara atau langkah yang digunakan untuk menghiasi bentuk ukiran	9. Presentasi karya
J. Alat yang digunakan untuk menghaluskan permukaan hasil ukiran	10. Refleksi karya

Seni Mengukir Bambu | 17

Figure 1. The task analysis

The concept and task analyses successfully structured learning materials around the prescribed *Capaian Pembelajaran* (CP) and *Alur Tujuan Pembelajaran* (ATP) for Phase D Visual Arts, breaking down carving techniques from basic motif design to surface finishing. This rigorous curriculum mapping ensured that every instructional unit aligned seamlessly with national educational standards while establishing a clear, progressive learning trajectory for secondary students. By translating broad competency standards into manageable learning units, the instructional framework effectively bridged macro-level policy requirements with micro-level classroom execution.

Furthermore, this systematic decomposition of artistic skills enabled a granular approach to technical instruction, guiding learners progressively from fundamental conceptualization to advanced practical mastery. Structuring the carving process into distinct developmental phases not only facilitated cognitive understanding of design principles but also fostered precise psychomotor control during hands-on execution.

Consequently, this methodological thoroughness guarantees that the instructional module provides a comprehensive, pedagogically sound framework for fostering both technical proficiency and artistic creativity in visual arts education.

Design Stage Findings

During the design phase, a comprehensive test blueprint was established to evaluate cognitive learning outcomes. Bamboo was formally chosen as the optimal material due to its fiber rigidity, accessibility, and smooth outer epidermis suitable for fine incisions.



Figure 2. Initial Design

The resulting product was designed as a 49-page instructional module produced in both high-resolution digital (PDF) and physical print formats (A4 size). The layout integrated all necessary pedagogical components, including structural learning objectives, student activity sheets, formative assessment banks (multiple choice and matching items), answer keys, and a glossary. Typographical hierarchy was strictly maintained using clean sans-serif and serif fonts to optimize readability.

Develop Stage Findings: Expert Validation

Following initial prototyping, the module was submitted for expert appraisal.

Content Validation Results

Content evaluation by the material expert covered two primary dimensions: (a) content and objective suitability, and (b) instructional quality. The quantitative results are presented in Table 2.

Table 2. Content validation scores by the material expert

No.	Assessed Aspect	Mean Score	Category
1	Content and Learning Objectives	4.64	Very Good
2	Instructional Design Quality	4.66	Very Good
	Overall Mean Score	4.65	Very Good

The overall content validation score of 4.65 placed the material firmly in the "Very Good" category ($x > 4.2$). This exceptional quantitative rating demonstrates that the instructional module possesses superior pedagogical quality, ensuring strict alignment with curriculum objectives and deep learning principles. Such a high score reflects the theoretical soundness and structural accuracy of the content, validating its readiness to serve as a reliable supplementary learning resource for secondary visual arts instruction.

Furthermore, minor qualitative recommendations provided by the validator included relocating the author's curriculum vitae to the back cover and reducing the dimensions of the author's photograph. These adjustments were fully incorporated into the final revision, demonstrating a rigorous iterative design process that enhances the professional layout and ergonomic presentation of the module. Implementing this expert feedback successfully bridged quantitative validation metrics with practical typographic refinements, ensuring optimal readability and aesthetic appeal for end-users.

Media Validation Results

Media validation evaluated the technical and aesthetic presentation of the module, encompassing visual layout, color harmony, illustration clarity, typography, and ergonomic usability. This comprehensive technical assessment ensures that the instructional artifact meets professional design standards required for effective digital and print distribution. Evaluating these visual elements is critical, as well-structured typography and harmonious color compositions directly influence cognitive load and student engagement during independent study.

The media expert assigned an overall mean score of $x = 4.00$, which falls within the $3.4 < x \leq 4.2$ interval, classifying the product as "Good". This favorable rating indicates that while the technical and visual layouts are robust and functionally sound, minor aesthetic enhancements can still be integrated to elevate the overall user experience. Balancing aesthetic appeal with ergonomic functionality remains essential for maximizing the instructional impact of practice-based learning modules in secondary classrooms.

Synthesizing both evaluations, the bamboo-carving teaching material successfully exceeded the minimum feasibility threshold (3.4), confirming its validity and readiness as a supplementary learning resource for lower secondary visual arts education. This culmination of expert appraisal demonstrates that the module successfully harmonizes rigorous pedagogical content with high-quality technical presentation. Consequently, the validated product stands fully prepared for classroom deployment, offering a reliable and context-responsive instructional tool to support modern art education curricula.

Discussion

The findings from the Define stage underscore a widespread structural challenge in contemporary education: curriculum reforms such as the *Kurikulum Merdeka* frequently outpace the availability of context-responsive teaching materials. Reliance on generic textbooks limits students' connection to their immediate socio-cultural ecology. By substituting expensive or culturally distant wood media with locally abundant bamboo, this study successfully operationalized the principles of contextual education and resource sustainability, echoing Ansoriyah et al. (2026) and Guerra and Holgaard (2019). This pedagogical shift addresses a crucial void in modern curriculum implementation, proving that local natural resources can serve as powerful mediums for authentic learning (Dean & Wenner, 2026; Gan & Gal, 2024; Morris et al., 2021).

The Design and Develop stages validate the efficacy of a structured R&D workflow. Achieving high expert ratings (4.65 for content and 4.00 for media) demonstrates that systematic instructional design—integrating deep learning principles, clear task analyses, and professional graphic formatting—yields highly robust learning tools. This aligns with Dreer (2023) and Jiang et al. (2025), who emphasized that locally contextualized craft modules significantly elevate student psychomotor engagement. The rigorous structuring of learning modules ensures that instructional goals are met seamlessly through standardized developmental phases (Ma & Wu, 2025; Stephan, 2026).

Interestingly, while content quality achieved a "Very Good" rating, media validation scored slightly lower ("Good"). This nuance indicates that while pedagogical alignment and curriculum mapping were nearly flawless, visual layouts and digital asset integration offer continuous room for aesthetic refinement in future iterations. Analyzing this variance is essential for instructional designers to balance substantive curriculum mapping with visual ergonomics in subsequent prototyping cycles.

From a theoretical standpoint, these results reinforce the assertions of Leung et al. (2025) and Yan (2026) that arts education achieves maximum meaningfulness when learners interact with authentic, tactile materials rooted in their cultural environment. Grounding artistic instruction in tangible local artifacts bridges cognitive understanding with practical execution, thereby reinforcing cultural preservation alongside technical skill acquisition (Hung et al., 2021; Peppler et al., 2023; Sun et al., 2022).

Nevertheless, this study carries inherent limitations: the R&D cycle concluded at the Develop stage without empirical classroom trials or large-scale effectiveness testing, and validator participation was restricted to two experts. While expert appraisal confirms theoretical validity and product feasibility, classroom-based performance metrics remain necessary to substantiate direct student outcomes. Acknowledging these boundaries ensures academic transparency and establishes a clear trajectory for ongoing scholarly inquiry.

Subsequent investigations must scale these findings into the Disseminate phase by conducting quasi-experimental classroom trials, measuring pre- and post-intervention psychomotor skill gains across diverse school populations. Broadening field implementations across varied regional settings will ultimately test the scalability, long-

term efficacy, and adaptability of bamboo-carving instructional modules within diverse educational ecosystems.

4. CONCLUSION

This study successfully developed and validated a contextualized bamboo-carving teaching material entitled *"Carving with Bamboo Media"* for eighth-grade students at SMP Negeri 3 Labakkang, utilizing a rigorous 3-stage 4D Research and Development model. Through the Define stage, critical pedagogical needs and local resource potentials under the *Kurikulum Merdeka* were systematically mapped, while the Design stage yielded a comprehensive 49-page instructional module equipped with structured learning objectives, activity sheets, and evaluation banks. Furthermore, the Develop stage established exceptional product validity and technical feasibility through expert appraisal, culminating in a content validity score of 4.65 ("Very Good") and a media validity score of 4.00 ("Good"). These quantitative metrics confirm that the module meets stringent academic standards, positioning it as an innovative, sustainable, and highly viable supplementary learning resource for contemporary visual arts education.

Building upon these foundational validation outcomes, future research must prioritize empirical field implementation, longitudinal effectiveness testing, and wider dissemination to evaluate student learning outcomes comprehensively. Transitioning the product into classroom trials and quasi-experimental designs will provide critical quantitative insights into its direct impact on students' psychomotor skill acquisition, creative dexterity, and aesthetic engagement across diverse educational settings. Ultimately, scaling this model offers a replicable framework for integrating local ecological commodities and indigenous wisdom into modern curriculum delivery worldwide.

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During the preparation of this work, the author(s) used Google Gemini to improve language readability, refine academic phrasing, and format structural components of the manuscript. After using this tool, the author(s) thoroughly reviewed, edited, and verified the content to ensure scientific precision and preserve the original research intent. The author(s) take full responsibility for the content, final integrity, and accuracy of this publication.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

DATA AVAILABILITY STATEMENT

The authors state that the data supporting the findings of this study will be made available by the corresponding author, S.F. D, upon reasonable request.

AUTHOR CONTRIBUTIONS

S.F.D: Conceptualization, Methodology, Software, Investigation, Data curation, Writing – original draft preparation, Visuals & Module Design. A.A.A: Conceptualization, Supervision, Formal analysis, Writing – review & editing, Validation. P.P.Y: Methodology, Validation, Resources, Writing – review & editing, Project administration. All authors have read and agreed to the published version of the manuscript.

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