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Interactive Multimedia: Maritma Quest Based on Discovery Learning for Junior High School Social Arithmetic

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Abstract

This study aimed to develop Maritma Quest Interactive Multimedia based on Discovery Learning for junior high school social arithmetic and to determine its validity and practicality as a mathematics learning medium. The study employed a Research and Development (R&D) approach using the ADDIE model, which was implemented through the Analysis, Design, Development, and Implementation phases, while evaluation was conducted formatively throughout the development process. The novelty of this multimedia lies in the integration of maritime contexts into all learning activities and the application of Discovery Learning stages to support students' active concept discovery. The study involved one subject matter expert, one media expert, one language expert, one mathematics teacher, and 36 seventh-grade students at SMP Negeri 5 Tanjungpinang. Data was collected through observation, interviews, validation sheets, and practicality questionnaires and analyzed using descriptive quantitative techniques. The results showed that the multimedia achieved validity scores of 92% from the subject matter expert, 85% from the media expert, and 90.91% from the language expert, all categorized as very valid. The practicality results showed a score of 90% from the teacher, categorized as very practical, and 77% from the students, categorized as practical. Therefore, Maritma Quest Interactive Multimedia is considered valid and practical for use in mathematics learning and can serve as an alternative medium that promotes more interactive, contextual, and engaging learning experiences through maritime-based Discovery Learning activities.

Keywords: Interactive Multimedia; Discovery Learning; Social Arithmetic; Junior High School; Maritime Context

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INTRODUCTION

Mathematics is one of the most important subjects in various aspects of daily life. Mathematics helps children learn to think logically, critically, systematically, and creatively so they can solve various types of problems (NCTM, 2000; Polya, 1973) . Putri et al (2021) states that many students still view mathematics as a difficult and uninteresting subject. Furthermore,

classroom instruction often fails to encourage students' active participation in learning activities (Bonwell & Eison, 1991; Hattie, 2009). As a result, they are less engaged in mathematics lessons and lack interest in learning.

Social arithmetic is a branch of mathematics that is closely related to everyday life (Nurbayan & Basuki, 2022; Daniatun et al., 2022). This subject covers various concepts, such as profit and loss, discounts, interest, taxes, gross, net, and tare, which are frequently encountered in various economic activities in society. Many students struggle to understand word problems related to social arithmetic (Afriansyah et al., 2024), even though this material is frequently encountered in daily life (Gravemeijer, 1994; Verschaffel et al., 2000). This difficulty arises because students focus more on applying formulas than on understanding the meaning of the given problem, making it hard for them to connect mathematical concepts to real-life situations (Annisa et al., 2023).

One of the causes of this problem is that the learning process remains teacher centered. In mathematics instruction, the lecture method still dominates, thereby limiting students' opportunities to actively participate in learning activities (Istiqomah & Nurulhaq, 2021). Furthermore, the learning materials used have not been able to capture students' attention because they lack interactivity (Keller, 2010; Mayer, 2020; Haqq et al., 2025). The presentation of material that appears boring causes students to quickly become bored and lose enthusiasm for participating in mathematics lessons. Therefore, an educational innovation is needed that can create a more engaging and interactive learning experience and encourage students' active involvement in the learning process (Lestari et al., 2021; Santika et al., 2025).

One approach that can be implemented is to utilize interactive media in the mathematics learning process. Interactive multimedia can help students better understand mathematical concepts by presenting lessons that are more engaging and easier to grasp (Faqih et al., 2021; Azizah et al., 2025). Interactive multimedia combines various types of media such as text, images, audio, video, AI-based animations, and interactive exercises making the learning process more diverse and engaging (Luritawaty et al., 2026). In addition, the use of interactive multimedia can encourage more active student engagement by giving them the opportunity to interact directly with the media used in learning (Ulpah & Insani, 2025). Lestari et al (2021) said that with interactive multimedia, student engagement increases because they are not merely receiving information but are actively participating in exploring and applying the learning material.

The use of interactive multimedia combined with the Discovery Learning model has the potential to be a solution for improving the quality of mathematics education. Discovery Learning is a learning model that encourages students' active engagement in discovering and constructing their own knowledge through a series of activities such as observation, exploration, data collection, and drawing conclusions (Alfieri et al., 2011; Bruner, 1961; Lesmana & Afriansyah, 2024). In mathematics education, this model is relevant to implement because it can strengthen students' conceptual understanding and help them connect learning

materials to real-life experiences and situations. In addition, Anggelya & Rahayu (2024) note that Discovery Learning is also well-suited for integration with interactive multimedia, as both encourage students to be active throughout the learning process.

Several previous studies have shown that interactive multimedia can be effectively used in mathematics education. Interactive media is considered capable of increasing students' interest in learning and helping them understand mathematical concepts more easily (Dewi & Izzati, 2020; Purnomo et al., 2025). Furthermore, research by Khilya et al (2025) indicates that the use of interactive media can make learning more engaging for students and encourage them to participate more actively in the learning process. Adzani & Pramuditya, (2025) state that interactive learning media can support the mathematics learning process, making it more effective and fostering students' active engagement in learning activities.

Although interactive multimedia has been widely developed to support mathematics learning, most previous studies have focused on improving conceptual understanding and learning motivation without integrating local contexts into the learning process. In addition, multimedia based on Discovery Learning generally emphasizes the learning model itself rather than connecting mathematical concepts with students' real-life environments. Therefore, the development of interactive multimedia that integrates maritime contexts with Discovery Learning activities for social arithmetic learning remains limited.

Based on this gap, this study developed the Maritma Quest Interactive Multimedia based on Discovery Learning for junior high school social arithmetic. The novelty of this multimedia lies in the integration of maritime contexts into all learning activities, allowing students to learn concepts such as profit and loss, discounts, gross, net, and tare through problems related to maritime economic activities. In addition, the multimedia is designed according to the stages of Discovery Learning to encourage students to actively discover mathematical concepts. Therefore, this study aims to develop a valid and practical interactive multimedia alternative for mathematics learning.

METHODS

This study employs the Research and Development (R&D) method using the ADDIE model, which consists of five stages: Analysis, Design, Development, Implementation, and Evaluation, carried out systematically (Branch, 2009). The ADDIE model was chosen because it provides structured and systematic development steps, making it suitable for use in designing and developing educational multimedia.

In this study, the phases carried out included Analysis, Design, Development, and Implementation. Evaluation was conducted formatively through expert validation, revision, and practicality testing during the development process. Therefore, the Evaluation stage was not implemented as a separate summative phase because this study focused on assessing the validity and practicality of the developed multimedia. The Implementation phase involved pilot

testing of the interactive multimedia with students to assess the product's usability and gather user feedback on the developed multimedia

The study was conducted at SMP Negeri 5 Tanjungpinang during the second semester of the 2025/2026 academic year. The participants in the study included subject matter experts, media experts, and language experts as product validators, as well as one mathematics teacher and 36 seventh-grade students as users of the Maritma Quest Interactive Multimedia. The validators were tasked with assessing the validity of the developed product, while the teacher and students provided feedback on the use of the multimedia during the implementation phase.

The instruments used in this study included observation guidelines, interview guidelines, a validation sheet, and a practicality questionnaire. The observation and interview guidelines were used to collect information regarding learning needs, student characteristics, mathematics learning situations, and teachers' needs in using learning media. The validation sheet was used to assess the validity of the Maritma Quest Interactive Multimedia based on content, media, and language aspects. Meanwhile, the practicality questionnaire was used to obtain feedback from teachers and students regarding the use of multimedia in learning.

Data collection was conducted in an integrated manner at every stage of development. During the analysis phase, data was collected through observation and interviews to analyze student and teacher needs, student characteristics, and the social arithmetic content to be developed in the educational multimedia. The results of this analysis served as the basis for determining the specifications and characteristics of the multimedia being developed.

During the Design phase, the Maritma Quest interactive multimedia program based on discovery learning was developed for social arithmetic content. Activities during this phase included formulating learning objectives, developing content, creating storyboards, designing the media interface, mapping out the navigation flow, and developing research instruments.

During the development phase, the Maritma Quest interactive multimedia product was created in accordance with the established plan. The resulting product was then evaluated by subject matter, media, and language experts to gather feedback and verify the quality of the developed product. The results of this evaluation were used as a basis for making further improvements to the product before the testing process began.

During the development process, formative evaluation was conducted through expert validation, product revision, and practicality testing. The formative evaluation aimed to identify weaknesses and improve the quality of the multimedia before implementation. Therefore, evaluation was integrated into the Development and Implementation phases rather than being conducted as a separate summative stage. Since this study focused on determining the validity and practicality of the developed multimedia, a summative evaluation to measure its effectiveness in improving students' learning outcomes was not conducted.

During the Implementation phase, the Maritima Quest Interactive Multimedia was implemented with seventh-grade students at SMP Negeri 5 Tanjungpinang to assess its

practicality in the learning process. A pilot test was conducted to evaluate the feasibility of using the multimedia and to gather feedback from teachers and students regarding the developed product. Data for this phase was collected through a practicality questionnaire administered after the multimedia was used in the learning process.

The reliability of the data in this study was established using the method of technical triangulation, which involves comparing data derived from observations, interviews, and questionnaires. Meanwhile, the validity of the product was determined based on evaluations provided by subject matter experts, media experts, and language experts. The data obtained from the research were then analyzed using quantitative descriptive methods with a five-point Likert scale: score 5 = strongly agree (SS), score 4 = agree (S), score 3 = somewhat agree (C), score 2 = disagree (TS), and score 1 = strongly disagree (STS) (Sugiyono, 2017). The scores obtained from the validation sheets and the practicality questionnaire were converted into percentages, then interpreted according to the established rating categories to determine the levels of validity and practicality of the Maritma Quest Interactive Multimedia.

The validity percentage is calculated by comparing the total score obtained from the validation results to the maximum score and then multiplying the result by 100%. The resulting percentage indicates the level of multimedia validity. The total score used is the sum of the scores assigned by the validators, while the maximum score is the highest possible score across all evaluated aspects.

The practicality of the Maritma Quest interactive multimedia system, based on discovery learning, was measured through a pilot study involving students and teachers after the multimedia was used in the mathematics learning process for social arithmetic material. Data on practicality was collected by distributing questionnaires to teachers and seventh-grade students at SMP Negeri 5 Tanjungpinang. The practicality indicators assessed included ease of use of the multimedia, learning time efficiency, ease of understanding and interpreting the multimedia content, suitability of the multimedia to the learning material, appeal of the multimedia, and the multimedia's ability to be used independently in the learning process. These indicators were used to obtain information regarding the level of ease, usefulness, and applicability of the multimedia in supporting learning activities. The practicality questionnaire assessment used a five-point Likert scale, with the following alternatives: score 5 = strongly agree (SS), score 4 = agree (S), score 3 = somewhat agree (C), score 2 = disagree (TS), and score 1 = strongly disagree (STS) (Sugiyono, 2017). Higher scores indicate that multimedia has a higher level of practicality according to the respondents. The results of the practicality and feasibility percentages for multimedia were then interpreted based on the following criteria:

Table 1. Practical Interpretation and multimedia compatibility

Achievement Level	Practicality	Feasibility
81-100	Very Practical	Very Valid
61-80	Practical	Valid
41-60	Quite Practical	Quite valid
21-40	Less practical	Less valid
0-20	Not practical	Not valid

(Yanto, 2019; Nasikhah & Karimah 2022)

RESULTS AND DISCUSSION

Results

This study developed the “Maritma Quest” interactive multimedia program, which applies the Discovery Learning model to social arithmetic material for junior high school students. The study was conducted in the seventh-grade class at SMPN 5 Tanjungpinang. This interactive multimedia program aims to provide a contextual and engaging learning experience by integrating maritime elements into mathematics instruction, with the expectation that it will improve students’ ability to solve mathematical problems.

This research adapted the ADDIE model, which consists of the stages of Analysis, Design, Development, and Implementation. The evaluation stage was not implemented because the research focused on product development and testing the validity and practicality of the multimedia. A broader evaluation of the product's effectiveness on student learning outcomes is a future research agenda.

The Analysis phase aims to identify learning needs, student characteristics, and issues that arise in mathematics instruction at SMPN 5 Tanjungpinang. From observations and interviews with mathematics teachers, it was found that social arithmetic instruction often tends to rely on conventional methods. This situation results in students participating less actively in learning and facing difficulties in understanding mathematical concepts relevant to daily life, particularly in social arithmetic material.

Given the existing challenges, there is a need for learning tools that can facilitate an interactive and contextual learning process. Therefore, an interactive multimedia tool has been developed that incorporates visual elements, animations, videos, and interactive activities to help students understand mathematical concepts in a more meaningful way.

During the Design phase, instructional materials were prepared, media were selected, and preliminary designs were developed. Based on the results of the analysis, the selected instructional materials focused on social arithmetic, including aspects of profit and loss, discounts, interest, taxes, gross, net, and tare. These materials were designed to integrate a warehouse and weighing docks. The integration of maritime contexts is intended to make learning more relevant to students’ daily lives in an archipelagic environment. Additionally, the materials are structured according to the stages of the Discovery Learning model by presenting various contextual problems that encourage students to discover concepts independently. Thus, the Maritma Quest Interactive Multimedia can provide a more meaningful and engaging learning experience that supports students’ mathematical problem-solving skills.

The choice of media format is tailored to the nature of middle school students, who tend to be more interested in visual and interactive learning. Interactive multimedia allows for the integration of text, images, animations, videos, and student-engaging activities into a single

learning tool. The Maritma Quest interactive multimedia program was developed using Articulate Storyline 3 and features a maritime adventure theme. In this medium, students are invited to follow the journey of characters in the interactive multimedia through various locations, such as a fish market, a port warehouse, and a weighing dock, to solve social arithmetic problems.

The initial design of the interactive multimedia begins with developing a conceptual framework and learning scenarios that integrate Social Arithmetic content with a maritime context. In this step, the structure of the media content, the sequence of materials, and the character's journey in the Maritma Quest Interactive Multimedia are established. The next stage involves creating an initial storyboard that illustrates the visual appearance, navigation, animations, instructional videos, and interactive activities in each section of the multimedia.

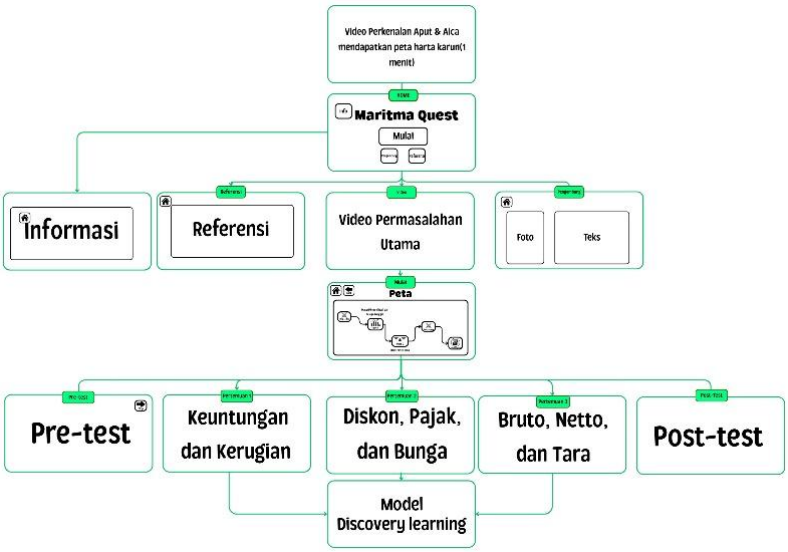

Figure 1. Interactive Multimedia Concept Map

The storyboard also includes designs for learning locations such as a fish market for material on profit and loss, a port warehouse for material on discounts, interest, and taxes, and a weighing dock for material on gross, net, and tare weights. Additionally, at this stage, learning activities based on Discovery Learning were designed, allowing students to observe problems, gather information, process data, and discover concepts independently. This initial design serves as a crucial foundation before entering the interactive multimedia development phase.

The Development phase aims to create the "Maritma Quest" interactive multimedia program, based on discovery learning, which is ready for use in the mathematics learning process. In this phase, the interactive multimedia program is developed based on the preliminary design that was previously created, including the creation of the user interface, animations, instructional videos, maritime visual illustrations, and interactive activities integrated with social arithmetic content.

After being developed, the Maritma Quest Interactive Multimedia was validated by three validators consisting of a material expert, a media expert, and a language expert. The material expert was a mathematics teacher at SMP Negeri 5 Tanjungpinang who understood the characteristics of mathematics learning at the junior high school level. The media expert was a

Mathematics Education lecturer who had experience in developing learning media. Meanwhile, the language expert was an Indonesian Language teacher at SMP Negeri 5 Tanjungpinang who understood the use of good and correct language in learning media. Validation was carried out to assess the suitability of the material, media display, interactivity, navigation, and language use so that the developed multimedia was suitable for use in the learning process.

Table 2. Validation Results

Evaluation Criteria	N	Sum	Mean	Std. Deviation	Percentage	Description
Subject Matter Expert	15	69,00	4,6000	,50709	92%	Very Valid
Media Expert	19	80,00	4,2105	,53530	85%	Very Valid
Linguist	11	50,00	4,5455	,52223	90,91%	Very Valid

The results of the evaluation by subject matter experts indicate that the Maritma Quest interactive multimedia program achieved a score of 92%, earning a rating of "highly appropriate." These results demonstrate that the materials provided align with the learning objectives, the established indicators, and the characteristics of middle school students in the topic of social arithmetic.

Furthermore, the evaluation by media experts showed that 85% of the responses fell into the "excellent" category. These findings indicate that the visual aspects, navigation, interactivity, and multimedia design have met the standards required for effective and engaging educational media, making them suitable for use in the learning process.

In addition, the evaluation results from language experts indicate a score of 90.91%, classified as "very adequate." This indicates that the language used in the media is easily understandable, interactive, and appropriate for the students' developmental level.

After completing the validation phase, the Maritma Quest Interactive Multimedia was revised based on suggestions provided by the validators. Several improvements were made to enhance the clarity, consistency, and interactivity of the multimedia. First, the title displayed on the multimedia was changed from "MATHRA Maritma Quest" to "Maritma Quest" to ensure consistency with the focus of this study, which specifically examines the Maritma Quest multimedia. The previous title included the broader concept of MATHRA (Mathematics Nusantara), which was considered less representative because the content developed in this study focuses only on maritime contexts. Second, input fields were added to several activities, allowing students to type their answers directly into the multimedia and increasing user interaction during the learning process. Third, instructional texts and task directions were added to several screens to provide clearer guidance for students when completing learning activities. These revisions improved the usability, clarity, and interactivity of the multimedia, making it more effective and engaging for students.

Figure 2. Revision of the Maritma Quest Interactive Multimedia by media experts

During the implementation phase, the Maritma Quest interactive multimedia program which had undergone a process of revision and refinement was used in mathematics instruction for seventh-grade students at SMPN 5 Tanjungpinang. The purpose of this implementation phase was to assess the practicality of this medium and to observe students' reactions to the use of interactive multimedia in the teaching of social arithmetic.

The implementation process took place during the 2025–2026 school year and involved 36 seventh-grade students from Class VII B at SMPN 5 Tanjungpinang. During the learning process, teachers used the Maritma Quest Interactive Multimedia as the primary medium, integrated with the Discovery Learning model. Students learned through various interactive activities within the platform, such as watching animated videos, solving contextual problems, engaging in group discussions, and exploring materials at each maritime learning site.

In the implementation phase, Maritma Quest Interactive Multimedia is used in learning by integrating the six stages of Discovery Learning. In the stimulation phase, students are given problems related to maritime activities to arouse curiosity. In the problem statement phase, students identify and formulate the given problem. Next, in the data collection phase, students gather information through interactive materials and activities in multimedia. In the data processing phase, students process the information obtained to solve the problem. The verification phase is carried out by re-examining the obtained results based on the concepts that have been learned. Finally, in the generalization phase, students draw conclusions regarding the social arithmetic concepts learned. All learning activities are packaged in a maritime context so that the material is closer to students' daily lives.

Throughout the learning process, observations were made and data was collected to understand teachers' and students' responses regarding the use of the media. The results of the teachers' practical assessment showed that the Maritma Quest interactive multimedia received a rating of 90% in the "very easy to use" category. This indicates that the media is user-friendly and helps teachers create more engaging and interactive learning experiences.

Table 3. Teacher Practical Results

Evaluation Criteria	N	Sum	Mean	Std. Deviation	Percentage	Description
Practicality Teacher	10	45,00	4,5000	,52705	90%	Very Practical

Meanwhile, the students' practicality level reached 77%, falling into the "practical" category. These results indicate that the Maritma Quest interactive multimedia tool is fairly easy to use and helps students understand the learning topics. In addition, students appeared more enthusiastic and actively participated in the learning process when using this tool.

Table 4. Student Practical Results

Student Practicality	N	Sum	Mean	Std. Deviation	Percentage	Description
Question 1	36	136,00	3,7778	0,79682	77%	Practical
Question 2	36	136,00	3,7778	0,79682		
Question 3	36	142,00	3,9444	0,79082		
Question 4	36	120,00	3,3333	0,86189		
Question 5	36	159,00	4,4167	0,76997		
Question 6	36	135,00	3,7500	0,84092		
Question 7	36	108,00	3,0000	0,92582		
Question 8	36	150,00	4,1667	0,87831		
Question 9	36	147,00	4,0833	0,93732		
Question 10	36	151,00	4,1944	0,82183		

The results of the implementation show that the Maritma Quest Interactive Multimedia can create a more interactive and contextual learning experience through the integration of maritime elements into social arithmetic materials. The use of the Discovery Learning model in this medium also helps students become more engaged in discovering mathematical concepts through the exploration and problem-solving activities presented in the Maritma Quest Interactive Multimedia.

Based on the validation results, the Maritma Quest Interactive Multimedia received a "very good" rating for content, media, and language. The results of the teacher practicality assessment also indicated a "very practical" rating; these findings confirm that the developed media meets the standards of suitability and is easy to use in the mathematics teaching and learning process.

Discussion

The validation results indicate that the Maritma Quest Interactive Multimedia has a high level of validity in terms of content, media, and language aspects. The high content validity score was achieved because the material was aligned with the learning objectives and social

arithmetic concepts for junior high school students. Several revisions were made based on validator feedback, including improving contextual problems and adjusting Discovery Learning activities to better reflect the intended learning syntax. The high media validity score was supported by attractive visual design, easy navigation, and the use of animations that helped students understand social arithmetic problems more clearly. In addition, the language used was considered appropriate for students' developmental level, with only minor revisions needed to improve the clarity of instructions.

The practicality results showed that teachers rated the multimedia as very practical (90%), while students rated it as practical (77%). The higher teacher score indicates that the multimedia was easy to use, helped explain mathematical concepts, and increased student engagement during learning. Meanwhile, the lower student score may be attributed to the fact that students had never previously used interactive multimedia developed with Articulate Storyline and still required guidance in understanding some instructions and learning activities. This is supported by the lowest practicality score, which relates to students' ability to use the multimedia independently without teacher assistance.

These findings are consistent with previous studies by Dewi and Izzati (2020), which showed that interactive multimedia can support mathematics learning and increase student engagement. However, Maritma Quest offers a distinctive contribution through the integration of maritime contexts into all learning activities. Social arithmetic concepts are presented through contexts such as fish markets, port warehouses, and weighing docks, making learning more relevant to students' daily experiences, particularly in maritime regions such as Tanjungpinang.

The implementation of Discovery Learning within the multimedia also provides positive implications for mathematics learning. Students appeared more enthusiastic, more active in asking questions, and better able to understand social arithmetic word problems. Therefore, Maritma Quest has the potential to serve as an alternative interactive learning medium that promotes more contextual, engaging, and student-centered mathematics learning.

CONCLUSION

This study successfully developed the Maritma Quest Interactive Multimedia based on Discovery Learning for social arithmetic learning at the junior high school level. The validation results showed that the multimedia achieved a score of 92% from the subject matter expert, 85% from the media expert, and 90.91% from the language expert, all of which were categorized as highly valid. In addition, the practicality assessment showed a score of 90% from the teacher, categorized as very practical, and 77% from the students, categorized as practical.

Based on these findings, Maritma Quest is considered valid and practical for use in mathematics learning. The multimedia can serve as an alternative learning medium that supports more interactive, contextual, and engaging learning experiences through the integration of maritime contexts and Discovery Learning activities. Future studies are

recommended to examine the effectiveness of Maritma Quest in improving students' mathematical abilities and learning outcomes.

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Declarations

Author Contribution	:	Author 1 & 2: Conceptualization, Writing - Original Draft, Editing and Visualization; Author 3 & 4: Writing & Editing, Formal analysis, and Methodology; Author 5: Writing & Formal analysis.
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Generative AI Statement	:	This paper was assisted by AI tools, including ChatGPT for translation, text refinement, and coherence enhancement. These tools were used to improve readability and adherence to academic standards. The authors are fully responsible for the content and interpretations presented.
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