WISE (Wondering-Investigating-Synthesizing-Expressing) Oriented Instructional Design to Promote Students' Reading Literacy and Numeracy

Endah Tri Priyatni[1,*], Abdur Rahman As'ari[2], Suharyadi[3], Ahmad[4]

[1, 2, 3, 4] *Universitas Negeri Malang, Malang, Indonesia*
[*] *Corresponding author. Email: endah.tri.fs@um.ac.id*

ABSTRACT
In order for students to improve literacy and numeracy, practicing answering questions may not be sufficient. The regular learning process of all subjects at school should be integrated with reading literacy and numeracy. A WISE (Wondering-Investigating-Synthesizing-Expressing) oriented instructional design is expected to be able to improve students' reading literacy and numeracy. This study aimed to generate a WISE-oriented instructional design for Bahasa Indonesia, Mathematics, Natural Science and Social Science that can be useful for the improvement of students' reading literacy and numeracy. The research and development procedures of ADDIE were applied to develop the product. The ADDIE stages consisted of analysis, design, development, implementation, and evaluation. Quantitative data were collected in the form of scores obtained from expert and practitioner validation. Qualitative data comprised critiques, recommendations and feedback from the experts and practitioners. The research findings indicate that the WISE-oriented instructional design is valid and applicable. The activities contained in WISE, intended for each school subject, possess distinctive forms and patterns.

Keywords: *Expressing, Investigating, Reading Literacy and Numeracy, Synthesizing, Wondering.*

1. INTRODUCTION

One concern for the world of Indonesian education today is students' low levels of basic literacy, particularly in reading, mathematics, and science. This is demonstrated by the PISA 2018 findings, which indicate a drop in scores from 2015 to 2018 [1], [2]. PISA 2018 data suggest a declining trend in all aspects of literacy (science, math, and reading). Table 1 compares PISA scores between 2000 and 2018.

Table 1. PISA Scores between 2000 and 2018

	2000	2003	2006	2009	2012	2015	2018
Mathematics	367	360	391	371	375	385	379
Reading	371	382	393	402	396	397	371
Science	-	360	391	371	375	386	379

In comparison to other nations, particularly neighboring Thailand and Malaysia, Indonesian students have much lower average PISA scores. Furthermore, Korea, Hong Kong, Singapore, Japan, and Finland all outperform Indonesia on the PISA test [3]. Additionally, the results of a large-scale nationwide study indicated that Indonesian pupils had low levels of basic literacy. The Indonesian Student Competency Assessment (AKSI) revealed that the majority of junior high school pupils in Indonesia remained in the lowest categories for reading, mathematics, and science [4]. Mathematics competence is the lowest of the three skills measured at the national level, with 79 percent of students scoring in the "poor" category. Meanwhile, 66% and 55% of students, respectively, did poorly in science and reading. Additionally, 55% of students were able to comprehend explicit information from a discourse, showing that they lacked the ability to grasp implicit information. Over half of the pupils (55%) were unable to draw inferences from multiple pieces of information. In mathematics, 79% of pupils were unable to apply their knowledge in more diversified circumstances and could only solve simple, routine problems. Moreover, 66% of students lacked the ability to apply scientific information in a

variety of contexts. The AKSI results corroborate those of the PISA (Program International Pupils Assessment), which also assesses students' reading, maths, and science competencies [5]. Numerous initiatives have been implemented to increase student literacy, one of which is the School Literacy Movement (SLM). This movement has been shown to boost students' interest in and frequency of reading [6], but has not been shown to improve students' reasoning skills [7]. This is also consistent with the findings of Puspendik's research on students' reading literacy skills, namely that (1) students cannot properly answer reasoning and integrated questions, (2) students can only answer reflective and evaluative questions in general without providing relevant arguments, (3) students struggle to respond to questions that require arguments, (4) students are unable to discern connections between data contained in several texts, and (5) students are unable to interpret implicit data contained in texts [5].

To expedite reading literacy and numeracy improvement, the current SLM must be modified into a WISE-based SLM. WISE stands for wondering-investigating-synthesizing-expressing. Curiosity is the essence of wondering [8] which is essentially the urge that exists within each individual. Wondering evolves into an urge to inquire. This habit is supposed to develop in students, prompting them to think and learn. The curious practice fits perfectly with the learning paradigm communicated by the Minister of Education and Culture, according to which students are required to ask a lot of questions, make a lot of attempts, and create a lot of work [9]. There are two types of critical questions that students should ask during the learning process: why and how. Children should be taught to develop the habit of inquiring why and how things work. By asking why, students will be motivated to go further into a subject in order to gain a firm grasp on it. By asking how, students will be encouraged to generate creative ideas, which will promote their creativity and inventiveness.

Investigating Skills are those that enable individuals to discover the solutions to perplexing issues. Investigation-based learning can serve as a vehicle for students to rediscover their inherent investigative instincts and use them to accomplish noble aims, generate creative ideas, and creatively solve real-world problems [10]. A sensible person will not remain motionless after pondering why and how. He will make an attempt to ascertain the solution. Investigating Skills also include the capacity to ascertain the answers to certain questions. Students who possess investigative skills are capable of: (a) developing the best possible investigation plan; (b) conducting valid, practical, and effective investigations; and (c) organizing and managing the results of their investigations neatly in order to facilitate analysis and conclusion-drawing.

Synthesizing skills, or the ability to synthesize, are advantageous for building conclusions from a variety of available data. Synthesizing Skills require pupils to be able to draw inferences from disparate pieces of information and transform them into new knowledge. Naturally, some information is required to do the synthesis. Synthesis is accomplished by comparing and contrasting the available data, followed by pattern recognition. The pattern discovered is a conclusion, which can be used as an initial conclusion (hypothesis) or conjecture, or it can be used as a final conclusion, or as a principle, rule, or law, if it is already established.

Expressing Skills are used to communicate an investigation's findings. Expressing is the act of conveying messages from one individual or group of individuals to another individual or group of individuals. Communicating is not a straightforward task since it needs in-depth consideration of the message's substance, its selection and packaging, and its formulation in appropriate and effective language [11]. Communication is comprised of two critical components: representation and communication [11]. By developing Expressing Skills, students are expected to be able to effectively explain their investigation findings in such a way that they captivate their intended audience.

It is critical to build an instructional design that is WISE (Wondering-Investigating-Synthesizing-Expressing) focused in order to increase students' reading literacy and numeracy. Questions and big ideas raised by students in the classroom demonstrate that they are engaged in learning and actively thinking. Students must be guided through investigative activities in order to discover the answers to the questions. Investigations can take a variety of forms, including surveys, interviews, and experiments. Data are gathered, classified, compared, and synthesized during an investigation. The results of the synthesis will then be communicated or expressed in various modes of communication. This is the essence of WISE-based instruction. Hopefully, this WISE-based instruction will inspire the younger generation to participate in and develop in the twenty-first century.

2. METHOD

The ADDIE model was applied to develop the WISE-oriented instructional design for Indonesian, Mathematics, Natural Sciences and Social Sciences. The instructional design is beneficial for students' reading and numeracy literacy development. The ADDIE model entails five steps in the development of instructional designs: analysis, design, development, implementation, and evaluation [12].

The analysis phase included an examination of the beginning conditions and the prerequisites for

developing the WISE-oriented instructional design. An instructional design was created during the design stage for the topics of Indonesian Language, Mathematics, Natural Sciences, and Social Sciences. At the develop stage, the intended concept was materialized into a concrete product that was ready for implementation. The product was tested during the implementation stage to determine its advantages and weaknesses, as well as to see whether the design can truly be utilized to enhance students' reading literacy and numeracy. Finally, the tested product was revised in light of the expert team's and users' feedback during the evaluation step.

The data for this study come in the form of comments, criticisms, and suggestions made during the product's tryout period by a team of experts and practitioners. Participants in the tryouts included literacy and numeracy professionals, as well as learning experts and practitioners. A questionnaire was the primary instrument used to collect data for study. The data were examined by grouping the comments, criticisms, and suggestions of the team of experts and practitioners. The results of the analysis were used to improve the product. The quantitative data collected via the questionnaire were evaluated descriptively. Table 2 summarizes the findings of the product validation.

Table 2. Criteria of Product Validity

Range	**Criteria**
3.26-4.00	Very feasible
2.51-3.25	Feasible
1.76-2.50	Feasible enough
1.00-1.75	Not Feasible

3. FINDINGS AND DISCUSSION

3.1 Findings

3.1.1 Product Description

The product developed in this study is a WISE-oriented instructional design that can be used for Indonesian language, mathematics, science and social studies at the junior high school level. This instructional design can be utilized to help students improve their reading literacy and numeracy skills. Table 3 summarizes the product design for each subject.

3.1.2 Product Validation

The WISE-oriented instructional design for Indonesian language, mathematics, science and social studies at junior high school levels was validated by three experts, namely literacy and numeracy experts, learning experts, and practitioners. Table 4 summarizes the findings of the product validation. The table indicates that the learning approach is feasible for implementation in the classroom.

3.2 Discussion

According to the validation results from experts and practitioners, the average score for the wondering activity was only 3.3 for the indicator "students ask wondering questions." This is natural, as developing the habit of asking wondering questions is not easy. Wondering is an innate human capacity that has been in humans from the dawn of time [8]. However, this exceptional quality fades with time as youngsters enter the 'world' of institutions that overburden them with thick curricula [13]. We need to instil in children the habit of asking why and how. By asking why, students will be motivated to study something in depth in order to gain a firm grasp on it. By asking how, students will be prompted to consider creative solutions, so stimulating the growth and development of creativity and invention. Students are expected to develop a wondering habit through their pondering. This curious habit is meant to develop in students, prompting them to think and learn. The wondering habit is entirely consistent with the learning paradigm articulated by the Minister of Education and Culture, according to which students are required to ask a lot of questions, make a lot of attempts, and create a lot of work [9]. All subjects received an average score of 4.00 for the indicator "multimodal utilization of stimulus." Stimuli include visuals, tables, infographics, diagrams, and continuous texts (in the form of sentences). The stimuli chosen are appealing and encourage student inquiry. Stimuli are drawn from indigenous knowledge and phenomena that exist around pupils, as well as sociocultural phenomena that present in the student's immediate environment. Teachers can utilize a variety of media to arouse students' "wondering" including the environment around the school, reading books, movies, photos/pictures, online tours, field trips, Word Walls, experiments/demonstrations, power-point presentations, concept maps, and storytelling [14].

The average score for investigative activities across all topics was 4.00. Investigative skills are the ability to discover the answers to the wondering question [10]. After wondering why and wondering how, a wise person will not stand still. He will make an attempt to ascertain the solution. Investigating Skills refers to the capacity to ascertain the answers to certain questions [14]. Students who possess investigation skills are capable of: (a) developing the best investigative plan possible; (b) conducting valid, practical, and effective investigations; and (c) organizing and managing the results of their investigations neatly in order to facilitate analysis and conclusion-drawing. This activity is suitable for all subjects.

Table 3. Summary of the Product Design

Subject	Activities			
	Wondering	**Investigating**	**Synthesizing**	**Expressing**
Indonesian Language	• Read continuous texts (sentences) and pictures with socio-cultural themes • Read the example questions, wondering: why and how • Compose wondering questions independently • Answer the questions	• Choose an investigative question • Establish the purpose of the investigation • Establish theoretical foundations and methods • Carry out the investigation • Record the results of the investigation	• Perform a synthesis based on the results of the investigation • Draw conclusions	• Present the findings in the form of argumentative texts/articles
Mathematics	• Students are given the first four elements of a sequence of numbers. • Students are asked to determine the 5th term, for example: 1,2,3,4,…. • Students are likely to answer that the 5th term is 5. However, we can invite them to remember the number of repeated exercises from 1 to 4 as follows: 1, 2, 3, 4, 1, 2, 3, 4, 1, 2, 3, 4, ... • Invite students to look at other sequences. For example: the first 4 terms of the sequence are 2, 5, 8, 11, ... What is the 5th term? • Students might answer 14, because the next term is obtained by adding the previous term to the number 3. This can happen if the	• Invite students to imitate the formula from the n-th term • Invite students to find the formula by conducting an investigation. • The sequence of numbers is 1, 3, 5, 7, ...The 5th term is 9; The 6th term is 11; The 7th term is 13; What is the n-th term? • Invite students to see that the teacher is trying to associate the natural numbers 1, 2, 3, 4, ... with 1,3, 5, 7, ... • Invite students to discuss how to find the pattern until one of the students tries to make two columns; one column is filled vertically with 1, 2, 3,4, ... and another column is filled with 1, 3, 5, 7 ...	• Students are instructed to conduct an internet search for strategies to discover patterns or to consult with someone who are more knowledgeable about mathematics. • Students are asked to compare the information presented by the teacher to the information explained on YouTube and on the id.school website. • Invite students to compare and contrast the three and draw conclusions.	• Invite students to evaluate the merits and demerits of the items they create. • Following that, inquire about the resources or technologies they want to employ to enable them express themselves fully. • Once all of the plans are complete and the expressing materials are completed, ask students to practice expressing in front of their friends and the teacher. It would be better if it could be recorded. • After finishing the simulation, ask other students to express their appreciation for the efforts made by the individuals (to foster an atmosphere of expression), offer suggestions for improvement, and conclude with enthusiasm and praise for the efforts made.

Subject	Activities			
	Wondering	**Investigating**	**Synthesizing**	**Expressing**
	sequence consists of real numbers or natural numbers. • If the sequence occurs at 12 o'clock which contains only numbers 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, then the 5th term of the sequence 2, 5, 8, 11, ... could be 2, because 3 hours after 12, is 2 o'clock. • Students are encouraged to ask questions			
Natural Sciences	• Instruct students to examine various images of foods that have been colored using coloring chemicals. • Instruct students to observe a variety of traditional foods and snacks available at the market. • Ask students to observe examples of wondering questions • Inspire students to create their own wondering questions based on firsthand observation of images. • Instruct students to respond to the questions using a variety of sources.	• Assign each student one inquiry question, such as determining which foods include natural or artificial coloring. • Assign students the responsibility of preparing tools and materials. • Instruct students to do the experiment in accordance with the steps. • Instruct students to keep track of their analysis results. • Examine the findings.	• Encourage students to synthesize or draw conclusions about which foods include natural dyes and which contain artificial dyes based on the experimental results.	• Present the outcomes of the practicum and explanations regarding dyes using power-point presentations, posters, and mind maps.
Social Sciences	• Read news texts related to superior products in an area • Observe examples of wondering questions related to the text being	• Choose an investigative question, such as how fisherman catches big prawns in North Kalimantan's	• After gathering data or information, students are instructed to form groups to discuss and evaluate their ideas, classifying	• Each group is required to create a product or act as a conduit for the dissemination of information concerning giant

Subject	Activities			
	Wondering	**Investigating**	**Synthesizing**	**Expressing**
	read • Arrange wondering questions	Sesayap River. • Consult a variety of credible sources • Create a group • Prepare an observation and interview schedule. • Arrange interview instruments • Gather data • Keep track of outcomes	and comparing them to determine similarities and differences in order to reach a new conclusion.	prawn fisherman in the Sesayap River. • Make a poster with the theme: Giant Prawn Fisherman at KTT. Then, present the poster in front of friends.

Table 4. The Results of the Product Validation

Evaluation Aspects	Indicators	Results (mean)	Criteria
Wondering activities	Encourage students' inquisitiveness	3.67	Very feasible
	Students ask wondering questions after reading the text (stimulus)	3.33	Very feasible
	The text (stimulus) is multitextually and multimodally structured.	4.00	Very feasible
Investigating activities	Investigate the grand concept advanced in the wondering activities.	4.00	Very feasible
	Students are responsible for organizing, implementing, and analyzing the investigation's findings.	4.00	Very feasible
Synthesizing activities	Relate the data/information gathered during the inquiry and establish the linkages between concepts.	3,67	Very feasible
	Synthesize the major concepts discovered during the inquiry.	3.67	Very feasible
Expressing activities	Communicate large or novel ideas succinctly and creatively using appropriate methods.	3.33	Very feasible
	Utilize various modes of communication	3.67	Very feasible

While synthesis operations are frequently dependent on investigation data, inference is a less precise procedure. The synthesis method used in Mathematics to discover formulas or patterns is quite precise. In general, expressing activities are quite diverse, involving the use of a variety of ways of communication, both oral and written. However, gesture, acoustic, and oral means of communication must be added [11].

4. CONCLUSIONS AND SUGGESTIONS

As per the findings of this study, the WISE-oriented instructional design for Indonesian language, mathematics, science, and social subjects at the junior high school level is extremely viable to implement in the classroom. It is believed that this WISE-oriented instructional design will reawaken students' wondering habits, in which students ask a lot of questions, make a lot of attempts, and produce a lot of work. By implementing a WISE-oriented instructional design, students can be encouraged to engage in investigative activities, draw data-driven conclusions, and communicate their results in a variety of engaging ways.

All teachers are encouraged to incorporate WISE-oriented learning into their classrooms. The teacher may declare that he or she wishes to develop simply Wondering Skills initially. Additionally, teachers may choose to identify students' Wondering and Investigating Skills first, before moving on to

Synthesizing and Expressing Skills. However, teachers can also prioritize Expressing Skills for their students.

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