



Science Teaching Materials Based on Multiple Intelligences

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ABSTRAK

Masalah dalam penelitian ini adalah belum adanya bahan ajar IPA berbasis multiple intelligences serta rendahnya hasil belajar IPA. Penelitian ini bertujuan untuk menghasilkan bahan ajar IPA berbasis multiple intelligences yang layak, serta mengetahui keefektifan bahan ajar IPA berbasis multiple intelligences. Jenis penelitian ini adalah penelitian pengembangan yang mengacu kepada model pengembangan ADDIE. Metode pengumpulan data menggunakan kuesioner. Instrumen penelitian yang digunakan berupa angket dalam bentuk lembar validitas dan praktikalitas, lembar validasi diisi oleh ahli materi dan ahli design pembelajaran dan guru, sedangkan uji efektifitas diuji oleh siswa kelas IV. Data yang terkumpul dari hasil angket dianalisis dengan teknik analisis deskripsi kuantitatif. Hasil penelitian menunjukkan hasil validasi ahli materi termasuk kategori sangat layak 89.67 %. Validasi ahli desain pembelajaran kategori sangat layak, 91 %. Hasil validasi guru termasuk kategori layak 79.20 %. Berdasarkan hasil uji coba terbatas bahan ajar IPA berbasis kecerdasan jamak menurut pendapat guru dan siswa layak digunakan untuk pembelajaran di kelas IV maupun pembelajaran secara mandiri. Disimpulkan bahwa bahan ajar IPA berbasis kecerdasan jamak layak digunakan dalam pembelajaran.

ABSTRACT

The problem in this research is that there need to be science teaching materials based on multiple intelligences and low science learning outcomes. This study aims to produce appropriate multiple intelligences-based science teaching materials and know the effectiveness of science teaching materials based on multiple intelligences. This type of research is development research which refers to the ADDIE development model. Methods of data collection using a questionnaire. The research instrument used was a questionnaire in the form of validity and practicality sheets; the validation sheet was filled in by material experts, learning design experts, and teachers, while fourth-grade students carried out the student effectiveness test. The data collected from the questionnaire results were analyzed using quantitative description analysis techniques. The results showed that the material expert validation included the very feasible category of 89.67%. The validation of category learning design experts is very feasible, 91%. The teacher validation results are in the proper category at 79.20%. Based on the results of limited trials of multi-intelligence-based science teaching materials, teachers and students believe it is suitable for use in class IV and for independent learning. It was concluded that science teaching materials based on multiple intelligences were appropriate for learning.

1. INTRODUCTION

Education is the deliberate, systematic, and sustained effort to transmit, provoke or acquire knowledge, values, attitudes, skills or sensibilities as well as any learning that results from the effort (Adijaya et al., 2023; Parmiti et al., 2022). This potential will emerge and develop optimally through appropriate, integrated learning through learning management that adapts to the development of students as a whole. One of the greatest potentials possessed by students is multiple intelligences (Ratnasari, 2020; Suhendri, 2011). The key of multiple intelligences theory is that all human beings have eight intelligences that are independent each other with varying degrees. Multiple Intelligence theory which points out individual differences aims students to use all their abilities, interests and ambitious in practice (Gardner & Hatch, 1989; Khatabyeh, 2011). By means of this theory, educators broaden horizons

in program development, which care for individual differences and enrich the intelligence types by using the fundamentals in a creative way. This theory argues that each individual has different intellectual capacities regarding the types of intelligences rather than indicating a single and traditional type of intelligence (Ferrero et al., 2021; Widiانا et al., 2021). However, the level of the intelligence types in question can differ among people.

The applications of multiple intelligence theory in education are wide. Students apply the learning in the classroom according to their own dominant intelligence and learning style, which is most effective for them. Combining learning styles with dominant intelligences enhances the students' learning processes (Özdemir, 2010; Winarti et al., 2019; Yavich & Rotnitsky, 2020). Individuals rely on these intelligences independently and collectively to make things, produce behaviors, and resolve issues that apply to the communities where they live. Intelligence involves the ability to reason, plan, solve problems, think abstractly, comprehend complex ideas, learn quickly and learn from experience. Rather it reflect a broader and deeper capability for comprehending our surroundings (Al-Qatawneh et al., 2021; Singh et al., 2017).

The learning carried out in schools has been dominated by the development of logic-mathematics intelligence. In fact, every student has various kinds of intelligence called multiple intelligences. Multiple intelligences are actually a philosophical theory. This can be seen in his attitude towards learning and his views on education or learning. Education/learning from the point of view of multiple intelligences is more directed to the nature of education itself, which is directly related to existence, truth, and knowledge. Every intelligence possessed by children will appear to be seen at certain times according to their developmental stages as made by Piaget in, which occurs starting from the sensorimotor stage (0-2 years), the preoperational stage (2 - 7 years), the concrete operation stage (7-12 years) to the formal operation stage (12 to adulthood). Through educational activities students can be honed with the environment to hone their abilities, namely cognitive abilities, namely hone knowledge, affective feelings, and psychomotor skills to do something. Armed with these three abilities students are expected to become independent and capable individuals (Hermita, 2017; Indria, 2020; Widiانا et al., 2021).

The theory of multiple intelligences requires to generate a fundamental shift in the way schools are structured. This gives educators around the world the strong message that all students that show up in schools at the beginning of each day have the right to live experiences that activate and develop all their intelligences. During a typical school day, every student must be exposed to courses, projects or programs that focus on the development of their intelligences and not just in standard verbal and logical skills that for decades have been exalted (Suniyah et al., 2018; Susanto, 2005). Teaching materials are a set of learning tools or tools that contain learning materials, methods, media, and ways of evaluating which are designed systematically and attractively in order to achieve the expected learning objectives, namely achieving competence or sub competence with all its complexity. Based on this understanding, it is emphasized that the teaching materials will be more meaningful if they are designed with instructional principles by paying attention to competencies and materials that come from the curriculum, are effective, interesting, and involve students. Modules or teaching materials that have the potential to be developed as a means of conveying material in teaching and learning activities are an attraction for students' interest and motivation to take part in learning is a module. The advantages of the module include that it can be studied without having to present a teacher, can study at any time, learning can be adjusted according to one's own abilities, learning can choose according to its own order (Díaz-Posada et al., 2017; Murni & Ruqoyyah, 2020).

Modules can be compiled and developed by teachers according to the needs and characteristics of students. Teachers as the forefront of education who are directly involved in classroom learning are required to have competence in using and developing teaching materials. Teachers can not only develop modules limited to attracting and increasing student motivation in science learning, but also in increasing and stimulating the emergence of multiple intelligences. The study of the development of students' abilities based on multiple intelligences is expected to provide a new nuance of how human nature in terms of potential, talents, and abilities can be optimally developed, as well as providing opportunities for teachers and students from the start, especially regarding multiple intelligences, presumably can provide a strong motivation; that education and learning activities need to be studied more deeply, that the essence of the theory of multiple intelligences according to Gardner is to appreciate the uniqueness of each individual, the variety of learning methods, to create a number of models to assess them, and the almost limitless way to actualize oneself in this world. In fact, multiple intelligences exist in every individual, but each individual can have one or more multiple intelligences that have the highest level of multiple intelligences. However, in the practice of learning in schools, it is appropriate for a teacher to have data about the level of tendencies for each student's multiple (Acesta et al., 2020; Rofiah et al., 2018).

In fact, in superior public elementary schools, teachers have not prepared science teaching materials based on multiple intelligences, so that multiple intelligences have not been stimulated properly, therefore students' learning outcomes in science are low. The development of teaching materials/modules in Natural Sciences based on multiple intelligences is very important to develop because this concept facilitates all students who have various intelligences. Based on the concept of multiple intelligence from Gardner that each individual is not divided based on high intelligence and low intelligence. If each student is stimulated, facilitated and served properly in accordance with the concept of multiple intelligence with various types of intelligence, students can grow and develop all of their potential to the maximum. The concept of multiple intelligences in education has not been optimally integrated in schools.

The study of potential development based on multiple intelligences is expected that students can contribute as a vehicle for knowledge of how human nature in terms of potential, interests, talents and abilities can be optimally developed. as well as providing opportunities for teachers and students from the start, regarding multiple intelligences can provide a strong motivational boost, that the process of education and learning needs to be studied more broadly. The importance of this research is because the results of preliminary research have found low student learning outcomes in science material and the absence of alternative teaching materials as enrichment materials for science learning in elementary schools based on multiple intelligences which are combined to improve higher-order thinking skills and student learning outcomes The purpose of this study is to develop teaching materials for science students based on multiple intelligences, which are appropriate and effective, to improve higher order thinking skills and improve student learning outcomes. The novelty of this research is the product of a multiple intelligences-based science teaching material module for class IV Elementary Schools to improve higher order thinking skills for one semester.

2. METHOD

The type of research in this research is development research. The development design in this study was adapted from the ADDIE development model (Branch & Dousay, 2015). The research place was carried out at SDN Unggulan Cikaso Village, Kramat Mulya District, Kuningan Regency, the research subjects were Class IV A students totaling 18 students and Class IV B with 23 students. The implementation of the module trial can be carried out in various stages, in the development of this science learner module is through expert validation, namely material experts, linguists, media experts and learning design experts. A validation process as a vehicle for information for basic foundational materials to improve the quality of learning modules, in order to obtain information and data from experts using the instruments as presented in Table 1. Table 2 and Table 3 shows the instrument grid for teacher and students' responses.

Table 1. Instrument Grids for Module Validation Instrument

No	Instrument	Aspects	Indicators
1	Instrument for Material Experts	Eligibility of Contents Eligibility of Presentation	Suitability of Material with KI and KD Accuracy of the material Supporting Learning materials Material Update Serving Techniques Serving supporters Presentation of Learning Completeness of presentation
2	Instrument for Linguists	Language	Businesslike Communicative Dialogic and Interactive Compliance with the level of development of learners The collapse and cohesiveness of the train of thought Use of the term symbol and icon
3	Instrument for Media Experts	Module Graphics	Display Components Use of font variations (types and sizes) Layout and layout Illustrations, drawings and photos Display design Cover according to the contents of the module Use of Illustrative colors in modules

No	Instrument	Aspects	Indicators
4	Instrument for Learning Design Experts	Linguistics	Readability of text or writing Clarity of information Effective and efficient use of language
		Eligibility of Materials	Module systematics Clarity of formulation of learning objectives Variations in the delivery of concepts / teaching materials Relevance of the material to the learning objectives
		Eligibility of Presentation	Compatibility of the example with the discussion of the material The suitability of the material to the abilities of the student Accuracy of exercises/tasks with the material Adequacy of time to study the material Adequacy of material materials to achieve competence
		Methods and evaluation	Compliance with the method used Compatibility with student characteristics Evaluation suitability (tasks and exercises) Conclusion

Table 2. Instrument Grid for Teacher Response Instruments

No	Category	Indicators
1	Aspects of Material Content	Suitability of the material to the 2013 Curriculum Accuracy in formulating learning indicators Ease of understanding the instructions for use of the book Accuracy of language use in the delivery of material The conformity of the material presented with the truth of science Material compatibility with the development of Multiple Intelligences Images and examples according to the learning material Suitability of evaluation with learning material The suitability of the summary with the content of the book Compatibility of the answer key to the question
2.	Learning Aspects	Completeness of the order of presentation of the material Task compatibility with the demands of student-centered learning
3	Design Aspects	Suitability of teaching material cover design Shape and size of teaching materials Selection of paper types for printing teaching materials Tidiness and resilience in binding teaching materials
4	Language Aspects	Suitability of language use to student characteristics Conformity of terms used in teaching materials Clarity of use of sentence structure Readability level
5	Illustration Aspects	Accuracy of use of illustrations with the material Clarity of Illustration with material Color composition according to the writing and characteristics of students Clarity of the image used Conformity of illustrations with multiple intelligences

Table 3. Student Response Instruments to Science Modules

No.	Aspects	Statement
1	Ease of Use	The use of modules in learning can save time efficiently The material inside the module is easy for me to understand The presentation of the material in the module is more practical and I can learn it repeatedly The description of the material and exercises present in the module is clear and simple The language used on the module is easy for me to understand

No.	Aspects	Statement
2	Serving Attractiveness	Practical and easy module I carry because it can be stored
		I can self-study according to my learning ability
3	Benefit	The design of the presentation display of the module is attractive to look at
		The content of the material in the textbook is supplemented with illustrations, drawings, photos that match the material
		I can clearly read the writing on the module
		The color combinations used in the module are already interesting
		Modules help me in understanding the science material
		The module can replace my notes.
		Modules help me in connecting the material learned with everyday life.
Modules can help my knowledge/memory and the refinement of the material I learn.		
		I can use the module anywhere and anytime
		Modules make me become active in science learning
		Modules can motivate me in learning
		Modules can add to my insights in science materials

This study used two data analysis techniques, namely quantitative descriptive analysis and qualitative descriptive analysis. Quantitative data analysis method is a way of analyzing data in the form of percentages or numbers. Qualitative descriptive analysis was used to process data derived from expert judgment, individual trials, and small group trials. Qualitative descriptive analysis is used to process data in the form of suggestions, comments, interviews and so on. Then for descriptive statistical analysis used to calculate the average of the percentages of the results of the assessment of experts, individual trials, and small group trials.

3. RESULT AND DISCUSSION

Result

Material Experts Validation

Assessment by material experts aims to find out the quality of the material presented in the module; the results of material experts' validation is presented in [Table 4](#).

Table 4. Validation of Material Experts

No	Assessment aspects	Validators			Average	Percentage	Conclusion
		1	2	3			
1	Eligibility of Contents	4.52	3.65	3.61	3.93	78.53	Eligible
2	Eligibility of Presentation	4.37	3.83	4.37	4.19	83.80	Very Eligible

Assessment from the three material experts, modules based on aspects of material content achieved an average score of 3.93 out of the total value scale of 5, and with a feasibility percentage of 78.53% included in the decent category, based on the presentation aspect got an average score of 4.19 from the total value scale of 5 and with an eligible percentage of 83.80% included in the category is very eligible.

Linguist Validation

The purpose of the linguist's assessment is to determine the readability of the information, the adaptation of the language used to the level of student development, the effectiveness of sentence structure. Validator 1 gives a score of 4.50, validator 2 gives a score of 4.71, and validator 3 gives a score of 4.71. Assessment based on the language feasibility aspect obtained an average score of 4.64 out of a total scale of 5, and with a feasibility proportion of 92.80% it was included in the category of Very Eligible.

Learning Design Experts Validation

The assessment of learning design experts is carried out to determine the feasibility of modules based on aspects of learning design. The results shows that validator 1 gives a score of 4.54, validator 2 gives a score of 4.38, and validator 3 gives a score of 4.04. The assessment of the science module based on

design aspects obtained an average score of 4.32 out of a total scale of 5, with an eligibility percentage of 86.10%, including in the category of very eligible.

Learning Media Experts Validation

Assessment by learning media experts is carried out to determine the quality of multiple intelligence-based science learning modules in elementary schools. The results of the assessment shows that validator 1 gives a score of 4.81, validator 2 gives a score of 4.00, and validator 3 gives a score of 4.27. Assessment of *multiple intelligence-based* science learning modules based on aspects of learning media getting an average score of 4.36, with an eligibility percentage value of 87.70% is included in the category of very eligible.

Teacher Responses

The assessment of modules based on aspects of material content received an average score of 3.70 on a scale of 5 with a percentage of 74.00 included in the good category. Assessment based on learning aspects obtained a score of 4.00 with an eligibility percentage of 80.00% included in the good category. The assessment based on the design aspect obtained an average score of 4.25 with an eligibility percentage value of 85.00%. assessment based on aspects Language obtained an average score of 3.75 with a percentage of eligibility value of 75.00% included in the feasible category Furthermore, the assessment based on the illustration aspect obtained an average score of 4.40 from a scale of 5 with a total feasibility score of 88.00% included in the very feasible category Based on the entirety of the five aspects obtained an average score of 4.02 with a feasibility percentage value of 80.40 % including the feasible category.

Small Group Testing

Individual evaluation is carried out using six students who have different abilities, namely students who have high, medium and low abilities, the three students have participated in multiple *intelligence-based* science learning, then students are asked to give their responses to the science modules they have learned, based on aspects of ease of use, aspects of presentation attractiveness, and aspects of benefits.

Table 5. The Results of Students Responses

No	Assessed aspects	Average	Percentage
1	Ease of Use aspect	3.81	76.19
2	Aspects of the attractiveness of the dish	4.50	90.00
3	Aspects of benefits	4.23	80.83
Total		12.35	226.35
Average		4.18	82.34

Based on [Table 5](#), the results of students' response of the science module still need improvement in aspects of the attractiveness of the presentation including display design, photo image illustrations, clarity of writing and color combinations, to attract reading interest and make it easier for students to learn and understand the material presented.

Field Trials

This field trial phase was carried out on 22 grade IV students of SD Unggulan, Cikaso, Kuningan Regency. To follow the learning using a *multiple intelligence-based* science module. This field trial by evaluating learning outcomes, namely the initial test (pretest) and the final test (posttest) is then calculated with the test. Field trial activities are the last stage of the ADDIE development stage, which aims to identify the shortcomings of module development, to determine the effectiveness of modules, the benefits of module development in achieving learning objectives and the response of users to science modules.

Descriptive Analysis Results

The results of the descriptive analysis of pretest and posttest in experimental and control group can be seen in [Table 6](#).

Table 6. Descriptive Analysis Results

Group		Mean	N	Std. Deviation	Std. Error Mean
Experimental Group	Pretest	71.32	22	6.722	1.433
	Posttest	85.68	22	6.792	1.448
Control Group	Pretest	70.00	18	5.980	1.410
	Posttest	77.06	18	4.869	1.148

Based on the results of descriptive analysis, the average value of student learning outcomes before using the multiple intelligence-based science learning module in experimental class is 71.32 and the control class is 70.00, while the average score of learning outcomes after using the *multiple intelligence-based* science learning module for the experimental class is 85.68 and the control class is 77.06, meaning that the average student learning outcomes increase after using the module science learning based on *multiple intelligences* and thematic books.

Paired Sample Correlations

The relationship between learning outcomes before and after using *multiple intelligence-based* science learning modules can be seen in [Table 7](#).

Table 7. Paired Sample Correlations

Pair		N	Correlation	Sig.
Experimental	Pretest & Posttest	22	0.533	0.011
Control	Pretest & Posttest	18	0.404	0.096

[Table 7](#) shows that the experimental class correlation between pretest and posttests has a positive rating score of 0.533 high rating between pretest and posttest and there is a significant relationship because the significance value is $0.011 < \text{Sig } 0.05$. as for the control class, it showed that between the pretest and posttest scores had a positive rating score of 0.404 and there was no significant relationship because the significance value was $0.096 > \text{Sig } 0.05$. this means that there is a significant and positive correlation between the two average scores of learning outcomes before and after using multiple intelligence-based science learning modules.

Hypothesis Testing

The results of hypothesis testing in this study is presented in [Table 8](#).

Table 8. Hypothesis Testing

Pair	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference		t	df	Sig (2-tailed)
				Lower	Upper			
Experiment Pretest-Posttest	-14.364	6.529	1.392	-17.258	-11.469	-10.319	21	0.000
Control Pretest-Posttest	-7.056	5.995	1.413	-10.037	-4.074	-4.993	17	0.000

Based on the results of the hypothesis test in [Table 8](#), the significance value (2-tailed) is 0.00 so that the results of the initial test (pretest) and final test (posttest) have undergone significant changes (very meaningful) based on descriptive statistics of the initial test and the final test, it is proven that the final test is higher, it can be concluded that learning using modules and thematic books can increase *higher order thinking skills*. Based on [Table 8](#), the significance value is smaller than < 0.05 , it can be concluded that H1 is accepted this shows that there are differences in student learning outcomes before and after using multiple *intelligence-based* science learning modules.

Based on the output value in [Table 9](#), it is known that the significance value of Levene's Test for equality of Variance is $0.145 > 0.05$, it can be concluded that the data variants of the dick class and experimental class are homogeneous. So, for the interpretation of output independent sample test based on the values contained in the equal variances assumed. Based on the results of the independent sample test for posttest results as presented in the [Table 9](#), the value of equal variances assumed is known to be a sig value (2 tailed) of $0.00 < 0.05$, then as a basis for decision making in the independent sample test it can

be concluded that H_0 is rejected and H_a is accepted thus that there is a significant difference in posttest results between the control class and the experimental class.

Table 9. Independent Test sample Test Posttest Score

Variable	Levene's Test for Equality of Variances		t-test for Equality of Means							
	F	Sig.	t	Df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference		
								Lower	Upper	
Science Learning Outcomes	Equal variances assumed	2.212	0.145	-4.518	38	0.000	-8.626	1.909	-12.492	-4.761
	Equal variances not assumed			-4.669	37.425	0.000	-8.626	1.847	-12.368	-4.884

Teacher's Response to Science Module

Data on the analysis of teacher responses to multiple intelligence-based science learning modules using questionnaires with Likert scale which are analyzed descriptively then the values are converted into standard scores that match the assessment scale. The results of the assessment of teacher responses to the multiple intelligence-based science learning module can be seen in [Table 10](#).

Table 10. Teacher Responses to Science Modules

No	Assessment Aspects	Average score	Percentage
1	Content of the Material	3.70	74.00
2	Learning aspects	4.00	80.00
3	Design Aspects	4.25	85.00
4	Language Aspects	3.75	75.00
5	Illustration aspect	4.40	88.00
Average		4.02	80.40

Based on [Table 10](#), it is seen from the aspects of material content, learning, design, language, illustrations including good categories.

Student response to the Science Module

The results of student response analysis data to multiple intelligence-based science learning modules using questionnaires and Likert scale assessments are analyzed descriptively then the values are converted into standard scores in accordance with the assessment scale. The results of the assessment of student responses to the multiple intelligence-based science learning module can be seen in [Table 11](#).

Table 11. Student Responses to Science Modules

No	Assessment Aspects	Average score	Percentage
1	Ease of Use Aspects	3.81	76.19
2	Aspects of Serving Attractiveness	4.50	90.00
3	Benefit Aspects	4.23	80.83
Average		4.18	82.34

Based on the assessment of student responses to the multiple intelligence-based science learning module, it is assessed from the aspect of ease of use, the aspects of the attractiveness of the presentation and the aspects of benefits are included in the good category.

Learning Outcomes Data

Learning outcomes assessment data is an evaluation of the cognitive realm of students obtained after doing test questions and participating in teaching and learning activities using a *multiple intelligence-based* science learning module. Learning outcomes data presented in [Table 12](#).

Table 12. Learning Outcomes of Experimental Class Students

Value Interval	Before using the IPA module		After using the IPA module	
	Number of Students	Percentage	Number of Students	Percentage
60-65	5	22.73	0	0.00
66-71	7	31.82	0	0.00
72-77	8	36.36	2	9.09
78-83	2	9.09	9	40.91
84-89	0	0.00	5	22.73
90-95	0	0.00	3	13.64
96-100	0	0.00	3	13.64

The Minimum Completion Criteria (KKM) set by the teacher is 75.00, based on the data presented in [Table 12](#) shows that student learning outcomes before using the science learning module based on *multiple intelligences* of students who have reached KKM are 36.36% (8 students) while students who have not reached KKM are 63.63%. (14 students). Student learning outcomes after using science learning modules that have not reached KKM are 0% (0 students) meaning that students have reached KKM 100% (22 students).

Discussion

The assumption about the potential for multiple intelligences in children arises based on the paradigm that every child born has the potential for genius, so it is very important for this multiple intelligence to be stimulated in learning. Multiple intelligences theory (MIT) which takes into account students' individual differences has an important role in the teaching and learning process. The development of multiple intelligences used to focus on kindergartens and Elementary schools as educational experts and official considered that the development of students' multiple intelligences should be cultivated from childhood and slowly promoted to other levels. Nevertheless, the framework of multiple intelligences should not be simply Promoted in kindergartens and elementary schools, but was also suitable in high schools, universities, and even graduate schools, ([Akkuzu & Akçay, 2011](#); [Lei et al., 2021](#))

Multiple intelligences are interconnected so that they become a complete intelligence ([Ferrero et al., 2021](#); [Shahzada & Khan, 2014](#)). This is in line with, research which states that although multiple intelligences are separate units, they support each other every time a job is done, multiple intelligences are interconnected, and there is a moderate relationship between verbal linguistic intelligence, logical mathematics and academic achievement. So it can be concluded that multiple intelligences have a significant positive correlation with academic achievement. explained the results of her research that there is a positive relationship between multiple intelligences, effective learning skills and academic achievement, there is a positive relationship between effective learning abilities and academic achievement, and there is a positive relationship between multiple intelligences and good academic achievement ([Ayesha & Khurshid, 2013](#); [Shahzada & Khan, 2014](#))

The components of professionalism competence that must be possessed by teachers include being able to compile quality teaching materials based on core competencies and basic competencies that are in accordance with the needs and characteristics of students. The preparation of teaching materials that are in accordance with the needs and characteristics of students, will greatly help teachers in the learning process so that it will help students in understanding the learning material so that the desired learning objectives can be achieved. The development of teaching materials is very important for teachers to make learning more effective, efficient, and in accordance with the competencies to be achieved and facilitate the learning process.

Teachers play an important role in the learning process so that it is necessary to improve teacher performance to achieve learning objectives. Therefore, teaching materials are very important to be developed both in print and non-printed forms as a supporting means to improve the quality of learning, in line with these materials, explaining that teaching materials are all forms of material used to assist the teacher or instructor in implementing the learning process in the classroom. Teaching materials contain material that must be studied by students either in printed or non-printed form facilitated by the teacher

to achieve certain goals. that teaching materials can make the complexity of teaching simple. Good teaching materials are teaching materials that can be used and help students in the learning process. For this reason, teaching materials must be prepared based on the needs of students. The need for teaching materials is determined by the environment, the development of information technology, and the culture of the local community (Amir, 2020; Fitria & Idriyani, 2017; Nurlela et al., 2018) The use of teaching materials must be able to involve students' mentality in carrying out the learning process so that it helps learners more easily to achieve the competencies to be achieved, teaching materials should contain materials that are tied to the real world around the student environment so that teachers can more easily provide examples in learning activities (Syofyan, 2018; Syofyan et al., 2019) teaching materials or *instructional materials* are knowledge, skills, and attitudes that students must learn in order to achieve predetermined competency standards. In detail, the types of learning materials consist of knowledge (facts, concepts, principles, procedures), skills, and attitudes or values. In addition to being used as a vehicle to carry out activities in learning, teaching materials can also be used to carry out learning that functions for improvement (*remedial*) or *enrichment* (*enrichment*),

This research resulted in a multiple *intelligence-based* science learning module product to improve *higher order thinking skills* for grade IV elementary school students. Based on the results of trials in the field, it can be concluded that the science module that has been developed can effectively improve student learning outcomes as can be seen from the comparison of the average scores of pretests and posttest where the average posttest score is higher. Presumably, all the intelligences should be used as channels when presenting new materials so that students experience the material via their best intelligence, and thus understanding will be promoted.

In line with Smith & Ragan's opinion as quoted by Richey, expressing the definition of instructional design is : The systematic and reflective process of implementing the principles of learning and instruction into the planning of teaching materials, teaching and learning activities, learning resources, and evaluation (Ferrero et al., 2021; Richey & Klein, 2014) That institutional development is a systematic and reflective analysis activity in implementing rules, learning principles including the development of teaching materials, learning activities, information sources and evaluations. This definition emphasizes the ilmian foundation of instructional design and the various process-oriented design instructional products closely related to the teaching system i.e. analysis, design, development, implementation and evaluation. Furthermore, Perkins' opinion as quoted by Reigeluth (Charles M. Reigeluth, 1999) exposing instructional design is Instructional design theory is a theory that offers explicit guidance on how to better help people to learn and develop. The types of learning and development can include cognitive, emotional, social, physical, and spiritual. Perkins explained the guidelines that should be included in teaching to encourage cognitive learning. The instruction should provide: 1) Clear information. Description and examples of goals, required knowledge, and expected performances. 2) Exercise wisely. Opportunities for learners to be actively involved and reflective of anything that should be learned add numbers, solve word problems, write essays. 3) Informative feedback. Clear and thorough advice to learners about their performance, helps them to step more effectively. 4) Strong intrinsic or extrinsic motivation. Quite appreciated activities, either because they are very interesting and interesting in themselves or because they feed into other achievements that concern the learner.

The novelty of the multiple intelligence-based science learning module product for Grade IV elementary school students that has been developed is that in each chapter of the learning material presented there are parts of the subject matter that stimulate the emergence of *multiple intelligence* abilities or multiple intelligences. For example; let's tell stories is a means to support the stimulation of linguistic verbal intelligence, let's draw is a means to support the development of aspects of spatial visual intelligence, let's do it is a means to stimulate the development of aspects of naturalist intelligence, let's observe and practice questions are a means to stimulate aspects of the development of mathematical logic intelligence, let's sing is a means to support aspects of the development of musical intelligence, let's be creative is a means to support the development of aspects of kinesthetic intelligence, the horizon of Islamic science is a means to support the development of aspects of spiritual intelligence.

In each section of the subject matter as a whole there are clear illustrations of images related to daily life that can help students to make it easier to learn the material so that students can implement / apply their knowledge in the surrounding environment. This is reinforced by the opinion, that the basic concepts of Natural Science (IPA) must be studied and mastered perfectly, so that they can be applied in solving the problems faced by every human being in living his life. Science education is expected to be a vehicle for students to learn about themselves and the surrounding nature as well as the prospect of further development in applying it in everyday life. In line with this opinion revealed that, Natural Sciences or science is taught at the non-formal education level starting from early childhood followed by learning in elementary schools, the learning process of Natural Sciences (IPA) is designed to produce

human resources that are critical, sensitive to the environment, and able to solve environmental problems in everyday life. Therefore, it is necessary to strive for science learning that can facilitate students to be able to think critically, creatively, and think innovatively, be able to collaborate and communicate well so that they can solve their environmental problems (Gani, 2016; Iskandar & Kusmayanti, 2018).

Science learning modules based on *multiple intelligences* that have been developed by researchers, have several advantages including: 1) modules can be learned independently by students because they have been adjusted to the level of development and abilities of students and are equipped with instructions for use. 2) The module is equipped with illustrations of drawings and explanations according to the material, 3) Teaching materials contain material that is in accordance with the curriculum for class IV. 4) modules are equipped with practice multiple choice questions and essays as well as assignments both group and independent. Science learning modules based on *multiple intelligences* are expected to be enrichment materials and sources of information for learning science materials so that they can help students in achieving predetermined competencies, because students have been able to learn the materials thoroughly and can apply their knowledge in accordance with their learning packages. This is in accordance with the opinion that explaining that teaching materials are useful in assisting teachers in carrying out learning (Nurdyansyah & Mutala'iah, 2015). For teachers, teaching materials are used to focus all learning activities, then for students as a guide that must be learned in participating in learning, modules or teaching materials function as individual learning tools to evaluate the process of achieving student information acquisition.

Modules are designed to help students to master learning objectives and as a means of learning independently according to the level of cognitive abilities of each student. Furthermore, revealed the development of teaching materials based on Multiple Intelligences or multiple intelligences that improve students' critical abilities. through the critical abilities that students have can be used as a reference in identifying various problems and students can assume to evaluate arguments based on the evidence found. This is in line with the opinion that the development of teaching materials in the form of multiple intelligence-based handouts can improve students' critical thinking skills (Abidin, 2017; Kusumaningtias & Kurniawan, 2014).

Learning strategies based on multiple intelligences focus more on the uniqueness of students. Multiple intelligence also assumes that no child is stupid, but that each child is intelligent with their own strengths in intelligence. The Multiple Intelligence Learning Strategy in practice is to spur intelligence that stands out in students so that it is optimal, explained that teaching materials that are well compiled and equipped with interesting material and image illustrations will stimulate students to use teaching materials as learning resources in supporting the learning process, through teaching materials become a means of connecting between teachers and students, teachers act as facilitators, so that the use of teaching materials can be a solution to the problem of limitations student understanding and teachers' ability to design classroom learning. The development of teaching materials is an effort to improve and improve the quality of learning, teaching materials focus on student learning activities so that they are arranged based on the needs and motivations of students so that students are more interested, enthusiastic and enthusiastic in following the learning process, the form of presentation of teaching materials is adjusted to the stage of intellectual development of students so that they are easy to understand (Mediartika & Aznam, 2018; Nurbaeti, 2019)

Textbooks are very important for teachers and students in the learning process. Without textbooks it will be difficult for teachers to increase the effectiveness of learning. Likewise with students, without textbooks it will be difficult to adjust to learning, especially if the teacher teaches the material quickly and unclearly. Therefore, textbooks are considered a material that can be used by both teachers and students as an effort to improve the quality of learning. The role of textbooks for teachers includes (1) saving time, (2) changing the role of the teacher as a facilitator, and (3) the learning process is more effective and interactive. teaching materials are one of the solutions to inserting the expected skills. Teaching materials have a relevant function that can be used as a reference for teachers in directing all learning process activities as well as a competency substance that should be taught/trained to students (Noorhapizah et al., 2023; Suwanto & Azrina, 2021)

Contribution of research results in the development of science learning modules, as an alternative teaching material that has several advantages, 1) Aspects of material description, in each chapter the material has been explained extensively and in detail about concepts, theories and facts, so that students can easily understand and learn independently. 2) The aspect of accuracy of the material, in full the material presented is accompanied by examples, concepts and theory development accompanied by the presentation of illustrations and visualizations with clear pictures, so that students can understand examples of material concretely. 3) Aspects of completeness of presentation, instructions for using the modules presented in full, Core Competencies, Basic Competencies, indicators and learning objectives,

details of reading materials, assignments of practice questions, which can stimulate multiple intelligences and higher order thinking skills, summaries and bibliography. 4) Science module material delivered can encourage curiosity 5) Science module has fairly high legibility.

4. CONCLUSION

The science learning module based on multiple intelligences produced in this development research has been declared suitable for use from the results of teacher response analysis and aspects of student response are included in the very feasible category. The science learning module based on multiple intelligences produced in this development research has been declared effective in improving higher order thinking skills as seen from the improvement in student learning outcomes. Before using the science learning module and after using the science learning module the student's learning outcomes increase.

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