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Developing of Science Teaching Materials Based on Multiple Intelligences

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ABSTRAK

Penelitian ini bertujuan untuk 1) menghasilkan bahan ajar IPA berbasis multiple intellegences yang layak. 2) mengetahui keefektifan bahan ajar IPA berbasis multiple intellegences, jenis penelitian ini adalah penelitian pengembangan yang mengacu kepada model pengembangan ADDIE terdiri dari lima tahap yaitu Analyze, Design, Development, Implementation, Evaluation. 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 didi oleh siswa kelas IV. Data yang terkuml dari hasil angket dianalisis dengan teknik analisis deskripsi kuantitatif. Hasil penelitian menunjukkan; 1) hasil validasi ahli materi termasuk kategori sangat layak 89.67 % 2) Validasi ahli desain pembelajaran kategori sangat layak,91 % 3) hasil validasi guru termasuk kategori layak 79.20 %
Berdasarkan hasil uji coba terbatas bahan ajar IPA berbasiss kecerdasan jamak menurut pendapat guru dan siswa layak digunakan untuk pembelajaran di kelas IV maupun pembelajaran secara mandiri

ABSTRACT

This study aims to 1) produce proper science teaching materials based on multiple intelligence. 2) to determine the effectiveness of science teaching materials based on multiple intelligence, this type of research is development research which refers to the ADDIE development model consisting of five stages, namely Analyze, Design, Development, Implementation, Evaluation. The research instrument used was in the form of a questionnaire in the form of validity and practicality sheets, validation sheets were filled in by material experts and learning design experts and teachers, while the effectiveness test was done by grade IV students. The data collected from the questionnaire results were analyzed using quantitative description analysis techniques. The results showed; 1) the results of the material expert validation are very feasible 89.67% 2) The validation of the learning design experts is very feasible, 91% 3) the results of the teacher validation are categorized as feasible 79.20%. Based on the results of limited trials, science teaching materials based on multiple intelligence according to the opinion of the teacher and students are suitable for use for learning in grade IV and independent learning

1. INTRODUCTION

Education is a human creative effort in guiding and helping develop the potential of students in a planned and continuous manner as a vehicle for the formation of very basic skills intellectually, spiritually and emotionally towards the realization of a complete personality. education is a human creative effort in guiding and helping develop the potential of students in a planned and continuous manner as a vehicle for ordering very basic, spiritual and emotional skills towards the realization of a complete personality. This potential will emerge and develop optimally through appropriate, integrated and 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 intelligence (Multiple Intelligence). Every intelligence possessed by children will appear to be seen at certain times according to their developmental stages as made by Piaget in (Hermita, 2017), 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.

Through education also students can interact with the environment to develop the abilities that exist in him. This ability can be in the form of cognitive abilities that hone knowledge, affective abilities to hone the sensitivity of feelings, and psychomotor abilities, namely the ability to do something. Through these three abilities a student is expected to be able to become an individual who is ready to enter the world outside of school.(Acesta, Sumantri, & Fahrurrozi, 2020), One of the most basic problems in the scope of our education is the problem of the weakness of the learning process. Learning is a communication process between teachers, students, and teaching materials

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 subcompetence 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 (Murni & Ruqoyyah, 2020). 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.

(Rofiah, Aminah, & Widha, 2018) 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.

Multilple intellgences . In his theory, Gardner states that each individual has eight types of intelligence in his personality, those are (1) verbal-linguistics, (2) logical-mathematical, (3) visual-spatial, (4) musical-rhythmic (musical smart), (5) intrapersonal, (6) interpersonal, (7) naturalists, and (8) physical-kinesthetic. (Dewi & Martini, 2020).

in line with(Marenus, 2020). Multiple intelligences theory states that everyone has all eight intelligences at varying degrees of proficiency and an individual's learning style is unrelated to the areas in which they are the most intelligent. For example, someone with linguistic intelligence may not necessarily learn best through writing and reading. Classifying students by their learning styles or intelligences alone may limit their potential for learning

2. METHOD

The type of research in this research is development research. The resulting product is an IPA module based on multiple intelligences. The development design in this study was adapted from the ADDIE development model (Analysis, Design, Develop, Implement and Evaluate),(Branch & Dousay, 2015).

The analysis stage consists of competency analysis that must be mastered by students after using the developed development products and analysis of student characteristics which aims to determine the characteristics of students who will use the developed development products. The design stage is carried out by selecting learning materials, learning strategies and evaluation activities that are in accordance with student characteristics and competency demands. Furthermore, the development stage is that the researcher develops a science module that is used in the learning process. At the implementation stage, product trials developed in field trial activities were carried out with trial designs using experimental research designs, namely one group pretest-posttest design with a pretest giving stage to measure initial knowledge before learning using modules, then the learning process was carried out modules and giving posttest to measure student learning outcomes after the learning process using modules. The last stage is evaluation to determine the feasibility of the module being developed

The data collection techniques in this study consisted of (1) the validation sheet used to assess the instruments to be used in the study assessed by two academics and one practitioner; (2) Student response questionnaires are used to measure student responses to the products developed as an assessment of the practicality of the developed modules; (3) The learning outcome test is used to measure the level of effectiveness of the module being developed, namely in the form of a pretest and posttest learning outcomes

test; The validity of the module is determined by the compatibility of the validity results with the specified validity criteria. The validated instruments consisted of a science module, a teacher response questionnaire, a student response questionnaire and a learning outcome test. The average validity value obtained is then matched with the module validity assessment criteria. Based on the scale value, determine the average value of the interval range from each aspect that can use the formula

$$\text{Interval Scale (RS)} = \frac{m-n}{B}$$

RS = Scale Interval
m = he highest number on the answer score
n = The lowest number in the answer score
B = number of answer choices

Based on the calculation of the formula, it is then converted into a descriptive value as shown in table 1 as follows

Table 1. Interpretation of the Assessment Criteria

Score range	Criteria
4.6 – 5	Excellent
3.7 – 4.5	Good
2.8 – 3.6	Average
1.9 – 2.7	Poor
1 - 1.8	Very poor

Furthermore, calculating the percentage of feasibility based on the scale range data, the researcher determined the average of each validator by calculating each aspect assessed using the following formula:

$$P = \frac{\sum X}{N} \times 100$$

P = Presentation of scores for each criterion
$\sum X$ = number of answers for each criterion
N = maximum score for each criterion

Based on the calculation of the formula, the value is then converted into eligibility data as in the following table:

Table 2 Percentage of score suitability

Value Scale (%)	Feasibility Level
81-100	Very Eligible
61- 80	Eligible
41-60	Quite feasible
21-40	Inadequate
0-20	Not feasible

From the results of the analysis of the assessment of the opinion of material experts, design experts, linguists and media experts and teachers, they get a decent and very decent category assessment, so the science module based on multiple intellenges can be used in the learning process. . However, if the results of the expert opinion assessment do not meet the proper and very feasible criteria, the science-based multiple intelligence module must be improved or revised to meet the criteria so that it is suitable for use by students and teachers.

3. RESULT

a) The results of validity by experts on the development of sustainable environmental modules and natural resources can be seen in the table1:

Table 1. Module validity test results according to the expert

No	Expert Validation	Value
1	Material Expert	4.38
2	Learning Design Expert	4.54

The results of validation by experts on the science learning module based on multiple intelligence include two components, namely; material aspects, learning design. The results of the assessment by experts, the developed module is in the good category, with various suggestions and inputs to be improved and refined, the science learning module developed is suitable for use in the learning process. This is in line with the results of research (Astuti, Hartini, & Mastuang, 2018), that a valid science module can be tested on students in learning and can be used as a learning resource and teacher reference in teaching ... further strengthened research results(Rusmiati, Santyasa, & Warpala, 2013), explains that the module developed from the material and design aspects is valid with a good qualification response.

b) Teacher Response to Science Module

Data analysis of teacher responses to the science learning module based on multiple intelligence using a questionnaire with a liketr scale assessment (values 1 to 5) which is analyzed descriptively then the value is converted into a standard score in accordance with the assessment scale. The results of the assessment of teacher responses to the multiple intelligence-based science learning module can be seen in table 3 below

Table. 2 Teacher Response to Science Module

No	Assessment Aspects	Average score
1	Contents	3.70
2	Learning	4.00
3	Design	4.25
4	Language	3.75
5	Illustration	4.40
	Average	4.02

Based on the assessment of the teacher's response to the science learning module based on multiple intelligence, seen from the aspects of the content of the material, learning, design, language, illustrations are categorized as good. In line with the results of the research (Minati, 2018), the results of the development of science teaching materials based on the neat content of the material get a score of 3.3 from a scale of 4 with a presentation of 82.5% which is included in the very good category, while from the design aspect, teaching gets an average value of 3.5 from the scale 4 with an eligibility percentage of 87.5% included in the very good category

c) Student Response to Science Module

The results of the data analysis of student responses to the science learning module based on multiple intelligence using a questionnaire and a liketr scale assessment (values 1 to 5) were analyzed descriptively and then the values were converted into standard scores according to the assessment scale. The results of assessing student responses to the science learning module based on muntiple intelligence can be seen in table 3 below:

Table 3. Student Responses to the Science Module

No	Assessment	Average score
1	Ease of Use	3.80
2	Attractiveness of Servings	4.50
3	Benefits	4.04
	Average	4.11

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 attractiveness aspect of the presentation and the benefit aspect, which is categorized as good This is reinforced by the results of research(Gita, Annisa, & Nanna, 2018), explaining that the aspects of convenience 91.60% and 84.33% are included in the very good category, in the sense that the developed modules can be used as learning materials in class.

Discussion

The development of teaching materials is a process that is coherent, effective and efficient in learning to solve various problems in learning and improve student competence through various stages of problem identification, development and evaluation activities. The development of teaching materials is very important and has the goal of helping students in the learning process so as to get the final grade of optimal learning outcomes

The essence of the theory of multiple intelligences (Multiple Intelligences) according to (Gardner, 1993) is to appreciate the uniqueness of each individual, the various ways of learning, embodying a number of models to assess them and an almost unlimited way to actualize them. Gardner formulates 8 (eight) multiple intelligences, namely: (a) Linguistic Verbal Intelligence, (b) Mathematical Logical Intelligence, (c) Musical Intelligence (d) Kinesthetic Intelligence, (e) Visual Spatial Intelligence, (f) Interpersonal Intelligence, (g)) Intrapersonal Intelligence and (h) Naturalist Intelligence.

That the eight multiple intelligences can be possessed by individuals only at different levels
The findings of this study support his research (Sesmiarni, 2014), that elementary school students already have different intelligences. For this reason, teachers need to deal with various ways that stimulate their brains to think and produce the desired competencies. In addition, the authors argue that to overcome individual differences related to multiple intelligences, it is necessary to design learning that is able to facilitate student differences, especially from students' multiple intelligences.
It is very important for all educators to apply Gardner's theory of multiple intelligences in learning to enhance students' learning experiences, to continuously hone critical thinking skills to be taught and applied to real world experiences (Zobish & Swanson, 2015).

The relationship between learning and multiple intelligences as the opinion (Ayesha & Khurshid, 2013) results of his research clearly analysis and interpretation of data, reveals that multiple intelligences, learning skills and academic achievement are interrelated constructs in the teaching and learning environment. Based on the research findings: 1) Multiple intelligence, learning skills and academic achievement are significantly positively correlated with each other. 2) Teachers can use specific strategies that can improve students' linguistic, logical, spatial, body-kinesthetic, musical, intrapersonal, interpersonal and naturalist abilities, especially more attention can be paid to social science students

Natural science (IPA) is a science that studies nature and everything in it, as well as the phenomena that occur in it. Many phenomena in everyday life are related to science, the main purpose of studying science is: to improve the welfare of human life through various efforts to utilize everything that exists in nature. Characteristics of elementary school students always want to do something, they want to be active, learn, and do, respond (pay attention) to various aspects of the world around them. Spontaneously paying attention to events, objects around him. They have broad interests and are scattered around their environment.

Therefore, science learning in elementary schools must be adapted to the needs and characteristics of students, learning that involves students with various real activities so that students have knowledge concepts that are relevant to what they are learning. For better science learning, a module with learning steps is needed that can stimulate students to be more active in learning so that it can facilitate the emergence of multiple intelligences (multiple intelligences) by stimulating these various intelligences properly, it will be directly related to high-level thinking skills (higher order thinking skills).

4. CONCLUSION

Based on the results of the development and trials that have been carried out, several conclusions can be drawn as follows;

1. The research and development process that has been carried out produces a science learning module based on multiple intelligences, printing through several stages, namely; define materials, identify core competencies and basic competencies, indicators, learning objectives, prepare teaching materials and validate them to material experts, linguists, media experts and learning design experts. the development process uses the ADDIE development model namely Analyze, Design, Development, Implementation and evaluation, the resulting modules are in good categories from material aspects 4.38, design aspects 4.54 very good category
2. The science learning module based on multiple intelligences produced in this development research has been declared suitable for use from the results of the teacher response analysis, namely with an average percentage of 88.0 % and aspects of student responses with an average percentage of 84.05 % including the very feasible category.
3. The science learning module based on multiple intelligences produced in this development research has been declared effective in increasing higher order thinking skills as seen from the increase in student learning outcomes. Before using the Science learning module the average student learning outcomes were 69.95 and after using the Science learning module the student learning outcomes increased to 82.59.

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ABSTRAK

Masalah dalam penelitian ini adalah belum adanya bahan ajar IPA berbasis multiple intellegences serta rendahnya hasil belajar IPA, Penelitian ini bertujuan untuk menghasilkan bahan ajar IPA berbasis multiple intellegences yang layak. serta mengetahui keefektifan bahan ajar IPA berbasis multiple intellegences, jenis penelitian ini adalah penelitian pengembangan yang mengacu kepada model pengembangan ADDIE terdiri dari lima tahap yaitu Analyze, Design, Development, Implementation, Evaluation. 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 didi oleh siswa kelas IV. Data yang terkuml dari hasil angket dianalisis dengan teknik analisis deskripsi kuantitatif. Hasil penelitian menunjukkan; 1) hasil validasi ahli materi termasuk kategori sangat layak 89.67 % 2) Validasi ahli desain pembelajaran kategori sangat layak,91 % 3) hasil validasi guru termasuk kategori layak 79.20 %
Berdasarkan hasil uji coba terbatas bahan ajar IPA berbasiss kecerdasan jamak menurut pendapat guru dan siswa layak digunakan untuk pembelajaran di kelas IV maupun pembelajaran secara mandiri

ABSTRACT

The problem in this study is that there are no science teaching materials based on multiple intelligences and the low science learning outcomes. This study aims to produce appropriate multiple intelligences-based science teaching materials. as well as knowing the effectiveness of science teaching materials based on multiple intelligences, this type of research is development research which refers to the ADDIE development model which consists of five stages namely Analysis, Design, Development, Implementation, Evaluation. The research instrument used was a questionnaire in the form of validity and practicality sheets, the validation sheet was filled in by material experts and learning design experts as well as teachers, while the effectiveness test was carried out by fourth grade students. The data collected from the results of the questionnaire were analyzed using quantitative descriptive analysis techniques. The research results show; 1) the results of validation by material experts in the very feasible category 89.67% 2) the validation of learning design experts in the very feasible category 91% 3) the results of teacher validation in the feasible category 79.20%
Based on the results of limited trials of multi-intelligence-based science teaching materials, in the opinion of teachers and students, it is appropriate for learning in class IV and for independent learning.

1. INTRODUCTION

Education is a human creative effort in guiding and helping develop the potential of students in a planned and continuous manner as a vehicle for the formation of very basic skills intellectually, spiritually and emotionally towards the realization of a complete personality. education is a human creative effort in guiding and helping develop the potential of students in a planned and continuous manner as a vehicle for ordering very basic, spiritual and emotional skills towards the realization of a complete personality. This potential will emerge and develop optimally through appropriate, integrated and 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. intelligence is the human ability to create

problems and solve them. The key of multiple intelligences theory is that all human beings have eight intelligences that are independent each other with varying degrees (Winarti, Yuanita, & Nur, 2019), individuals rely on these intelligences independently and collectively to make things, produce behaviors, and resolve issues that apply to the communities where they live (Al-Qatawneh, Alsalhi, Eltahir, & Siddig, 2021). Multiple intelligences is 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 . (Indria, 2020)

Every intelligence possessed by children will appear to be seen at certain times according to their developmental stages as made by Piaget in (Hermita, 2017), 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.

Through education also students can interact with the environment to develop the abilities that exist in him. This ability can be in the form of cognitive abilities that hone knowledge, affective abilities to hone the sensitivity of feelings, and psychomotor abilities, namely the ability to do something. Through these three abilities a student is expected to be able to become an individual who is ready to enter the world outside of school.(Acesta, Sumantri, & Fahrurrozi, 2020b), As an educational institution with a strategic role, schools should ideally be able to accommodate every form of intelligence of their students. Therefore, every learning activity in schools must be directed to develop the potential of their students through activities that effectively also refer to multiple intelligences.(Husna, 2020) One of the most basic problems in the scope of our education is the problem of the weakness of the learning process. Learning is a communication process between teachers, students, and teaching materials.

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(Díaz-Posada, Varela-Londoño, & Rodríguez-Burgos, 2017)

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 subcompetence 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 (Murni & Ruqoyyah, 2020). 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.

(Rofiah, Aminah, & Widha, 2018) 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, Sumantri, & Fahrurrozi, 2020a)

Multilple intellgences . In his theory, Gardner states that each individual has eight types of intelligence in his personality, those are (1) verbal-linguistics, (2) logical-mathematical, (3) visual-spatial, (4) musical-rhythmic (musical smart), (5) intrapersonal, (6) interpersonal, (7) naturalists, and (8) physical-kinesthetic. (Dewi & Martini, 2020). in line with(Marenus, 2020). Multiple intelligences theory states that everyone has all eight intelligences at varying degrees of proficiency and an individual's learning style is unrelated to the areas in which they are the most intelligent. For example, someone with linguistic intelligence may not necessarily learn best through writing and reading. Classifying students by their learning styles or intelligences alone may limit their potential for learning.

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.

2. METHOD

The type of research in this research is development research. The resulting product is an IPA module based on multiple intelligences. The development design in this study was adapted from the ADDIE development model (Analysis, Design, Develop, Implement and Evaluate),(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,

Module development steps

1. Analysis

   At this stage of the analysis, the activities carried out are; a) analyze the competencies that must be mastered by students, which will be outlined in the module, namely core competencies, basic competencies, and learning objectives. b) analyze the materials that will be the subject matter related to the competencies to be achieved, c) analyze the characteristics of students related to the knowledge, attitudes and skills they already have.

2. Design

   At the design stage or design stage, the activities carried out are; steps in compiling a science learning module, so that the resulting module is in accordance with the rules, it must meet several components in compiling the module including:

   Step 1 . Conducting Module Needs Analysis

   At this stage, it is the initial process carried out to compile teaching materials. In the analysis of the need for teaching materials, there are three stages, namely; The stages of analysis of teaching material needs consist of: analysis of the curriculum, analysis of learning resources, and determination of the type and title of teaching materials.

   Analyzing the Curriculum

   This first step is to determine the competencies required for teaching materials. a) Competency Standards, are the minimum ability qualifications of students who describe the mastery of knowledge, attitudes, and skills that are expected to be achieved at each level. Competency standards consist of several basic competencies as a standard reference that must be met and apply nationally. b) Basic Competencies, Basic competencies are a number of abilities that learners must have in subjects as a reference for compiling competency indicators. c) Indicators of achievement of learning outcomes, namely the formulation of specific competencies, which can be used as a reference for assessment criteria in determining whether or not students are competent. d). Subject matter,. The subject matter is a number of main information containing knowledge, skills, value references arranged in such a way by educators so that students master the competencies that have been set. The subject matter is one of the main references in compiling the

content of teaching materials. e) Learning experience, learning experience is an activity designed so that students master the competencies that have been determined through the learning activities held.

Learning Resource Analysis

After conducting a curriculum analysis, the next step in analyzing the needs of learning resources, the criteria for analyzing these learning resources are carried out based on the suitability, availability, and ease of utilizing them. The way to analyze learning resources is to inventory the availability of learning resources that are associated with needs. a) Availability criteria, b). Conformity Criteria c). Convenience Criteria

Selecting and Determining Teaching Materials

The third step in the analysis of teaching material needs is to select and determine teaching materials. This step aims to meet one of the criteria that teaching materials must be interesting and can help learners to achieve competence.

Step 2: Compiling a Map of Teaching Materials

After the teaching material needs analysis process is complete, the next step in making and compiling modules, the next step is to compile a module needs map, there are at least three uses for compiling a map of teaching material needs. The uses of compiling a map of teaching materials are: a) being able to find out the number of teaching materials that must be written, b) being able to know the order of the contents of the module c). Can determine module properties

Step 3: Creating the Structure of Teaching Materials

The third step in module creation is to create a module structure. consists of seven components, namely title, study instructions, basic competencies or subject matter, supporting information, exercises, work tasks or steps, and assessments. The arrangement of parts is then combined, so that it becomes a whole building that deserves to be called teaching material.

3. Development

   At the stage of development the activity carried out is; a) search for various sources as material for enrichment and deepening of the material, b) creation of drawings, charts and illustrations, c) editing and layout modules. Furthermore, the product draft that has been compiled will be validated by linguists, material experts, learning design experts, learning media experts and practitioners (teachers). If the results of expert validation of the product draft are still not feasible, they will be revised according to the advice and input from experts.

4. Implementation

   At the implementation stage, it is to carry out a trial of a science learning module based on multiple intellegences to teachers to be applied in class IV SDN Unggulan Cikaso Village, Kramat Mulya District, Kuningan Regency, the material delivered is in accordance with the module that has been developed. At the implementation stage the goal is to find out the quality of the module, the effectiveness of the module in learning. The application of the trial in small groups was carried out on 6 students with different abilities, consisting of 2 high-ability students, 2 medium-ability students and 2 lace ability students. After the multiple intellegeneces-based science learning module is carried out, students are then given a questionnaire in the form of a practicality sheet which aims to find out the student's response to the module from the aspects of convenience, attractiveness of presentation and benefits. If the module is included in the good category if it is in accordance with the criteria that have been set. If not, improvements will be made in accordance with the respondents' suggestions and comments. This trial aims to get feedback from students as material for improving the module draft, before the next stage of trial, comments and suggestions obtained through questionnaires, this stage of trial is a product feasibility trial. Furthermore, a limited field trial was carried out on 22 students, this limited field trial was carried out to determine the effectiveness of a science learning module based on multiple intelligences.

5. Evaluation

   The evaluation stage is the last activity in the module development process, evaluation is carried out in the form of formative evaluation, namely evaluation carried out after each learning (weekly evaluation) data used for improvement at each stage and summative evaluation is an evaluation at the end of the program the data obtained is used to determine the influence of learning outcomes and the quality of student learning.

Module Evaluation and Revision Validation

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. For evaluations conducted with small group trials and field trials on a limited basis, this final

evaluation aims to determine the feasibility of the module theoretically and empirically so that it can be further piloted to a wider and larger respondent.the following is a detailed explanation:

1) Expert Validation

Validation and evaluation in the development of science learning modules based on *multiple intelligences*, which involve expert validators, namely material experts aiming to validate the accuracy of the content or content of the material, conformity with the core competencies and basic competencies of the science learning module to be developed, linguists validate from linguistic, communicative, straightforward, readability of messages and sentences effectively, learning design experts validate the appropriateness of the evaluation and exercises, adequacy of time allocation, variation in material concept delivery and learning media experts validate module appearance, letter suitability, color composition and module illustrations. The review carried out is a theoretical feasibility test, 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 following instruments:

Table 1. Instrument Grids for Material Experts

No	Assessment Aspects	Assessment Indicators	No Item
I	Eligibility of Contents	Suitability of Material with KI and KD	1,2,3
		Accuracy of the material	4,5,6,7,8,9,10,11,12,13
		Supporting Learning materials	14,15,16,17,18,19,
		Material Update	20,21,22,23,
II	Eligibility of Presentation	Serving Techniques	1
		Serving supporters	2
		Presentation of Learning	3,4
		Completeness of presentation	5,6,7

Source: modifications (Syofyan, 2019)

Table 2. Instrument Grids for Linguists

No	Assessment Aspects	Assessment Indicators	No Item
1	Language	Businesslike	1,2,3
		Communicative	4,5
		Dialogic and Interactive	6,7
		Compliance with the level of development of learners	8,9,10
		The collapse and cohesiveness of the train of thought	11, 12
		Use of the term symbol and icon	1314

Table 3. Instrument Grids for Media Experts

No	Assessment Aspects	Assessment Indicators	No Item
1	Module Graphics	Display Components	1.2
		Use of font variations (types and sizes)	3
		Layout and layout	4
		Illustrations, drawings and photos	5
		Display design	6
		Cover according to the contents of the module	7
		Use of Illustrative colors in modules	8
2	Linguistics	Readability of text or writing	9
		Clarity of information	10
		Effective and efficient use of language	11

Table 4. Instrument Grids for Design Experts

No	Assessment Aspects	Assessment Indicators	No Item
1	Eligibility of Materials	Module systematics	1
		Clarity of formulation of learning objectives	2
		Variations in the delivery of concepts / teaching materials	3
		Relevance of the material to the learning objectives	4
2	Eligibility of Presentation	Compatibility of the example with the discussion of the material	5
		The suitability of the material to the abilities of the student	6
		Accuracy of exercises/tasks with the material	7
		Adequacy of time to study the material	8
		Adequacy of material materials to achieve competence	9
3	Methods and evaluation	Compliance with the method used	10
		Compatibility with student catractism	11
		Evaluation suitability (tasks and exercises)	12
		Conclusion	13

Table 5. Teacher Response Instruments to Science Modules

No	Category		Indicators	Item number
1	Aspects of Material Content	1.	Suitability of the material to the 2013 Curriculum	1
		2.	Accuracy in formulating learning indicators	2
		3.	Ease of understanding the instructions for use of the book	3
		4.	Accuracy of language use in the delivery of material	4
		5.	The conformity of the material presented with the truth of science	5
		6.	Material compatibility with the development of Multiple Intellegences	6
		7.	Images and examples according to the learning material	7
		8	Suitability of evaluation with learning material	8
		9	The suitability of the summary with the content of the book	9
		10	Compatibility of the answer key to the question	10
2.	Learning Aspects	11	Completeness and systemicity of the order of presentation of the material	11

		12	Task compatibility with the demands of student-centered learning	12
3	Design Aspects	13	Suitability of teaching material cover design	13
		14	Shape and size of teaching materials	14
		15	Selection of paper types for printing teaching materials	15
		16	Tidiness and resilience in binding teaching materials	16
4	Language Aspects	17	Suitability of language use to student characteristics	17
		18	Conformity of terms used in teaching materials	18
		19	Clarity of use of sentence structure	19
		20	Readability level	20
5	Illustration Aspects	21	Accuracy of use of illustrations with the material	21
		22	Clarity of Illustration with material	22
		23	Color composition according to the writing and characteristics of students	23
		24	Clarity of the image used	24
		25	Conformity of illustrations with multiple intellegences	25

Table 6. Student Response Instruments to Science Modules

No	Statement	No Item
A	**Aspects of Ease of Use**	
1.	The use of modules in learning can save time efficiently	1
2.	The material inside the module is easy for me to understand	2
3.	The presentation of the material in the module is more practical and I can learn it repeatedly	3
4.	The description of the material and exercises present in the module is clear and simple	4
5.	The language used on the module is easy for me to understand	5
6.	Practical and easy module I carry because it can be stored	6
7.	I can self-study according to my learning ability	7
B	**Aspects of Serving Attractiveness**	
1.	The design of the presentation display of the module is attractive to look at	1
2.	The content of the material in the textbook is supplemented with illustrations, drawings, photos that match the material	2
3.	I can clearly read the writing on the module	3
4.	The color combinations used in the module are already interesting	4
C	**Benefit Aspects**	
1.	Modules help me in understanding the science material	1
2.	The module can replace my notes.	2
3.	Modules help me in connecting the material learned with everyday life.	3
4.	Modules can help my knowledge/memory and the refinement of the material I learn.	4
5.	I can use the module anywhere and anytime	5
6.	Modules make me become active in science learning	6
7.	Modules can motivate me in learning	7

8.	Modules can add to my insights in science materials	8

Data Analysis Techniques

Validation Questionnaire data analysis

The data analysis used in this study is a qualitative and quantitative descriptive stratistic analysis technique. Qualitative data is obtained from the results of inputs and suggestions during the activities of field trials while quantitative data is obtained from the results of the validation assessment questionnaire of experts, teachers and students. The data on the results obtained using a likert scale with a scale of 5, namely ; 1. Very poor, 2. Poor, 3. Average, 4. Good, 5. Excellent.

Based on the value of the scale, it then determines the average value of the interval range of aspects assessed by using the formula:

$$P = \frac{m-n}{N}$$

P = Scale Value
m = largest value
n = smallest value
N = number of answer choices

Based on the calculation of the formula, it is then converted into a descriptive value as presented in table 7

Table 7. Interpretation of grade assessment criteria

Score range	Criteria
4.6 – 5	Excellent
3.7 – 4.5	Good
2.8 – 3.6	Average
1.9 – 2.7	Poor
1 - 1.8	Very poor

Furthermore, calculating the percentage of feasibility based on the data of the scale range, the researcher determines the average of each validator by calculating each aspect assessed using the following formula:

$$P = \frac{\sum X}{} \times 100$$

P = Presentation of scores for each criterion
∑X = number of answers for each criterion
N = maximum score for each criterion

Based on the calculation of the formula, the values are then converted into inevitability data as in the following table:

Table 8. Interpretation of Eligibility criteria

Value Scale (%)	Eligibility Level
81-100	Very Eligible
61- 80	Eligible
41-60	Quite feasible
21-40	Inadequate
0-20	Not feasible

If from the results of the analysis of the assessment of the opinions of material experts, design experts, experts, linguists and media experts and teachers get a category assessment ranging from cuku to very good, then the science module based on *multiple intellgences* is feasible and can be used. However, if the results of the expert opinion assessment have not met the criteria Very good and good, then the science

module based on *multiple intellgences* then the module must be improved or revised until it meets the criteria very well or well so that it is suitable for use by students

2) Effectiveness analysis

The effective meaning based on the Big Dictionary of Indonesian is that there is an effect, there is an influence, there is a result. Meanwhile, Effectiveness is the level of achievement of predetermined goals, while practicality implies the ease of a test both in preparing, using, processing and interpreting. In this study, researchers applied the following criteria for effectiveness and practicality:

a) Student learning completion is at least 75% of the number of students who score ≥75.in improving learning outcomes.
b) Student learning outcomes show significant differences before and after using science learning modules based on *multiple intellegences*

3) Class data analysis

Class data analysis is obtained from the test results that have been given and then analyzed using the t test. The t test technique is a statistical technique used to test the significance of the difference between two averages. which comes from two distributions using SPSS.22 with criteria if the level of ≤ 0.05 then it can be concluded that there is a difference in student learning outcomes between before and after using the science learning module. If the significance level ≥ 0.05, it can be concluded that there is no difference in learning outcomes between before and after using the science learning module

3. RESULT AND DISCUSSION

Result

This research uses the Research and Development (R&D) research method, the product developed is a science learning module based on *multiple intellegences* to improve the *higher order thinking skills* of elementary school students. The development model used refers to the ADDIE development model consisting of five stages, namely: *Analysis*, *Design*, *Development*, *Implementation*, *Evaluation*. The results of research and development are as follows:

Stage Analyze (Analysis)

The first stage of this study is Analysis. At this stage the researcher conducts a needs analysis, curriculum analysis, and analysis of student characteristics. The results obtained at this stage are as follows :

a. Needs Analysis

At the stage of implementing this needs analysis aims to find out how science learning activities at SDN Unggulan, at this stage the activities carried out by researchers are to make observations and distribute questionnaires. Based on the results of observations and the distribution of questionnaire filling given to 15 Grade IV students of SDN Unggulan, after recapitulation of the questionnaire results showed 86% of students had difficulty in following the learning process of science material, 60% stated that the handbook is currently difficult to learn, 93% of students revealed that they need teaching materials or other alternative modules, 86.67% need learning that can stimulate various intelligences. 80% of students need science learning that activates students to stimulate higher-order thinking skills.

Meanwhile, the distribution of questionnaires and interviews with grade IV teachers at SDN Unggul, which in essence teachers revealed that they often find difficulties in delivering some science learning materials, because in the current thematic handbook it is felt to be incomplete and in-depth, therefore teachers need teaching materials or modules that are more complete reviews of science materials, so that teachers can easily deliver all the learning materials of science content so that it can motivate and help students to follow the science learning process.

Based on the findings in the field, it can be concluded that it is necessary to develop teaching materials in the form of learning modules that can facilitate students and teachers to facilitate the implementation of science learning.

b. Curriculum Analysis

Curriculum analysis activities aim to formulate core competencies, basic competencies, indicators and learning objectives that have been implemented at SDN Unggulan. Based on the results of the analysis, the curriculum tools at SDN Unggulan that apply refer to the 2013 curriculum revision 2018 are as follows:

Material 1: Sound and Sense of Hearing

Core Competencies**:**

1. Accepting, appreciating, and living the teachings of the religion it adheres to
2. Have honest behavior, discipline, responsibility, courtesy, care, and confidence in interacting with family, friends, teachers and neighbors.

3. Understand factual knowledge by observing (hearing, seeing, reading) and questioning it based on curiosity about himself, God's creatures and their activities, and the objects he encounters at home and at school, and playgrounds
4. Presenting factual knowledge in clear, logical and systematic language, in aesthetic works, in movements that reflect healthy children, and in actions that reflect the behavior of children of faith and noble character.

Basic Competencies:

1. Applying the properties of sound and inequality with the sense of hearing
2. Present reports of observations and/or experiments on the properties of sound

Indicators:

1. Check the source of the surrounding sound completely
2. Correctly detects various sounds from nearby objects
3. Proving the various sound properties of surrounding objects
4. Analyze the nature of sounds related to the function of the ear as a hearing device
5. Present a report on the results of the experiment on the properties of sound

Learning Objectives

After participating in the learning, students are expected to be able to:

1 Describing the properties of sound
2 Explaining the sources of sound
3 After exploration, students are able to explain how to fully produce sounds from various nearby objects
4 After exploration and discussion, students are able to present observational reports on how to produce sounds from various objects around them systematically.
5 Conducting exploration activities using objects that can make sounds in the classroom and its surroundings
6 After exploration and discussion, students are able to present observational reports on how to produce sounds from various objects around them systematically.

Matter 2: Energy Source

Core Competencies:

1. Accepting, appreciating, and living the teachings of the religion it adheres to
2. Have honest behavior, discipline, responsibility, courtesy, care, and confidence in interacting with family, friends, teachers and neighbors.
3. Understand factual knowledge by observing (hearing, seeing, reading) and questioning it based on curiosity about himself, God's creatures and their activities, and the objects he encounters at home and at school, and playgrounds
4. Presenting factual knowledge in clear, logical and systematic language, in aesthetic works, in movements that reflect healthy children, and in actions that reflect the behavior of children of faith and noble character.

Basic Competencies**:**

1. Understand various energy sources, energy shape changes, and alternative energy sources (wind, water, solar, geothermal, organic fuels, and nuclear) in everyday life.
2. Present reports of the results of observations and tracing information about various changes in the shape of energy.

Indicators:

1. Analyze various energy sources in everyday life
2. Explain the benefits and sources of thermal energy in everyday life
3. Linking the changing form of energy from alternative energy sources
4. Combining the results of observation and tracing information about energy sources
5. Present a report of the results of observations on changes in the shape of energy.

Learning Objectives

After participating in the learning, students are expected to be able to:

1. Students are able to explain the benefits of solar energy in everyday life precisely.
2. After the experiment, students are able to present a report of the results of observations on changes in the form of solar energy in life systematically.
3. With discussion and problem solving, students are able to identify natural resources and their proper utilization.

Material 3 : Material 3 :Caring for Living Things

Core Competencies:

1. Accepting, appreciating, and living the teachings of the religion it adheres to

2. Have honest behavior, discipline, responsibility, courtesy, care, and confidence in interacting with family, friends, teachers and neighbors.
3. Understand factual knowledge by observing (hearing, seeing, reading) and questioning it based on curiosity about himself, God's creatures and their activities, and the objects he encounters at home and at school, and playgrounds
4. Presenting factual knowledge in clear, logical and systematic language, in aesthetic works, in movements that reflect healthy children, and in actions that reflect the behavior of children of faith and noble character.

Basic Competencies**:**

1. Understand the relationship between the shape and function of animal and plant body parts
2. Write a report on the results of observations on the shape and function of animal and plant body parts
3. Understand the importance of efforts to balance and preserve natural resources and the environment
4. Explain the activities of efforts to conserve natural resources with people in their environment

Indicators:

1. Explain the external shape (morphology) of the animal's body and its functions after observing the image.
2. Present a report on the results of observations on the shape and function of plant and animal parts
3. Identify problems with environmental balance problems
4. Carry out activities to conserve nature and balance the environment

Learning Objectives

After participating in the learning, students are expected to be able to:

1. With problem-solving discussions, students are able to identify environmental balance problems appropriately .
2. English Discussion of solving problems, students are able to identify environmental balance problems appropriately.
3. By observing the image, students are able to identify the characteristics of the highlands, lowlands, and beaches and the concentration of their natural resources for the welfare of the community appropriately.
4. By observing the picture, students are able to present information on the results of identifying the characteristics of the highlands, lowlands, and beaches as well as the systematic use of natural resources for the welfare of the community.

Material 4: Natural Resource Preservation

Core Competencies:

1. Accepting, appreciating, and living the teachings of the religion it adheres to
2. Have honest behavior, discipline, responsibility, courtesy, care, and confidence in interacting with family, friends, teachers and neighbors.
3. Understand factual knowledge by observing (hearing, seeing, reading) and questioning it based on curiosity about himself, God's creatures and their activities, and the objects he encounters at home and at school, and playgrounds
4. Presenting factual knowledge in clear, logical and systematic language, in aesthetic works, in movements that reflect healthy children, and in actions that reflect the behavior of children of faith and noble character.

Basic Competencies**:**

1. Understand the importance of efforts to balance and preserve natural resources and the environment.
2. Explaining activities to conserve natural resources with people in the environment

Indicators:

1. Explain the benefits of caring for and preserving natural resources and the environment
2. Identifying environmental balance problems.
3. Practice planting one plant seed in a polybag
4. Carrying out activities to care for and preserve natural resources and the environment

Learning Objectives

1.After discussion, students are able to explain the benefits of maintaining natural balance and the preservation of natural resources in the form of mind maps.
2. After discussion, students are able to carry out activities to reflect on the habit of loving the environment and maintain the balance and sustainability of natural resources completely.

Utilization of technology and its impact on Natural Resources

Core Competencies**:**

1. Accepting, appreciating, and living the teachings of the religion it adheres to
2. Have honest behavior, discipline, responsibility, courtesy, care, and confidence in interacting with family, friends, teachers and neighbors.

3. Understand factual knowledge by observing (hearing, seeing, reading) and questioning it based on curiosity about himself, God's creatures and their activities, and the objects he encounters at home and at school, and playgrounds
4. Presenting factual knowledge in clear, logical and systematic language, in aesthetic works, in movements that reflect healthy children, and in actions that reflect the behavior of children of faith and noble character.

Basic Competencies

1. Understand the importance of efforts to balance and preserve natural resources in their environment.
2. Carry out activities to conserve natural resources with people in their environment.

Indicators

1. Identify the importance of natural balance and the preservation of natural resources **.**
2. Provide examples of activities to preserve natural resources**.**

Learning Objectives

1. After discussion, students are able to inform the importance of maintaining natural balance and the preservation of natural resources in the form of mind maps.
2. After discussion, students are able to carry out activities that can maintain the balance and sustainability of natural resources completely.

Matter 5: Properties of Light

Core Competencies:

1. Accepting, appreciating, and living the teachings of the religion it adheres to
2. Have honest behavior, discipline, responsibility, courtesy, care, and confidence in interacting with family, friends, teachers and neighbors.
3. Understand factual knowledge by observing (hearing, seeing, reading) and questioning it based on curiosity about himself, God's creatures and their activities, and the objects he encounters at home and at school, and playgrounds
4. Presenting factual knowledge in clear, logical and systematic language, in aesthetic works, in movements that reflect healthy children, and in actions that reflect the behavior of children of faith and noble character.

Basic Compatibility

1. Understanding the properties of light and its interrelationships with the sense of sight
2. Presenting reports of observations and / or experiments that utilize the properties of light

Indicators

1. Identify the properties of light and its interrelationship with the sense of sight in everyday life.
2. Report the results of experiments that utilize the properties of light in written form.

Learning Objectives

1. After conducting experiments on light , students are able to correctly deduce the properties of light and its relationship with vision.
2. After conducting experiments on light, students are able to write a report on the nature of light and its relationship to vision in detail and correctly.

Analysis of Student Characteristics

The student characteristics analysis stage is a stage of activity carried out to determine the characteristics of students who will be used as subjects in research as a basis for compiling modules to be developed. It is hoped that modules that are in accordance with the characteristics and development of students can stimulate and motivate them to learn so that they can improve student learning outcomes. Grade IV elementary school students ranging in age between 9-10 years are at the stage of concrete operational cognitive development, namely in the phase where mental activity is focused on real objects or on various kinds of events that have been experienced in general, learning in grade IV SD Negeri Unggulan students follow learning activities quite well, learning activities using lecture methods so that students become passive and less active, Furthermore, the teacher gives assignments to students to do the practice questions contained in the package book.

Based on the results of observations in grade IV of SD Negeri Unggulan, stimulation is needed to increase student activity in participating in learning, one of which is through learning modules that are able to guide and motivate students to be active and enthusiastic about learning both independently and with teachers. Science learning modules based on *multiple intellegences* to improve *higher order thinking skills* are expected to be able to increase learning activities so as to improve student learning outcomes.

Design Stage

The development of multiple *intelligence-based* science learning modules begins with making an initial product (*protype*) which is the initial design of the grade IV Elementary School science learning module product to be developed. There are 4 activities at this design stage, namely; preparation of module frameworks, selection of references, preparation of designs and preparation of learning module assessment instruments. The results of the design / design of science learning modules based on *multiple intellegences are described* as follows:

1) Preparation of learning module framework

In compiling the learning module framework, it refers to the syllabus that already exists at SDN Unggulan. The science learning module based on *multiple intellegences* consists of three parts, namely; beginning, content and end. The initial part contains the cover, foreword, instructions for use of the module, dafftar of the contents. The content section consists of chapter titles, core competencies, basic competencies, indicators, introductions, learning objectives, reading materials, assignments, summaries. The final section contains an evaluation and a bibliography.

Module Eligibility

The preparation of learning modules consists of the beginning, content and end parts. Display The design of the initial part of the learning module is as follows:

a) Cover

The cover of a *multiple intellegences-based* science learning module consists of a front cover and a back cover. The front cover contains the module title which is a Multiple Intellegences-Based Science Learning Module, author, student book, illustration of pictures of vegetables and fruits, pictures of birds and children's images, module identity, light green *full color* design, while the color of the back cover is adjusted to the front cover with pictures of mountain scenery A good and attractive cover design is expected to attract students to learn the materials presented in the science learning module, the following is a display of the cover of the science learning module,

Figure 1. Front and back cover views

b) Module Usage Instructions

Instructions for using the module contains instructions for each learning activity and describes the development of compound intelligence to be developed in each phase of learning, here is a display of instructions for using the module,

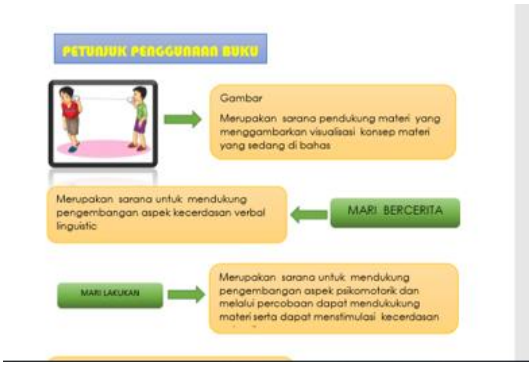

Figure 2. Instructions for using the book

The systematics of this module contains the title in each chapter, core competencies, basic competencies, indicators, introduction to learning, learning objectives, reading materials, assignments, summaries, evaluations, bibliography. At this stage of product development, *multiple intelligence* analysis is carried out to be connected with science learning materials that are in accordance with the level of development and ability of grade IV students. multiple *intelligences* developed in this science module include

a) Let's observe is a means to support spatial visual development

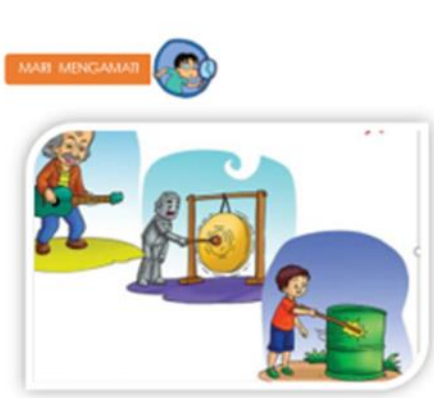

Figure 3. Let's Observe View

b) Let's sing is a means to support the development of musical intelligence

Figure 4. Let's Sing View

c) Let's be creative is a means to support the development of psychomotor/ kinesthetic intelligence.

Figure 5. Let's Get Creative

3. *Development* Phase

The *Development* stage aims to determine the feasibility of the learning module that has been designed. After an eligibility assessment, the learning module is revised according to suggestions and input from expert validators. Validation of *multiple intelligence-based* science modules was carried out by 12 experts, namely 3 linguists, 3 learning design experts, 3 material experts and 3 media experts and practitioners (teachers). Validation is carried out aimed at determining the quality and feasibility of the module, the assessment score is converted into five categories of the liket score scale 1. Not good/irrelevant, score 2 less good/less relevant, score 3 good enough/moderately relevant, score 4 good/relevant, score 5 excellent/very relevant.

a) Material expert assessment

Assessment by material experts aims to find out the quality of the material presented in the module, ahlli assessment of the material is carried out by Dr.agr. Asep Ginanjar Arip, M.Si Kuningan University, Dr Rifat Showatul Anam, M.Pd, STKIP Sebelas April, Dr (C) Yogi Kuncoro Adi, M.Pd IAIN Salatiga. The results of the assessment of the science mudul can be seen in the appendix

Table 9. Vaalidation 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

Assesment 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 a eligible percentage of 83.80% included in the category is very eligible.

b) Linguist assesment

The assessment of linguists was carried out by Prof. Dr. Kosadi Hidayat, M.Pd Kuningan University, Dr Salam, M.Pd Gorontalo State University, Dr Evi Chalamah, M.Pd Sultan Agung Islamic University, the purpose of the language expert assessment is to find out the readability of information, the suitability of the language used with the level of student development, the effectiveness of sentence structure. The results of the IPA module assessment can be seen in the appendix

Table. 10 . Linguist Validation

No	Assessment aspects	Validators			Average	Percentage	Conclusion
		1	2	3			
1	Language	4.50	4.71	4.71	4.64	92.80	Very Eligible

The assesment based on language eligibility aspects received an average score of 4.64 out of a total scale of 5, and with a percentage of eligibility of 92.80% it was included in the category of highly feasible

c). Assesment of learning design experts

The assessment of learning design experts is carried out to determine the feasibility of modules based on aspects of learning design, the assessment of learning design experts is carried out by Dr. Yeyen Suryani, M.Pd, Kuningan University, Dr. Ryan Dwi Puspita, M.Pd, IKIP Siliwangi, Dr. Sarnelly, M.Pd, Haluoleo University, the results of the assesment can be seen in the appendix.

Table 11 . Design Expert Validation

No	Assessment aspects	Validators			Average	Percentage	Conclusion
		1	2	3			
1	Eligibility of Learning Design	4.54	4.38	4.04	4.32	86.40	Very Eligible

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

d) Expert assessment of Learning media

Assessment by learning media experts is carried out to determine the quality of multiple intellgenece-based science learning modules in elementary schools. The assessment was conducted by Dr.. Zaenal Abidin, M.Si Kuningan University. Dr Badrully Martati, M.Pd, Muhammadiyah Saurabaya University. Joko Sulistianto, M.PD PGRI Semarang University. The results of the assessment of the science learning module can be seen in the appendix.

Table 12 Media Expert Validation

No	Assessment aspects	Validators			Average	Percentage	Conclusion
		1	2	3			
1	Eligibility of Learning Media	4.81	4.00	4.27	4.36	87.70	Very Eligible

Assessment of *multiple intelligence-based* science learning modules based on aspects of learning media service, getting an average score of 4.36, with an eligibility percentage value of 87.70% is included in the very feasible category.

e) Grade IV Teacher Assessment

Module assessment by the teacher, namely by Mrs. Enok Elin Seftiani, M.Pd, as a grade IV teacher at SDN Unggulan. The results of the assessment can be seen in the appendix. 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

4. Implementation Stage (*Implementation*)

The fourth stage of the ADDIE development model is the implementation stage after being declared feasible by expert validators, science learning modules are used in the classroom. In the implementation stage, the learning was attended by 22 students divided into 5 learning groups due to the Covid-19 pandemic situation and online meetings were held using the zoom application and direct learning at students' homes. on a limited basis.

5. *Evaluation* Stage

At this stage of evaluation, researchers only conduct formative evaluations because evaluation activities at this stage are closely related to the stages of research and development, namely to improve the results of development products. At this stage, we carry out evaluation activities based on two data obtained, namely from student responses by using student response questionnaires to science learning modules and implementation results used to improve the development of science learning modules. This activity is carried out in order to produce a more feasible science learning module product.

After a validation assessment by a team of experts, then the science learning module in field trials to determine the effectiveness of the module. Field trials are carried out if they have been declared feasible or have received proper recommendations from experts that the module can be used, the meaning of the

effectiveness of the evaluation results in the field can be seen from the expediency of the module developed based on two aspects, namely; 1) aspects of student response, 2) aspects of learning outcomes tests.

a) Small group evaluation
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. The instrument for student response to the module is in the form of a questionnaire with a score assessment with a likert scale from 1 to 5, with an assessment criteria of 1 = Very poor 2 = Poor 3 = Average 4 = Good , 5 = Excellent

Table 13 Assessment of Science Modules by Students

No	Assessed aspects	Value Flat	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
	Sum	12.35	226.35
	Average	4.18	82.34

Based on table 13 the results of students' assessment of the science module still need improvement and 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.

b) 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 (pre test) and the final test (post test) 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.
a) Student learning outcomes analyst
Based on the results of the pre-test and post test, the learning results using the *multiple intelligence-based* science learning module for 22 grade IV students of SDN Unggulan showed that the lowest pre-test score was 60 and the highest score was 76, while for the test post score the lowest score was 75 and the highest score was 100. From these results, it can be concluded that all students or 22 students have test questions used for pre-test and post-test are multiple choices, totaling to meet the minimum completion criteria of 75, if you look at the comparison between pretest and posttest scores, it can be seen that there is an increase in learning outcomes.
b) Pretest and posttest data analysis
Pretest and posttest result data are then calculated with *paired sample t test*
By using SPSS 22 software for windows. To find out whether there are differences in learning outcomes before and after learning using a *multiple intelligence-based* science module.
1) Normality Test
The normality test is used to determine the distribution of normally distributed data or not the data to be analyzed. Normality test is used to test student pretest and posttest result data, normality test using Shapiro wilk with criteria if the significance of the calculation result is > 0.05 then it can be concluded that normal distributed data can be seen in table 14

Table 14 Normality Test

Tests of Normality

		Kolmogorov-Smirnov[a]			Shapiro-Wilk		
Class		Statistics	Df	Sig.	Statistics	Df	Sig.
The Value of Learning	Control	.136	18	.200*	.950	18	.425
	Experiment	.210	22	.013	.928	22	.113

*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

Based on the data from the normality test output results show that the significance value of the control class pretest 0.425 and Experiment 0.113 is greater than 0.05, it can be concluded that the two data are normally distributed.

Table 15 Homogeneity Tests

Test of Homogeneity of Variance

		Levene Statistics	DF1	DF2	Sig.
Experiment test post	Based on Mean	2.212	1	38	.145
	Based on Median	2.189	1	38	.147
	Based on Median and with adjusted df	2.189	1	35.456	.148
	Based on trimmed mean	2.154	1	38	.150

Based on the data from the test output of the homogeneity of variance test shows that the significance based on the mean of the control class and experiment 0.145 is greater than 0.05, it can be concluded that the two data are homogeneous

2). Test the difference between two paired samples
The results of the paired samples can be seen in table 16

Table 16 Test Difference of two paired samples

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Pre test Experiments	71.32	22	6.722	1.433
	Experiment test post	85.68	22	6.792	1.448
Pair 2	Pre test Control	70.00	18	5.980	1.410
	Post Test Control	77.06	18	4.869	1.148

Based on the results of the test of differences in pairs the average value of student learning outcomes before using the multiple intelligence-based science learning module 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.

3). Test the difference in the relationship of two paired samples

The relationship between learning outcomes before and after using *multiple intelligence-based* science learning modules can be seen in table 17

Table 17 Relationship of learning outcomes before and after using science learning modules

Paired Samples Correlations

		N	Correlation	Sig.
Pair 1	Pre test Experiment & Post test Experiment	22	.533	.011
Pair 2	Pre test Control & Post Test Control	18	.404	.096

Based on the results of the pairwise sample correlation test, it shows that the experimental class correlation between pretes and posttests has a positive rating score of 0.533 high rating between pretes and postes and there is a significant relationship because the significance value is 0.011 < Sig 0.05. as for the control class, it showed that between the pretest and postes scores had a positive rating score of 0.404 and there was no significant relationship because the significance value was 0.096 > 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.*

4) Test the Hypothesis

The hypotheses proposed are:

Ho: There is no difference in student learning outcomes after using multiple intelligence-based science learning modules

H1: There are differences in student learning outcomes after using science learning modules based on multiple intelligences

Table 18 Hypothesis Test

Paired Samples Test

		Paired Differences					t	Df	Sig. (2-tailed)
					95% Confidence Interval of the Difference				
		Mean	Std. Deviation	Std. Error Mean	Lower	Upper			
Pair 1	Pre test Experiment - Experiment test post	-14.364	6.529	1.392	-17.258	-11.469	-10.319	21	.000
Pair 2	Pre test Control - Pos test Control	-7.056	5.995	1.413	-10.037	-4.074	-4.993	17	.000

Based on the results of the hypothesis test, the significance value (2 taled) is 0.00 so that the results of the initial test (pretest) and final test (post test) 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* . with a significance of 0.00, because the significance value is smaller (< 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.

5) Data analysis of postest results

a. Postest Normality Test

Table 19 Normality Test of Postes Values

Tests of Normality

Class		Kolmogorov-Smirnov[a]			Shapiro-Wilk		
		Statistics	Df	Sig.	Statistics	Df	Sig.
Science Learning Outcomes	Control Class	.162	18	.200*	.941	18	.298
	Experimental Class	.162	22	.137	.892	22	.020

*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

Based on the results of the normality test of postes values presented in table 19 in the Kolmogorov-smirnov column, it shows that both the postes value of the significance of the control class 0.200 and the experimental class of 0.137 are greater than 0.05 meaning that the two postes value data are normally distributed

b) Postes Homogeneity Test

Table 20 Homogeneity Test posttes

Test of Homogeneity of Variance

		Levene Statistics	DF1	DF2	Sig.
Science Learning Outcomes	Based on Mean	2.212	1	38	.145
	Based on Median	2.189	1	38	.147
	Based on Median and with adjusted df	2.189	1	35.456	.148
	Based on trimmed mean	2.154	1	38	.150

The homogeneity test out put data presented in table 20 that the base on mean significance value for the student learning outcome value of 0.145 is greater than 0.05 which means that the variance value of student learning outcomes between the experimental class and the control class is homogeneous

c) Independent Test of postes value

Table 21 Groups of statistics

Group Statistics

	Class	N	Mean	Std. Deviation	Std. Error Mean
Science Learning Outcomes	Control Class	18	77.0556	4.86853	1.14752
	Experimental Class	22	85.6818	6.79206	1.44807

Based on the *out put group statistics* table of postes result data for the control class with 18 students and for the experimental class of 22 students, the average score of the postes results of the control class was 77.05 and for the experimental class was 85.68 thus descriptively startistically it can be concluded that

there is a difference in the average posttest results between the control class and the experimental class. Furthermore, to prove the difference is significant or not, an independent sample test is carried out.

Table 22 Independent Test sample test Postes Values

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	Df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Science Learning Outcomes	Equal variances assumed	2.212	.145	-4.518	38	.000	-8.626	1.909	-12.492	-4.761
	Equal variances not assumed			-4.669	37.425	.000	-8.626	1.847	-12.368	-4.884

Based on the out put value, 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 out put *independent sample test* based on the values contained in the *equal variances assumed.*

Based on the results of the independent *sample* test for postes results as presented in the table above, 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 Ho is rejected and Ha is accepted thus that there is a significant difference in postes results between the control class and the experimental class.

5) Teacher's Response to Science Module

Data on the analysis of teacher responses to multiple intelligence-based science learning modules using questionnaires with liketr scale assessments (grades 1 to 5) 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 muntiple intelligence-based science learning module can be seen in the following table 23

Table 23 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 the assessment of teacher responses to multiple intelligence-based science learning modules, it is seen from the aspects of material content, learning, design, language, illustrations including good categories.

6) Student response to the Science Module

The results of student response analysis data to multiple intelligence-based science learning modules using questionnaires and liketr scale assessments (grades 1 to 5) 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 muntiple intelligence-based science learning module can be seen in table 24 below:

Table 24 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.

7) 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 25

Table 25 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 25 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)

Table 26 Control Class Student Learning Outcomes

Value Interval	Before using the package book		After using the package book	
	Number of students	percentage	Number of students	percentage
60-65	3	16.67	0	0.00
66-71	6	33.33	3	16.67
72-77	6	33.33	8	44.44
78-83	3	16.67	6	33.33
84-89	0	0.00	1	5.56
90-95	0	0.00	0	0.0
96-100	0	0.00	0	0.0
	18	100.00	18	100.0

F. Discussion

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 (Fitria & Idriyeni, 2017). 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 (Amir, 2020), in line with these materials (Nurlela, Sumantri, & Bachtiar, 2018), 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.

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, Zulela, & Sumantri, 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*), Sharon, Smaldino in(Syofyan, 2018).

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 pretest and postest where the average postest 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. (Ferrero, Vadillo, & León, 2021). 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 " (Rita C Rechey and James D Klien, 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 evalution. Furthermore, Perkins' opinion as quoted by Reigiluth (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 (Gani, 2016), 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 (Iskandar, 2018) 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.

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 intellegences* 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 (Nurdyansyah & Mutala'liah, 2015), explaining that teaching materials are useful in assisting teachers in carrying out learning. 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, (Rozhana Meth & Moh. Farid Nurul Anwar, 2022), 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 (Kusumaningtias & Kurniawan, 2014) that the development of teaching materials in the form of multiple intelligence-based handouts can improve students' critical thinking skills.

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 (Mediartika & Aznam, 2018)

In line with this opinion (Nurbaeti, 2019), 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.

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. (Suwanto & Azrina, 2021)

The development of science learning modules has several advantages, including 1) Aspects of material description, in each chapter the material has been described broadly and in detail on concepts, theories and facts, so that students can easily understand and can learn independently. 2) Aspects of material accuracy, in full the material presented is equipped with examples, concepts and theoretical development accompanied by the presentation of illustrations and visualizations with clear images, so that students can understand the material examples concretely. 3) Aspects of completeness of presentation, fully presented instructions for the use of modules, core competencies, basic competencies, learning indicators and objectives, detailed material reading materials, practice questions tasks, which can stimulate plural intelligence and high-level thinking ability, summaries and bibliography. 4) The science module material presented can encourage curiosity 5) The IPA module has a fairly high readability.

As for the science learning module based on *multiple intellegences* that has been developed, there are still several things that need to be improved and refined. However, after implementing some improvements, revisions and improvements, the module has become better. Some of the drawbacks in this module are; a) There are some images that are not clear to observe, have been corrected so that it is clear that the image is to be observed, b) there is unclear writing due to inappropriate color composition, has been corrected and perfected so that the writing appears clear. c) there are no clues to do the practice questions, it has been corrected before the practice questions there are instructions for working on the practice questions.d) Aspects of drawing, graphic and layout design are still not good due to the limited ability of the researcher.

Conclusion

The research and development process that has been carried out produces science learning modules based on multiple intelligences, printing through several stages, namely; establish material, identify core competencies and basic competencies, indicators, learning objectives, preparation of teaching materials and validate to material experts, linguists, media experts and learning design experts. the development process using the ADDIE development model, namely *Analyze, Design, Development, Implementation* and *evaluation*, the resulting modules are included in the categories both from material aspects, language aspects, design aspects and media aspects excellent categories

The science learning module based on multiple intellegences 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 intellegences* 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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Developing of Science Teaching Materials Based on Multiple Intelligences [RV1]

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ABSTRAK

Masalah dalam penelitian ini adalah belum adanya bahan ajar IPA berbasis multiple intellegences serta rendahnya hasil belajar IPA, Penelitian ini bertujuan untuk menghasilkan bahan ajar IPA berbasis multiple intellegences yang layak. serta mengetahui keefektifan bahan ajar IPA berbasis multiple intellegences, jenis penelitian ini adalah penelitian pengembangan yang mengacu kepada model pengembangan ADDIE terdiri dari lima tahap yaitu Analyze, Design, Development, Implementation, Evaluation. 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 didi oleh siswa kelas IV. Data yang terkuml dari hasil angket dianalisis dengan teknik analisis deskripsi kuantitatif. Hasil penelitian menunjukkan; 1) hasil validasi ahli materi termasuk kategori sangat layak 89.67 % 2) Validasi ahli desain pembelajaran kategori sangat layak,91 % 3) hasil validasi guru termasuk kategori layak 79.20 %
Berdasarkan hasil uji coba terbatas bahan ajar IPA berbasiss kecerdasan jamak menurut pendapat guru dan siswa layak digunakan untuk pembelajaran di kelas IV maupun pembelajaran secara mandiri

ABSTRACT

The problem in this study is that there are no science teaching materials based on multiple intelligences and the low science learning outcomes. This study aims to produce appropriate multiple intelligences-based science teaching materials. as well as knowing the effectiveness of science teaching materials based on multiple intelligences, this type of research is development research which refers to the ADDIE development model which consists of five stages namely Analysis, Design, Development, Implementation, Evaluation. The research instrument used was a questionnaire in the form of validity and practicality sheets, the validation sheet was filled in by material experts and learning design experts as well as teachers, while the effectiveness test was carried out by fourth grade students. The data collected from the results of the questionnaire were analyzed using quantitative descriptive analysis techniques. The research results show; 1) the results of validation by material experts in the very feasible category 89.67% 2) the validation of learning design experts in the very feasible category 91% 3) the results of teacher validation in the feasible category 79.20%
Based on the results of limited trials of multi-intelligence-based science teaching materials, in the opinion of teachers and students, it is appropriate for learning in class IV and for independent learning.

1. INTRODUCTION [RV2]

Education is a human creative effort in guiding and helping develop the potential of students in a planned and continuous manner as a vehicle for the formation of very basic skills intellectually, spiritually and emotionally towards the realization of a complete personality. education is a human creative effort in guiding and helping develop the potential of students in a planned and continuous manner as a vehicle for ordering very basic, spiritual and emotional skills towards the realization of a complete personality. This potential will emerge and develop optimally through appropriate, integrated and 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. intelligence is the human ability to create

problems and solve them. The key of multiple intelligences theory is that all human beings have eight intelligences that are independent each other with varying degrees (Winarti, Yuanita, & Nur, 2019), individuals rely on these intelligences independently and collectively to make things, produce behaviors, and resolve issues that apply to the communities where they live (Al-Qatawneh, Alsalhi, Eltahir, & Siddig, 2021). Multiple intelligences is 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 . (Indria, 2020)

Every intelligence possessed by children will appear to be seen at certain times according to their developmental stages as made by Piaget in (Hermita, 2017), 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.

Through education also students can interact with the environment to develop the abilities that exist in him. This ability can be in the form of cognitive abilities that hone knowledge, affective abilities to hone the sensitivity of feelings, and psychomotor abilities, namely the ability to do something. Through these three abilities a student is expected to be able to become an individual who is ready to enter the world outside of school.(Acesta, Sumantri, & Fahrurrozi, 2020b), As an educational institution with a strategic role, schools should ideally be able to accommodate every form of intelligence of their students. Therefore, every learning activity in schools must be directed to develop the potential of their students through activities that effectively also refer to multiple intelligences.(Husna, 2020) One of the most basic problems in the scope of our education is the problem of the weakness of the learning process. Learning is a communication process between teachers, students, and teaching materials.

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(Díaz-Posada, Varela-Londoño, & Rodríguez-Burgos, 2017)

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 subcompetence 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 (Murni & Ruqoyyah, 2020). 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.

(Rofiah, Aminah, & Widha, 2018)[RV3] 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, Sumantri, & Fahrurrozi, 2020a)

Multilple intellgences . In his theory, Gardner states that each individual has eight types of intelligence in his personality, those are (1) verbal-linguistics, (2) logical-mathematical, (3) visual-spatial, (4) musical-rhythmic (musical smart), (5) intrapersonal, (6) interpersonal, (7) naturalists, and (8) physical-kinesthetic. (Dewi & Martini, 2020). in line with(Marenus, 2020). Multiple intelligences theory states that everyone has all eight intelligences at varying degrees of proficiency and an individual's learning style is unrelated to the areas in which they are the most intelligent. For example, someone with linguistic intelligence may not necessarily learn best through writing and reading. Classifying students by their learning styles or intelligences alone may limit their potential for learning.

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.

2. METHOD[RV4]

The type of research in this research is development research. The resulting product is an IPA module based on multiple intelligences. The development design in this study was adapted from the ADDIE development model (Analysis, Design, Develop, Implement and Evaluate),(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,

Module development steps

1. Analysis[RV5]

   At this stage of the analysis, the activities carried out are; a) analyze the competencies that must be mastered by students, which will be outlined in the module, namely core competencies, basic competencies, and learning objectives. b) analyze the materials that will be the subject matter related to the competencies to be achieved, c) analyze the characteristics of students related to the knowledge, attitudes and skills they already have.

2. Design

   At the design stage or design stage, the activities carried out are; steps in compiling a science learning module, so that the resulting module is in accordance with the rules, it must meet several components in compiling the module including:

   Step 1 . Conducting Module Needs Analysis

   At this stage, it is the initial process carried out to compile teaching materials. In the analysis of the need for teaching materials, there are three stages, namely; The stages of analysis of teaching material needs consist of: analysis of the curriculum, analysis of learning resources, and determination of the type and title of teaching materials.

   Analyzing the Curriculum

   This first step is to determine the competencies required for teaching materials. a) Competency Standards, are the minimum ability qualifications of students who describe the mastery of knowledge, attitudes, and skills that are expected to be achieved at each level. Competency standards consist of several basic competencies as a standard reference that must be met and apply nationally. b) Basic Competencies, Basic competencies are a number of abilities that learners must have in subjects as a reference for compiling competency indicators. c) Indicators of achievement of learning outcomes, namely the formulation of specific competencies, which can be used as a reference for assessment criteria in determining whether or not students are competent. d). Subject matter,. The subject matter is a number of main information containing knowledge, skills, value references arranged in such a way by educators so that students master the competencies that have been set. The subject matter is one of the main references in compiling the

content of teaching materials. e) Learning experience, learning experience is an activity designed so that students master the competencies that have been determined through the learning activities held.

Learning Resource Analysis

After conducting a curriculum analysis, the next step in analyzing the needs of learning resources, the criteria for analyzing these learning resources are carried out based on the suitability, availability, and ease of utilizing them. The way to analyze learning resources is to inventory the availability of learning resources that are associated with needs. a) Availability criteria, b). Conformity Criteria c). Convenience Criteria

Selecting and Determining Teaching Materials

The third step in the analysis of teaching material needs is to select and determine teaching materials. This step aims to meet one of the criteria that teaching materials must be interesting and can help learners to achieve competence.

Step 2: Compiling a Map of Teaching Materials

After the teaching material needs analysis process is complete, the next step in making and compiling modules, the next step is to compile a module needs map, there are at least three uses for compiling a map of teaching material needs. The uses of compiling a map of teaching materials are: a) being able to find out the number of teaching materials that must be written, b) being able to know the order of the contents of the module c). Can determine module properties

Step 3: Creating the Structure of Teaching Materials

The third step in module creation is to create a module structure. consists of seven components, namely title, study instructions, basic competencies or subject matter, supporting information, exercises, work tasks or steps, and assessments. The arrangement of parts is then combined, so that it becomes a whole building that deserves to be called teaching material.

3. Development

   At the stage of development the activity carried out is; a) search for various sources as material for enrichment and deepening of the material, b) creation of drawings, charts and illustrations, c) editing and layout modules. Furthermore, the product draft that has been compiled will be validated by linguists, material experts, learning design experts, learning media experts and practitioners (teachers). If the results of expert validation of the product draft are still not feasible, they will be revised according to the advice and input from experts.

4. Implementation

   At the implementation stage, it is to carry out a trial of a science learning module based on multiple intellegences to teachers to be applied in class IV SDN Unggulan Cikaso Village, Kramat Mulya District, Kuningan Regency, the material delivered is in accordance with the module that has been developed. At the implementation stage the goal is to find out the quality of the module, the effectiveness of the module in learning. The application of the trial in small groups was carried out on 6 students with different abilities, consisting of 2 high-ability students, 2 medium-ability students and 2 lace ability students. After the multiple intellegeneces-based science learning module is carried out, students are then given a questionnaire in the form of a practicality sheet which aims to find out the student's response to the module from the aspects of convenience, attractiveness of presentation and benefits. If the module is included in the good category if it is in accordance with the criteria that have been set. If not, improvements will be made in accordance with the respondents' suggestions and comments. This trial aims to get feedback from students as material for improving the module draft, before the next stage of trial, comments and suggestions obtained through questionnaires, this stage of trial is a product feasibility trial. Furthermore, a limited field trial was carried out on 22 students, this limited field trial was carried out to determine the effectiveness of a science learning module based on multiple intelligences.

5. Evaluation

   The evaluation stage is the last activity in the module development process, evaluation is carried out in the form of formative evaluation, namely evaluation carried out after each learning (weekly evaluation) data used for improvement at each stage and summative evaluation is an evaluation at the end of the program the data obtained is used to determine the influence of learning outcomes and the quality of student learning.

Module Evaluation and Revision Validation

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. For evaluations conducted with small group trials and field trials on a limited basis, this final

evaluation aims to determine the feasibility of the module theoretically and empirically so that it can be further piloted to a wider and larger respondent.the following is a detailed explanation:

1) Expert Validation

Validation and evaluation in the development of science learning modules based on *multiple intelligences*, which involve expert validators, namely material experts aiming to validate the accuracy of the content or content of the material, conformity with the core competencies and basic competencies of the science learning module to be developed, linguists validate from linguistic, communicative, straightforward, readability of messages and sentences effectively, learning design experts validate the appropriateness of the evaluation and exercises, adequacy of time allocation, variation in material concept delivery and learning media experts validate module appearance, letter suitability, color composition and module illustrations. The review carried out is a theoretical feasibility test, 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 following instruments:

Table 1. Instrument Grids for Material Experts

No	Assessment Aspects	Assessment Indicators	No Item
I	Eligibility of Contents	Suitability of Material with KI and KD	1,2,3
		Accuracy of the material	4,5,6,7,8,9,10,11,12,13
		Supporting Learning materials	14,15,16,17,18,19,
		Material Update	20,21,22,23,
II	Eligibility of Presentation	Serving Techniques	1
		Serving supporters	2
		Presentation of Learning	3,4
		Completeness of presentation	5,6,7[RV6]

Source: modifications (Syofyan, 2019)

Table 2. Instrument Grids for Linguists

No	Assessment Aspects	Assessment Indicators	No Item
1	Language	Businesslike	1,2,3
		Communicative	4,5
		Dialogic and Interactive	6,7
		Compliance with the level of development of learners	8,9,10
		The collapse and cohesiveness of the train of thought	11, 12
		Use of the term symbol and icon	1314

Table 3. Instrument Grids for Media Experts

No	Assessment Aspects	Assessment Indicators	No Item
1	Module Graphics	Display Components	1.2
		Use of font variations (types and sizes)	3
		Layout and layout	4
		Illustrations, drawings and photos	5
		Display design	6
		Cover according to the contents of the module	7
		Use of Illustrative colors in modules	8
2	Linguistics	Readability of text or writing	9
		Clarity of information	10
		Effective and efficient use of language	11

Table 4. Instrument Grids for Design Experts

No	Assessment Aspects	Assessment Indicators	No Item
1	Eligibility of Materials	Module systematics	1
		Clarity of formulation of learning objectives	2
		Variations in the delivery of concepts / teaching materials	3
		Relevance of the material to the learning objectives	4
2	Eligibility of Presentation	Compatibility of the example with the discussion of the material	5
		The suitability of the material to the abilities of the student	6
		Accuracy of exercises/tasks with the material	7
		Adequacy of time to study the material	8
		Adequacy of material materials to achieve competence	9
3	Methods and evaluation	Compliance with the method used	10
		Compatibility with student catractism	11
		Evaluation suitability (tasks and exercises)	12
		Conclusion	13

Table 5. Teacher Response Instruments to Science Modules

No	Category	Indicators		Item number
1	Aspects of Material Content	1.	Suitability of the material to the 2013 Curriculum	1
		2.	Accuracy in formulating learning indicators	2
		3.	Ease of understanding the instructions for use of the book	3
		4.	Accuracy of language use in the delivery of material	4
		5.	The conformity of the material presented with the truth of science	5
		6.	Material compatibility with the development of Multiple Intellegences	6
		7.	Images and examples according to the learning material	7
		8	Suitability of evaluation with learning material	8
		9	The suitability of the summary with the content of the book	9
		10	Compatibility of the answer key to the question	10
2.	Learning Aspects	11	Completeness and systemicity of the order of presentation of the material	11

		12	Task compatibility with the demands of student-centered learning	12
3	Design Aspects	13	Suitability of teaching material cover design	13
		14	Shape and size of teaching materials	14
		15	Selection of paper types for printing teaching materials	15
		16	Tidiness and resilience in binding teaching materials	16
4	Language Aspects	17	Suitability of language use to student characteristics	17
		18	Conformity of terms used in teaching materials	18
		19	Clarity of use of sentence structure	19
		20	Readability level	20
5	Illustration Aspects	21	Accuracy of use of illustrations with the material	21
		22	Clarity of Illustration with material	22
		23	Color composition according to the writing and characteristics of students	23
		24	Clarity of the image used	24
		25	Conformity of illustrations with multiple intellegences	25

Table 6. Student Response Instruments to Science Modules

No	Statement	No Item
A	**Aspects of Ease of Use**	
1.	The use of modules in learning can save time efficiently	1
2.	The material inside the module is easy for me to understand	2
3.	The presentation of the material in the module is more practical and I can learn it repeatedly	3
4.	The description of the material and exercises present in the module is clear and simple	4
5.	The language used on the module is easy for me to understand	5
6.	Practical and easy module I carry because it can be stored	6
7.	I can self-study according to my learning ability	7
B	**Aspects of Serving Attractiveness**	
1.	The design of the presentation display of the module is attractive to look at	1
2.	The content of the material in the textbook is supplemented with illustrations, drawings, photos that match the material	2
3.	I can clearly read the writing on the module	3
4.	The color combinations used in the module are already interesting	4
C	**Benefit Aspects**	
1.	Modules help me in understanding the science material	1
2.	The module can replace my notes.	2
3.	Modules help me in connecting the material learned with everyday life.	3
4.	Modules can help my knowledge/memory and the refinement of the material I learn.	4
5.	I can use the module anywhere and anytime	5
6.	Modules make me become active in science learning	6
7.	Modules can motivate me in learning	7

8.	Modules can add to my insights in science materials	8

Data Analysis Techniques

Validation Questionnaire data analysis

The data analysis used in this study is a qualitative and quantitative descriptive stratistic analysis technique. Qualitative data is obtained from the results of inputs and suggestions during the activities of field trials while quantitative data is obtained from the results of the validation assessment questionnaire of experts, teachers and students. The data on the results obtained using a likert scale with a scale of 5, namely ; 1. Very poor, 2. Poor, 3. Average, 4. Good, 5. Excellent.

Based on the value of the scale, it then determines the average value of the interval range of aspects assessed by using the formula:

$P = [RV7] \frac{m-n}{N}$

P = Scale Value
m = largest value
n = smallest value
N = number of answer choices

Based on the calculation of the formula, it is then converted into a descriptive value as presented in table 7

Table 7. Interpretation of grade assessment criteria

Score range	Criteria
4.6 – 5	Excellent
3.7 – 4.5	Good
2.8 – 3.6	Average
1.9 – 2.7	Poor
1 - 1.8	Very poor

Furthermore, calculating the percentage of feasibility based on the data of the scale range, the researcher determines the average of each validator by calculating each aspect assessed using the following formula:

$P = \frac{\sum X}{} \times 100$

P = Presentation of scores for each criterion
∑X = number of answers for each criterion
N = maximum score for each criterion

Based on the calculation of the formula, the values are then converted into inevitability data as in the following table:

Table 8. Interpretation of Eligibility criteria

Value Scale (%)	Eligibility Level
81-100	Very Eligible
61- 80	Eligible
41-60	Quite feasible
21-40	Inadequate
0-20	Not feasible

If from the results of the analysis of the assessment of the opinions of material experts, design experts, experts, linguists and media experts and teachers get a category assessment ranging from cuku to very good, then the science module based on *multiple intellgences* is feasible and can be used. However, if the results of the expert opinion assessment have not met the criteria Very good and good, then the science

module based on *multiple intellgences* then the module must be improved or revised until it meets the criteria very well or well so that it is suitable for use by students

2) Effectiveness analysis

The effective meaning based on the Big Dictionary of Indonesian is that there is an effect, there is an influence, there is a result. Meanwhile, Effectiveness is the level of achievement of predetermined goals, while practicality implies the ease of a test both in preparing, using, processing and interpreting. In this study, researchers applied the following criteria for effectiveness and practicality:

a) Student learning completion is at least 75% of the number of students who score ≥75.in improving learning outcomes.

b) Student learning outcomes show significant differences before and after using science learning modules based on *multiple intellegences*

3) Class data analysis

Class data analysis is obtained from the test results that have been given and then analyzed using the t test. The t test technique is a statistical technique used to test the significance of the difference between two averages. which comes from two distributions using SPSS.22 with criteria if the level of ≤ 0.05 then it can be concluded that there is a difference in student learning outcomes between before and after using the science learning module. If the significance level ≥ 0.05, it can be concluded that there is no difference in learning outcomes between before and after using the science learning module

3. RESULT AND DISCUSSION

Result[RV8]

This research uses the Research and Development (R&D) research method, the product developed is a science learning module based on *multiple intellegences* to improve the *higher order thinking skills* of elementary school students. The development model used refers to the ADDIE development model consisting of five stages, namely: *Analysis*, *Design*, *Development*, *Implementation*, *Evaluation*. The results of research and development are as follows:

Stage Analyze (Analysis)

The first stage of this study is Analysis. At this stage the researcher conducts a needs analysis, curriculum analysis, and analysis of student characteristics. The results obtained at this stage are as follows :

a. Needs Analysis

At the stage of implementing this needs analysis aims to find out how science learning activities at SDN Unggulan, at this stage the activities carried out by researchers are to make observations and distribute questionnaires. Based on the results of observations and the distribution of questionnaire filling given to 15 Grade IV students of SDN Unggulan, after recapitulation of the questionnaire results showed 86% of students had difficulty in following the learning process of science material, 60% stated that the handbook is currently difficult to learn, 93% of students revealed that they need teaching materials or other alternative modules, 86.67% need learning that can stimulate various intelligences. 80% of students need science learning that activates students to stimulate higher-order thinking skills.

Meanwhile, the distribution of questionnaires and interviews with grade IV teachers at SDN Unggul, which in essence teachers revealed that they often find difficulties in delivering some science learning materials, because in the current thematic handbook it is felt to be incomplete and in-depth, therefore teachers need teaching materials or modules that are more complete reviews of science materials, so that teachers can easily deliver all the learning materials of science content so that it can motivate and help students to follow the science learning process.

Based on the findings in the field, it can be concluded that it is necessary to develop teaching materials in the form of learning modules that can facilitate students and teachers to facilitate the implementation of science learning.

b. Curriculum Analysis

Curriculum analysis activities aim to formulate core competencies, basic competencies, indicators and learning objectives that have been implemented at SDN Unggulan. Based on the results of the analysis, the curriculum tools at SDN Unggulan that apply refer to the 2013 curriculum revision 2018 are as follows:

Material 1: Sound and Sense of Hearing

Core Competencies**:**

1. Accepting, appreciating, and living the teachings of the religion it adheres to
2. Have honest behavior, discipline, responsibility, courtesy, care, and confidence in interacting with family, friends, teachers and neighbors.

3. Understand factual knowledge by observing (hearing, seeing, reading) and questioning it based on curiosity about himself, God's creatures and their activities, and the objects he encounters at home and at school, and playgrounds
4. Presenting factual knowledge in clear, logical and systematic language, in aesthetic works, in movements that reflect healthy children, and in actions that reflect the behavior of children of faith and noble character.

Basic Competencies:

1. Applying the properties of sound and inequality with the sense of hearing
2. Present reports of observations and/or experiments on the properties of sound

Indicators:

1. Check the source of the surrounding sound completely
2. Correctly detects various sounds from nearby objects
3. Proving the various sound properties of surrounding objects
4. Analyze the nature of sounds related to the function of the ear as a hearing device
5. Present a report on the results of the experiment on the properties of sound

Learning Objectives

After participating in the learning, students are expected to be able to:

1 Describing the properties of sound
2 Explaining the sources of sound
3 After exploration, students are able to explain how to fully produce sounds from various nearby objects
4 After exploration and discussion, students are able to present observational reports on how to produce sounds from various objects around them systematically.
5 Conducting exploration activities using objects that can make sounds in the classroom and its surroundings
6 After exploration and discussion, students are able to present observational reports on how to produce sounds from various objects around them systematically.

Matter 2: Energy Source

Core Competencies:

1. Accepting, appreciating, and living the teachings of the religion it adheres to
2. Have honest behavior, discipline, responsibility, courtesy, care, and confidence in interacting with family, friends, teachers and neighbors.
3. Understand factual knowledge by observing (hearing, seeing, reading) and questioning it based on curiosity about himself, God's creatures and their activities, and the objects he encounters at home and at school, and playgrounds
4. Presenting factual knowledge in clear, logical and systematic language, in aesthetic works, in movements that reflect healthy children, and in actions that reflect the behavior of children of faith and noble character.

Basic Competencies**:**

1. Understand various energy sources, energy shape changes, and alternative energy sources (wind, water, solar, geothermal, organic fuels, and nuclear) in everyday life.
2. Present reports of the results of observations and tracing information about various changes in the shape of energy.

Indicators:

1. Analyze various energy sources in everyday life
2. Explain the benefits and sources of thermal energy in everyday life
3. Linking the changing form of energy from alternative energy sources
4. Combining the results of observation and tracing information about energy sources
5. Present a report of the results of observations on changes in the shape of energy.

Learning Objectives

After participating in the learning, students are expected to be able to:

1. Students are able to explain the benefits of solar energy in everyday life precisely.
2. After the experiment, students are able to present a report of the results of observations on changes in the form of solar energy in life systematically.
3. With discussion and problem solving, students are able to identify natural resources and their proper utilization.

Material 3 : Material 3 :Caring for Living Things

Core Competencies:

1. Accepting, appreciating, and living the teachings of the religion it adheres to

2. Have honest behavior, discipline, responsibility, courtesy, care, and confidence in interacting with family, friends, teachers and neighbors.
3. Understand factual knowledge by observing (hearing, seeing, reading) and questioning it based on curiosity about himself, God's creatures and their activities, and the objects he encounters at home and at school, and playgrounds
4. Presenting factual knowledge in clear, logical and systematic language, in aesthetic works, in movements that reflect healthy children, and in actions that reflect the behavior of children of faith and noble character.

Basic Competencies**:**

1. Understand the relationship between the shape and function of animal and plant body parts
2. Write a report on the results of observations on the shape and function of animal and plant body parts
3. Understand the importance of efforts to balance and preserve natural resources and the environment
4. Explain the activities of efforts to conserve natural resources with people in their environment

Indicators:

1. Explain the external shape (morphology) of the animal's body and its functions after observing the image.
2. Present a report on the results of observations on the shape and function of plant and animal parts
3. Identify problems with environmental balance problems
4. Carry out activities to conserve nature and balance the environment

Learning Objectives

After participating in the learning, students are expected to be able to:

1. With problem-solving discussions, students are able to identify environmental balance problems appropriately .
2. English Discussion of solving problems, students are able to identify environmental balance problems appropriately.
3. By observing the image, students are able to identify the characteristics of the highlands, lowlands, and beaches and the concentration of their natural resources for the welfare of the community appropriately.
4. By observing the picture, students are able to present information on the results of identifying the characteristics of the highlands, lowlands, and beaches as well as the systematic use of natural resources for the welfare of the community.

Material 4: Natural Resource Preservation

Core Competencies:

1. Accepting, appreciating, and living the teachings of the religion it adheres to
2. Have honest behavior, discipline, responsibility, courtesy, care, and confidence in interacting with family, friends, teachers and neighbors.
3. Understand factual knowledge by observing (hearing, seeing, reading) and questioning it based on curiosity about himself, God's creatures and their activities, and the objects he encounters at home and at school, and playgrounds
4. Presenting factual knowledge in clear, logical and systematic language, in aesthetic works, in movements that reflect healthy children, and in actions that reflect the behavior of children of faith and noble character.

Basic Competencies**:**

1. Understand the importance of efforts to balance and preserve natural resources and the environment.
2. Explaining activities to conserve natural resources with people in the environment

Indicators:

1. Explain the benefits of caring for and preserving natural resources and the environment
2. Identifying environmental balance problems.
3. Practice planting one plant seed in a polybag
4. Carrying out activities to care for and preserve natural resources and the environment

Learning Objectives

1.After discussion, students are able to explain the benefits of maintaining natural balance and the preservation of natural resources in the form of mind maps.
2. After discussion, students are able to carry out activities to reflect on the habit of loving the environment and maintain the balance and sustainability of natural resources completely.

Utilization of technology and its impact on Natural Resources

Core Competencies**:**

1. Accepting, appreciating, and living the teachings of the religion it adheres to
2. Have honest behavior, discipline, responsibility, courtesy, care, and confidence in interacting with family, friends, teachers and neighbors.

3. Understand factual knowledge by observing (hearing, seeing, reading) and questioning it based on curiosity about himself, God's creatures and their activities, and the objects he encounters at home and at school, and playgrounds
4. Presenting factual knowledge in clear, logical and systematic language, in aesthetic works, in movements that reflect healthy children, and in actions that reflect the behavior of children of faith and noble character.

Basic Competencies

1. Understand the importance of efforts to balance and preserve natural resources in their environment.
2. Carry out activities to conserve natural resources with people in their environment.

Indicators

1. Identify the importance of natural balance and the preservation of natural resources **.**
2. Provide examples of activities to preserve natural resources**.**

Learning Objectives

1. After discussion, students are able to inform the importance of maintaining natural balance and the preservation of natural resources in the form of mind maps.
2. After discussion, students are able to carry out activities that can maintain the balance and sustainability of natural resources completely.

Matter 5: Properties of Light

Core Competencies:

1. Accepting, appreciating, and living the teachings of the religion it adheres to
2. Have honest behavior, discipline, responsibility, courtesy, care, and confidence in interacting with family, friends, teachers and neighbors.
3. Understand factual knowledge by observing (hearing, seeing, reading) and questioning it based on curiosity about himself, God's creatures and their activities, and the objects he encounters at home and at school, and playgrounds
4. Presenting factual knowledge in clear, logical and systematic language, in aesthetic works, in movements that reflect healthy children, and in actions that reflect the behavior of children of faith and noble character.

Basic Compatibility

1. Understanding the properties of light and its interrelationships with the sense of sight
2. Presenting reports of observations and / or experiments that utilize the properties of light

Indicators

1. Identify the properties of light and its interrelationship with the sense of sight in everyday life.
2. Report the results of experiments that utilize the properties of light in written form.

Learning Objectives

1. After conducting experiments on light , students are able to correctly deduce the properties of light and its relationship with vision.
2. After conducting experiments on light, students are able to write a report on the nature of light and its relationship to vision in detail and correctly.

Analysis of Student Characteristics

The student characteristics analysis stage is a stage of activity carried out to determine the characteristics of students who will be used as subjects in research as a basis for compiling modules to be developed. It is hoped that modules that are in accordance with the characteristics and development of students can stimulate and motivate them to learn so that they can improve student learning outcomes. Grade IV elementary school students ranging in age between 9-10 years are at the stage of concrete operational cognitive development, namely in the phase where mental activity is focused on real objects or on various kinds of events that have been experienced in general, learning in grade IV SD Negeri Unggulan students follow learning activities quite well, learning activities using lecture methods so that students become passive and less active, Furthermore, the teacher gives assignments to students to do the practice questions contained in the package book.

Based on the results of observations in grade IV of SD Negeri Unggulan, stimulation is needed to increase student activity in participating in learning, one of which is through learning modules that are able to guide and motivate students to be active and enthusiastic about learning both independently and with teachers. Science learning modules based on *multiple intellegences* to improve *higher order thinking skills* are expected to be able to increase learning activities so as to improve student learning outcomes.

Design Stage

The development of multiple *intelligence-based* science learning modules begins with making an initial product (*protype*) which is the initial design of the grade IV Elementary School science learning module product to be developed. There are 4 activities at this design stage, namely; preparation of module frameworks, selection of references, preparation of designs and preparation of learning module assessment instruments. The results of the design / design of science learning modules based on *multiple intellegences are described* as follows:

1) Preparation of learning module framework

In compiling the learning module framework, it refers to the syllabus that already exists at SDN Unggulan. The science learning module based on *multiple intellegences* consists of three parts, namely; beginning, content and end. The initial part contains the cover, foreword, instructions for use of the module, dafftar of the contents. The content section consists of chapter titles, core competencies, basic competencies, indicators, introductions, learning objectives, reading materials, assignments, summaries. The final section contains an evaluation and a bibliography.

Module Eligibility

The preparation of learning modules consists of the beginning, content and end parts. Display The design of the initial part of the learning module is as follows:

a) Cover

The cover of a *multiple intellegences-based* science learning module consists of a front cover and a back cover. The front cover contains the module title which is a Multiple Intellegences-Based Science Learning Module, author, student book, illustration of pictures of vegetables and fruits, pictures of birds and children's images, module identity, light green *full color* design, while the color of the back cover is adjusted to the front cover with pictures of mountain scenery A good and attractive cover design is expected to attract students to learn the materials presented in the science learning module, the following is a display of the cover of the science learning module,

Figure 1. Front and back cover views

b) Module Usage Instructions

Instructions for using the module contains instructions for each learning activity and describes the development of compound intelligence to be developed in each phase of learning, here is a display of instructions for using the module,

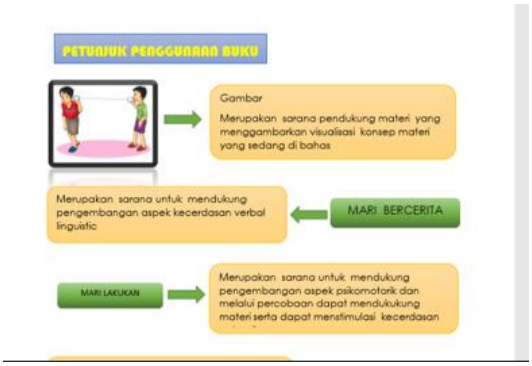

Figure 2. Instructions for using the book

The systematics of this module contains the title in each chapter, core competencies, basic competencies, indicators, introduction to learning, learning objectives, reading materials, assignments, summaries, evaluations, bibliography. At this stage of product development, *multiple intelligence* analysis is carried out to be connected with science learning materials that are in accordance with the level of development and ability of grade IV students. multiple *intelligences* developed in this science module include

a) Let's observe is a means to support spatial visual development

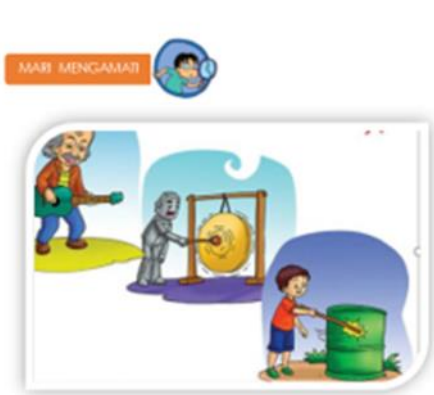

Figure 3. Let's Observe View

b) Let's sing is a means to support the development of musical intelligence

Figure 4. Let's Sing View

c) Let's be creative is a means to support the development of psychomotor/ kinesthetic intelligence.

Figure 5. Let's Get Creative

3. *Development* Phase

The *Development* stage aims to determine the feasibility of the learning module that has been designed. After an eligibility assessment, the learning module is revised according to suggestions and input from expert validators. Validation of *multiple intelligence-based* science modules was carried out by 12 experts, namely 3 linguists, 3 learning design experts, 3 material experts and 3 media experts and practitioners (teachers). Validation is carried out aimed at determining the quality and feasibility of the module, the assessment score is converted into five categories of the liket score scale 1. Not good/irrelevant, score 2 less good/less relevant, score 3 good enough/moderately relevant, score 4 good/relevant, score 5 excellent/very relevant.

a) Material expert assessment

Assessment by material experts aims to find out the quality of the material presented in the module, ahlli assessment of the material is carried out by Dr.agr. Asep Ginanjar Arip, M.Si Kuningan University, Dr Rifat Showatul Anam, M.Pd, STKIP Sebelas April, Dr (C) Yogi Kuncoro Adi, M.Pd IAIN Salatiga. The results of the assessment of the science mudul can be seen in the appendix

Table 9. Vaalidation 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

Assesment 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 a eligible percentage of 83.80% included in the category is very eligible.

b) Linguist assesment

The assessment of linguists was carried out by Prof. Dr. Kosadi Hidayat, M.Pd Kuningan University, Dr Salam, M.Pd Gorontalo State University, Dr Evi Chalamah, M.Pd Sultan Agung Islamic University, the purpose of the language expert assessment is to find out the readability of information, the suitability of the language used with the level of student development, the effectiveness of sentence structure. The results of the IPA module assessment can be seen in the appendix

Table. 10 . Linguist Validation

No	Assessment aspects	Validators			Average	Percentage	Conclusion
		1	2	3			
1	Language	4.50	4.71	4.71	4.64	92.80	Very Eligible[RV9]

The assesment based on language eligibility aspects received an average score of 4.64 out of a total scale of 5, and with a percentage of eligibility of 92.80% it was included in the category of highly feasible

c). Assesment of learning design experts

The assessment of learning design experts is carried out to determine the feasibility of modules based on aspects of learning design, the assessment of learning design experts is carried out by Dr. Yeyen Suryani, M.Pd, Kuningan University, Dr. Ryan Dwi Puspita, M.Pd, IKIP Siliwangi, Dr. Sarnelly, M.Pd, Haluoleo University, the results of the assesment can be seen in the appendix.

Table 11 . Design Expert Validation

No	Assessment aspects	Validators			Average	Percentage	Conclusion
		1	2	3			
1	Eligibility of Learning Design	4.54	4.38	4.04	4.32	86.40	Very Eligible

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

d) Expert assessment of Learning media

Assessment by learning media experts is carried out to determine the quality of multiple intellgenece-based science learning modules in elementary schools. The assessment was conducted by Dr.. Zaenal Abidin, M.Si Kuningan University. Dr Badrully Martati, M.Pd, Muhammadiyah Saurabaya University. Joko Sulistianto, M.PD PGRI Semarang University. The results of the assessment of the science learning module can be seen in the appendix.

Table 12 Media Expert Validation

No	Assessment aspects	Validators			Average	Percentage	Conclusion
		1	2	3			
1	Eligibility of Learning Media	4.81	4.00	4.27	4.36	87.70	Very Eligible

Assessment of *multiple intelligence-based* science learning modules based on aspects of learning media service, getting an average score of 4.36, with an eligibility percentage value of 87.70% is included in the very feasible category.

e) Grade IV Teacher Assessment

Module assessment by the teacher, namely by Mrs. Enok Elin Seftiani, M.Pd, as a grade IV teacher at SDN Unggulan. The results of the assessment can be seen in the appendix. 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

4. Implementation Stage (*Implementation*)

The fourth stage of the ADDIE development model is the implementation stage after being declared feasible by expert validators, science learning modules are used in the classroom. In the implementation stage, the learning was attended by 22 students divided into 5 learning groups due to the Covid-19 pandemic situation and online meetings were held using the zoom application and direct learning at students' homes. on a limited basis.

5. *Evaluation* Stage

At this stage of evaluation, researchers only conduct formative evaluations because evaluation activities at this stage are closely related to the stages of research and development, namely to improve the results of development products. At this stage, we carry out evaluation activities based on two data obtained, namely from student responses by using student response questionnaires to science learning modules and implementation results used to improve the development of science learning modules. This activity is carried out in order to produce a more feasible science learning module product.

After a validation assessment by a team of experts, then the science learning module in field trials to determine the effectiveness of the module. Field trials are carried out if they have been declared feasible or have received proper recommendations from experts that the module can be used, the meaning of the

effectiveness of the evaluation results in the field can be seen from the expediency of the module developed based on two aspects, namely; 1) aspects of student response, 2) aspects of learning outcomes tests.

a) Small group evaluation
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. The instrument for student response to the module is in the form of a questionnaire with a score assessment with a likert scale from 1 to 5, with an assessment criteria of 1 = Very poor 2 = Poor 3 = Average 4 = Good , 5 = Excellent

Table 13 Assessment of Science Modules by Students

No	Assessed aspects	Value Flat	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
	Sum	12.35	226.35
	Average	4.18	82.34

Based on table 13 the results of students' assessment of the science module still need improvement and 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.

b) 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 (pre test) and the final test (post test) 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.
a) Student learning outcomes analyst
Based on the results of the pre-test and post test, the learning results using the *multiple intelligence-based* science learning module for 22 grade IV students of SDN Unggulan showed that the lowest pre-test score was 60 and the highest score was 76, while for the test post score the lowest score was 75 and the highest score was 100. From these results, it can be concluded that all students or 22 students have test questions used for pre-test and post-test are multiple choices, totaling to meet the minimum completion criteria of 75, if you look at the comparison between pretest and posttest scores, it can be seen that there is an increase in learning outcomes.
b) Pretest and posttest data analysis
Pretest and posttest result data are then calculated with *paired sample t test*
By using SPSS 22 software for windows. To find out whether there are differences in learning outcomes before and after learning using a *multiple intelligence-based* science module.
1) Normality Test
The normality test is used to determine the distribution of normally distributed data or not the data to be analyzed. Normality test is used to test student pretest and posttest result data, normality test using Shapiro wilk with criteria if the significance of the calculation result is > 0.05 then it can be concluded that normal distributed data can be seen in table 14

Table 14 Normality Test

Tests of Normality

		Kolmogorov-Smirnov[a]			Shapiro-Wilk		
Class		Statistics	Df	Sig.	Statistics	Df	Sig.
The Value of Learning	Control	.136	18	.200*	.950	18	.425
	Experiment	.210	22	.013	.928	22	.113

*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

Based on the data from the normality test output results show that the significance value of the control class pretest 0.425 and Experiment 0.113 is greater than 0.05, it can be concluded that the two data are normally distributed.

Table 15 Homogeneity Tests

Test of Homogeneity of Variance

		Levene Statistics	DF1	DF2	Sig.
Experiment test post	Based on Mean	2.212	1	38	.145
	Based on Median	2.189	1	38	.147
	Based on Median and with adjusted df	2.189	1	35.456	.148
	Based on trimmed mean	2.154	1	38	.150

Based on the data from the test output of the homogeneity of variance test shows that the significance based on the mean of the control class and experiment 0.145 is greater than 0.05, it can be concluded that the two data are homogeneous

2). Test the difference between two paired samples
The results of the paired samples can be seen in table 16

Table 16 Test Difference of two paired samples

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Pre test Experiments	71.32	22	6.722	1.433
	Experiment test post	85.68	22	6.792	1.448
Pair 2	Pre test Control	70.00	18	5.980	1.410
	Post Test Control	77.06	18	4.869	1.148

Based on the results of the test of differences in pairs the average value of student learning outcomes before using the multiple intelligence-based science learning module 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.

3). Test the difference in the relationship of two paired samples

The relationship between learning outcomes before and after using *multiple intelligence-based* science learning modules can be seen in table 17

Table 17 Relationship of learning outcomes before and after using science learning modules

Paired Samples Correlations

		N	Correlation	Sig.
Pair 1	Pre test Experiment & Post test Experiment	22	.533	.011
Pair 2	Pre test Control & Post Test Control	18	.404	.096

Based on the results of the pairwise sample correlation test, it shows that the experimental class correlation between pretes and posttests has a positive rating score of 0.533 high rating between pretes and postes and there is a significant relationship because the significance value is 0.011 < Sig 0.05. as for the control class, it showed that between the pretest and postes scores had a positive rating score of 0.404 and there was no significant relationship because the significance value was 0.096 > 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.*

4) Test the Hypothesis

The hypotheses proposed are:

Ho: There is no difference in student learning outcomes after using multiple intelligence-based science learning modules

H1: There are differences in student learning outcomes after using science learning modules based on multiple intelligences

Table 18 Hypothesis Test

Paired Samples Test

		Paired Differences					t	Df	Sig. (2-tailed)
					95% Confidence Interval of the Difference				
		Mean	Std. Deviation	Std. Error Mean	Lower	Upper			
Pair 1	Pre test Experiment - Experiment test post	-14.364	6.529	1.392	-17.258	-11.469	-10.319	21	.000
Pair 2	Pre test Control - Pos test Control	-7.056	5.995	1.413	-10.037	-4.074	-4.993	17	.000

Based on the results of the hypothesis test, the significance value (2 taled) is 0.00 so that the results of the initial test (pretest) and final test (post test) 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* . with a significance of 0.00, because the significance value is smaller (< 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.

5) Data analysis of postest results

a. Postest Normality Test

Table 19 Normality Test of Postes Values

Tests of Normality

		Kolmogorov-Smirnov[a]			Shapiro-Wilk		
Class		Statistics	Df	Sig.	Statistics	Df	Sig.
Science Learning Outcomes	Control Class	.162	18	.200*	.941	18	.298
	Experimental Class	.162	22	.137	.892	22	.020

*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

Based on the results of the normality test of postes values presented in table 19 in the Kolmogorov-smirnov column, it shows that both the postes value of the significance of the control class 0.200 and the experimental class of 0.137 are greater than 0.05 meaning that the two postes value data are normally distributed

b) Postes Homogeneity Test

Table 20 Homogeneity Test posttes

Test of Homogeneity of Variance

		Levene Statistics	DF1	DF2	Sig.
Science Learning Outcomes	Based on Mean	2.212	1	38	.145
	Based on Median	2.189	1	38	.147
	Based on Median and with adjusted df	2.189	1	35.456	.148
	Based on trimmed mean	2.154	1	38	.150

The homogeneity test out put data presented in table 20 that the base on mean significance value for the student learning outcome value of 0.145 is greater than 0.05 which means that the variance value of student learning outcomes between the experimental class and the control class is homogeneous

c) Independent Test of postes value

Table 21 Groups of statistics

Group Statistics

	Class	N	Mean	Std. Deviation	Std. Error Mean
Science Learning Outcomes	Control Class	18	77.0556	4.86853	1.14752
	Experimental Class	22	85.6818	6.79206	1.44807

Based on the *out put group statistics* table of postes result data for the control class with 18 students and for the experimental class of 22 students, the average score of the postes results of the control class was 77.05 and for the experimental class was 85.68 thus descriptively startistically it can be concluded that

there is a difference in the average posttest results between the control class and the experimental class. Furthermore, to prove the difference is significant or not, an independent sample test is carried out.

Table 22 Independent Test sample test Postes Values

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	Df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Science Learning Outcomes	Equal variances assumed	2.212	.145	-4.518	38	.000	-8.626	1.909	-12.492	-4.761
	Equal variances not assumed			-4.669	37.425	.000	-8.626	1.847	-12.368	-4.884

Based on the out put value, 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 out put *independent sample test* based on the values contained in the *equal variances assumed.*

Based on the results of the independent *sample* test for postes results as presented in the table above, 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 Ho is rejected and Ha is accepted thus that there is a significant difference in postes results between the control class and the experimental class.

5) Teacher's Response to Science Module

Data on the analysis of teacher responses to multiple intelligence-based science learning modules using questionnaires with liketr scale assessments (grades 1 to 5) 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 muntiple intelligence-based science learning module can be seen in the following table 23

Table 23 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 the assessment of teacher responses to multiple intelligence-based science learning modules, it is seen from the aspects of material content, learning, design, language, illustrations including good categories.

6) Student response to the Science Module

The results of student response analysis data to multiple intelligence-based science learning modules using questionnaires and liketr scale assessments (grades 1 to 5) 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 muntiple intelligence-based science learning module can be seen in table 24 below:

Table 24 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.

7) 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 25

Table 25 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 25 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)

Table 26 Control Class Student Learning Outcomes

Value Interval	Before using the package book		After using the package book	
	Number of students	percentage	Number of students	percentage
60-65	3	16.67	0	0.00
66-71	6	33.33	3	16.67
72-77	6	33.33	8	44.44
78-83	3	16.67	6	33.33
84-89	0	0.00	1	5.56
90-95	0	0.00	0	0.0
96-100	0	0.00	0	0.0
	18	100.00	18	100.0

F. Discussion[RV10]

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 (Fitria & Idriyeni, 2017). 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 (Amir, 2020), in line with these materials (Nurlela, Sumantri, & Bachtiar, 2018), 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.

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, Zulela, & Sumantri, 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*), Sharon, Smaldino in(Syofyan, 2018).

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 pretest and postest where the average postest 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. (Ferrero, Vadillo, & León, 2021). 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 " (Rita C Rechey and James D Klien, 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 evalution. Furthermore, Perkins' opinion as quoted by Reigiluth (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 (Gani, 2016), 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 (Iskandar, 2018) 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.

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 intellegences* 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 (Nurdyansyah & Mutala'liah, 2015), explaining that teaching materials are useful in assisting teachers in carrying out learning. 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, (Rozhana Meth & Moh. Farid Nurul Anwar, 2022), 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 (Kusumaningtias & Kurniawan, 2014) that the development of teaching materials in the form of multiple intelligence-based handouts can improve students' critical thinking skills.

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 (Mediartika & Aznam, 2018)

In line with this opinion (Nurbaeti, 2019), 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.

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. (Suwanto & Azrina, 2021)

The development of science learning modules has several advantages, including 1) Aspects of material description, in each chapter the material has been described broadly and in detail on concepts, theories and facts, so that students can easily understand and can learn independently. 2) Aspects of material accuracy, in full the material presented is equipped with examples, concepts and theoretical development accompanied by the presentation of illustrations and visualizations with clear images, so that students can understand the material examples concretely. 3) Aspects of completeness of presentation, fully presented instructions for the use of modules, core competencies, basic competencies, learning indicators and objectives, detailed material reading materials, practice questions tasks, which can stimulate plural intelligence and high-level thinking ability, summaries and bibliography. 4) The science module material presented can encourage curiosity 5) The IPA module has a fairly high readability.

As for the science learning module based on *multiple intellegences* that has been developed, there are still several things that need to be improved and refined. However, after implementing some improvements, revisions and improvements, the module has become better. Some of the drawbacks in this module are; a) There are some images that are not clear to observe, have been corrected so that it is clear that the image is to be observed, b) there is unclear writing due to inappropriate color composition, has been corrected and perfected so that the writing appears clear. c) there are no clues to do the practice questions, it has been corrected before the practice questions there are instructions for working on the practice questions.d) Aspects of drawing, graphic and layout design are still not good due to the limited ability of the researcher.

Conclusion[RV11]

The research and development process that has been carried out produces science learning modules based on multiple intelligences, printing through several stages, namely; establish material, identify core competencies and basic competencies, indicators, learning objectives, preparation of teaching materials and validate to material experts, linguists, media experts and learning design experts. the development process using the ADDIE development model, namely *Analyze, Design, Development, Implementation* and *evaluation*, the resulting modules are included in the categories both from material aspects, language aspects, design aspects and media aspects excellent categories

The science learning module based on multiple intellegences 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 intellegences* 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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Developing of Science Teaching Materials Based on Multiple Intelligences

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ABSTRAK

Masalah dalam penelitian ini adalah belum adanya bahan ajar IPA berbasis multiple intellegences serta rendahnya hasil belajar IPA, Penelitian ini bertujuan untuk menghasilkan bahan ajar IPA berbasis multiple intellegences yang layak. serta mengetahui keefektifan bahan ajar IPA berbasis multiple intellegences, jenis penelitian ini adalah penelitian pengembangan yang mengacu kepada model pengembangan ADDIE terdiri dari lima tahap yaitu Analyze, Design, Development, Implementation, Evaluation. 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 didi oleh siswa kelas IV. Data yang terkuml dari hasil angket dianalisis dengan teknik analisis deskripsi kuantitatif. Hasil penelitian menunjukkan; 1) hasil validasi ahli materi termasuk kategori sangat layak 89.67 % 2) Validasi ahli desain pembelajaran kategori sangat layak,91 % 3) hasil validasi guru termasuk kategori layak 79.20 %
Berdasarkan hasil uji coba terbatas bahan ajar IPA berbasiss kecerdasan jamak menurut pendapat guru dan siswa layak digunakan untuk pembelajaran di kelas IV maupun pembelajaran secara mandiri

ABSTRACT

The problem in this study is that there are no science teaching materials based on multiple intelligences and the low science learning outcomes. This study aims to produce appropriate multiple intelligences-based science teaching materials. as well as knowing the effectiveness of science teaching materials based on multiple intelligences, this type of research is development research which refers to the ADDIE development model which consists of five stages namely Analysis, Design, Development, Implementation, Evaluation. The research instrument used was a questionnaire in the form of validity and practicality sheets, the validation sheet was filled in by material experts and learning design experts as well as teachers, while the effectiveness test was carried out by fourth grade students. The data collected from the results of the questionnaire were analyzed using quantitative descriptive analysis techniques. The research results show; 1) the results of validation by material experts in the very feasible category 89.67% 2) the validation of learning design experts in the very feasible category 91% 3) the results of teacher validation in the feasible category 79.20%
Based on the results of limited trials of multi-intelligence-based science teaching materials, in the opinion of teachers and students, it is appropriate for learning in class IV and for independent learning.

1. INTRODUCTION[RV1]

Education is a human creative effort in guiding and helping develop the potential of students in a planned and continuous manner as a vehicle for the formation of very basic skills intellectually, spiritually and emotionally towards the realization of a complete personality. education is a human creative effort in guiding and helping develop the potential of students in a planned and continuous manner as a vehicle for ordering very basic, spiritual and emotional skills towards the realization of a complete personality. This potential will emerge and develop optimally through appropriate, integrated and 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. intelligence is the human ability to create

problems and solve them. The key of multiple intelligences theory is that all human beings have eight intelligences that are independent each other with varying degrees (Winarti, Yuanita, & Nur, 2019), individuals rely on these intelligences independently and collectively to make things, produce behaviors, and resolve issues that apply to the communities where they live (Al-Qatawneh, Alsalhi, Eltahir, & Siddig, 2021). Multiple intelligences is 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 . (Indria, 2020)

Every intelligence possessed by children will appear to be seen at certain times according to their developmental stages as made by Piaget in (Hermita, 2017), 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.

Through education also students can interact with the environment to develop the abilities that exist in him. This ability can be in the form of cognitive abilities that hone knowledge, affective abilities to hone the sensitivity of feelings, and psychomotor abilities, namely the ability to do something. Through these three abilities a student is expected to be able to become an individual who is ready to enter the world outside of school.(Acesta, Sumantri, & Fahrurrozi, 2020b), As an educational institution with a strategic role, schools should ideally be able to accommodate every form of intelligence of their students. Therefore, every learning activity in schools must be directed to develop the potential of their students through activities that effectively also refer to multiple intelligences.(Husna, 2020) One of the most basic problems in the scope of our education is the problem of the weakness of the learning process. Learning is a communication process between teachers, students, and teaching materials.

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(Díaz-Posada, Varela-Londoño, & Rodríguez-Burgos, 2017)

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 subcompetence 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 (Murni & Ruqoyyah, 2020). 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.

(Rofiah, Aminah, & Widha, 2018) 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, Sumantri, & Fahrurrozi, 2020a)

Multilple intellgences . In his theory, Gardner states that each individual has eight types of intelligence in his personality, those are (1) verbal-linguistics, (2) logical-mathematical, (3) visual-spatial, (4) musical-rhythmic (musical smart), (5) intrapersonal, (6) interpersonal, (7) naturalists, and (8) physical-kinesthetic. (Dewi & Martini, 2020). in line with(Marenus, 2020). Multiple intelligences theory states that everyone has all eight intelligences at varying degrees of proficiency and an individual's learning style is unrelated to the areas in which they are the most intelligent. For example, someone with linguistic intelligence may not necessarily learn best through writing and reading. Classifying students by their learning styles or intelligences alone may limit their potential for learning.

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.

2. METHOD[RV2]

The type of research in this research is development research. The resulting product is an IPA module based on multiple intelligences. The development design in this study was adapted from the ADDIE development model (Analysis, Design, Develop, Implement and Evaluate),(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,

Module development steps

1. Analysis[RV3]

At this stage of the analysis, the activities carried out are; a) analyze the competencies that must be mastered by students, which will be outlined in the module, namely core competencies, basic competencies, and learning objectives. b) analyze the materials that will be the subject matter related to the competencies to be achieved, c) analyze the characteristics of students related to the knowledge, attitudes and skills they already have.

2. Design

At the design stage or design stage, the activities carried out are; steps in compiling a science learning module, so that the resulting module is in accordance with the rules, it must meet several components in compiling the module including:

Step 1 . Conducting Module Needs Analysis

At this stage, it is the initial process carried out to compile teaching materials. In the analysis of the need for teaching materials, there are three stages, namely; The stages of analysis of teaching material needs consist of: analysis of the curriculum, analysis of learning resources, and determination of the type and title of teaching materials.

Analyzing the Curriculum

This first step is to determine the competencies required for teaching materials. a) Competency Standards, are the minimum ability qualifications of students who describe the mastery of knowledge, attitudes, and skills that are expected to be achieved at each level. Competency standards consist of several basic competencies as a standard reference that must be met and apply nationally. b) Basic Competencies, Basic competencies are a number of abilities that learners must have in subjects as a reference for compiling competency indicators. c) Indicators of achievement of learning outcomes, namely the formulation of specific competencies, which can be used as a reference for assessment criteria in determining whether or not students are competent. d). Subject matter,. The subject matter is a number of main information containing knowledge, skills, value references arranged in such a way by educators so that students master the competencies that have been set. The subject matter is one of the main references in compiling the

content of teaching materials. e) Learning experience, learning experience is an activity designed so that students master the competencies that have been determined through the learning activities held.

Learning Resource Analysis

After conducting a curriculum analysis, the next step in analyzing the needs of learning resources, the criteria for analyzing these learning resources are carried out based on the suitability, availability, and ease of utilizing them. The way to analyze learning resources is to inventory the availability of learning resources that are associated with needs. a) Availability criteria, b). Conformity Criteria c). Convenience Criteria

Selecting and Determining Teaching Materials

The third step in the analysis of teaching material needs is to select and determine teaching materials. This step aims to meet one of the criteria that teaching materials must be interesting and can help learners to achieve competence.

Step 2: Compiling a Map of Teaching Materials

After the teaching material needs analysis process is complete, the next step in making and compiling modules, the next step is to compile a module needs map, there are at least three uses for compiling a map of teaching material needs. The uses of compiling a map of teaching materials are: a) being able to find out the number of teaching materials that must be written, b) being able to know the order of the contents of the module c). Can determine module properties

Step 3: Creating the Structure of Teaching Materials

The third step in module creation is to create a module structure. consists of seven components, namely title, study instructions, basic competencies or subject matter, supporting information, exercises, work tasks or steps, and assessments. The arrangement of parts is then combined, so that it becomes a whole building that deserves to be called teaching material.

3. Development

   At the stage of development the activity carried out is; a) search for various sources as material for enrichment and deepening of the material, b) creation of drawings, charts and illustrations, c) editing and layout modules. Furthermore, the product draft that has been compiled will be validated by linguists, material experts, learning design experts, learning media experts and practitioners (teachers). If the results of expert validation of the product draft are still not feasible, they will be revised according to the advice and input from experts.

4. Implementation

   At the implementation stage, it is to carry out a trial of a science learning module based on multiple intellegences to teachers to be applied in class IV SDN Unggulan Cikaso Village, Kramat Mulya District, Kuningan Regency, the material delivered is in accordance with the module that has been developed. At the implementation stage the goal is to find out the quality of the module, the effectiveness of the module in learning. The application of the trial in small groups was carried out on 6 students with different abilities, consisting of 2 high-ability students, 2 medium-ability students and 2 lace ability students. After the multiple intellegeneces-based science learning module is carried out, students are then given a questionnaire in the form of a practicality sheet which aims to find out the student's response to the module from the aspects of convenience, attractiveness of presentation and benefits. If the module is included in the good category if it is in accordance with the criteria that have been set. If not, improvements will be made in accordance with the respondents' suggestions and comments. This trial aims to get feedback from students as material for improving the module draft, before the next stage of trial, comments and suggestions obtained through questionnaires, this stage of trial is a product feasibility trial. Furthermore, a limited field trial was carried out on 22 students, this limited field trial was carried out to determine the effectiveness of a science learning module based on multiple intelligences.

5. Evaluation

   The evaluation stage is the last activity in the module development process, evaluation is carried out in the form of formative evaluation, namely evaluation carried out after each learning (weekly evaluation) data used for improvement at each stage and summative evaluation is an evaluation at the end of the program the data obtained is used to determine the influence of learning outcomes and the quality of student learning.

Module Evaluation and Revision Validation

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. For evaluations conducted with small group trials and field trials on a limited basis, this final

evaluation aims to determine the feasibility of the module theoretically and empirically so that it can be further piloted to a wider and larger respondent.the following is a detailed explanation:

1) Expert Validation

Validation and evaluation in the development of science learning modules based on *multiple intelligences*, which involve expert validators, namely material experts aiming to validate the accuracy of the content or content of the material, conformity with the core competencies and basic competencies of the science learning module to be developed, linguists validate from linguistic, communicative, straightforward, readability of messages and sentences effectively, learning design experts validate the appropriateness of the evaluation and exercises, adequacy of time allocation, variation in material concept delivery and learning media experts validate module appearance, letter suitability, color composition and module illustrations. The review carried out is a theoretical feasibility test, 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 following instruments:

Table 1. Instrument Grids for Material Experts

No	Assessment Aspects	Assessment Indicators	No Item
I	Eligibility of Contents	Suitability of Material with KI and KD	1,2,3
		Accuracy of the material	4,5,6,7,8,9,10,11,12,13
		Supporting Learning materials	14,15,16,17,18,19,
		Material Update	20,21,22,23,
II	Eligibility of Presentation	Serving Techniques	1
		Serving supporters	2
		Presentation of Learning	3,4
		Completeness of presentation	5,6,7

Source: modifications (Syofyan, 2019)

Table 2. Instrument Grids for Linguists

No	Assessment Aspects	Assessment Indicators	No Item
1	Language	Businesslike	1,2,3
		Communicative	4,5
		Dialogic and Interactive	6,7
		Compliance with the level of development of learners	8,9,10
		The collapse and cohesiveness of the train of thought	11, 12
		Use of the term symbol and icon	1314

Table 3. Instrument Grids for Media Experts

No	Assessment Aspects	Assessment Indicators	No Item
1	Module Graphics	Display Components	1.2
		Use of font variations (types and sizes)	3
		Layout and layout	4
		Illustrations, drawings and photos	5
		Display design	6
		Cover according to the contents of the module	7
		Use of Illustrative colors in modules	8
2	Linguistics	Readability of text or writing	9
		Clarity of information	10
		Effective and efficient use of language	11

Table 4. Instrument Grids for Design Experts

No	Assessment Aspects	Assessment Indicators	No Item
1	Eligibility of Materials	Module systematics	1
		Clarity of formulation of learning objectives	2
		Variations in the delivery of concepts / teaching materials	3
		Relevance of the material to the learning objectives	4
2	Eligibility of Presentation	Compatibility of the example with the discussion of the material	5
		The suitability of the material to the abilities of the student	6
		Accuracy of exercises/tasks with the material	7
		Adequacy of time to study the material	8
		Adequacy of material materials to achieve competence	9
3	Methods and evaluation	Compliance with the method used	10
		Compatibility with student catractism	11
		Evaluation suitability (tasks and exercises)	12
		Conclusion	13

Table 5. Teacher Response Instruments to Science Modules

No	Category		Indicators	Item number
1	Aspects of Material Content	1.	Suitability of the material to the 2013 Curriculum	1
		2.	Accuracy in formulating learning indicators	2
		3.	Ease of understanding the instructions for use of the book	3
		4.	Accuracy of language use in the delivery of material	4
		5.	The conformity of the material presented with the truth of science	5
		6.	Material compatibility with the development of Multiple Intellegences	6
		7.	Images and examples according to the learning material	7
		8	Suitability of evaluation with learning material	8
		9	The suitability of the summary with the content of the book	9
		10	Compatibility of the answer key to the question	10
2.	Learning Aspects	11	Completeness and systemicity of the order of presentation of the material	11

		12	Task compatibility with the demands of student-centered learning	12
3	Design Aspects	13	Suitability of teaching material cover design	13
		14	Shape and size of teaching materials	14
		15	Selection of paper types for printing teaching materials	15
		16	Tidiness and resilience in binding teaching materials	16
4	Language Aspects	17	Suitability of language use to student characteristics	17
		18	Conformity of terms used in teaching materials	18
		19	Clarity of use of sentence structure	19
		20	Readability level	20
5	Illustration Aspects	21	Accuracy of use of illustrations with the material	21
		22	Clarity of Illustration with material	22
		23	Color composition according to the writing and characteristics of students	23
		24	Clarity of the image used	24
		25	Conformity of illustrations with multiple intellegences	25

Table 6. Student Response Instruments to Science Modules

No	Statement	No Item
A	**Aspects of Ease of Use**	
1.	The use of modules in learning can save time efficiently	1
2.	The material inside the module is easy for me to understand	2
3.	The presentation of the material in the module is more practical and I can learn it repeatedly	3
4.	The description of the material and exercises present in the module is clear and simple	4
5.	The language used on the module is easy for me to understand	5
6.	Practical and easy module I carry because it can be stored	6
7.	I can self-study according to my learning ability	7
B	**Aspects of Serving Attractiveness**	
1.	The design of the presentation display of the module is attractive to look at	1
2.	The content of the material in the textbook is supplemented with illustrations, drawings, photos that match the material	2
3.	I can clearly read the writing on the module	3
4.	The color combinations used in the module are already interesting	4
C	**Benefit Aspects**	
1.	Modules help me in understanding the science material	1
2.	The module can replace my notes.	2
3.	Modules help me in connecting the material learned with everyday life.	3
4.	Modules can help my knowledge/memory and the refinement of the material I learn.	4
5.	I can use the module anywhere and anytime	5
6.	Modules make me become active in science learning	6
7.	Modules can motivate me in learning	7

8.	Modules can add to my insights in science materials	8

Data Analysis Techniques

Validation Questionnaire data analysis

The data analysis used in this study is a qualitative and quantitative descriptive stratistic analysis technique. Qualitative data is obtained from the results of inputs and suggestions during the activities of field trials while quantitative data is obtained from the results of the validation assessment questionnaire of experts, teachers and students. The data on the results obtained using a likert scale with a scale of 5, namely ; 1. Very poor, 2. Poor, 3. Average, 4. Good, 5. Excellent.

Based on the value of the scale, it then determines the average value of the interval range of aspects assessed by using the formula:

$$P = \frac{m-n}{N}$$

P = Scale Value
m = largest value
n = smallest value
N = number of answer choices

Based on the calculation of the formula, it is then converted into a descriptive value as presented in table 7

Table 7. Interpretation of grade assessment criteria

Score range	Criteria
4.6 – 5	Excellent
3.7 – 4.5	Good
2.8 – 3.6	Average
1.9 – 2.7	Poor
1 - 1.8	Very poor

Furthermore, calculating the percentage of feasibility based on the data of the scale range, the researcher determines the average of each validator by calculating each aspect assessed using the following formula:

$$P = \frac{\sum X}{} \times 100$$

P = Presentation of scores for each criterion
∑X = number of answers for each criterion
N = maximum score for each criterion

Based on the calculation of the formula, the values are then converted into inevitability data as in the following table:

Table 8. Interpretation of Eligibility criteria

Value Scale (%)	Eligibility Level
81-100	Very Eligible
61- 80	Eligible
41-60	Quite feasible
21-40	Inadequate
0-20	Not feasible

If from the results of the analysis of the assessment of the opinions of material experts, design experts, experts, linguists and media experts and teachers get a category assessment ranging from cuku to very good, then the science module based on *multiple intellgences* is feasible and can be used. However, if the results of the expert opinion assessment have not met the criteria Very good and good, then the science

module based on *multiple intellgences* then the module must be improved or revised until it meets the criteria very well or well so that it is suitable for use by students

2) Effectiveness analysis

The effective meaning based on the Big Dictionary of Indonesian is that there is an effect, there is an influence, there is a result. Meanwhile, Effectiveness is the level of achievement of predetermined goals, while practicality implies the ease of a test both in preparing, using, processing and interpreting. In this study, researchers applied the following criteria for effectiveness and practicality:

a) Student learning completion is at least 75% of the number of students who score ≥75.in improving learning outcomes.

b) Student learning outcomes show significant differences before and after using science learning modules based on *multiple intellegences*

3) Class data analysis

Class data analysis is obtained from the test results that have been given and then analyzed using the t test. The t test technique is a statistical technique used to test the significance of the difference between two averages. which comes from two distributions using SPSS.22 with criteria if the level of ≤ 0.05 then it can be concluded that there is a difference in student learning outcomes between before and after using the science learning module. If the significance level ≥ 0.05, it can be concluded that there is no difference in learning outcomes between before and after using the science learning module

3. RESULT AND DISCUSSION

Result[RV4]

This research uses the Research and Development (R&D) research method, the product developed is a science learning module based on *multiple intellegences* to improve the *higher order thinking skills* of elementary school students. The development model used refers to the ADDIE development model consisting of five stages, namely: *Analysis*, *Design*, *Development*, *Implementation*, *Evaluation*. The results of research and development are as follows:

Stage Analyze (Analysis)

The first stage of this study is Analysis. At this stage the researcher conducts a needs analysis, curriculum analysis, and analysis of student characteristics. The results obtained at this stage are as follows :

a. Needs Analysis

At the stage of implementing this needs analysis aims to find out how science learning activities at SDN Unggulan, at this stage the activities carried out by researchers are to make observations and distribute questionnaires. Based on the results of observations and the distribution of questionnaire filling given to 15 Grade IV students of SDN Unggulan, after recapitulation of the questionnaire results showed 86% of students had difficulty in following the learning process of science material, 60% stated that the handbook is currently difficult to learn, 93% of students revealed that they need teaching materials or other alternative modules, 86.67% need learning that can stimulate various intelligences. 80% of students need science learning that activates students to stimulate higher-order thinking skills.

Meanwhile, the distribution of questionnaires and interviews with grade IV teachers at SDN Unggul, which in essence teachers revealed that they often find difficulties in delivering some science learning materials, because in the current thematic handbook it is felt to be incomplete and in-depth, therefore teachers need teaching materials or modules that are more complete reviews of science materials, so that teachers can easily deliver all the learning materials of science content so that it can motivate and help students to follow the science learning process.

Based on the findings in the field, it can be concluded that it is necessary to develop teaching materials in the form of learning modules that can facilitate students and teachers to facilitate the implementation of science learning.

b. Curriculum Analysis

Curriculum analysis activities aim to formulate core competencies, basic competencies, indicators and learning objectives that have been implemented at SDN Unggulan. Based on the results of the analysis, the curriculum tools at SDN Unggulan that apply refer to the 2013 curriculum revision 2018 are as follows:

Material 1: Sound and Sense of Hearing

Core Competencies**:**

1. Accepting, appreciating, and living the teachings of the religion it adheres to
2. Have honest behavior, discipline, responsibility, courtesy, care, and confidence in interacting with family, friends, teachers and neighbors.

3. Understand factual knowledge by observing (hearing, seeing, reading) and questioning it based on curiosity about himself, God's creatures and their activities, and the objects he encounters at home and at school, and playgrounds
4. Presenting factual knowledge in clear, logical and systematic language, in aesthetic works, in movements that reflect healthy children, and in actions that reflect the behavior of children of faith and noble character.

Basic Competencies:

1. Applying the properties of sound and inequality with the sense of hearing
2. Present reports of observations and/or experiments on the properties of sound

Indicators:

1. Check the source of the surrounding sound completely
2. Correctly detects various sounds from nearby objects
3. Proving the various sound properties of surrounding objects
4. Analyze the nature of sounds related to the function of the ear as a hearing device
5. Present a report on the results of the experiment on the properties of sound

Learning Objectives

After participating in the learning, students are expected to be able to:

1 Describing the properties of sound
2 Explaining the sources of sound
3 After exploration, students are able to explain how to fully produce sounds from various nearby objects
4 After exploration and discussion, students are able to present observational reports on how to produce sounds from various objects around them systematically.
5 Conducting exploration activities using objects that can make sounds in the classroom and its surroundings
6 After exploration and discussion, students are able to present observational reports on how to produce sounds from various objects around them systematically.

Matter 2: Energy Source

Core Competencies:

1. Accepting, appreciating, and living the teachings of the religion it adheres to
2. Have honest behavior, discipline, responsibility, courtesy, care, and confidence in interacting with family, friends, teachers and neighbors.
3. Understand factual knowledge by observing (hearing, seeing, reading) and questioning it based on curiosity about himself, God's creatures and their activities, and the objects he encounters at home and at school, and playgrounds
4. Presenting factual knowledge in clear, logical and systematic language, in aesthetic works, in movements that reflect healthy children, and in actions that reflect the behavior of children of faith and noble character.

Basic Competencies**:**

1. Understand various energy sources, energy shape changes, and alternative energy sources (wind, water, solar, geothermal, organic fuels, and nuclear) in everyday life.
2. Present reports of the results of observations and tracing information about various changes in the shape of energy.

Indicators:

1. Analyze various energy sources in everyday life
2. Explain the benefits and sources of thermal energy in everyday life
3. Linking the changing form of energy from alternative energy sources
4. Combining the results of observation and tracing information about energy sources
5. Present a report of the results of observations on changes in the shape of energy.

Learning Objectives

After participating in the learning, students are expected to be able to:

1. Students are able to explain the benefits of solar energy in everyday life precisely.
2. After the experiment, students are able to present a report of the results of observations on changes in the form of solar energy in life systematically.
3. With discussion and problem solving, students are able to identify natural resources and their proper utilization.

Material 3 : Material 3 :Caring for Living Things

Core Competencies:

1. Accepting, appreciating, and living the teachings of the religion it adheres to

2. Have honest behavior, discipline, responsibility, courtesy, care, and confidence in interacting with family, friends, teachers and neighbors.
3. Understand factual knowledge by observing (hearing, seeing, reading) and questioning it based on curiosity about himself, God's creatures and their activities, and the objects he encounters at home and at school, and playgrounds
4. Presenting factual knowledge in clear, logical and systematic language, in aesthetic works, in movements that reflect healthy children, and in actions that reflect the behavior of children of faith and noble character.

Basic Competencies**:**

1. Understand the relationship between the shape and function of animal and plant body parts
2. Write a report on the results of observations on the shape and function of animal and plant body parts
3. Understand the importance of efforts to balance and preserve natural resources and the environment
4. Explain the activities of efforts to conserve natural resources with people in their environment

Indicators:

1. Explain the external shape (morphology) of the animal's body and its functions after observing the image.
2. Present a report on the results of observations on the shape and function of plant and animal parts
3. Identify problems with environmental balance problems
4. Carry out activities to conserve nature and balance the environment

Learning Objectives

After participating in the learning, students are expected to be able to:

1. With problem-solving discussions, students are able to identify environmental balance problems appropriately .
2. English Discussion of solving problems, students are able to identify environmental balance problems appropriately.
3. By observing the image, students are able to identify the characteristics of the highlands, lowlands, and beaches and the concentration of their natural resources for the welfare of the community appropriately.
4. By observing the picture, students are able to present information on the results of identifying the characteristics of the highlands, lowlands, and beaches as well as the systematic use of natural resources for the welfare of the community.

Material 4: Natural Resource Preservation

Core Competencies:

1. Accepting, appreciating, and living the teachings of the religion it adheres to
2. Have honest behavior, discipline, responsibility, courtesy, care, and confidence in interacting with family, friends, teachers and neighbors.
3. Understand factual knowledge by observing (hearing, seeing, reading) and questioning it based on curiosity about himself, God's creatures and their activities, and the objects he encounters at home and at school, and playgrounds
4. Presenting factual knowledge in clear, logical and systematic language, in aesthetic works, in movements that reflect healthy children, and in actions that reflect the behavior of children of faith and noble character.

Basic Competencies**:**

1. Understand the importance of efforts to balance and preserve natural resources and the environment.
2. Explaining activities to conserve natural resources with people in the environment

Indicators:

1. Explain the benefits of caring for and preserving natural resources and the environment
2. Identifying environmental balance problems.
3. Practice planting one plant seed in a polybag
4. Carrying out activities to care for and preserve natural resources and the environment

Learning Objectives

1.After discussion, students are able to explain the benefits of maintaining natural balance and the preservation of natural resources in the form of mind maps.
2. After discussion, students are able to carry out activities to reflect on the habit of loving the environment and maintain the balance and sustainability of natural resources completely.

Utilization of technology and its impact on Natural Resources

Core Competencies**:**

1. Accepting, appreciating, and living the teachings of the religion it adheres to
2. Have honest behavior, discipline, responsibility, courtesy, care, and confidence in interacting with family, friends, teachers and neighbors.

3. Understand factual knowledge by observing (hearing, seeing, reading) and questioning it based on curiosity about himself, God's creatures and their activities, and the objects he encounters at home and at school, and playgrounds
4. Presenting factual knowledge in clear, logical and systematic language, in aesthetic works, in movements that reflect healthy children, and in actions that reflect the behavior of children of faith and noble character.

Basic Competencies

1. Understand the importance of efforts to balance and preserve natural resources in their environment.
2. Carry out activities to conserve natural resources with people in their environment.

Indicators

1. Identify the importance of natural balance and the preservation of natural resources **.**
2. Provide examples of activities to preserve natural resources**.**

Learning Objectives

1. After discussion, students are able to inform the importance of maintaining natural balance and the preservation of natural resources in the form of mind maps.
2. After discussion, students are able to carry out activities that can maintain the balance and sustainability of natural resources completely.

Matter 5: Properties of Light

Core Competencies:

1. Accepting, appreciating, and living the teachings of the religion it adheres to
2. Have honest behavior, discipline, responsibility, courtesy, care, and confidence in interacting with family, friends, teachers and neighbors.
3. Understand factual knowledge by observing (hearing, seeing, reading) and questioning it based on curiosity about himself, God's creatures and their activities, and the objects he encounters at home and at school, and playgrounds
4. Presenting factual knowledge in clear, logical and systematic language, in aesthetic works, in movements that reflect healthy children, and in actions that reflect the behavior of children of faith and noble character.

Basic Compatibility

1. Understanding the properties of light and its interrelationships with the sense of sight
2. Presenting reports of observations and / or experiments that utilize the properties of light

Indicators

1. Identify the properties of light and its interrelationship with the sense of sight in everyday life.
2. Report the results of experiments that utilize the properties of light in written form.

Learning Objectives

1. After conducting experiments on light , students are able to correctly deduce the properties of light and its relationship with vision.
2. After conducting experiments on light, students are able to write a report on the nature of light and its relationship to vision in detail and correctly.

Analysis of Student Characteristics

The student characteristics analysis stage is a stage of activity carried out to determine the characteristics of students who will be used as subjects in research as a basis for compiling modules to be developed. It is hoped that modules that are in accordance with the characteristics and development of students can stimulate and motivate them to learn so that they can improve student learning outcomes. Grade IV elementary school students ranging in age between 9-10 years are at the stage of concrete operational cognitive development, namely in the phase where mental activity is focused on real objects or on various kinds of events that have been experienced in general, learning in grade IV SD Negeri Unggulan students follow learning activities quite well, learning activities using lecture methods so that students become passive and less active, Furthermore, the teacher gives assignments to students to do the practice questions contained in the package book.

Based on the results of observations in grade IV of SD Negeri Unggulan, stimulation is needed to increase student activity in participating in learning, one of which is through learning modules that are able to guide and motivate students to be active and enthusiastic about learning both independently and with teachers. Science learning modules based on *multiple intellegences* to improve *higher order thinking skills* are expected to be able to increase learning activities so as to improve student learning outcomes.

Design Stage

The development of multiple *intelligence-based* science learning modules begins with making an initial product (*protype*) which is the initial design of the grade IV Elementary School science learning module product to be developed. There are 4 activities at this design stage, namely; preparation of module frameworks, selection of references, preparation of designs and preparation of learning module assessment instruments. The results of the design / design of science learning modules based on *multiple intellegences are described* as follows:

1) Preparation of learning module framework

In compiling the learning module framework, it refers to the syllabus that already exists at SDN Unggulan. The science learning module based on *multiple intellegences* consists of three parts, namely; beginning, content and end. The initial part contains the cover, foreword, instructions for use of the module, dafftar of the contents. The content section consists of chapter titles, core competencies, basic competencies, indicators, introductions, learning objectives, reading materials, assignments, summaries. The final section contains an evaluation and a bibliography.

Module Eligibility

The preparation of learning modules consists of the beginning, content and end parts. Display The design of the initial part of the learning module is as follows:

a) Cover

The cover of a *multiple intellegences-based* science learning module consists of a front cover and a back cover. The front cover contains the module title which is a Multiple Intellegences-Based Science Learning Module, author, student book, illustration of pictures of vegetables and fruits, pictures of birds and children's images, module identity, light green *full color* design, while the color of the back cover is adjusted to the front cover with pictures of mountain scenery A good and attractive cover design is expected to attract students to learn the materials presented in the science learning module, the following is a display of the cover of the science learning module,

Figure 1. Front and back cover views

b) Module Usage Instructions

Instructions for using the module contains instructions for each learning activity and describes the development of compound intelligence to be developed in each phase of learning, here is a display of instructions for using the module,

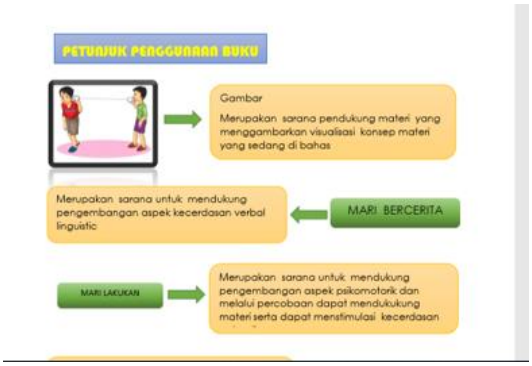

Figure 2. Instructions for using the book

The systematics of this module contains the title in each chapter, core competencies, basic competencies, indicators, introduction to learning, learning objectives, reading materials, assignments, summaries, evaluations, bibliography. At this stage of product development, *multiple intelligence* analysis is carried out to be connected with science learning materials that are in accordance with the level of development and ability of grade IV students. multiple *intelligences* developed in this science module include

a) Let's observe is a means to support spatial visual development

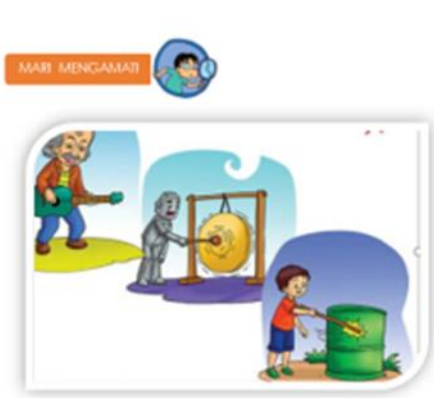

Figure 3. Let's Observe View

b) Let's sing is a means to support the development of musical intelligence

Figure 4. Let's Sing View

c) Let's be creative is a means to support the development of psychomotor/ kinesthetic intelligence.

Figure 5. Let's Get Creative

3. *Development* Phase

The *Development* stage aims to determine the feasibility of the learning module that has been designed. After an eligibility assessment, the learning module is revised according to suggestions and input from expert validators. Validation of *multiple intelligence-based* science modules was carried out by 12 experts, namely 3 linguists, 3 learning design experts, 3 material experts and 3 media experts and practitioners (teachers). Validation is carried out aimed at determining the quality and feasibility of the module, the assessment score is converted into five categories of the liket score scale 1. Not good/irrelevant, score 2 less good/less relevant, score 3 good enough/moderately relevant, score 4 good/relevant, score 5 excellent/very relevant.

a) Material expert assessment

Assessment by material experts aims to find out the quality of the material presented in the module, ahlli assessment of the material is carried out by Dr.agr. Asep Ginanjar Arip, M.Si Kuningan University, Dr Rifat Showatul Anam, M.Pd, STKIP Sebelas April, Dr (C) Yogi Kuncoro Adi, M.Pd IAIN Salatiga. The results of the assessment of the science mudul can be seen in the appendix

Table 9. Vaalidation 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

Assesment 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 a eligible percentage of 83.80% included in the category is very eligible.

b) Linguist assesment

The assessment of linguists was carried out by Prof. Dr. Kosadi Hidayat, M.Pd Kuningan University, Dr Salam, M.Pd Gorontalo State University, Dr Evi Chalamah, M.Pd Sultan Agung Islamic University, the purpose of the language expert assessment is to find out the readability of information, the suitability of the language used with the level of student development, the effectiveness of sentence structure. The results of the IPA module assessment can be seen in the appendix

Table. 10 . Linguist Validation

No	Assessment aspects	Validators			Average	Percentage	Conclusion
		1	2	3			
1	Language	4.50	4.71	4.71	4.64	92.80	Very Eligible

The assesment based on language eligibility aspects received an average score of 4.64 out of a total scale of 5, and with a percentage of eligibility of 92.80% it was included in the category of highly feasible

c). Assesment of learning design experts

The assessment of learning design experts is carried out to determine the feasibility of modules based on aspects of learning design, the assessment of learning design experts is carried out by Dr. Yeyen Suryani, M.Pd, Kuningan University, Dr. Ryan Dwi Puspita, M.Pd, IKIP Siliwangi, Dr. Sarnelly, M.Pd, Haluoleo University, the results of the assesment can be seen in the appendix.

Table 11 . Design Expert Validation

No	Assessment aspects	Validators			Average	Percentage	Conclusion
		1	2	3			
1	Eligibility of Learning Design	4.54	4.38	4.04	4.32	86.40	Very Eligible

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

d) Expert assessment of Learning media

Assessment by learning media experts is carried out to determine the quality of multiple intellgenece-based science learning modules in elementary schools. The assessment was conducted by Dr.. Zaenal Abidin, M.Si Kuningan University. Dr Badrully Martati, M.Pd, Muhammadiyah Saurabaya University. Joko Sulistianto, M.PD PGRI Semarang University. The results of the assessment of the science learning module can be seen in the appendix.

Table 12 Media Expert Validation

No	Assessment aspects	Validators			Average	Percentage	Conclusion
		1	2	3			
1	Eligibility of Learning Media	4.81	4.00	4.27	4.36	87.70	Very Eligible

Assessment of *multiple intelligence-based* science learning modules based on aspects of learning media service, getting an average score of 4.36, with an eligibility percentage value of 87.70% is included in the very feasible category.

e) Grade IV Teacher Assessment

Module assessment by the teacher, namely by Mrs. Enok Elin Seftiani, M.Pd, as a grade IV teacher at SDN Unggulan. The results of the assessment can be seen in the appendix. 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

4. Implementation Stage (*Implementation*)

The fourth stage of the ADDIE development model is the implementation stage after being declared feasible by expert validators, science learning modules are used in the classroom. In the implementation stage, the learning was attended by 22 students divided into 5 learning groups due to the Covid-19 pandemic situation and online meetings were held using the zoom application and direct learning at students' homes. on a limited basis.

5. *Evaluation* Stage

At this stage of evaluation, researchers only conduct formative evaluations because evaluation activities at this stage are closely related to the stages of research and development, namely to improve the results of development products. At this stage, we carry out evaluation activities based on two data obtained, namely from student responses by using student response questionnaires to science learning modules and implementation results used to improve the development of science learning modules. This activity is carried out in order to produce a more feasible science learning module product.

After a validation assessment by a team of experts, then the science learning module in field trials to determine the effectiveness of the module. Field trials are carried out if they have been declared feasible or have received proper recommendations from experts that the module can be used, the meaning of the

effectiveness of the evaluation results in the field can be seen from the expediency of the module developed based on two aspects, namely; 1) aspects of student response, 2) aspects of learning outcomes tests.

a) Small group evaluation
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. The instrument for student response to the module is in the form of a questionnaire with a score assessment with a likert scale from 1 to 5, with an assessment criteria of 1 = Very poor 2 = Poor 3 = Average 4 = Good , 5 = Excellent

Table 13 Assessment of Science Modules by Students

No	Assessed aspects	Value Flat	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
	Sum	12.35	226.35
	Average	4.18	82.34

Based on table 13 the results of students' assessment of the science module still need improvement and 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.

b) 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 (pre test) and the final test (post test) 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.
a) Student learning outcomes analyst
Based on the results of the pre-test and post test, the learning results using the *multiple intelligence-based* science learning module for 22 grade IV students of SDN Unggulan showed that the lowest pre-test score was 60 and the highest score was 76, while for the test post score the lowest score was 75 and the highest score was 100. From these results, it can be concluded that all students or 22 students have test questions used for pre-test and post-test are multiple choices, totaling to meet the minimum completion criteria of 75, if you look at the comparison between pretest and posttest scores, it can be seen that there is an increase in learning outcomes.
b) Pretest and posttest data analysis
Pretest and posttest result data are then calculated with *paired sample t test*
By using SPSS 22 software for windows. To find out whether there are differences in learning outcomes before and after learning using a *multiple intelligence-based* science module.
1) Normality Test
The normality test is used to determine the distribution of normally distributed data or not the data to be analyzed. Normality test is used to test student pretest and posttest result data, normality test using Shapiro wilk with criteria if the significance of the calculation result is > 0.05 then it can be concluded that normal distributed data can be seen in table 14

Table 14 Normality Test

Tests of Normality

		Kolmogorov-Smirnov[a]			Shapiro-Wilk		
Class		Statistics	Df	Sig.	Statistics	Df	Sig.
The Value of Learning	Control	.136	18	.200*	.950	18	.425
	Experiment	.210	22	.013	.928	22	.113

*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

Based on the data from the normality test output results show that the significance value of the control class pretest 0.425 and Experiment 0.113 is greater than 0.05, it can be concluded that the two data are normally distributed.

Table 15 Homogeneity Tests

Test of Homogeneity of Variance

		Levene Statistics	DF1	DF2	Sig.
Experiment test post	Based on Mean	2.212	1	38	.145
	Based on Median	2.189	1	38	.147
	Based on Median and with adjusted df	2.189	1	35.456	.148
	Based on trimmed mean	2.154	1	38	.150

Based on the data from the test output of the homogeneity of variance test shows that the significance based on the mean of the control class and experiment 0.145 is greater than 0.05, it can be concluded that the two data are homogeneous

2). Test the difference between two paired samples
The results of the paired samples can be seen in table 16

Table 16 Test Difference of two paired samples

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Pre test Experiments	71.32	22	6.722	1.433
	Experiment test post	85.68	22	6.792	1.448
Pair 2	Pre test Control	70.00	18	5.980	1.410
	Post Test Control	77.06	18	4.869	1.148

Based on the results of the test of differences in pairs the average value of student learning outcomes before using the multiple intelligence-based science learning module 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.

3). Test the difference in the relationship of two paired samples

The relationship between learning outcomes before and after using *multiple intelligence-based* science learning modules can be seen in table 17

Table 17 Relationship of learning outcomes before and after using science learning modules

Paired Samples Correlations

		N	Correlation	Sig.
Pair 1	Pre test Experiment & Post test Experiment	22	.533	.011
Pair 2	Pre test Control & Post Test Control	18	.404	.096

Based on the results of the pairwise sample correlation test, it shows that the experimental class correlation between pretes and posttests has a positive rating score of 0.533 high rating between pretes and postes and there is a significant relationship because the significance value is 0.011 < Sig 0.05. as for the control class, it showed that between the pretest and postes scores had a positive rating score of 0.404 and there was no significant relationship because the significance value was 0.096 > 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.*

4) Test the Hypothesis

The hypotheses proposed are:

Ho: There is no difference in student learning outcomes after using multiple intelligence-based science learning modules

H1: There are differences in student learning outcomes after using science learning modules based on multiple intelligences

Table 18 Hypothesis Test

Paired Samples Test

		Paired Differences					t	Df	Sig. (2-tailed)
					95% Confidence Interval of the Difference				
		Mean	Std. Deviation	Std. Error Mean	Lower	Upper			
Pair 1	Pre test Experiment - Experiment test post	-14.364	6.529	1.392	-17.258	-11.469	-10.319	21	.000
Pair 2	Pre test Control - Pos test Control	-7.056	5.995	1.413	-10.037	-4.074	-4.993	17	.000

Based on the results of the hypothesis test, the significance value (2 taled) is 0.00 so that the results of the initial test (pretest) and final test (post test) 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* . with a significance of 0.00, because the significance value is smaller (< 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.

5) Data analysis of postest results

a. Postest Normality Test

Table 19 Normality Test of Postes Values

Tests of Normality

		Kolmogorov-Smirnov[a]			Shapiro-Wilk		
Class		Statistics	Df	Sig.	Statistics	Df	Sig.
Science Learning Outcomes	Control Class	.162	18	.200*	.941	18	.298
	Experimental Class	.162	22	.137	.892	22	.020

*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

Based on the results of the normality test of postes values presented in table 19 in the Kolmogorov-smirnov column, it shows that both the postes value of the significance of the control class 0.200 and the experimental class of 0.137 are greater than 0.05 meaning that the two postes value data are normally distributed

b) Postes Homogeneity Test

Table 20 Homogeneity Test posttes

Test of Homogeneity of Variance

		Levene Statistics	DF1	DF2	Sig.
Science Learning Outcomes	Based on Mean	2.212	1	38	.145
	Based on Median	2.189	1	38	.147
	Based on Median and with adjusted df	2.189	1	35.456	.148
	Based on trimmed mean	2.154	1	38	.150

The homogeneity test out put data presented in table 20 that the base on mean significance value for the student learning outcome value of 0.145 is greater than 0.05 which means that the variance value of student learning outcomes between the experimental class and the control class is homogeneous

c) Independent Test of postes value

Table 21 Groups of statistics

Group Statistics

	Class	N	Mean	Std. Deviation	Std. Error Mean
Science Learning Outcomes	Control Class	18	77.0556	4.86853	1.14752
	Experimental Class	22	85.6818	6.79206	1.44807

Based on the *out put group statistics* table of postes result data for the control class with 18 students and for the experimental class of 22 students, the average score of the postes results of the control class was 77.05 and for the experimental class was 85.68 thus descriptively startistically it can be concluded that

there is a difference in the average posttest results between the control class and the experimental class. Furthermore, to prove the difference is significant or not, an independent sample test is carried out.

Table 22 Independent Test sample test Postes Values

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	Df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Science Learning Outcomes	Equal variances assumed	2.212	.145	-4.518	38	.000	-8.626	1.909	-12.492	-4.761
	Equal variances not assumed			-4.669	37.425	.000	-8.626	1.847	-12.368	-4.884

Based on the out put value, 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 out put *independent sample test* based on the values contained in the *equal variances assumed.*

Based on the results of the independent *sample* test for postes results as presented in the table above, 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 Ho is rejected and Ha is accepted thus that there is a significant difference in postes results between the control class and the experimental class.

5) Teacher's Response to Science Module

Data on the analysis of teacher responses to multiple intelligence-based science learning modules using questionnaires with liketr scale assessments (grades 1 to 5) 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 muntiple intelligence-based science learning module can be seen in the following table 23

Table 23 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 the assessment of teacher responses to multiple intelligence-based science learning modules, it is seen from the aspects of material content, learning, design, language, illustrations including good categories.

6) Student response to the Science Module

The results of student response analysis data to multiple intelligence-based science learning modules using questionnaires and liketr scale assessments (grades 1 to 5) 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 muntiple intelligence-based science learning module can be seen in table 24 below:

Table 24 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.

7) 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 25

Table 25 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 25 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)

Table 26 Control Class Student Learning Outcomes

Value Interval	Before using the package book		After using the package book	
	Number of students	percentage	Number of students	percentage
60-65	3	16.67	0	0.00
66-71	6	33.33	3	16.67
72-77	6	33.33	8	44.44
78-83	3	16.67	6	33.33
84-89	0	0.00	1	5.56
90-95	0	0.00	0	0.0
96-100	0	0.00	0	0.0
	18	100.00	18	100.0

F. Discussion[RV5]

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 (Fitria & Idriyeni, 2017). 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 (Amir, 2020), in line with these materials (Nurlela, Sumantri, & Bachtiar, 2018), 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.

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, Zulela, & Sumantri, 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*), Sharon, Smaldino in(Syofyan, 2018).

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 pretest and postest where the average postest 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. (Ferrero, Vadillo, & León, 2021). 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 " (Rita C Rechey and James D Klien, 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 evalution. Furthermore, Perkins' opinion as quoted by Reigiluth (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 (Gani, 2016), 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 (Iskandar, 2018) 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.

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 intellegences* 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 (Nurdyansyah & Mutala'liah, 2015), explaining that teaching materials are useful in assisting teachers in carrying out learning. 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, (Rozhana Meth & Moh. Farid Nurul Anwar, 2022), 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 (Kusumaningtias & Kurniawan, 2014) that the development of teaching materials in the form of multiple intelligence-based handouts can improve students' critical thinking skills.

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 (Mediartika & Aznam, 2018)

In line with this opinion (Nurbaeti, 2019), 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.

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. (Suwanto & Azrina, 2021)

The development of science learning modules has several advantages, including 1) Aspects of material description, in each chapter the material has been described broadly and in detail on concepts, theories and facts, so that students can easily understand and can learn independently. 2) Aspects of material accuracy, in full the material presented is equipped with examples, concepts and theoretical development accompanied by the presentation of illustrations and visualizations with clear images, so that students can understand the material examples concretely. 3) Aspects of completeness of presentation, fully presented instructions for the use of modules, core competencies, basic competencies, learning indicators and objectives, detailed material reading materials, practice questions tasks, which can stimulate plural intelligence and high-level thinking ability, summaries and bibliography. 4) The science module material presented can encourage curiosity 5) The IPA module has a fairly high readability.

As for the science learning module based on *multiple intellegences* that has been developed, there are still several things that need to be improved and refined. However, after implementing some improvements, revisions and improvements, the module has become better. Some of the drawbacks in this module are; a) There are some images that are not clear to observe, have been corrected so that it is clear that the image is to be observed, b) there is unclear writing due to inappropriate color composition, has been corrected and perfected so that the writing appears clear. c) there are no clues to do the practice questions, it has been corrected before the practice questions there are instructions for working on the practice questions.d) Aspects of drawing, graphic and layout design are still not good due to the limited ability of the researcher.

Conclusion[RV6]

The research and development process that has been carried out produces science learning modules based on multiple intelligences, printing through several stages, namely; establish material, identify core competencies and basic competencies, indicators, learning objectives, preparation of teaching materials and validate to material experts, linguists, media experts and learning design experts. the development process using the ADDIE development model, namely *Analyze, Design, Development, Implementation* and *evaluation*, the resulting modules are included in the categories both from material aspects, language aspects, design aspects and media aspects excellent categories

The science learning module based on multiple intellegences 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 intellegences* 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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Developing of Science Teaching Materials Based on Multiple Intelligences

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ABSTRAK

Masalah dalam penelitian ini adalah belum adanya bahan ajar IPA berbasis multiple intellegences serta rendahnya hasil belajar IPA, Penelitian ini bertujuan untuk menghasilkan bahan ajar IPA berbasis multiple intellegences yang layak. serta mengetahui keefektifan bahan ajar IPA berbasis multiple intellegences, jenis penelitian ini adalah penelitian pengembangan yang mengacu kepada model pengembangan ADDIE terdiri dari lima tahap yaitu Analyze, Design, Development, Implementation, Evaluation. 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 didi oleh siswa kelas IV. Data yang terkuml dari hasil angket dianalisis dengan teknik analisis deskripsi kuantitatif. Hasil penelitian menunjukkan; 1) hasil validasi ahli materi termasuk kategori sangat layak 89.67 % 2) Validasi ahli desain pembelajaran kategori sangat layak,91 % 3) hasil validasi guru termasuk kategori layak 79.20 %
Berdasarkan hasil uji coba terbatas bahan ajar IPA berbasiss kecerdasan jamak menurut pendapat guru dan siswa layak digunakan untuk pembelajaran di kelas IV maupun pembelajaran secara mandiri

ABSTRACT

The problem in this study is that there are no science teaching materials based on multiple intelligences and the low science learning outcomes. This study aims to produce appropriate multiple intelligences-based science teaching materials. as well as knowing the effectiveness of science teaching materials based on multiple intelligences, this type of research is development research which refers to the ADDIE development model which consists of five stages namely Analysis, Design, Development, Implementation, Evaluation. The research instrument used was a questionnaire in the form of validity and practicality sheets, the validation sheet was filled in by material experts and learning design experts as well as teachers, while the effectiveness test was carried out by fourth grade students. The data collected from the results of the questionnaire were analyzed using quantitative descriptive analysis techniques. The research results show; 1) the results of validation by material experts in the very feasible category 89.67% 2) the validation of learning design experts in the very feasible category 91% 3) the results of teacher validation in the feasible category 79.20%
Based on the results of limited trials of multi-intelligence-based science teaching materials, in the opinion of teachers and students, it is appropriate for learning in class IV and for independent learning.

1. INTRODUCTION

Education is a human creative effort in guiding and helping develop the potential of students in a planned and continuous manner as a vehicle for the formation of very basic skills intellectually, spiritually and emotionally towards the realization of a complete personality. education is a human creative effort in guiding and helping develop the potential of students in a planned and continuous manner as a vehicle for ordering very basic, spiritual and emotional skills towards the realization of a complete personality. This potential will emerge and develop optimally through appropriate, integrated and integrated learning

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through learning management that adapts to the development of students as a whole. One of the greatest potentials possessed by students is multiple intelligences. intelligence is the human ability to create problems and solve them. The key of multiple intelligences theory is that all human beings have eight intelligences that are independent each other with varying degrees (Winarti, Yuanita, & Nur, 2019), individuals rely on these intelligences independently and collectively to make things, produce behaviors, and resolve issues that apply to the communities where they live (Al-Qatawneh, Alsalhi, Eltahir, & Siddig, 2021). Multiple intelligences is 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 **.** (Indria, 2020)

Every intelligence possessed by children will appear to be seen at certain times according to their developmental stages as made by Piaget in (Hermita, 2017), 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.

Through education also students can interact with the environment to develop the abilities that exist in him. This ability can be in the form of cognitive abilities that hone knowledge, affective abilities to hone the sensitivity of feelings, and psychomotor abilities, namely the ability to do something. Through these three abilities a student is expected to be able to become an individual who is ready to enter the world outside of school.(Acesta, Sumantri, & Fahrurrozi, 2020b), As an educational institution with a strategic role, schools should ideally be able to accommodate every form of intelligence of their students. Therefore, every learning activity in schools must be directed to develop the potential of their students through activities that effectively also refer to multiple intelligences.(Husna, 2020) One of the most basic problems in the scope of our education is the problem of the weakness of the learning process. Learning is a communication process between teachers, students, and teaching materials.

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(Díaz-Posada, Varela-Londoño, & Rodríguez-Burgos, 2017)

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 subcompetence 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 (Murni & Ruqoyyah, 2020). 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.

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(Rofiah, Aminah, & Widha, 2018). 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

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teacher to have data about the level of tendencies for each student's multiple. (Acesta, Sumantri, & Fahrurrozi, 2020a)

Multilple intellgences . In his theory, Gardner states that each individual has eight types of intelligence in his personality, those are (1) verbal-linguistics, (2) logical-mathematical, (3) visual-spatial, (4) musical-rhythmic (musical smart), (5) intrapersonal, (6) interpersonal, (7) naturalists, and (8) physical-kinesthetic. (Dewi & Martini, 2020). in line with(Marenus, 2020). Multiple intelligences theory states that everyone has all eight intelligences at varying degrees of proficiency and an individual's learning style is unrelated to the areas in which they are the most intelligent. For example, someone with linguistic intelligence may not necessarily learn best through writing and reading. Classifying students by their learning styles or intelligences alone may limit their potential for learning.

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 (Analysis, Design, Develop, Implement and Evaluate),(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,

Module development steps

Analysis

At this stage of the analysis, the activities carried out are; a) analyze the competencies that must be mastered by students, which will be outlined in the module, namely core competencies, basic competencies, and learning objectives. b) analyze the materials that will be the subject matter related to the competencies to be achieved, c) analyze the characteristics of students related to the knowledge, attitudes and skills they already have.

Design

At the design stage or design stage, the activities carried out are; steps in compiling a science learning module, so that the resulting module is in accordance with the rules, it must meet several components in compiling the module including:Step 1 . Conducting Module Needs Analysis, Step 2: Compiling a Map of Teaching Materials, Step 3: Creating the Structure of Teaching Materials

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Development

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At the stage of development the activity carried out is; a) search for various sources as material for enrichment and deepening of the material, b) creation of drawings, charts and illustrations, c) editing and layout modules. Furthermore, the product draft that has been compiled will be validated by linguists, material experts, learning design experts, learning media experts and practitioners (teachers). If the results of expert validation of the product draft are still not feasible, they will be revised according to the advice and input from experts.

Implementation

At the implementation stage, it is to carry out a trial of a science learning module based on multiple intellegences to teachers to be applied in class IV SDN Unggulan Cikaso Village, Kramat Mulya District, Kuningan Regency, the material delivered is in accordance with the module that has been developed. At the implementation stage the goal is to find out the quality of the module, the effectiveness of the module in learning. The application of the trial in small groups was carried out on 6 students with different abilities, consisting of 2 high-ability students, 2 medium-ability students and 2 lace ability students.

Evaluation

The evaluation stage is the last activity in the module development process, evaluation is carried out in the form of formative evaluation, namely evaluation carried out after each learning (weekly evaluation) data used for improvement at each stage and summative evaluation is an evaluation at the end of the program the data obtained is used to determine the influence of learning outcomes and the quality of student learning.

Module Evaluation and Revision Validation

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 following instruments:

Table 1. Instrument Grids for Material Experts

No	Assessment Aspects	Assessment Indicators	No Item
I	Eligibility of Contents	Suitability of Material with KI and KD	1,2,3
		Accuracy of the material	4,5,6,7,8,9,10,11,12,13
		Supporting Learning materials	14,15,16,17,18,19,
		Material Update	20,21,22,23,
II	Eligibility of Presentation	Serving Techniques	1
		Serving supporters	2
		Presentation of Learning	3,4
		Completeness of presentation	5,6,7

Source: modifications (Syofyan, 2019)

Table 2. Instrument Grids for Linguists

No	Assessment Aspects	Assessment Indicators	No Item
1	Language	Businesslike	1,2,3
		Communicative	4,5
		Dialogic and Interactive	6,7
		Compliance with the level of development of learners	8,9,10
		The collapse and cohesiveness of the train of thought	11, 12
		Use of the term symbol and icon	1314

Table 3. Instrument Grids for Media Experts

No	Assessment Aspects	Assessment Indicators	No Item
1	Module Graphics	Display Components	1.2
		Use of font variations (types and sizes)	3
		Layout and layout	4

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		Illustrations, drawings and photos	5
		Display design	6
		Cover according to the contents of the module	7
		Use of Illustrative colors in modules	8
2	Linguistics	Readability of text or writing	9
		Clarity of information	10
		Effective and efficient use of language	11

Table 4. Instrument Grids for Design Experts

No	Assessment Aspects	Assessment Indicators	No Item
1	Eligibility of Materials	Module systematics	1
		Clarity of formulation of learning objectives	2
		Variations in the delivery of concepts / teaching materials	3
		Relevance of the material to the learning objectives	4
2	Eligibility of Presentation	Compatibility of the example with the discussion of the material	5
		The suitability of the material to the abilities of the student	6
		Accuracy of exercises/tasks with the material	7
		Adequacy of time to study the material	8
		Adequacy of material materials to achieve competence	9
3	Methods and evaluation	Compliance with the method used	10
		Compatibility with student catractism	11
		Evaluation suitability (tasks and exercises)	12
		Conclusion	13

Table 5. Teacher Response Instruments to Science Modules

No	Category	Indicators		Item number
1	Aspects of Material Content	1.	Suitability of the material to the 2013 Curriculum	1
		2.	Accuracy in formulating learning indicators	2
		3.	Ease of understanding the instructions for use of the book	3
		4.	Accuracy of language use in the delivery of material	4
		5.	The conformity of the material presented with the truth of science	5

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		6.	Material compatibility with the development of Multiple Intellegences	6
		7.	Images and examples according to the learning material	7
		8	Suitability of evaluation with learning material	8
		9	The suitability of the summary with the content of the book	9
		10	Compatibility of the answer key to the question	10
2.	Learning Aspects	11	Completeness and systemicity of the order of presentation of the material	11
		12	Task compatibility with the demands of student-centered learning	12
3	Design Aspects	13	Suitability of teaching material cover design	13
		14	Shape and size of teaching materials	14
		15	Selection of paper types for printing teaching materials	15
		16	Tidiness and resilience in binding teaching materials	16
4	Language Aspects	17	Suitability of language use to student characteristics	17
		18	Conformity of terms used in teaching materials	18
		19	Clarity of use of sentence structure	19
		20	Readability level	20
5	Illustration Aspects	21	Accuracy of use of illustrations with the material	21
		22	Clarity of Illustration with material	22
		23	Color composition according to the writing and characteristics of students	23
		24	Clarity of the image used	24
		25	Conformity of illustrations with multiple intellegences	25

Table 6. Student Response Instruments to Science Modules

No	Statement	No Item
A	**Aspects of Ease of Use**	
1.	The use of modules in learning can save time efficiently	1
2.	The material inside the module is easy for me to understand	2
3.	The presentation of the material in the module is more practical and I can learn it repeatedly	3
4.	The description of the material and exercises present in the module is clear and simple	4
5.	The language used on the module is easy for me to understand	5
6.	Practical and easy module I carry because it can be stored	6
7.	I can self-study according to my learning ability	7
B	**Aspects of Serving Attractiveness**	
1.	The design of the presentation display of the module is attractive to look at	1

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2.	The content of the material in the textbook is supplemented with illustrations, drawings, photos that match the material	2
3.	I can clearly read the writing on the module	3
4.	The color combinations used in the module are already interesting	4
C	**Benefit Aspects**	
1.	Modules help me in understanding the science material	1
2.	The module can replace my notes.	2
3.	Modules help me in connecting the material learned with everyday life.	3
4.	Modules can help my knowledge/memory and the refinement of the material I learn.	4
5.	I can use the module anywhere and anytime	5
6.	Modules make me become active in science learning	6
7.	Modules can motivate me in learning	7
8.	Modules can add to my insights in science materials	8

3. RESULT AND DISCUSSION

Result

Material expert assessment

Assessment by material experts aims to find out the quality of the material presented in the module,

Table 9. Vaalidation 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

Assesment 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 a eligible percentage of 83.80% included in the category is very eligible.

Linguist assesment

The purpose of the language expert assessment is to find out the readability of information, the suitability of the language used with the level of student development, the effectiveness of sentence structure.

Table. 10 . Linguist Validation

No	Assessment aspects	Validators			Average	Percentage	Conclusion
		1	2	3			
1	Language	4.50	4.71	4.71	4.64	92.80	Very Eligible

The assesment based on language eligibility aspects received an average score of 4.64 out of a total scale of 5, and with a percentage of eligibility of 92.80% it was included in the category of highly feasible

Assesment of learning design experts

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The assessment of learning design experts is carried out to determine the feasibility of modules based on aspects of learning design, , the results of the assesment

Table 11 . Design Expert Validation

No	Assessment aspects	Validators			Average	Percentage	Conclusion
		1	2	3			
1	Eligibility of Learning Design	4.54	4.38	4.04	4.32	86.40	Very Eligible

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

Expert assessment of Learning media

Assessment by learning media experts is carried out to determine the quality of multiple intellgenece-based science learning modules in elementary schools. The results of the assessment

Table 12 Media Expert Validation

No	Assessment aspects	Validators			Average	Percentage	Conclusion
		1	2	3			
1	Eligibility of Learning Media	4.81	4.00	4.27	4.36	87.70	Very Eligible

Assessment of *multiple intelligence-based* science learning modules based on aspects of learning media service, getting an average score of 4.36, with an eligibility percentage value of 87.70% is included in the very feasible category.

Grade IV Teacher Assessment

Module assessment by the teacher. 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 evaluation

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. The instrument for student response to the module is in the form of a questionnaire with a score assessment with a likert scale from 1 to 5, with an assessment criteria of 1 = Very poor 2 = Poor 3 = Average 4 = Good , 5 = Excellent

Table 13 Assessment of Science Modules by Students

No	Assessed aspects	Value Flat	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
	Sum	12.35	226.35
	Average	4.18	82.34

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Based on table 13 the results of students' assessment of the science module still need improvement and 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 (pre test) and the final test (post test) 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.

Test the difference between two paired samples
The results of the paired samples can be seen in table 14

Table 14 Test Difference of two paired samples

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Pre test Experiments	71.32	22	6.722	1.433
	Experiment test post	85.68	22	6.792	1.448
Pair 2	Pre test Control	70.00	18	5.980	1.410
	Post Test Control	77.06	18	4.869	1.148

Based on the results of the test of differences in pairs the average value of student learning outcomes before using the multiple intelligence-based science learning module 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.

Test the difference in the relationship of two paired samples
The relationship between learning outcomes before and after using *multiple intelligence-based* science learning modules can be seen in table 15

Table 15 Relationship of learning outcomes before and after using science learning modules

Paired Samples Correlations

		N	Correlation	Sig.
Pair 1	Pre test Experiment & Post test Experiment	22	.533	.011
Pair 2	Pre test Control & Post Test Control	18	.404	.096

Based on the results of the pairwise sample correlation test, it shows that the experimental class correlation between pretes and posttests has a positive rating score of 0.533 high rating between pretes and postes and there is a significant relationship because the significance value is 0.011 < Sig 0.05. as for the control class, it showed that between the pretest and postes scores had a positive rating score of 0.404 and there was no significant relationship because the significance value was 0.096 > 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.*

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Test the Hypothesis

Table 18 Hypothesis Test

Paired Samples Test

		Paired Differences					t	Df	Sig. (2-tailed)
					95% Confidence Interval of the Difference				
		Mean	Std. Deviation	Std. Error Mean	Lower	Upper			
Pair 1	Pre test Experiment - Experiment test post	-14.364	6.529	1.392	-17.258	-11.469	-10.319	21	.000
Pair 2	Pre test Control - Pos test Control	-7.056	5.995	1.413	-10.037	-4.074	-4.993	17	.000

Based on the results of the hypothesis test, the significance value (2 taled) is 0.00 so that the results of the initial test (pretest) and final test (post test) 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* . with a significance of 0.00, because the significance value is smaller (< 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.

Independent Test of postes value

Table 19 Independent Test sample test Postes Values

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	Df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Science Learning Outcomes	Equal variances assumed	2.212	.145	-4.518	38	.000	-8.626	1.909	-12.492	-4.761
	Equal variances not assumed			-4.669	37.425	.000	-8.626	1.847	-12.368	-4.884

Based on the out put value, 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 out put *independent sample test* based on the values contained in the *equal variances assumed.*

Based on the results of the independent *sample* test for postes results as presented in the table above, 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 Ho is rejected and Ha is accepted thus that there is a significant difference in postes results between the control class and the experimental class.

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Teacher's Response to Science Module

Data on the analysis of teacher responses to multiple intelligence-based science learning modules using questionnaires with liketr scale assessments (grades 1 to 5) 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 muntiple intelligence-based science learning module can be seen in the following table 20

Table 20 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 the assessment of teacher responses to multiple intelligence-based science learning modules, 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 liketr scale assessments (grades 1 to 5) 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 muntiple intelligence-based science learning module can be seen in table 21 below:

Table 21 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 22

Table 22 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 25 shows that student learning outcomes before using the science learning module based on *multiple*

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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)

Table 23 Control Class Student Learning Outcomes

Value Interval	Before using the package book		After using the package book	
	Number of students	percentage	Number of students	percentage
60-65	3	16.67	0	0.00
66-71	6	33.33	3	16.67
72-77	6	33.33	8	44.44
78-83	3	16.67	6	33.33
84-89	0	0.00	1	5.56
90-95	0	0.00	0	0.0
96-100	0	0.00	0	0.0
	18	100.00	18	100.0

F. 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. because multiple intelligences are interconnected so that they become a complete intelligence. This is in line with (Shahzada & Khan, 2014), 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. In line with this opinion, (Ayesha & Khurshid, 2013), 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. Higher.

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 (Fitria & Idriyeni, 2017). 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 (Amir, 2020), in line with these materials (Nurlela, Sumantri, & Bachtiar, 2018), 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.

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, Zulela, & Sumantri, 2019). Teaching materials or *instructional materials* are knowledge, skills, and attitudes that students must learn

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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*), Sharon, Smaldino in(Syofyan, 2018).

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 pretest and postest where the average postest 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. (Ferrero, Vadillo, & León, 2021). 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 " (Rita C Rechey and James D Klien, 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 evalution. Furthermore, Perkins' opinion as quoted by Reigiluth (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 (Gani, 2016), 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 (Iskandar, 2018) 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.

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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 intellegences* 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 (Nurdyansyah & Mutala'liah, 2015), explaining that teaching materials are useful in assisting teachers in carrying out learning. 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, (Rozhana Meth & Moh. Farid Nurul Anwar, 2022), 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 (Kusumaningtias & Kurniawan, 2014) that the development of teaching materials in the form of multiple intelligence-based handouts can improve students' critical thinking skills.

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 (Mediartika & Aznam, 2018)

In line with this opinion (Nurbaeti, 2019), 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.

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. (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.

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Conclusion

The science learning module based on multiple intellegences 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 intellegences* 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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