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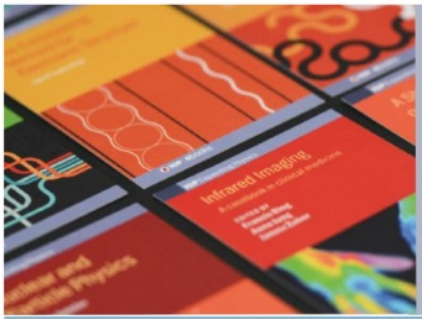

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Worksheet based on multiple intelligences for improving student's result

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Abstract. Basically, every individual have multiple intelligence. Therefore, in the learning process must facilitate students to be able to develop their intelligence. There are five intelligences that will be developed in worksheet based on multiple intelligences on the human motion system material, that is verbal-linguistic, visual-spatial, musical-rhythmic, intrapersonal, and physical-kinesthetic. The aim of this study is to develop worksheet based on multiple intelligences that fulfill validity, practicality, and effectiveness. Worksheet development uses the 4D model. The worksheets include the subject: bones, joints, muscles, and motion systems in humans. The results of the worksheet validation were obtained very feasibly with a percentage of 95.5% on suitability aspect; 92.5% on conformity of presentation aspect; and 90.0% on language aspects. Practical analysis was seen through implementation of learning in three meeting with an average of 72.5%; 87.2%; and 85.7% (very good). Effectiveness seen from learning outcomes increases from the average score of 38.5 (pretest) to 85.2 (posttest). The completeness of multiple intelligences also increased, from 21,9% to
84.4% for verbal-linguistics; 9.4% to 75.0% for visual-spatial; 25% to 84.4% for intrapersonal; 0% to 46.9% for physical-kinesthetic and 0% to 56,4% for rhythmic music. The conclusion of this study is worksheet based on multiple intelligences that have fulfilled validity, practicality, and effectiveness.

1. Introduction

Along with the times, especially in the field of education, the government has officially implemented the 2013 curriculum on a national scale when entering the 2014-2015 school year. Based on Government Regulation of the Republic of Indonesia No. 32 of 2013 article 19 concerning the National Education Standards, that the learning process in educational units is held in an interactive, inspirational, fun, challenging, motivating student to actively participate, and provides sufficient space for initiative, creativity and independence in accordance with talent, interests, and students' physical and psychological development. It can be said that each teacher is required to provide space by paying attention to the development of abilities and intelligence that exist in each student in the learning process because each student has a level of ability and intelligence that is not the same, so it becomes imperative for the teachers to study and identity the students with the different intelligences [1]. Teachers must use appropriate methods to be more flexible for students who have different abilities [2].

Based on the opinion of Thomas Armstrong in Suparno students' intelligence in general can be developed to an adequate level of mastery, meaning that everyone actually has the ability to develop intelligence to the highest extent by stimulating that intelligence or by gaining support, enrichment and

teaching enough[3]. Therefore, in the learning process there needs to be a learning strategy that can facilitate students in stimulating the intelligence that they already have so that they can develop well.

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 [4]. Verbal-linguistic intelligence is the ability to think in the form of words, use language to express, and appreciate complex meanings. Competence that can be achieved in verbal-linguistics intelligence is seen from the ability of a person to read, write, discuss, and argue.

According to Gardner physical-kinesthetic intelligence is the ability of a person to use the body or gestures to express their ideas and feelings. Competence that can be measured in someone who has this intelligence is being able to do physical movements and coordination of the body well, when reading pointing his words with his fingers, and using body movements when expressing something.

According to the musical-rhythmic intelligence can be realized in people's sensitivity to music, songs, rhythms, tones, and so on. People with this intelligence often sing, whistle, or hum while doing activities. They can move rhythmically when accompanying music or making rhythms and songs to help them remember other facts and information[3].

Learning based on musical-rhythmic intelligence can be combined with other types of physical-kinesthetic intelligence. This collaboration will make learning effective and a good medium for students to imagine and create without limits. In addition, the use of music in learning will improve learning outcomes because music makes the atmosphere in learning relaxed.

Interpersonal intelligence is the ability to understand and be sensitive to feelings, intentions, motivations, character, temperament of others. This intelligence can be described by group discussion activities, cooperation, games and making joint simulations. In general, interpersonal intelligence is related to a person's ability to establish relationships and communication with various people. According to Suparno people who are strong in intelligence are usually very easy to work with other people, easy to communicate with others[3].

Suparno writes that students who stand out in intrapersonal intelligence often seem quiet, prefer to dwell in class, preferring to work alone. According to Amstrong [4] this intelligence is intelligence to be able to reflect on the purpose of life itself and trust yourself.

Gardner in Amstrong [4] explains that naturalist intelligence is the ability of a person to be able to understand flora and fauna well, the ability to understand and enjoy nature; and use that ability productively in hunting, farming, and developing knowledge of nature. This intelligence can be illustrated by the activity of seeing a topic learned and its relation to their environment with the nature in which they live.

Multiple Intelligences emphasizes the important to create a student-centered learning environment and show students various ways to be smart [5]. Horward Gardner said that the theory of multiple intelligences is suitable for use in teaching to encourage students to develop all intelligence as much as possible [3]. Howard Gardner conducted a study entitled Schools Using Multiple Intelligences Theory (SUMIT) to find out the benefits of multiple intelligences for students in school. The results of the study state that after the learning process have been held with activities based on the traditional approach and on the theory of Multiple Intelligences; it can be observed that the mean success scores of both of the student groups have increased compared to the pre-test, it seen that this increase has been higer in the experimental group in which activities based on the theory of multiple intelligences have been held [6]. Acording to Derakhshan and Faribi[7], some intelligences strategies should apllied in the classroom to improve student learning skilss.

Based on the results of the study and the results of observations on a number of students in schools and interviews with teachers, where it was found that there is a relatively difficult science material, namely the human motion system, the authors feel need to design learning that makes it easier for students to study the material .The problem found that students find it difficult to memorize the material of the human motion system. Therefore, to make it easier for students to remember and

understand the material. The author develops multiple intelligences based student worksheet to support student learning process. The benefits of this worksheet in addition to helping students remember and help students to develop their intelligence. Worksheet developed includes five multiple intelligences, those are verbal-linguistic intelligence, visual-spatial intelligence, physical-kinesthetic intelligence, musical-rhythmic intelligence, and intrapersonal intelligence. Based on the description above, the research aim to describe the eligibility, practicality and effectiveness of the multiple intelligences based worksheet developed.

2. Methods

The method on worksheet development refers to the 4D instructional design model (Define, Design, Develop, and Disseminate). At the define stage, curriculum analysis, student analysis, and concept analysis are carried out to formulate learning objectives. At the design stage, it is designed worksheet based on multiple intelligences, which are divided into: worksheet A (subject matter of bone), worksheet B (subject matter of joints), worksheet C (subject matter of muscles) and worksheet D (subject matter of disruption to the human motion system).

Validation is carried out to see eligibility before the worksheet is being tested. There are three instrument for assessing the feasibility of worksheet, those are eligibility of contents, eligibility of presentation, and eligibility of language. Each component consists of several statements with each statement provided on a score in scale 1-5. Score 1 (verry less); 2 (less); 3 (enough); 4 (good); and 5 (very good) given by two validators. The results of the validator assessment calculated using the formula:

(%) = 100 (1)

The values obtained are interpreted using the score interpretation criteria as follows. **Table 1.** Criteria for interpreting scores

Percentage (%)	Criteria
0-20	Not Feasible
21-40	Less Feasible
41-60	Worthy
61-80	Quite Decent
81-100	Very Decent

Source: Riduwan [8]

After being declared eligibility, the trial was limited to 32 students of Sidoarjo 3 Public Middle School. Trials were conducted to obtain empirical data on practicality and effectiveness. Practicality seen from the implementation of learning, and effectiveness is seen from the results of learning.

The learning feasibility score is obtained through observation with a Likert scale, as follows: scoring 1 (very less); 2 (less); 3 (enough); 4 (good); and 5 (very good) given by two validators. The results of subsequent observations are calculated using Formula 1 above, and interpreted according to the criteria in Table 1.

Analysis of knowledge competency learning outcomes was obtained from the pretest and posttest. Students are declared to have completed when showing an indicator of a value of ≥75 from the test results. To measure student grades, the following formula is used;

= 100 (2)

Table 2. Completeness criteria of knowledge competence

Range of Numbers	Criteria
94-100	Very Good
84-93	Good

75-83	Passably
≤74	Not Good

Source: Permendikbud [9]

3. Results and Discussion

3.1 Feasibility of Worksheet

In accordance with the objectives to be achieved, namely to produce worksheet based on multiple intelligences that are valid, practical, and effective, the first step in this research is to validate the worksheet in the validator. Worksheet based on multiple intelligences *is validated by two validators.*

The worksheet validation sheet includes 3 components, those are suitability of content, suitability of presentation, and suitability of language. Each component consists of several statements with each statement provided on a scale of 1-5. The results of multiple intelligences worksheet validation in human motion system material are listed in Table 3.

Table 3. Results of worksheet Validation

Rated Aspect	% Eligibility of Worksheet				∑ (%)
	A	B	C	D	
Eligibility of Contents	96,0	96,0	96,0	94,0	95,5
Eligibility of Presentation	96,7	93,3	90,0	90,0	92,5
Eligibility of Language	93,3	90,0	90,0	86,7	90,0
Percentage of Eligibility	95,3	93,1	92,0	90,2	

The average aspects for each component indicate criteria “very feasible”, with scores in eligibility of contents is 95.5%; eligibility of presentation is 92.5%; and eligibility of language is 90.0%. Eligibility aspects of the contents of the four worksheets, each sub-component obtained an average interpretation criterion of a “very feasible” score. This is caused by the title and purpose of the worksheet in accordance with the material of the motion system in humans. Moreover, the factor of appearance concerns lettering or typography which includes font size, row density, and other elements of visual appearance while language factors involve word choice, waking up sentences, paragraph arrangements, and other elements of grammar.

3.2 Practicality of Worksheet

Observation of the Implementation of Learning with worksheet Based on Multiple Intelligences was conducted to determine whether the learning process was carried out in accordance with the Learning Implementation Plan (RPP). Observation is done by giving a score to the implementation of the learning process, from the range of 1 to 5 with the following criteria: 1 (less), 2 (less), 3 (enough), 4 (good), and 5 (very good). The results of the observation of the implementation of the learning process as the table below.

Table 4. Implementation of Learning Scores with worksheet Based on Multiple Intelligences.

Activity	Value of Feasibility and Interpretation of Scores
1st Meeting	
Introduction	72,5% *(Good)*
Mid Learning	72,5% *(Good)*
Closing	72,5% *(Good)*
Average	72,5%*(Good)*
2nd Meeting	
Introduction	86,7% *(Very Good)*
Mid Learning	90,0% *(Very Good)*
Closing	85,0% *(Very Good)*

Average	87,2%*(Very Good)*
3th Meeting	
Introduction	88,0% *(Very Good)*
Mid Learning	85,7% *(Very Good)*
Closing	83,3% *(Very Good)*
Average	85,7%*(Very Good)*

The implementation of learning with worksheet based on multiple intelligences, shows that in each activity that aims to practice multiple intelligences, the average score is "good" in first meeting, while "very good" in second and third meeting. This is because some students are quite enthusiastic and good enough in carrying out activities that can stimulate their intelligence, especially in conducting related activities by practicing multiple intelligences such as drawing posters that get a percentage of 80% in a good category. This is caused by the majority of students having dominant visual-spatial intelligence based on the multiple intelligences test results.

In line with the research conducted by Wahyudi and Alafiah[10] that teachers must understand more about the intelligence possessed by each student, because the most important thing in learning is the success of a teaching. The teacher must pay attention to the potential of each student, including intelligence. The teacher must package each learning material with interest which is accompanied by knowledge that is tailored to the potential that exists in students. If a teacher really understands and can pay attention to the multiple intelligences that exist in each student's self, learning will be carried out well [10].

The learning implementation score shows an increase from meeting 1 to meeting 3, with an average of 72.5%; 87.2%; and 85.7%. This result is supported by student activities when conducting the learning process with worksheet based on multiple intelligences. Based on research conducted by Yurt and Polat [11], he states that doing multiple intelligences theory on process learning repeatedly, it can improve kinesthetic intelligences, visual spatial, dan interpersonal. In line with statement from Posciak and Settles in Winarti, Yuanita, and Nur [12] states that the longer the duration of learning based multiple intelligences will get better results.

3.3 Effectiveness Analysis

The effectiveness of multiple intelligences based worksheet on human motion system material can be assessed from student learning outcomes, namely an increase in pretest scores and posttest scores obtained by students before and after the learning process by using multiple intelligences based worksheet.

Table 5. Recapitulation of Pretest and Posttest Scores

Student	Pretest Score	Postest Score	Gain Score	Category	Student	Pretest Score	Postest Score	Gain Score	Category
1	45	81	0,7	Medium	17	40	88	0,8	High
2	26	76	0,7	Medium	18	29	93	0,9	High
3	33	93	0,9	High	19	64	86	0,6	Medium
4	50	93	0,9	High	20	29	86	0,8	High
5	31	93	0,9	High	21	31	74	0,6	Medium
6	31	81	0,7	High	22	38	79	0,7	Medium
7	48	93	0,9	High	23	55	95	0,9	High
8	43	79	0,6	Medium	24	45	76	0,6	Medium
9	43	74	0,5	Medium	25	45	74	0,5	Medium
10	29	93	0,9	High	26	36	83	0,7	High
11	31	86	0,8	High	27	29	93	0,9	High
12	5	74	0,7	High	28	33	83	0,7	High
13	14	86	0,8	High	29	26	74	0,6	Medium

Student	Pretest Score	Postest Score	Gain Score	Category	Student	Pretest Score	Postest Score	Gain Score	Category
14	45	93	0,9	High	30	31	98	1,0	High
15	57	86	0,7	High	31	57	86	0,7	High
16	55	90	0,8	High	32	57	88	0,7	High
					Average	38,5	85,2		

Based on Table 5 above, it can be seen when compared with the value of the pretest, the average score of 32 students experienced an increase at the time of the post test. A total of 10 students received n-gain in the "moderate" category while (31.3%) and 22 students obtained the gain in the "high" category (68.7%).

Increasing the value of students in the medium and high categories is caused by the worksheet multiple intelligences having activities that vary according to the five intelligences stimulated in the worksheet. Students are not only given material to read, but students are told to tell about the material obtained in the reading to stimulate the verbal-linguistic intelligence they have. By reading and telling the information obtained, they will get their own concepts from the reading without being told beforehand by the teacher. In line with Kurnia, Sugianto, and Marwoto [12] who said that this increase in learning outcomes can occur because in learning using worksheet based on multiple intelligences students are invited to find themselves.

At the value of the pretest all student grades were not completed even though this material had been taught before. This is because previously in the human emotion system material students were taught with learning that was still centered on the teacher or teacher centered, so that students could not play an active role in learning and made the material obtained by students not meaningful.

After learning using worksheet based on multiple intelligences developed by researchers, students are more active in the proven learning process after being given the test, the students' scores increase and the average grade scores exceed the minimum limitation criteria. worksheet based on multiple intelligences can be said to be effective because classically the class average has reached the competency test ≥75. The involvement of students' intelligence during the learning process makes students enthusiastic to learn, making it easier for them to understand the material being taught. It has also been proven in research conducted by Kurnia, Sugianto, and Marwoto [13] that there is an increase in learning outcomes for students after learning with multiple intelligences based worksheet. In line with statement from Luthfiana, Ambarita, and Suwarjo [14] that worksheet based on multiple intelligences can support students in learn by doing, so that can make learning more pleasant. Worksheet can be useful for develop varied activities in many ways with support multiple intelligences that considered several different of intelligences. Different capabilities each student can be facilitate with worksheet base on multiple intelligences, so that student can be exist the creativity in learn.

In multiple intelligences based worksheet also invites students to strengthen their memories by providing fun activities such as singing parodies of songs and making their movements in accordance with the parodies of songs made. This is in line with Kurnia, Sugianto, and Marwoto [13] that if multiple intelligences are grown, developed, and involved in the learning process will increase the effectiveness and learning outcomes. Furthermore, based on statement of Yalmanci and Gozum [6], he explains that when using multiple intelligences strategies in learning then students will be more successful in academics.

Every child has a prominent plural intelligence or otherwise there is a less prominent one. But each student can be helped by applying the theory of multiple intelligences into learning both in methods, or the development of worksheets developed by researchers. Intelligence is not something that is dead and cannot be developed anymore, it is broken by Horward Gardner with the theory of multiple

intelligences which states the theory of multiple intelligences is suitable for use in teaching to encourage students to develop all intelligence as much as possible.

Completeness in training and developing multiple intelligences is by calculating completeness in answering various types of questions based on multiple intelligences that are trained at the pretest and posttest. The comparison of completeness can be seen in Table 6.

Table 6. Recapitulation of completeness of multiple intelligence based on pretest and posttes

MI[a] *Type*	*Pretest*			*Postest*		
	∑TT[b]	∑T[c]	%T[c]	∑TT[b]	∑T[c]	%T[c]
Verbal-Linguistik	25	7	21,9	5	27	84,4
Visual-Spasial	29	3	9,4	8	24	75,0
Intra-personal	24	8	25	5	27	84,4
Physical Kinesthetic	32	0	0	17	15	46,9
Musical Rhytmic	32	0	0	18	14	56,4
% Completeness of *MI*	11,3			69,4		

[a]Multiple Inteligences
[b]Not Complete
[c]Complete

Completeness in practicing multiple intelligences is obtained from calculating the pretest and posttest values of each multiple intelligence in the problem. In Table 6, the five intelligences stimulated in learning had increased overall. The five intelligences has differently increased because each student has a different ability to accept lesson or depend on their dominant intelligences [15-16].

Judging from the average completeness of students in multiple intelligences at pretest it was obtained at 11.3% with the category not complete and increasing to 69.4% with the complete category in the posttest. Based on the results of the data obtained, the multiple intelligences based worksheet developed can be said to be effective because the percentage of completeness of multiple intelligences obtained is ≥ 41%.

4. Conclusion

Based on the results of the study, it can be concluded that the worksheet has fulfilled the feasibility, practicality, and effectiveness. The percentage of eligibility for worksheet A is 95.3%; worksheet 93,1%; worksheet C 92.0%; and worksheet D 90.2%. The average implementation of learning by using multiple intelligences based worksheet on the material of human motion systems in a very good category with a percentage of 85.7%, so that practical worksheet is used in the learning process. There is an increase in student learning outcomes from 38.5 to 85.2. 31.3% of students got a moderate increase and 68.7% got a high increase.

The average student completeness seen from the multiple intelligences at the time of posttest was 69.4% with a fairly complete category. With details on verbal-linguistic intelligence; very thorough (84.4%), visual-spatial intelligence; complete (75.0%), intrapersonal intelligence; complete (84.4%), physical-kinesthetic intelligence; quite complete (46.9%), and musical-rhythmic intelligence; quite complete (56.4%).

From this research, it is suggested that the worksheet of the development results can be implemented in other students to improve multiple intelligences and learning outcomes. Research can also be continued to develop other intelligence in addition to the five multiple intelligences (multiple intelligences) contained in this study. Development can also be done on different material.

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