

CHAPTER III

RESEARCH METHODOLOGY

A. Research Design

This research was using quantitative method approach within quasi experimental because this research did use not random assignment of participant to groups or in the other words, the group in this research is already exist not created and no control group, for example one class of group (Creswell, 2012; Sugiyono, 2016). This research not using control group, only one experimental group is been used receives the treatment and take a pretest and posttest, so this research is called by the one group pretest-post-test design (Cohen, et al, 2007).

B. Place and Time of Research

This research has been done at SMP equal Bright, Jalan Dr. Setiabudi no. 20 Bandung, in the beginning of June 2017 to one class grade 8. Details of time can be seen on the table 3.1 below.

Table 3.1. The research timeline has been done

Implementation Date	Implementation Time	Activities
June 01, 2017	15 minute	Multiple Intelligence test for young people
June, 05, 2017	15 minute	Pre test
	25 minute	Giving a concept
June, 06, 2017	40 minute	Learning process (giving an assessment)
June, 07, 2017	30 minute	Learning peocess (giving an assessment)
	10 minute	Post test

C. Research Subject

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THE APPLICATION OF LEARNING PROCESS AND PORTFOLIO ASSESSMENT BASED ON MULTIPLE INTELLIGENCE TO ENHANCE STUDENTS' MASTERY ON HUMAN CIRCULATORY SYSTEM

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The subject in this research are students in grade 8 from equal Bright school based on the convenience sampling. There are 6 male students and 2 female students. Trial question were given to 16 grade 8 students at Cahaya Bangsa Classical School in Kota Baru Parahyangan, Padalarang using convenience sampling.

D. Key of Operational Definitions

For avoid from misconception of meaning from this research title, it needs the operational definition for som terms used in this study as below:

1. Multiple intelligence profile

Multiple intelligences profile from the students in this study were measured by using the Multiple Intelligences Test. It is describes in the graph to shows the students strength in learning as their dominant Multiple Intelligences. Howard Gardner state the individual has at least eight intelligences, there are logical-mathematical intelligence, visual-spatial intelligence, bodily-kinethetic intelligence, musical intelligence, interpersonal intelligence, intrapersonal intelligence, and naturalis intelligence. The intelligence profile is as independent variable in this research.

2. Learning process in the class

Learning process in the class during teaching human circulatory system is using multiple intelligence approach. It means teacher delivered the lesson is used some materials related with the multiple intelligence inventory from the students, suc as a video to shows the parts of heart, logical questions and discussion with the students.

3. Portfolio assessment

Portfolio assessment in this research has been use as assessment for learning. There are four stations of activities as a task that consist of dissect the heart's cow,

measure pulse rate before and after exercise, reassemble flash cards and create the lyric of song. The rubric is used for evaluate the task given and also teacher gave a feedback for each task based on the rubric used. This portfolio assessment is used as dependent variable. The portfolio assessment used in this study consist of some collection student's work based on the learning process in the class

4. Mastery of the concept

Mastery of the concept in this research is the student's ability to understand the circulatory system topic especially for sub bab of heart. This ability is measured by pre test and post test multiple choice questions which refers to bloom's taxonomy revision. The comparison result of pre test and post test become a reference to see the enhance mastery of concept from the students and analyzed statistically.

E. The Research Stages

This reseach consists of three stages i.e. preliminary stage, disposition stage and data retrieval stage. From every stage obtained some datas needed.

Preliminary stage is the preparation stage before taking data in the class. This stage covers study literature and writing the research proposal. This study literature is for reviewing the theory or concept related with the circulatory system learning process and also to learned the Multiple Intelligence theory and the concept of portfolio assessment. At this stage there is also the process of writing a research proposal and submitted for proposal seminar.

At **disposition stage**, researcher made a lesson plan; preparing the learning media and learning materials; also multiple choice questions and adopt Multiple Intelligence test for young people based on Howard Gardner's theory. The lesson plan, multiple choice questions and all learning materials including rubrics and worksheets assessed

by expert lecturers (judgement) before its used. The multiple choice questions given as limited trial to 31 students in Cahaya Bangsa Classical School, Bandung.

The last stage is **data retrieval stage**. In this stage, examined the learning materials which has been made in the classroom in a quasi experimental research design which is used the one group pretest-posttest design, only one group experimental and no control group (Cohen, et al, 2007). Below is the research design used.

Table 3.2. Research design used in the study

Group	Pretest	Experiment variabel	Posttest
Experiment 1	O1	X	O2

Explanation

Pretest : measured the student's understanding or mastery the concept

X : treatment in learning process use Multiple Intelligence approach consist of some activities to accommodate the difference intelligence from students

Posttest : measured the student's understanding or mastery the concept

After the learning process is done, researcher gives the self-assessment to the students to see their opinion toward the learning process and also assessment given. Beside that, the data collect support by observer assessed to see the learning process steps implementation.

F. Research Instruments

In this research, there are some instruments used including test and non-test. The instrument types used are rubrics, questionnaire, observation sheet and instrument to see their understanding toward the lesson given.

1. **Rubric assessment** of student worksheets is the instruments to assess student's worksheet during the learning process. There are four types of rubric used based on the activities that have been done by students. In this instruments,

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there are at least 2 – 3 criterias or indicators that each indicators item classified into 3 scores, i.e. 1, 2, and 3. The scores choosed by teachers based on the students work to see their achievement. Before it used, this rubric assessed by the expert lecturers.

2. Observation sheets

This instrument used during the learning process and assessed by observer, they are three Biology teachers, to see the learning process implementation by the teacher in the classroom. The observation sheet consist of some statements and assessed by expert lecturers before used.

Table 3.3. Indicators used to observe the teacher in the class

Indicators	3 (Exceed Expectation)	2 (Meets Expectation)	1 (Needs Improvement)
The material was explained in an understandable way			
The lesson was smooth, sequenced, and logical			
The lesson was well-paced			
Directions were clear, concise, and students were able to carry them out			
The teacher demonstrated understanding of the concepts presented and provided accurate information			
The teacher showed an interest in, and enthusiasm for, the subject taught			
The teachers move around the class and made eye contact with students			
The teacher positively reinforced the students			
Examples and illustrations were used effectively			
Instructional aids or resources materials were used effectively			
Patience in eliciting responses			

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Clarity, tone, and audibility of voice			
Communicates effectively in speech			
The teacher was able to control and direct the class			
Personal appearance			

3. Questionnaire

There are 3 types of questionnaire used in this research i.e. parents and children interaction questionnaire, to see the interaction among parents and their children to develop strength areas of the children related to their intelligence; student self-assessment, to see their responses toward the lesson; and the MI test questionnaire, to see the student's intelligence. Below are the examples of the questionnaire and for the detail is in appendix.

**PARENTS AND CHILDREN INTERACTION
QUESTIONNAIRE**

This questionnaire is to see the interaction among parents and their children to develop strength areas of the children related to their intelligence.

Parents name : _____
 Occupation : _____
 Child's name : _____
 Child's gender : Boy Girl

Please fill out this form to reflect your view of the child's behavior.

1. Please list the sport your child most likes to take part in. for example: swimming, baseball, skating, basketball, soccer, etc. How much time does he/she spend in each?

<input type="checkbox"/> None	Below Average	Average	Above Average	Don't Know
a. _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

2. Please list your child's favorite hobbies, activities, and games, other than sports. For example: video games, dolls, reading, piano, crafts, computer, singing, etc. (Do not include listening to radio, TV, or other media). How much time does he/she spend in each?

<input type="checkbox"/> None	Below Average	Average	Above Average	Don't Know
a. _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Figure 3.1. Sample of parents and children interaction questionnaire

**STUDENT SELF-ASSESSMENT
QUESTIONNAIRE**

Student's Name : _____

This questionnaire aims to explore your responses as a student who studies about Human Circulatory System. Please read the following statement carefully and give symbol (v) for your answer 'Yes' or 'No' for each items.

No	Items on questionnaire	Yes	No
1	This Biology lesson is so excited for me		
2	This human circulatory system concept is hard to understand for me		
3	The learning process makes me understand the concept		
4	I like to participate in the observation about the parts of heart activity by investigate the cow's heart		
5	I like to participate in the experiment to measure the rest heart rate and heart rate during the activity		
6	I like to participate in the activity for ordering the pictures about the circulatory system path in my body		
7	I like to participate in making song lyric song about the parts of heart and their function		
8	I'm very excited works with partner in a group		
9	I understand the assessment in this lesson gives me a knowledge and skills that useful for me		
10	I am clear about the types of assesment being used		
11	I know what are the advances of this assessment for me		
12	I can complete the assessment task on time		
13	The assessment given to me is motivate and accomodate my strength		
14	I didn't find difficulties finish this assessment		
15	All of the assessments given can improve my understanding toward the concept		

Figure 3.2. Sample of student-self assessment questionnaire

Students-self assessment questionnaire is given to the students after all the activities is done, to see the students responses toward the learning process and also

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portfolios assessment given. The questionnaire used in this research is the closed statement questionnaire with the option answer is Yes and No. For 'Yes' answer given score 1 and for 'No' answer is given score 0.

To measure the percentages of students' answer for each indicator or statement given which is stated in in the calculation as follows:

$$\frac{\text{Total student's answer}}{\text{Total students}} \times 100$$

Name : _____

Multiple Intelligence Test – based on Howard Gardner's MI model

Score the statements : 1 = Mostly Disagree, 2 = Slightly Disagree, 3 = Slightly Agree, 4 = Mostly Agree

Score the statements in the white-out boxes only	Score			
I can play a musical instrument	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I often have a song or piece of music in my head	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I find it easy to make up stories	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Pollution makes me angry	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I have always been physically well coordinated (run, jump, etc.)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Music is very important to me	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I am a good liar (if I want to be)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I play a sport or dance	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I notice similarities and differences in trees, flowers and other things in nature	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I am a very social person and like being with other people	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I find graphs, charts and diagrams easy to understand	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I feel very strongly about protecting the environment	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I find it easy to remember quotes or phrases or poems or song lyrics	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I can always recognize places that I have been before, even when I was very young	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
When I am concentrating I tend to doodle	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I find mental arithmetic easy (sums in my head)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
At school one of my favorite subject is English	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I like to think through a problem carefully, considering all the consequences	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I love adrenaline sports and scary rides	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I enjoy watching nature programs on television	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Figure 3.3. Sample of MI test questionnaire

Figure 3.3 is the questionnaire for measure the predominant intelligence of the students. They have to fill each statement with the option answer 1 to 4, which is 1 is the lowest answer and 4 is the highest answer. To measure the answer is just added all

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the total answer for each intelligence and the result is the multiple intelligence profile rank for each student.

4. Instrument mastery of concept

The mastery of concept for students has been measured by using written test. The questions is used for pretest and also posttest. The questions covers the structures and functions of the heart as one organ of Circulatory System.

The instrument used for measure the understanding and mastery of students is multiple choice questions based on Bloom's Taxonomy revision (appendix).

Table 3.4. Grading and instrument test mastery of concept

Indicators	Question number item					
	C1	C2	C3	C4	C5	C6
3.8.1 Describe the circulatory system as system of tubes with a pump and valves to ensure one-way flow of blood	1, 2	18				
3.8.2 Describe the structure of the heart including the muscular wall and septum, atria, ventricles, valves and associated blood vessels	3, 7, 8, 25	4, 6, 9, 24				
3.8.3 Describe the function of the heart in terms of muscular contraction and the working of the valves		5, 10, 13, 15, 20, 21				
3.8.4 Investigate the effect of physical activity on pulse rate			11, 17	12, 16, 22, 23		
3.8.5 Describe coronary heart disease in terms of the blockage			14, 19			
Total number item	6	11	4	4		

A. Difficulty Level of Questions

The difficulty level of question is used to measure the category for each question item. The category is consist of easy, medium, and hard level of question. To measure the difficulty level of question is using the formula below:

$$I = \frac{B}{N}$$

With:

I = Difficulty index

B = Total correct answer

N= Total students

The category of the difficulty level is show in the Table 3.5 below

Table 3.5. Category of dificulty level

Difficulty Level Index	Interpretation
0,01 – 0,30	Hard
0,31 – 0,70	Medium
0,71 – 1,0	Easy

(Sudjana, 2009)

B. Validity and Realibility

The quality of the questions item above was analyzed by using Kuder-Richardson (KR20). This methods is used for realibility coefficient to represent the statement true or false with score 1 or 0 (Santosa & Hidayat, 2014). The characteristics of good questions test was able to seen from some aspect i.e. validity and reliability. The result of validity and reability can be seen in the table below, for detail can be see in the attachment. Coefficient realibility Kuder-

Richardson (KR-20) measure by using the formula as follows:

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$$KR_{20} = \left(\frac{n}{n-1} \right) \left(\frac{S_1^2 - \sum pq}{S_1^2} \right)$$

where:

n : total item

S_1^2 : Total variance

P : the proportion of respondents answering an item i in the keyed direction (1)

q : the proportion of respondents answering an item i in the non-keyed direction (0)

If the reliability coefficient measured already, **Guilford Criterion** can used to interpret a correlation coefficient values as follows:

- a. $< 0,30$: indicate a weak linier relationship
- b. $0,30 - < 0,70$: indicate a moderate linier relationship
- c. $0,70 - < 1,00$: indicate a strong linier relationship

Table 3.6. Validity and Realibility result of multiple choice questions

Question number	Difficulty Level	Validity Test	r Table	Explanation	Reliability Test	r Table	Explanation
P1	Easy	0,497	0,3	Valid	0,879	0,7	Reliabel
P2	Hard	0,423	0,3	Valid			
P3	Easy	0,401	0,3	Valid			
P4	Easy	0,565	0,3	Valid			
P5	Hard	0,497	0,3	Valid			
P6	Easy	0,422	0,3	Valid			
P7	Medium	0,724	0,3	Valid			
P8	Medium	0,589	0,3	Valid			
P9	Easy	0,579	0,3	Valid			
P10	Medium	0,363	0,3	Valid			
P11	Hard	0,573	0,3	Valid			
P12	Easy	0,525	0,3	Valid			
P13	Medium	0,703	0,3	Valid			
P14	Medium	-0,031	0,3	Tidak Valid			
P15	Hard	0,209	0,3	Tidak Valid			
P16	Medium	0,344	0,3	Valid			
P17	Easy	0,620	0,3	Valid			
P18	Medium	0,055	0,3	Tidak Valid			
P19	Medium	0,677	0,3	Valid			
P20	Hard	0,354	0,3	Valid			
P21	Medium	0,667	0,3	Valid			
P22	Easy	0,565	0,3	Valid			
P23	Medium	0,718	0,3	Valid			
P24	Easy	0,397	0,3	Valid			
P25	Easy	0,607	0,3	Valid			

G. Data Analysis

1. Multiple Intelligence test

Multiple Intelligence test were given to the students consist of 40 statements that represent eight intelligence based on Howard Gardner theory and the scores used are 1 to 4. The score choosed for each statement summed up and got total scores for each

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intelligence. The data description of the Multiple Intelligence profile of the students in the form of the rank and mean and also present in the percentage.

2. Rubric assessment

The rubric used is for assessed the result of worksheet has been done during the learning process. There are 4 kinds of rubrics based on the activity types. Each rubric consist of 2-3 criterias or indicators that used score 1,2 and 3. The result of rubric was analyzed by summed up and got the mean or average in percentage

3. Questionnaire

I used 2 types of questionnaire in this research, they are questionnaire for parents about parents and children interaction relationship questionnaire and students – self assessment questionnaire. The questionnaire consists of some statements which is has some scores or choices. The questionnaire data will proceed in descriptive explanation.

4. Observation sheet

To see the learning process implementation by the teacher in the classroom, I used observation sheet. The result from the observation in the class was analyzed in descriptive explanation

5. Pretest and posttest

The learning process in the class is for enhance their mastery toward the circulatory system lesson especially about the structure of heart. The average of pretest and posttest are used to see their understanding of concept. The improvement of students understanding before and after learning process counted by using gain indeks (normalyzed gain). For counting N-Gain, it used formula based on Sugiyono (2016) :

$$g = \frac{\text{skor postes} - \text{skor pretes}}{\text{skor maksimum} - \text{skor pretes}}$$

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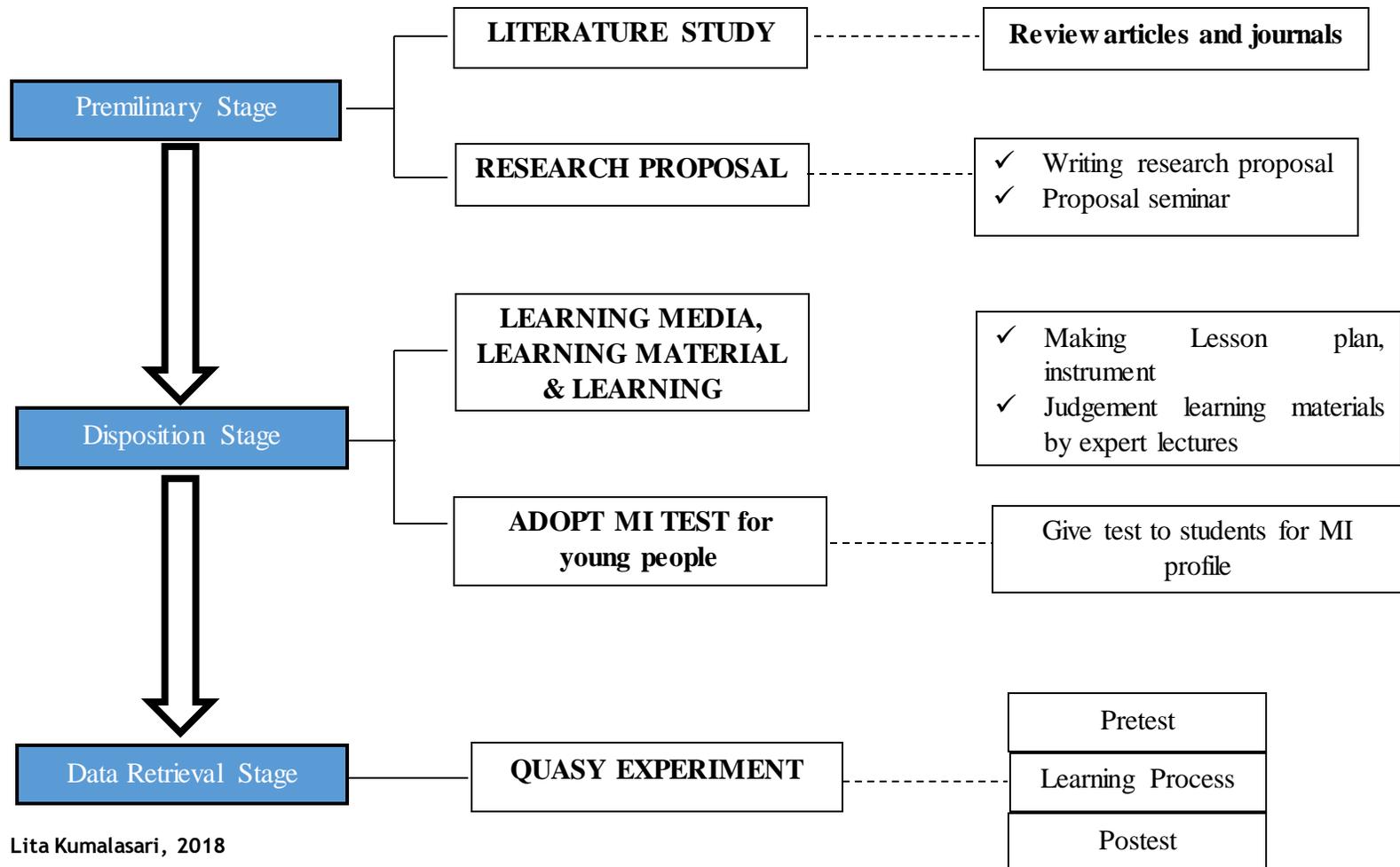
The N-Gain data can be classified into 3 categories as follow:

Table 3.7. Categories of N-Gain Scores

N-Gain scores range	Categories
$g > 0,7$	High
$0,7 > g > 0,3$	Medium
$g < 0,3$	Low

(Meltzer, 2002)

H. Research Scheme



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