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PREFACE

Praise to Allah SWT for all the blessings and guidance given to us all, so that the program of the International Seminar on Science Education (ISSE) 2017 with the topic about Enhancing Interdisciplinary Practice of Science Education in The Realization of NGSS (Next Generation Science Standards) which held on October 28th 2017 at Rectorate Hall, Yogyakarta State University can be completed successfully.

This proceeding is presented in four sections: 1) Science; 2) Physics; 3) Biology Chemistry; and 4) General Education. This comprises number of papers that have been presented in the seminar, written by lecturers and students from Yogyakarta State University and other universities.

We owe many parties for the success of the seminar. Therefore, we would like to sincerely extend our gratitude to:

1. The rector of Yogyakarta State University, Prof. Dr. Sutrisna Wibawa, M.Pd for facilitating all the activities of the International Seminar on Science Education (ISSE) 2017;
2. The director of Graduate School of Yogyakarta State University, Dr. Moch. Bruri Triyono for providing all the facilities of the International Seminar on Science Education (ISSE) 2017;
3. The invited speakers for their willingness to share thoughts and insights on science teaching and learning in the seminar;
4. All committee members for the time, effort, and thoughts for the success of this activity; and
5. All presenters and participants who have come a long way to contribute to the success of the seminar.

However, we truth fully understand that some imperfections might be find in this proceeding and in the seminar. Thus, suggestions and constructive criticisms are very much welcome. Finally, we hope that this proceeding may contribute in science and science education

Yogyakarta, Oktober 28th 2017

Chair Person

Prof. Dr. I Gusti Putu Suryadarma, M.S

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Implementation of Physics Learning Instrument Based On Hypermedia to Increase Science Process Skill

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Abstract. This research includes experimental research that aims to examine the application of learning instrument based on hypermedia that have been developed in physics education program students UNISMUH 2017. In addition, research aims to introduce the use of hypermedia as a means of learning for physics teacher candidate as well as measure the level of science process skills. The research method used was pre-experimental with research design was one shoot case study. In this study, students (physics teacher candidate) in three classes were treated through the application of hypermedia based learning instrument then at the same time were conducted observations by 3 observer to measure the science process skills of students and at the end of learning process, students were given questionnaire of student response to the utilization of learning instrument based on hypermedia. Based on the result of assessment of Student Worksheet and Hypermedia that are 94,9% and 95,1% which show hypermedia and Student Worksheet valid and reliable, while for science process skill with average every aspect is in range 85, And student responses to physics learning based on hypermedia is above 91%. This shows that the utilization of learning instruments that have been developed reach the categories of valid, interesting, practical and effective.
Keywords: ***Hypermedia, Learning Instrument, Student Worksheet.***

1. Introduction

National education aims to educate the life of the nation. If the process of educational output is not qualified, then the Indonesian nation is unlikely to achieve a bright future, peace and prosperity. Therefore, government policy in the education sector must be a top priority in the effort to face the challenges that arise in line with the changes that occur in all aspects of human life, especially in the era of globalization.

In terms of the quality of teaching of subjects especially physics, the TIMSS and PIRLS reports [1] showed that physics achievements measured on the reasoning aspect, Indonesia was ranked 40 out of 42 (TIMSS and PIRLS International Study Center, 2012). Based on the results TIMSS concluded that; (1) the average achievement of student physics in Indonesia in terms of cognitive aspects was still low; (2) the tendency of physics achievement of Indonesian students always decrease on the cognitive aspect so that students physics ability must be improved in all aspects. This shows that the thinking ability of high-middle-class students in Indonesia is still very low compared to other countries. Whereas according to Woolfolk (2008) stated that students who have higher order thinking skills (capable of distinguishing between facts and opinions, identify relevant information, solve problems, and able to deduce the information that has been analyzed. Or in other words, if students already have good high-level thinking skills then learning outcomes for all aspects of cognitive will also increase.

Based on observations and studies of researchers, there are some things that cause low quality of physics learning outcomes in high school. The first is the ability of teachers in teaching physics is still very lacking. Mastery of physics concepts and the use of models and learning methods are still simple to make less effective learning. Meanwhile, the demands of the 2013 curriculum with a scientific approach have not been applied maximally by most teachers. This is marked by the level of mastery of the class by teachers is still very high compared to the learners (teacher center) whereas K-13 demands , teachers only as a facilitator and learners are expected to be much more proactive in learning. The second is the learning tools used in the classroom has not been able to encourage students to be enthusiastic in learning physics. Most of the books and worksheets of learners used contain formulas

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and concepts summaries, while minimal in terms of applying physics in everyday life. This results in less interesting, monotonous and boring lessons. In addition, the use of information and communication technology has no direct impact on improving the quality of physics learning outcomes, teachers are still less in using power point display and other interactive learning media.

Therefore, based on the above problem. The research team developed a fundamental physics instruments based on hypermedia that aims to introduce the use of technology in physics teaching for physics teacher candidates (physics education students of UNISMUH). By presenting the concept of physics in the form of interactive simulation and students become the center of learning, it is expected that the use of hypermedia based physics learning devices can improve science process skill of physics teacher candidate.

2. Research Methods

Research method is the way of work used in doing a research ". The method used in this research is pre-experimental design method with one-shot case study design. The experimental research method is an experimental method for studying the effect of certain variables on other variables, through experiments in special conditions that are deliberately created [3]. The experimental research method is intended to investigate possible causal relationships by exposing one or more experimental groups and one or more experimental conditions. Pre-experimental design method has not been a serious experiment because there are still external variables that also influence the formation of dependent variable. Sugiyono [4] classifies three types of research design commonly used in pre-experimental design methods, namely one-shot case study, one-group pretest-posttest design, and intact-group comparison.

This study uses a one-shot case study design. In this study, no control group and students were given special treatment or teaching for some time (X mark). Subjects in this study will get treatment (treatment) that is the use of hypermedia based learning devices. Then at the end of the program, students are given tests related to the given treatment / teaching (mark T).

Subject	treatment	Test
Group	X	T

Information :
X: The use of learning instrument based on hypermedia in the experimental class
Q: Test after treatment

2.1 Data analysis of learning device to achieve validation result

Based on the assessment by three validators, the content validity analysis for each statement item using CVR (Content Validity Ratio) is used, while the validity analysis of each aspect consisting of several items using CVI (Content Validity Index) equation. Assessment is categorized valid if CVR or CVI is in the range value 0 s.d 1. To calculate the CVR used formula according to Lawshe [5] as follows:

$$CVR = \frac{n_e - \frac{N}{2}}{\frac{N}{2}} \quad (1)$$

Information:

ne: The number of validators that provide an essential value (good or excellent)

N: Number of validators

Based on the validity of each item statement, it can be determined the validity of each aspect by using the CVI equation as follows:

$$CVI = \frac{CVR}{\sum n} \quad (2)$$

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Information:

n: Number of items from every aspect

Furthermore, the declared statement validly performed reliability analysis. Testing reliability using the Alpha formula as follows:

$$r_{11} = \left(\frac{k}{k-1}\right)\left(1 - \frac{\sum \sigma_b^2}{\sigma_b^2}\right) \quad (3)$$

r11: Instrument reliability

k: Number of items of statement

Σσb2: The number of variance items

Σσt2: Total Variance

Reliability value obtained then consulted with the value of the reliability table. Instruments are categorized reliably if the calculated reliability value is greater than the reliability of the table.

2.2 Student's activities science process skills

To know the percentage level in learning using the percentage of liveliness formula:

$$P_i = \frac{A}{N} x\ 100\% \quad (4)$$

Pi is the percentage of liveliness towards learning; A is the number of scores obtained by teacners / learners; N is the total number of scores

2.3 Student's Questionnaire response

Formula percentage of respondents questionnaire response:

$$S = \frac{b}{A} \quad (5)$$

S is the percentage of students' response questionnaire scores; b is the number of questionnaire scores obtained; and A is the maximum number of questionnaire scores

3. Results And Discussion

Learning instruments in this study in the form of Student Worksheet, Hypermedia and Evaluation Tools to determine student science process skill and their responses. Concept of physics are presented in the student's worksheet is concise and clear. In addition, the student's worksheet contains learning objectives for each unit. Students are then directed to make a virtual observation through hypermedia by following the work steps listed in the student's worksheet. The observations result is then written in the table of observation then analyzed and answer the questions that have been presented in each unit, this questions is divided that aims to be answered based on the results of observations and analysis and also additional questions are taken from relevant sources and appropriate indicator available.

The hypermedia developed using Lectora contains: (1) Learning Objectives, (2) Material Summary, (3) Simulations adapted from www.eduMedia.fr [6] and www.kcvs.ca [7].

The hypermedia display for several units of observation as follows:

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Figure 1 Initial Display of hypermedia

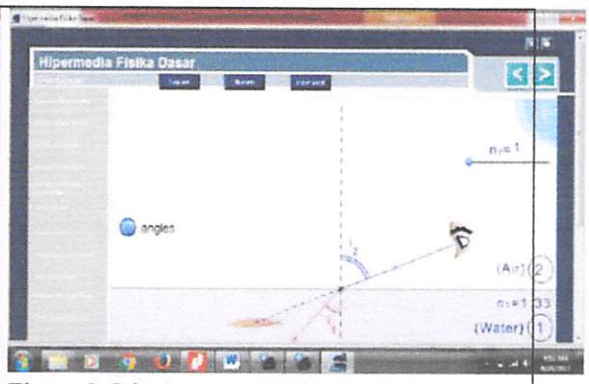

Figure 2 Display of refraction unit

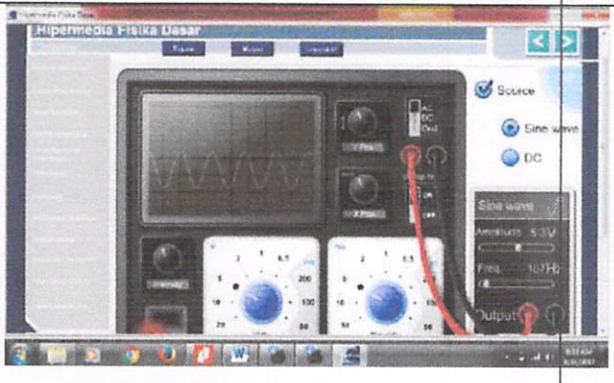

Figure 3 Display of AC Current unit

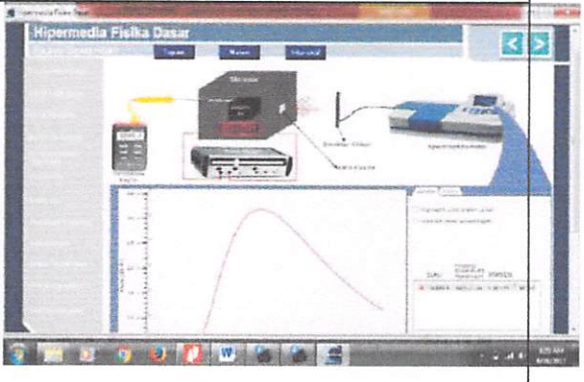

Figure 4 Display of Black Body Radiation unit

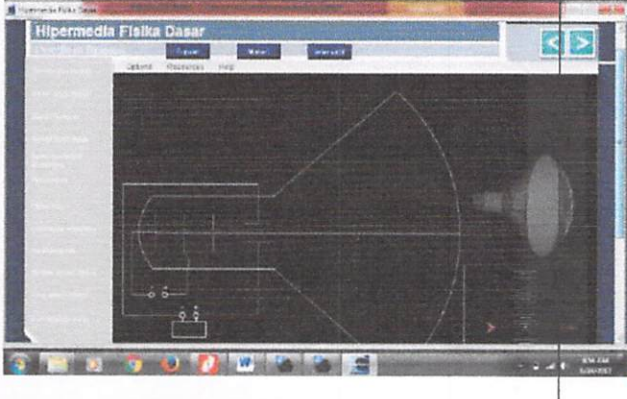

Figure 5 Display of Thomson Experiment unit

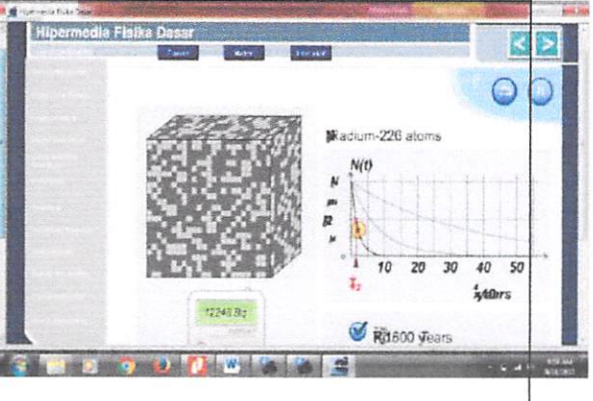

Figure 6 Display of Radioactive unit

This hypermedia can not be used if devices that used (laptop, computer and tab) are not completed with Flash Player and Adobe Reader. So the user need to download it by clicking the menu on initial display of hypermedia. In addition, Student's Worksheet can also be downloaded directly by clicking the download menu on the hypermedia in preliminary view. Examples of hypermedia display as follows:

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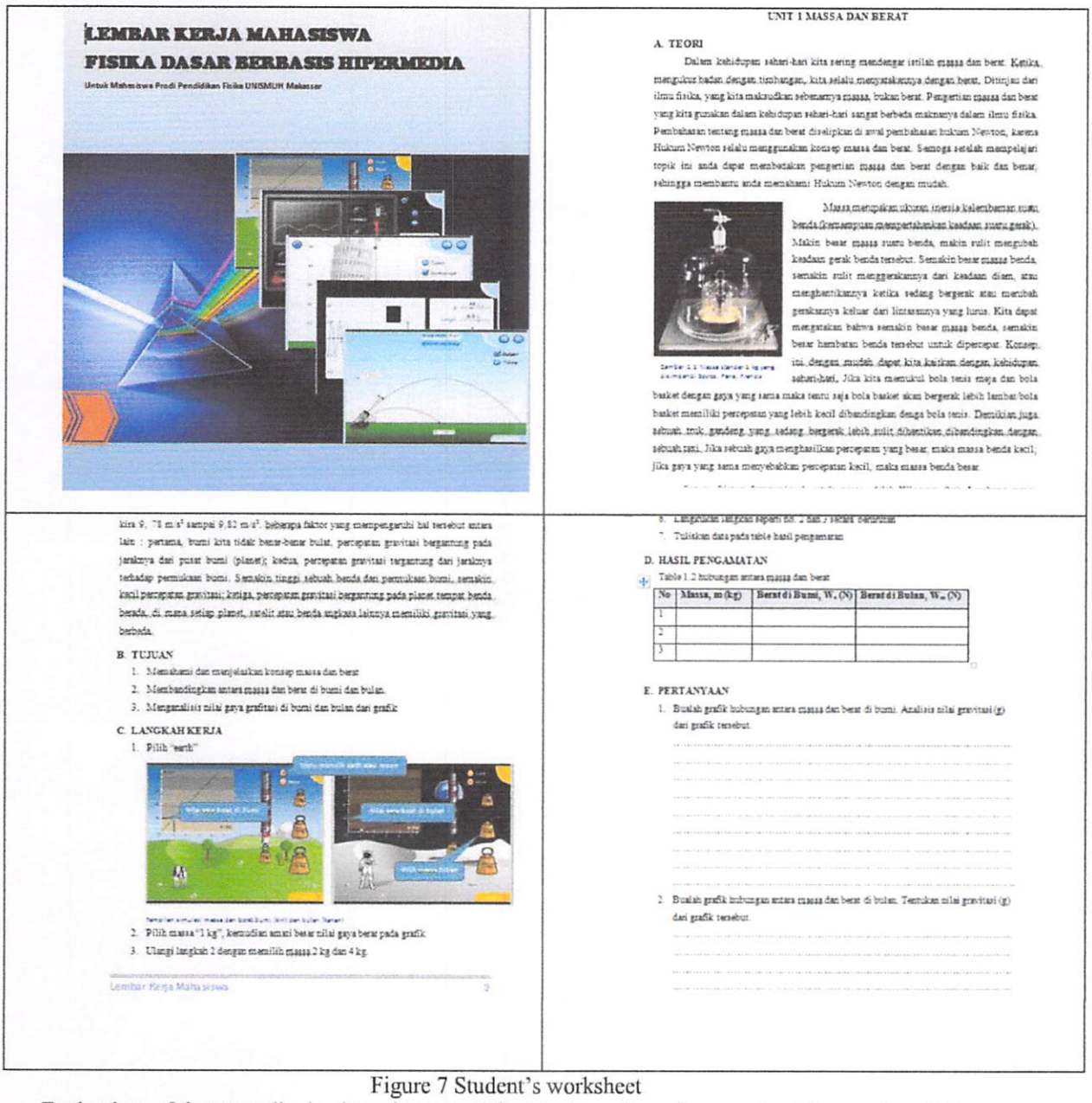

LEMBAR KERJA MAHASISWA
FISIKA DASAR BERBASIS HIPERMEDIA
Untuk Mahasiswa Prodi Pendidikan Fisika UNISMUH Makassar

UNIT 1 MASSA DAN BERAT

A. TEORI

Dalam kehidupan sehari-hari kita sering mendengar istilah massa dan berat. Ketika mengukur badan dengan timbangan, kita selalu menyatakannya dengan berat. Ditinjau dari ilmu fisika, yang kita maksudkan sebenarnya massa, bukan berat. Pengertian massa dan berat yang kita gunakan dalam kehidupan sehari-hari sangat berbeda maknanya dalam ilmu fisika. Pembahasan tentang massa dan berat diselipkan di awal pembahasan hukum Newton, karena Hukum Newton selalu menggunakan konsep massa dan berat. Semoga setelah mempelajari topik ini anda dapat membedakan pengertian massa dan berat dengan baik dan benar, sehingga membantu anda memahami Hukum Newton dengan mudah.

Massa merupakan ukuran inersia kelembaman suatu benda (kecenderungan mempertahankan keadaan suatu gerak). Makin besar massa suatu benda, makin sulit mengubah keadaan gerak benda tersebut. Semakin besar massa benda, semakin sulit menggerakannya dari keadaan diam, atau menghentikannya ketika sedang bergerak atau merubah gerakannya keluar dari lintasannya yang lurus. Kita dapat mengatakan bahwa semakin besar massa benda, semakin besar hambatan benda tersebut untuk dipercepat. Konsep ini, dengan mudah dapat kita kaitkan dengan kehidupan sehari-hari. Jika kita menukul bola tenis meja dan bola basket dengan gaya yang sama maka tentu saja bola basket akan bergerak lebih lambat bola basket memiliki percepatan yang lebih kecil dibandingkan denga bola tenis. Demikian juga sebuah truk gandeng yang sedang bergerak lebih sulit dihentikan dibandingkan dengan sebuah taxi. Jika sebuah gaya menghasilkan percepatan yang besar, maka massa benda kecil; jika gaya yang sama menyebabkan percepatan kecil, maka massa benda besar.

kira 9, 78 m/s² sampai 9,82 m/s². beberapa faktor yang mempengaruhi hal tersebut antara lain : pertama, bumi kita tidak benar-benar bulat, percepatan gravitasi bergantung pada jaraknya dari pusat bumi (planet); kedua, percepatan gravitasi tergantung dari jaraknya terhadap permukaan bumi. Semakin tinggi sebuah benda dari permukaan bumi, semakin kecil percepatan gravitasi; ketiga, percepatan gravitasi bergantung pada planet tempat benda berada, di mana setiap planet, satelit atau benda angkasa lainnya memiliki gravitasi yang berbeda.

B. TUJUAN

1. Memahami dan menjelaskan konsep massa dan berat
2. Membandingkan antara massa dan berat di bumi dan bulan.
3. Menganalisis nilai gaya grafitasi di bumi dan bulan dari grafik

C. LANGKAH KERJA

1. Pilih "earth"
2. Pilih massa "1 kg", kemudian amati besar nilai gaya berat pada grafik
3. Ulangi langkah 2 dengan memilih massa 2 kg dan 4 kg

Lembar Kerja Mahasiswa 9

6. Lengkapilah tabel seperti no. 2 dan 3 pada percobaan
7. Tuliskan data pada table hasil pengamatan

D. HASIL PENGAMATAN

Table 1.2 hubungan antara massa dan berat

No	Massa, m (kg)	Berat di Bumi, W_b (N)	Berat di Bulan, W_{bl} (N)
1			
2			
3			

E. PERTANYAAN

1. Buatlah grafik hubungan antara massa dan berat di bumi. Analisis nilai gravitasi (g) dari grafik tersebut.

2. Buatlah grafik hubungan antara massa dan berat di bulan. Temukan nilai gravitasi (g) dari grafik tersebut.

Figure 7 Student's worksheet

Evaluation of hypermedia is done by material experts and media experts. The results of the validation analysis show that hypermedia is valid and reliable for all aspects as in the table below:

Table 1. Results Analysis of validation and reliability of hypermedia

No.	Aspect	Percentage (%)
1	Display Quality	96,4
2	Attractiveness	94,0
3	Technical	95,2
	Average	**95,2**

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While the results of validation analysis showed that the material in hypermedia valid and reliable for all aspects as in the table below:

Table 2. Results Validation and reliability analysis of the material in hypermedia

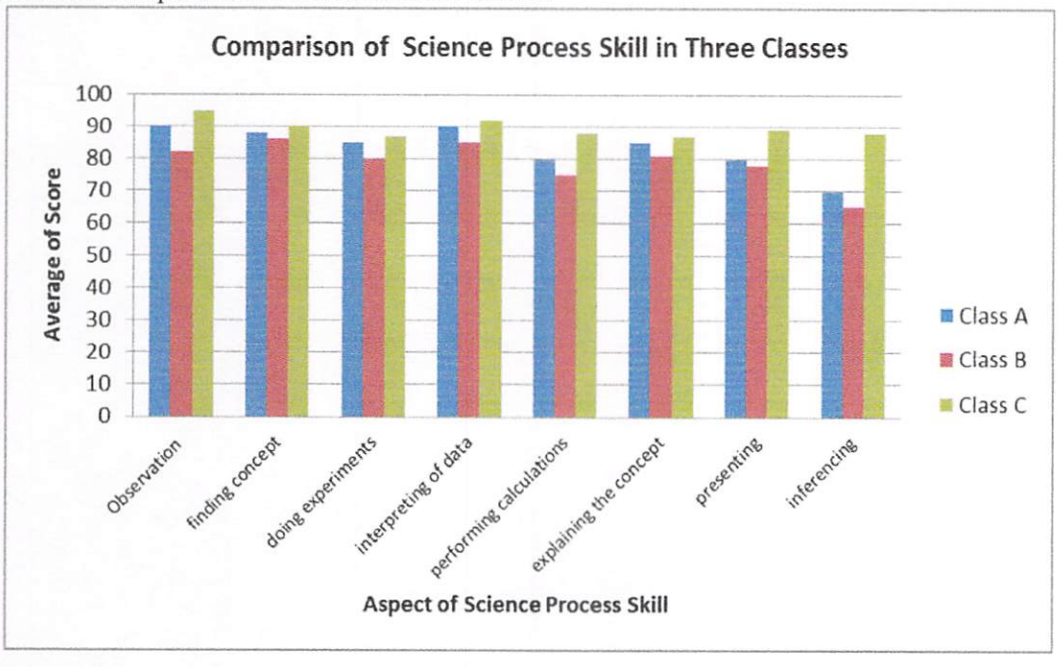
No.	Aspect	Percentage (%)
1	Materials / Concepts	92,0
2	Language	98,5
3	Presentation	94,5
	Average	**95,0**

While the results of validation analysis show that Student's Worksheet based on hypermedia is valid and reliable for all aspects as in the table below:

Table 3. Results Analysis of validation and reliability of Student's Worksheet based on hypermedia

No.	Aspect	Percentage (%)
1	Format of LKM	98,3
2	Content of LKM	96,4
3	Language of LKM	98,5
4	Benefit of LKM	98,3
	Average	**97,88**

when the learning process took place, observations were made by three observers who were assigned to provide an assessment of the student's activities using the observation sheet. on the observation sheet there are 8 aspects of science process skills as follows: Observation (observe demonstration); finding concept; doing experiments; interpreting of data; performing calculations; explaining the concept; presenting; and inferencing. here is the comparation of average score of the students' science process skill scores for the 3 classes.



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Abruscato (in Dahlan) [9], classifies the skills of the scientific process into two parts, namely basic process skills and Integrated Processes. Basic process skills consist of: Observation; Use of numbers; Classification; Measurement; Communications; Forecasting; Inference. While the integrated process skill consists of: Controlling variables; Data interpretation; Formulation of hypotheses; Defining operationally; Experimenting.

In order for students to have these skills, they must be trained to perform activities related to those skills. Based on the observer's assessment from each meeting, it was found that most aspects of student activity above 80% indicated that learning using hypermedia based learning tools gave students the opportunity to move. Hypermedia-based learning provides an opportunity for students to explore, enabling them to always move, not just listen and record as revealed by Cengiz [10] that media accompanied by appropriate learning tools can involve students actively in learning.

Some previous media development studies, such as those done by Swandi and Bunga Dara [11] which also measure student activity and perception. But the advantages of hypermedia-based learning tools enable students to access this media independently, whenever and wherever good used by hp, ipad, tab, notebook and laptop.

Although the results of this study indicate that student activities in both categories include activities of observing demonstrations, seeking concepts, calculating, categorizing, explaining, presenting, and creating processes. It is not claimed that virtual observations through computer media are more effective than experiments in real laboratories. Conversely, hypermedia experiments are done by reason of device limitations, timing considerations, abstract subject matter

The data about students' perceptions of learning using hypermedia learning devices as follows:

Table 4. Student Perceptions

No	Indicator	Percentage (%)
1	Facilities Learning Instrument Based on Hypermedia	85,40
2	Learning Appeal by Using Learning Instrument Based on Hypermedia	87,60
3	Learning Activity by Using Learning Instrument Based on Hypermedia	84,20
Rata-Rata		85,73

Based on the students' assessment of learning using hyermedia obtained data that the student response above 85% indicates that students strongly agree with the learning using hypermedia based learning tools Student perception after being treated in the form of application of Hipermedia based learning showed very agree, although there are some students who provide a disagreement assessment of some of the criteria proposed. Students interested in the display of learning hypermedia simulation, easy to run interactive simulations, easy to understand the subject matter, and happy to learn with the help of hypermedia. This is in accordance with Yulianti's research, et. al., [12] that the application of virtual media-based learning can improve students' affective abilities that describe feelings, interests, and attitudes toward the teaching process.

Acknowledgment

Thanks to physics concepts experts and hypermedia experts for their validations and advices, so that the development of learning tools based on hypermedia can be completed and implemented in fundamental physics learning.

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