Students and Teachers’ Necessity toward Multimedia Learning Modules (MLMs) Based on Benthik Local Wisdom to Provide Students’ Physics Initial Knowledge

A A Putry*, Warsono, Supahar and Jumadi
Physics Education Department, Yogyakarta State University, Kolombo Street Number 1 Karang Malang, Depok, Sleman, Yogyakarta, Indonesia

*Corresponding author’s email: andalia0335pasca2016@student.uny.ac.id

Abstract. Benthik is one of the local wisdom from DI Yogyakarta that consisted of two stages namely uthat and ilar. Benthik can explain various content of physics through Multimedia Learning Modules (MLMs). This research aims to determine the needs of students and teachers toward MLMs based on benthik local wisdom to provide students’ physics initial knowledge. The research used survey method. Data collection instruments used were questionnaires of students needs and interview. Research subjects consisted of 140 senior high school (SHS) students and 3 physics teachers. Research subjects were chosen by purposive sampling. The questionnaires were analyzed by percentage and the result of interview analyzed descriptively. The questionnaire contains about physics learning in schools, physics textbooks used, learning based on local wisdom, the use of technology in learning, and the media needed in learning. The result show that 99.28% of students need or very need MLMs based on benthik local wisdom. This condition is supported by the interview that showed teachers need MLMs because the students prefer to use multimedia technology than textbook. It means that students and teachers need Multimedia Learning Modules (MLMs) based on benthik local wisdom to provide students’ physics initial knowledge.

1. Introduction
The learning in the 21st century requires the various skills for students. One of the learning innovation and skills in the 21st-century framework is problem solving. It is necessary to build students who are skillful to solve problem and robust learning process to achieve an optimal result [1]-[4]. Problem solving is the ability to perform and solve problems through reasoning and relate them to initial knowledge and experience in the new days [5]. Student problem-solving skills can be improved with various classroom learning strategies.

Physics is one of the important subjects in high school. Physics learning time in school is only about 135-180 minutes per week. Whereas the content of physics at school is quite a lot to cover. Teachers often find it difficult to overcome this because of the lack initial knowledge of students. The lack of students' initial knowledge caused in a large number of material discussions and tasks during face-to-face learning. This leads to less effective face-to-face learning and it is difficult to improve students' problem-solving [6]-[8].

A way to provide initial knowledge is asking students to read textbooks before class. Teachers often ask students to read textbooks before class so the students are better prepared for learning. However, asking students to read textbooks is not an effective way [9], [10]. The reasons that make students lazy to complete their reading tasks are the lack of student motivation and the less effective...
and appropriate textbooks that used [11]. Another reason is explained by Cumming., et al [7] that students do not instill in themselves that reading is a useful thing. Podofsky [12] estimates that students actually assume that reading is useful but they do not see the relationship between the book they are reading and learning at school. Reading is not a priority for students. Students just focus to their face-to-face learning because they assumes it is more influencing their learning outcomes [10]. It causes the learning process to be less effective. In addition, students also assume that reading before learning is not important. Technological advances are also the reason for the rarity of students reading textbooks.

Technological advances make the application of traditional teaching increasingly difficult to sustain students' interest in physics. The use of textbooks in learning has been largely replaced by electronic modules [10], [13]. Many studies concluded that learning which is integrated with technology can improve student learning outcomes. The technology can be web, animation, multimedia and multimedia modules [14]-[16]. The design of instructional technology will need to pay attention to the problem-solving [17]. Students expect materials and teaching methods to be contextual. Contextual approaches can help teachers associate material taught with students' real situations and encourage students to make connections between the knowledge they have in their application in life as members of society [18]. Thus, the teachers must provide material and experience to give the student's expectations. Teachers can use multimedia technology to attract students and make learning more real or contextual [9], [15], [19]. Multimedia becomes one of the best educational techniques because it uses more than one sense simultaneously [20]. The use of multimedia in education can cover up the shortcomings of traditional teaching methods. In addition, students using multimedia have a better understanding than using textbooks [9]. The advantages of learning with multimedia include: can be used in independent teaching methods. In addition, students using multimedia have a better understanding than using textbooks [9]. The advantages of learning with multimedia include: can be used in independent teaching methods. In addition, students using multimedia have a better understanding than using textbooks [9].

Multimedia Learning Modules (MLMs) based on local wisdom. Multimedia Learning Modules (MLMs) can be integrated with local wisdom. Multimedia Learning Modules (MLMs) based on local wisdom is a learning activity that is packed in a whole and systematic refers to the learning outcomes to introduce the key concept of learning that combines various media, through animation and narration with a duration of 12-15 minutes. The use of MLMs has been widely researched and has a positive impact for students [6]-[9], [19], [22], [23].

MLMs can be integrated with local wisdom. Multimedia Learning Modules (MLMs) based on local wisdom is a learning activity that is packed in a whole and systematic refers to the learning outcomes to introduce the key concept of learning that combines various media, through animation and narration with a duration of 12-15 minutes associated with local wisdom. Local wisdom makes learning more contextual and relevant to life [24]-[25]. The use of local wisdom in learning is expected to understand the concept appropriately and contextually, improving problem solving ability, scientific communication, environmental awareness and character development of education [26]–[29].

Local wisdom is related to culture in society both abstract and concrete [30]. The physical dimensions of local wisdom in Indonesia can be traditional games. Traditional games can be a method of introducing the values of local wisdom [31], [32]. Benthik is one of the traditional games in DI Yogyakarta. This game is also called gatrik, pantak lele or patil lele. The tools used in the benthik game are two strong and straight bamboo logs called benthong and janak, a hole called lowokan [33]. Benthik consists of two stages, namely uthat stage and ilar stage. UTHAT stage start from the janak is levered from the lowokan. The ilar stage is done by leveraging the janak from the lowokan to the top and then the janak is struck forward.

Benthik can explain various concepts of physics such as momentum and impulse. In the uthat stage, it can explain the concept of momentum, impulse and impulse-momentum theorem. Momentum occurs when janak with the mass m is above the lowokan, then the janak is levered so that it moves with velocity v. Shortly after it is levered there will be a momentum change of Δp. The impulse occurs when the player leverages the janak with impulsive force $F$ and benthong comes into contact with the
The impulse-momentum theorem occurs when the \textit{janak} is leveraged with impulsive force $\mathbf{F}$ and the interval $\Delta t$ resulting in impulse of $I$. Then the \textit{janak} moves and generates a momentum change of $\Delta p$. The ilar stage can also explain momentum, impulse, and impulse-momentum theorem. Momentum occurs when the \textit{janak} that stays on the \textit{lowokan} is leveraged so that it moves with velocity $v$. The impulse occurs when the \textit{janak} is struck forward with impulsive force $\mathbf{F}$ and the length of \textit{janak} is in contact with \textit{benthong} during $\Delta t$. The impulse-momentum theorem occurs when the \textit{janak} in the air is at its highest point so the velocity is 0. \textit{Janak} is then struck with impulsive force $\mathbf{F}$ and interval $\Delta t$ resulting in a change in momentum of $\Delta p$. The various concepts of physics in \textit{benthik} game can also be integrated in MLMs. This study aims to determine the needs of teachers and students through MLMs based \textit{benthik} local wisdom that can provide initial knowledge for students. Knowing the needs of teachers and students is important because it can help teachers to meet those needs with expected solutions.

\section{2. Research Methodology}

The research method used is survey method. The research was conducted in SMAN 4, SMAN 6 and SMAN 11 of Yogyakarta at January - February 2018. The research subject shows in Table 1.

\begin{table}[h]
\centering
\caption{Research Subject}
\begin{tabular}{|c|c|}
\hline
Nu. & Research Subject & Total  \\
\hline
1. & Students of SMAN 4 Yogyakarta & 59 students  \\
2. & Students of SMAN 6 Yogyakarta & 49 students  \\
3. & Students of SMAN 11 Yogyakarta & 32 students  \\
4. & Teacher & 3 teachers  \\
\hline
\end{tabular}
\end{table}

The research subject are chosen by purposive sampling because the sample chosen to represent the high, middle and low based on national exam (UN) value in 2016. The instrument of data collection used is questionnaire of student needs and interview. The specification table of the questionnaire shows in Table 2. There are 5 aspect and 15 statements.

\begin{table}[h]
\centering
\caption{Specification table of questionnaire of student’ need}
\begin{tabular}{|c|c|c|}
\hline
Nu. & Aspects & Statement  \\
\hline
1. & Learning physics at school & 1. The learning of physics at school is interesting  \\
2. & Physics textbook & 2. The used textbooks is easy to understand  \\
& & 3. Always reading textbook before class  \\
& & 4. The physics textbook is interesting  \\
3. & Learning based on local wisdom & 5. Teachers always associate learning with local wisdom  \\
& & 6. Students know about \textit{benthik} local wisdom  \\
& & 7. Students like learning based on local wisdom  \\
& & 8. Momentum and impulse material taught with \textit{benthik} local wisdom will be fun  \\
4. & Using technology in learning & 9. Students always use technology to learning  \\
& & 10. Teachers often use learning media that utilize technology  \\
& & 11. Students like learning with the help of technology media  \\
\hline
\end{tabular}
\end{table}
12. Technology media can help students to improve their cognitive ability

13. What media is mostly used by teacher

Five. The needed media in learning

14. What kind of media is needed in learning

15. Multimedia Learning Modules (MLMs) based on benthik local wisdom is needed by students

Besides using questionnaires, it also uses interviews. Interviews are used to triangulate the statements obtained from the questionnaire. Data analysis techniques used for the questionnaire are percentage. Interview data were analyzed descriptively based on answers from the teachers.

3. Findings

The findings of the needs of teachers and students in MLMs based on benthik local wisdom through multimedia technology seen from several aspects. Table 3 shows the first aspects of assessing students’ needs of MLMs based on benthik local wisdom. The first aspect is physics learning at school that shows in Table 3 below.

| Table 3. Students’ opinions in physics learning at school |
|---------------------------------------------------------|
| Nu. | Statement | Strongly agree | Agree | Disagree | Strongly disagree |
|-----|-----------|----------------|-------|----------|------------------|
|     |           | f   | %    | f   | %    | f   | %    |
| 1   | The learning of physics at school is interesting | 7  | 5,00 | 21 | 15,00 | 108 | 77,14 | 4  | 2,86 |

Table 3 shows that physics learning at school isn’t interesting. Through interviews with students, less interesting learning physics at school due to less interesting textbooks used. In addition, students also reasoned different ways of teaching and too much physics material that make physics learning isn’t interesting.

One of the learning resources used in schools is textbooks. Physics textbooks are used by all of the students during the lesson as well as at homework. Table 4 shows students’ opinions about the use of physics textbooks at schools.

| Table 4. Students’ opinions about physics textbooks at school |
|-------------------------------------------------------------|
| Nu. | Statement | Strongly agree | Agree | Disagree | Strongly disagree |
|-----|-----------|----------------|-------|----------|------------------|
|     |           | f   | %    | f   | %    | f   | %    |
| 2   | The used physics textbook is easy to understand | 3  | 2,14 | 65 | 46,43 | 70 | 50,00 | 2  | 1,43 |
| 3   | Always reading textbook before class | 2  | 1,43 | 13 | 9,29 | 113 | 80,71 | 12 | 8,57 |
| 4   | The physics textbook is interesting | 2  | 1,43 | 25 | 17,86 | 107 | 76,43 | 6  | 4,29 |
Table 4 shows that more than half of students stated that they rarely read textbooks before class. It also reinforces the second statement that shows 50% of students disagree if the textbooks used are easy to understand. Based on interviews conducted with some students, students rarely read textbooks because they lack understanding of textbooks that used, the learning methods by teachers still conventional and less motivating students. In addition, textbooks aren’t interesting so students are reluctant to read the textbook except during the class. This is in accordance with the fourth statement which indicates that the textbook used is less attractive to students. The student’s statement caused 80.71% of students rarely read textbooks before class.

The use of textbooks can also be integrated to local wisdom. One of the local wisdom of Yogyakarta that can be used is benthik. Table 5 shows the use of local wisdom in learning.

Based on table 5, in the fifth statement can be seen that 70.71% of students stated that teachers rarely connected learning and local wisdom. Based on interviews with teachers it is known that teachers only associate learning with some daily occurrences. The teacher has never associated learning with existing local wisdom. In fact, 80% of students like learning based on local wisdom. One of the local wisdom of DI Yogyakarta is benthik. Through the questionnaire, it is also known that the majority of students still know the benthik traditional game and just 13.57% students don’t know. Interview with students also shows that, some student know benthik local wisdom from: a) told by someone is b) knowing because they ever play it, c) knowing because ever read in the book/internet. This means that most students still know benthik.

One of the physics materials that can be explained by benthik local wisdom is momentum and impulse. Students agree that momentum and impulse materials are taught with benthik local wisdom will be fun. Students argue that learning associated with local wisdom will assist students in understanding the material. In addition, it can help preserve local wisdom.

Technological developments have affected the world of education. Based on a questionnaire, it is known that all students (100%) have personal electronic devices, such as laptops/PCs, tablets or smartphones. Most students have more than one electronic devices. Most electronic devices owned by students are laptops and smartphones. Table 6 below shows the use of technology in learning.
Table 6. Students' opinions about the use of technology in learning

| Nu. | Statement                                                                 | Strongly agree | Agree | Disagree | Strongly disagree |
|-----|---------------------------------------------------------------------------|----------------|-------|----------|-------------------|
|     |                                                                            | f   | %     | f   | %     | f   | %     |
| 9   | Students always use technology to learning                                | 24  | 17,14 | 92  | 65,71 | 23  | 16,43 | 1   | 0,71  |
| 10  | Teachers often use learning media that utilize technology                  | 25  | 17,86 | 70  | 50,00 | 44  | 31,43 | 1   | 0,71  |
| 11  | Students like learning with the help of technology media                   | 53  | 37,86 | 84  | 60,00 | 2   | 1,43  | 1   | 0,71  |
| 12  | Technology media can help students to improve their cognitive ability      | 40  | 28,57 | 99  | 70,71 | 1   | 0,71  | 0   | 0     |

Statement 9 shows that most students (65.71%) often use electronic tools to learning. Based on the interviews, it is known that these electronic devices are used to aid additional references that they do not find in textbooks, especially when doing the task or homework.

Teachers also often use media technology for learning. This is consistent with statement 10, where 50% of students think that teachers often use the technology media in learning. According to teachers, using technology in learning can help students learn abstract concepts in physics. Based on interviews with students is also known that they like learning using technology. This result are in line with Statement 11 that show students' opinions about the use of technology in learning. 60% of students enjoy learning with technology and 37.86% of students are very enjoy to learn with the help of technology. One reason is that technology can increase student motivation and improve cognitive abilities. This is consistent with the statement 12 where 70.71% of students agree if technology can help improve cognitive abilities.

Figure 1 shows the most frequently technology media used by teachers according to students opinion. Most media that teachers used are powerpoint. This is proven from interviews with teachers that stating powerpoint can help focus students' attention and help learn abstract concepts. The use of technology in the right material can make learning easier. The results of the interviews also show that the all of teachers argued about the barrier of using technology in learning. The biggest barrier if the power goes out. In addition, to prepare the media takes considerable time so that it will reduce learning time.
Based on interviews, barrier in using media technology can be overcome with the existence of facilities such as the generator when the power goes out. In addition, teachers must prepare the media for learning so that the learning time can be efficient. Figure 2 shows the most needed media in learning.

Through the questionnaire, it is known that 80.00% of students prefer audio-visual media in the learning as in Figure 2. Students argue that the material will be more clear if delivered in audio-visual media than audio or visual only. One of the audio visual media is MLMs. An interview result from one of the teachers stating that the teacher once provided audio-visual media in the learning. The results obtained are very effective because students are more passionate and easier to understand the material. In addition, teachers feel very helpful in explaining the material. However, teachers have limited time to prepare the audio-visual media.
Having shown the example of MLMs, 77.14% of students thought they needed MLMs based on local wisdom and 22.14% were in very need, while only 0.71% considered less needed (see Figure 3). Students argue that MLMs can provide their initial knowledge and more interesting than textbooks. The audio-visual media presented through MLMs are preferred by students. In addition, MLMs that can be accessed through electronic devices make students more accessible. Interviews with teachers also state that all teachers need MLMs. Development of these MLMs can help teachers overcome the limited time of teachers in preparing audio-visual media for learning.

4. Discussion
Physics is a difficult subject for students [34]. Based on the results of the questionnaire is known that it’s because the less interesting students of physics learning. Apart from the learning aspect, in the student questionnaire results that the textbook used is quite interesting but still difficult to be understood by the students. Therefore, 80.71% of students still rarely read books before class. In fact, reading textbooks before class can provide initial knowledge for students but asking students to read books is not an effective way [9]. Whereas, initial knowledge is essential to make learning more effective.

Information, media, and technological skills are one part of the 21st century learning framework [35]. Technology has become a part of many areas of life including education. For the most part, the use of technology in education is used as a source of information [36]. One of the commonly used technology in learning is powerpoint. The use of this powerpoint only provides information from one perspective only [37]. In fact, based on the results of this study note that 97.86% of students argue that teachers most often use the powerpoint as a technology media. This is in accordance with interviews conducted on one of the teachers who stated that often use powerpoint because it can help simplify learning.

Learning media can be divided into three types: audio media, visual media and audiovisual media. The results of questionnaires indicate that students prefer the audio-visual media than audio media or visual media. The percentage of students who likes audiovisuals reach 80%. According to students, the use of audio-visual media can help students understand the material and more fun. Audio-visual media can make students more interested and motivated to learn the material [35]. In addition, audio-visual media that contain messages in the form of audio or hearing and images or visuals can stimulate the students’ thoughts, feelings and abilities in learning. Mishra & Yadav [36] who revealed that the use of audio-visual media can build more tangible and effective learning and provide students with a longer understanding.

A student preferred audio-visual media can be integrated to local wisdom in Indonesia. The form of local wisdom that can be used is benthik. Results of questionnaires, 80% of students like
learning based on local wisdom. As many as 81.43% of students still know *benthik* traditional game, whether they ever play it, know from others and have read it in books or internet. 56.43% of students agree that momentum and impulse material will fun if be taught through *benthik* local wisdom. The use of local wisdom in learning can also help improve student performance and motivate students to learn [27], develop the character [28] and improve students' critical thinking skills [40].

*Benthik* as a local wisdom from DI Yogyakarta can explain some physics material in high school. In addition to explaining the material momentum and impulse, *benthik* can also explain other physics material, such as parabolic motion, upward vertical motion, and vector. Parabolic motion occurs both in the stage *uthat* and *ilar*. At the stage *uthat*, when *janak* is revealed then resulted parabolic motion. At the *ilar* stage, when the *janak* stuck to forward then resulted half parabolic motion. Upward vertical motion occurs at the *ilar* stage when the *janak* is revealed up by *benthong*. Vectors can be explained at all stages of *benthik* because many physics quantities is including vectors and it can be reviewed in a *benthik*, such as velocity, acceleration, force, momentum, and impulse. Multimedia Learning Modules (MLMs) as one of the audio-visual media can be integrated with *benthik* local wisdom. A total of 77.14% of students stated that they needed MLMs based on *benthik* local wisdom. The use of MLMs can provide students' initial knowledge [19], improve memory capacity, display three-dimensional dynamic images to help students build mental representations, and make explicit connections between key concepts to help students organize concepts [6]. Based on questionnaires and interviews, MLMs can also be used as an effective media for students to provide initial knowledge. Thus, the initial knowledge of students through MLMs can make learning more effective than simply asking students to read textbooks.

References

[1] Pacific Policy Research Center 2010 21st Century Skills for Students and Teachers. Research & Evaluation (Kamehameha Schools, Research & Evaluation Division).

[2] The Partnership for 21st Century Skill 2010 21st Century Knowledge and Skills in Educator Preparation (Pearson, Washington DC) pp. 9.

[3] Ramadani M, Supahar S, & Rosana D 2017 J. Inov. Pendidik. IPA 3 180-188

[4] Nurhayati A, Jumadi, Wilujeng I, & Senam 2017 Int. J. Sci. Basic Appl. Res 36 175-184

[5] Ahonen A.K & Kinunnen 2015 Scand. J. Educ. Res 59 395 - 412

[6] Sadaghihani H R 2012 Phys. Rev. Spec. Top. - Phys. Educ. Res. 8 1–7

[7] Moore J C 2018 Educ. Sci. 8 23

[8] Sadaghihani H R 2012 Phys. Teach. 50 301

[9] Stelzer T, Gladding G, Mestre J & Brookes D T 2009 Am. J. Phys. 77 184

[10] Heiner C E, Banet A I & Wieman C 2014 Am. J. Phys. 82 989–996

[11] Starcher K & Proffitt D 2011 Int. J. Teach. Learn. High. Educ. 23 396–407

[12] Podelesky N & Finkelstein N 2006 Phys. Teach. 44, 338

[13] Khalid A, Atisqullah M M, Singh R & Stutzmann B 2014 Text books: Ebook Vs. Print. 121st ASEE Annu. Conf. Expo. 360 Degrees Eng. Educ. 3 243–258

[14] Hill M, Sharma M D & Johnston H 2015 Eur. J. Phys. 36 45019

[15] Nirmala V, Sharma G R & Subrahmanyeswari 2016 Int. J. Sci. Environ. 5 438–444

[16] Thomas O O & Israel O O 2014 J. Educ. Behav. Sci. 4 201–210

[17] Thohir M A and Warsono W 2018 Turkish Online J. Educ. Technol. – TOJET 17 24–36

[18] Wiyatmo Y & Warsono 2007 J. Educ. Learn. & Warsono 2007 J. Sci. Technol. 11 156-162

[19] Sadaghihani H R 2011 Phys. Rev. Spec. Top. - Phys. Educ. Res. 7 1–7

[20] Aloraini S 2012 J. King Saud Univ. - Lang. Transl. 24 75–82

[21] Wang T J 2010 TechTrends 54 47–57

[22] Lage M J, Platt G J & Treglia 2000 J. Econ. Educ. 31 30–43

[23] Chen Z, Stelzer T & Gladding G 2010 Phys. Rev. Spec. Top. - Phys. Educ. Res. 6 1–5

[24] Lye H, Fry M & Hart C 2001 Aust. Sci. Teach. J. 48 16–22

[25] Tural G 2013 Asia-Pacific Forum Sci. Learn. Teach. 14 1–23

[26] Dewi I N, Poerdijastoeiti S & Prahani B K 2017 Int. J. Educ. Res. 5 107–118

[27] Kurniawati A A, Wabyuni S & Putra P D A 2017 Int. J. Sci. Humanit. 7 47–50

[28] Marhayani D A 2016 J. Educ. Teach. Learn. 1 66–70

[29] Pornpimon C, Wallapha A & Prayuth C 2014 Procedia - Soc. Behav. Sci. 112 626–634
[30] Mungmachon R 2012 *Int. J. Human.* 2 174–181
[31] Wagiran 2011 *J. Penelit. dan Pengemb.* 3 85–100
[32] Rosala D 2016 *J. Seni dan Desain serta pembelajarannya* 2 17–26
[33] Arini C, Munawaroh S, Hartoyo, Wahyono T & Maharkesti R 1998 Pembinaan Nilai Budaya Melalui Permainan Rakyat Daerah Istimewa Yogyakarta. (Departemen Pendidikan dan Kebudayaan, Direktorat Jenderal Kebudayaan, Bagian Proyek Pengkajian dan Pembinaan Nilai-Nilai Budaya 1997)
[34] Ornek F, Robinson W R, Haugen M P & Email C A 2008 *Int. J. Environ. Sci. Educ.* 3 30–34
[35] Alishmail H A & Mcguire P 2015 *J. Educ. Pract.* 6 150–155
[36] Ramma Y, Bholoa A, Watts M & Nadal P S 2017 *Educ. Inq.* 0 1–27
[37] Isseks M 2011 *Educ. Leadersh.* 68 74
[38] Sediyani T, Yuniarti & Hadi E 2017 *J. Educ. Pract.* 8 106–112
[39] Mishra S K & Yadav B *Glob. J. Human-Social Sci.* 14 14–24
[40] Wahyuni S 2016 *J. Pendidik. Fis. Indones.* 12 33–40

**Acknowledgement**

The authors thanks to the The Ministry of Research, Technology and Higher Education (KEMENRISTEKDIKTI) 2017-Indonesia for funding this research. We also thank to teachers and students as contributors in this study.