Practicality of interactive multimedia of natural science integrated with the theme of motion in life using an integrated scientific approach to 21st-century learning

Annisa Kurniawati, Ratnawulan* and Ahmad Fauzi

Physics Education Master Study Program, Faculty of Mathematics and Natural Sciences, Universitas Negeri Padang, Jl. Prof Hamka, Padang 25131, Indonesia

*ratnawulan@fmipa.unp.ac.id

Abstract. This interactive multimedia was developed using a scientific approach and integrated with the characteristics that exist in 21st-century learning. The practicality test aims to assess the practicality of the interactive multimedia products being developed. The practicality test was carried out by distributing a questionnaire in the form of an instrument sheet for the practicality of the response of educators and the responses of students to 2 educators and 15 students. The data analysis technique to assess the practicality of the product is the Likert scale. The result is an Integrated Natural Science interactive multimedia developed with very practical criteria so that students and educators can use it in teaching and learning activities.

1. Introduction

This 21st century, information and communication technology are increasingly advanced and rapidly developed. So, everyone is required to be able to follow its developments in order to compete and get the maximum opportunity to survive in this world full of competition. One of them is that in the education field, educators are required to pursue every development of information and communication technology in order not to miss information and able to get benefit of these technologies and information developments in the learning process. Especially during currently pandemic, where some schools were forced to carry out online learning processes. So that educators must be able to adapt to the situation and must be able to take advantage of various existing technologies so that learning can be continued. Moreover, students are also required to master technology so that they can follow the learning process smoothly. Student are also required to have 4C skills, namely collaboration skills; critical thinking skills, and problem-solving skills; communication; and creativity, and innovation [1][2]. These skills are needed by students to improve their competence and to live a life full of challenges in this 21st century [3][4][5].

The government has made various efforts in order to boost the class of education in Indonesia, as quality education can produce superior human resources who can compete in this 21st century [6]. Among them is the change in the curriculum from the education unit level curriculum (KTSP) to K13 (curriculum 2013) [7], training for educators both online and offline to improve the quality of educators so that they can produce quality students as well, providing education funding assistance through BOS (School Operational Assistance) funds to assist schools in completing the various facilities they need to support the teaching and learning process to be better [8].
Based on field observations at SMPN 2 Koto XI Tarusan students' 4C ability is still low, the media used is still not able to increase independence and motivate students in learning science. In line with the results of the initial analysis of media, namely the media used by educators from the aspect of content quality is still low so that it cannot motivate students to learn [9][10], content media is not in accordance with the learning objectives [11], and the media used by educators has not been capable to help students improve their 4C skills [12][13]. 4C skills can be improved by applying the steps to a scientific approach in the learning process, namely observing, asking questions, gathering information or conducting experiments, associating, and communicating. Learning with a scientific approach can has an influence on student learning outcomes [14].

Technology can make learning activities quality and efficient [15]. By utilizing information technology, learning can be done anywhere and anytime such as online learning. Learning that utilizes technology includes the use of interactive multimedia in learning activities. Multimedia is a combination of the word multi and medium, where the meaning of multi is many, medium means something that is used to carry something [16]. Multimedia is a combination of many media including images, sound, video, and text which are useful for conveying messages. Interactive multimedia is a combination of several media, namely images, video, text, and sound which are combined to facilitate the delivery of information and interaction between users and computers [17]. This interactive multimedia can be used as a solution to natural science problems, namely in displaying phenomena that cannot be brought to class. For example, interactive multimedia can display the phenomenon of closing the shy daughter leaves when touched. Interactive multimedia has many advantages, including learning to be of higher quality, more effective, efficient, can make abstract concepts concrete [18]. Interactive multimedia can increase the independence and interest of students in learning [19][20]. So that from the advantages possessed by interactive multimedia is expected to have a positive impact on learning outcomes, especially an increase in the 4C skills of students.

In the 2013 curriculum, science learning is taught in an integrated manner at the Junior High School level or equivalent [21][22]. Currently, science learning is required to be taught with integrated 21st century skills [23]. Integrated natural science learning is learning about natural science which studies natural phenomena as a whole from the point of view of physics, chemistry, and biology in an inseparable unit that is tied to a theme. According to Arlitasari, Pujayanto, & Budihar ti, the combined material may be from at least two fields of study, namely chemistry-physics, physics-biology, biology-chemistry, or covers the three fields of physics-chemistry-biology [24]. Some examples of themes in Integrated Science learning include the theme of blood fluids [25], the theme of energy in life [26], the theme of muscles and human skeletal systems [11], the theme of cohesion and attachment in life [27]. Another example is, Integrated Natural Science learning with the theme of movement in life [28]. Then educators will teach material about motion in life in terms of chemistry, physics, and biology. Integrated science learning can increase interest and motivation to learn science, efficient, effective, and make it easier for students to understand science lessons [29][30].

So that researchers are interested in developing interactive multimedia integrated natural science with the theme of motion in life using an integrated scientific approach to 21st century learning. In the Plomp model, there are several steps that must be passed in order to produce a valid, practical, and effective product. The validation stage has been carried out, the results are in the form of product validation instruments, teacher practice response instruments, student responses practice instruments and valid products. Furthermore, the practicality stage is carried out. So, this study aims to conduct a practicality test of interactive multimedia Integrated Natural Science with the theme of motion in life using an integrated scientific approach to 21st century learning.

2. Method
This research uses a descriptive method [31]. In this research, the subjects were 15 class VIII students and 2 educators teaching natural science material at SMPN 2 Koto XI Tarusan, West Sumatera. Data obtained from the practicality instrument sheet of teacher and student responses. Data analysis techniques to assess the practicality of the product using a Likert scale. The practicality test aims to
determine whether the product being developed is practical or not used in the learning process. Practicality according to KBBI (Indonesia Dictionary) is easy and fun to use. Practicality test indicators are easy to use, attractive, efficient in learning time, and useful in use. The practicality category can be looked at in Table 1.

| Interval (%) | Category     |
|--------------|--------------|
| 81-100       | Very Practical|
| 61-80        | Practical    |
| 40-60        | Enough Practical |
| 20-40        | Less Practical |
| 0-20         | Not Practical |

Source: modified from Riduwan [32]

Based on Table 1. It shows that the impractical category is in the value (0-20)%, the value is less practical (20-40)%, is quite practical with a value between (40-60)%, is practical at the value (61-80)%, and is very practical with a value between (81-100)%. Integrated Natural Science Interactive Multimedia developed is said to be practical by respondents in the 61% - 80% category and the category is very practical at a value of 81% to 100%.

3. Results and Discussion

The practicality test went through three stages, namely, the first stage is one to one evaluation, one to one evaluation is done by distributing questionnaires to three students who have different abilities. Students use interactive multimedia products then provide comments about the products they have used through the interactive multimedia practicality sheet. The average result of the practicality test of the responses of three students to the evaluation one by one was 88.19% with very practical criteria. Among the students' comments, there were still sentences that were wrong in writing, then the product was revised. Therefore it can proceed to the next stage, namely small group evaluation. In the small group evaluation stage, the product was assessed by nine students, overall, the results were very practical with an average score of 83.68%. Then proceed to the field test stage, at this stage, products are tried out in learning activities. The results of the practicality test for the response of students and educators after using the Integrated Natural Science interactive multimedia product in the learning process are as follows.

3.1. Results of Practicality Test for Integrated Science Interactive Multimedia Student Response

The purpose of implementing the practicality test is to determine student responses to the product after using interactive multimedia in the learning process. Indicators of product are assessed by students, namely easy to use, interesting, efficient learning time, and benefits in the use. The practicality test results of students' responses can be looked at Table 2.

| No | Aspect                | Value   | Criteria     |
|----|-----------------------|---------|--------------|
| 1  | Ease to Use           | 90.56%  | Very Practical|
| 2  | Interesting           | 90.00%  | Very Practical|
| 3  | Efficient learning time| 88.33%  | Very Practical|
| 4  | Benefits in the us of | 91.67%  | Very Practical|
|    | Average               | 94.14%  | Very Practical|

Table 2. Student Response Practicality Test Results
From table 2, overall the results of the practicality test of students’ responses to the Integrated Natural Science interactive multimedia products that they use in the learning process are very practical. More details can be seen in Figure 1.

![Figure 1. Results of Practicality Test Analysis of Student Response](image)

Figure 1. shows that 1) seen from the aspect of easy to use of the product is at a value of 90.56% with the very practical category, this means that interactive multimedia Integrated Science is easy to use by students.; 2) students are interested in learning science by using interactive multimedia integrated science in learning activities, this is indicated by the value obtained from an interesting aspect, namely 90% with very practical criteria; 3) Integrated science interactive multimedia can saving time and be efficient used in learning according to students seen from the value obtained from the efficient aspect of learning time, namely 88.33% with very practical criteria; 4) in terms of benefits in use, the value is 91.67% with very practical criteria.

3.2. The Results of Practicality Test for Interactive Multimedia Educator Response

The results of the Integrated Science interactive multimedia practicality instrument sheet that has been filled in by educators after using the product can be looked at Table 3. The practicalities test indicator for the response of educators is the same as the practicality test for the response of students, namely attractive, ease of use, benefits in use, and efficient learning time.

| No | Aspect                        | Value  | Criteria   |
|----|-------------------------------|--------|------------|
| 1  | Ease to Use                   | 90.63% | Very Practical |
| 2  | Interesting                  | 93.75% | Very Practical |
| 3  | Efficient learning time       | 100.00%| Very Practical |
| 4  | Benefits in the us of         | 95.83% | Very Practical |
|    | **Average**                  | **90.05%** | **Very Practical** |

Table 3. Results of Educator Response Practicality Test
The results of the practicality test of educators' responses after using interactive multimedia products integrated natural science are shown in Table 3. This shows an average value of 95.05% with very practical criteria. More details can be seen in Figure 2.

![Figure 2](image)

**Figure 2. Results of the Practicality Test for Educator Responses**

From Figure 2, it can be seen that there are four aspects that can be analyzed from the results of the practicality test of educator responses, namely 1) from the aspect of ease of use, the criteria are very practical with a value of 90.63%; 2) interesting aspects are in the value of 93.75% with very practical criteria; 3) the efficient aspect of learning time with a value of 95.83% is very practical; and 4) the benefits in using it are also very practical with a value of 95.83%.

Analysis of data on the practicality of interactive multimedia, the response of students and educators, provides interactive multimedia results. Integrated Science is very practical to use in the learning process, namely first, seen from the aspect of easy to use, interactive multimedia has clear instructions so that it is easy to use, uses language that is easy to understand, and easy to read. Second, seen from an interesting aspect, interactive multimedia Integrated Science 1) is interesting to learn because it is made according to the characteristics of students, namely at the SMP/MTs level equivalent, 2) it is interesting to read because of the diverse color composition and the writing that is not monotonous, 3) making students happy learning science because it displays pictures and videos that are made as attractive as possible, 4) adding students' insight into the material of motion in life, including motion in humans, motion in animals, and motion in plants, and 5) There are additional 21st Century skills in Integrated Natural Science interactive multimedia which can make students have Higher-Order Thinking of Skills (HOTS) abilities. Research by Sanusi, Edi, and Davi, interactive multimedia can make students happy and interest in learning with high criteria [33].

Third, from the efficiency aspects of learning time, interactive multimedia on Integrated Natural Science can help overcome time limitations in the learning process so that it can save time and be efficiently used in the teaching and learning process. For example, educators do not need to spend a lot of time taking students outside of the classroom to study or observe objects or phenomena that cannot be brought into the classroom because these objects can be displayed through interactive multimedia that can be learned in the classroom so as to save learning time.
And fourth, in terms of benefits in use, interactive multimedia on Integrated Science can 1) train the independence of students in learning, in line with the goals of national education, which is contained in Law No. 20 of 2003, namely developing the potential of students to become independent humans [34], and supported by research conducted by Sutarno and Mukhidin, learning with interactive multimedia can upgrade student independence in learning [35]; 2) help students understand science learning easily, this is because the interactive multimedia integrated science used by students attracts students to learn which ultimately makes it easier for students to understand science learning; 3) can be used as additional teaching material for educators, 4) supports the role of educators as facilitators; 5) assisting educators in explaining abstract material, meaning that material that is abstract in nature can be displayed in real terms to students so that students can easily learn and understand it [36]; 6) guide students in building their own knowledge, through the steps in the scientific approach, namely observing, asking questions, gathering information or conducting experiments, associating, and communicating to help students build their own knowledge [37]; and 7) Integrated Natural Science interactive multimedia can measure the 4C skills of students.

In line with the research conducted by Rahmat and Arnawa, the results of the practicality test on interactive multimedia-based learning media that they developed are very practical [38]. Krismadinata, Elfizon, and Santika also conducted practicality tests on the products they developed, the results were interactive multimedia learning which was practically used in the learning process [39]. Ahmad and Ferit concluded from the results of their research that the interactive learning media they use in learning are stated to be practical so that they can be used in learning [40].

4. Conclusion
The conclusion from the practicality test that has been carried out by giving questionnaires to educators and students after using interactive multimedia products that are valid in the learning process is Integrated Natural Science interactive multimedia using the theme of motion in life with an integrated scientific approach 21st-century learning is included in the very practical category so that it can be utilized by educators and students in the learning process.

References
[1] T A Putri, Ratnawulan, and Gusnedi. 2019. Integrated science analysis of student text books with the theme of blood fluids using integrated connected type 21st century learning. Padang : IOP Conf. Series: Journal of Physics: Conf. Series 1185 (2019) 012110,
[2] Ayu Melati, Ratnawulan, and Gusnedi. 2019. Needs analysis of integrated natural science teacher book with theme senses of sight and optical devices using connected model for integrated 21st century learning. Padang : IOP Conf. Series: Journal of Physics: Conf. Series 1185 (2019) 012111,
[3] Zaitul Hidayat, Rahima Syabrina Sarmi, Ratnawulan, and Desnita.2020. Validity of science student books with the theme of energy in life based integrated local materials using integrated models for 21st century learning. Padang : IOP Conf. Series: Journal of Physics: Conf. Series 1481 (2020) 012116,
[4] Zaitul Hidayat, Rahima Syabrina Sarmi, Ratnawulan, and Desnita. 2019. Practicality of Science Student Books with the Theme of Energy in Life Based Integrated Local Materials Using Integrated Models for 21st Century Learning. International Journal of Progressive Sciences and Technologies (IJPSAT) , vol. 16.
[5] Firda Weri, Ratnawulan, and Gusnedi. 2019. *Analysis of student textbook in the development of integrated natural science student book with the theme sense of sight and optical devices using connected model for integrated 21st century learning.* Padang : IOP Conf. Series: Journal of Physics: Conf. Series 1185 (2019) 012113,

[6] Rahima Syabrina Sarmi, Zaitul Hidayat, Ratnawulan, and Desnita. 2020. *Validation of integrated science teacher book integrated mode with scene life energy in the regional local content based sijunjung for 21st century skills.* Padang : IOP Conf. Series: Journal of Physics: Conf. Series 1481 (2020) 012117,

[7] T Supriadi and Ratnawulan. 2019. *Identification characteristics of student in the development of integrated natural science student books integrated 21th century learning: a casestudy in SMP N 3 Talamau West Pasaman.* Padang : IOP Conf. Series: Journal of Physics: Conf. Series 1185 (2019) 012117,

[8] Gusnedi, Ratnawulan, and A Devialita. 2019. *Effectiveness of using sequenced model student books for integrated science lessons with themes of the human body adaptation system at temperature on student learning outcomes.* Padang : IOP Conf. Series: Journal of Physics: Conf. Series 1185 (2019) 012138,

[9] Zaitul Hidayat, Ratnawulan, and Gusnedi. 2019. *Analysis of learning media in developing science textbooks with theme energy in life using integrated model for integrated 21st century learning.* Padang : IOP Conf. Series: Journal of Physics: Conf. Series 1185 (2019) 012070,

[10] Rahima Syabrina Sarmi, Ratnawulan, and Gusnedi. 2020. *Learning media analysis in the development of integrated science teacher book with theme the energy in the life using type integrated of 21st century learning.* Padang : IOP Conf. Series: Journal of Physics: Conf. Series 1185 (2019) 012080,

[11] Nurhafifah and Ratnawulan. 2020. *Analysis of interactive media development of VIII grade integrated science with simple machine themes on human muscular and skeleton system using connected types integrated 21st century learning.* Padang : IOP Conf. Series: Journal of Physics: Conf. Series 1481 (2020) 012053,

[12] Annisa Kurniawati and Ratnawulan. 2020. *Analysis of interactive media integrated natural science by the motion themes in life using integrated connected type 21st century learning.* Padang: IOP Conf. Series: Journal of Physics: Conf. Series 1481 (2020) 012051

[13] Rizka Ariani and Ratnawulan. 2020. *Analysis of Interactive Media Integrated Natural Science with Energy Themes in the Life of Using Integrated types that Integrate of Learning for the 21st Century.* Padang: IOP Conf. Series: Journal of Physics: Conf. Series 1481 (2020) 012048,

[14] Syafri, Ratnawulan, Amali Putra, and Asrizal. 2019. Pengaruh Buku Teks IPA Terpadu Dalam Pendekatan Saintifik Terhadap Hasil Belajar Siswa Kelas VIII SMPN 13 Padang. *Pillar of Physics Education*, vol. 12.

[15] Herman, D. S. 2017. *Multimedia Pembelajaran Interaktif.* Yogyakarta: UNY Press

[16] Husnul Hamdi, Asrizal, and Zulhendri Kamus.2013. Pembuatan Multimedia Interaktif Menggunakan Moodle Pada Kompetensi Mengamati Gejala Alam Dan Keteraturannya Untuk Pembelajaran Siswa Sma Kelas XI Semester I. *Pillar Of Physics Education*, vol. 1,

[17] Linda Lia. 2015. Multimedia Interaktif Sebagai Salah Satu Alternatif Pembelajaran Dalam Bidang Pendidikan Sains. *Jurnal Inovasi dan Pembelajaran Fisika*, vol. 2.
[18] Tejo Nurseto. 2011. Membuat Media Pembelajaran yang Menarik. *Jurnal Ekonomi dan Pendidikan*, vol. 8.

[19] Sari Septiyan, Sudarmin, and Parmin. 2014. *Pengembangan Media Pembelajaran Interaktif (MPI) Pada Mata Pelajaran IPA Tema Zat Adiktif dan Respirasi untuk Siswa SMP*. *Unnes Science Education Journal*, vol. 3, no. 1.

[20] Susanto, Novi Ratna Dewi, and Andin Irsadi. 2013. Pengembangan Multimedia Interaktif dengan Education Game pada Pembelajaran IPA Terpadu Tema Cahaya untuk Siswa SMP/MTs. *Unnes Science Education Journal*, vol. 2, no. 1.

[21] Asrizal, A. Amran, A. Ananda, F. Festiyed, R. Sumarmin. 2018. The Development Of Integrated Science Instructional Materials To Improve Students’ Digital Literacy In Scientific Approach. *Jurnal Pendidikan IPA Indonesia*, vol. 7, no. 4, 2018.

[22] Yurnetti, Asrizal and Murtiani. 2020. *Need analysis to develop science learning material based on thematic teaching by integrating the new literacy*. Padang: IOP Conf. Series: Journal of Physics: Conf. Series 1481 (2020) 012122,

[23] Ayu Melati, Firda Weri, Ratnawulan, and Syafriani. 2020. *Validity of integrated natural science teacher book with theme senses of sight and optical devices using connected model integrated 21st century learning*. Padang : IOP Conf. Series: Journal of Physics: Conf. Series 1481 (2020) 012110,

[24] Arlitasari, Pujayanto, and Budiharti. 2013. Pengembangan Bahan Ajar IPA Terpadu Bebasis Salingtemas Dengan Tema Biomassa Sumber Energi Alternatif Terbarukan. *Jurnal Pendidikan Fisika*, vol. 1,

[25] Riza Helfira, Ratnawulan, and Syafriani S. 2020. *Validity of integrated science teacher’s book with the themes of blood fluid using integrated connected type learning in the 21st century*. Padang : IOP Conf. Series: Journal of Physics: Conf. Series 1481 (2020) 012106,

[26] Dian Arima Gusti and Ratnawulan. 2020. *An analysis of development of student’s worksheets with the theme integrated science energy in life by using integrated type of integrated learning in 21st century*. 2020. Padang : IOP Conf. Series: Journal of Physics: Conf. Series 1481 (2020) 012045,

[27] Tarinta Annisa Kendedes and Ratnawulan. 2020. *Validity of integrated science teacher’s book on junior high school based on character with the theme of cohesion and adhesion on living with shared model*.Padang : IOP Conf. Series: Journal of Physics: Conf. Series 1481 (2020) 012128,

[28] Joviana Marshel and Ratnawulan. 2020. *Analysis of Students Worksheet (LKPD) integrated science with the theme of the motion in life using integrated connected type 21st century learning*. Padang : IOP Conf. Series: Journal of Physics: Conf. Series 1481 (2020) 012046,

[29] Asrizal. 2015. *Studi Pendahuluan Tentang Permasalahan dan Kesiapan Guru untuk Mengimplementasikan Pembelajaran IPA Terpadu pada Siswa SMP*. *Eksakta*, vol. 2,

[30] T Supriadi, Ratnawulan, Syafriani, and A Samra. 2020. *Design of integrated science student book theme adaptation of the human body to change temperature integrated 21st century learning using integrated types*. Padang : IOP Conf. Series: Journal of Physics: Conf. Series 1481 (2020) 012091,

[31] Aprili Samra and Ratnawulan. 2020. *Validation of Integrated Science Teacher book with the
theme of the Human Body System Adaptation to Temperature Changes using Integrated Type of 21st Century Learning. Padang: IOP Conf. Series: Journal of Physics: Conf. Series 1481 (2020) 012099,

[32] Riduwan. 2012. Metode dan Teknik Menyusun Proposal Penelitian. Bandung: Alfabeta

[33] Sanusi, Edy Suprapto, and Davi Apriandi. 2015. Pengembangan Multimedia Interaktif Sebagai Media Pembelajaran Pada Pokok Bahasan Dimensi Tiga Di Sekolah Menengah Atas (SMA). Jurnal Ilmiah Pendidikan Matematika, vol. 3,

[34] “Undang-Undang Republik Indonesia Nomor 20 Tahun 2003 tentang Sistem Pendidikan Nasional,” 2003.

[35] Erwan Sutarno and Mukhidin. 2013. Pengembangan Model Pembelajaran Berbasis Multimedia Interaktif Pengukuran untuk Meningkatkan Hasil dan Kemandirian Belajar Siswa SMP di Kota Bandung. Jurnal Pendidikan Teknologi dan Kejuruan, vol. 21,

[36] Widi Widayat, Kasmui, and Sri Sukaesih. 2014. Pengembangan Multimedia Interaktif Sebagai Media Pembelajaran IPA Terpadu pada Tema Sistem Gerak pada Manusia, Unnes Science Education Journal, vol. 2,

[37] Daryanto. 2016. Media Pembelajaran. Yogyakarta: Gava Media,

[38] Holanda Rahmat and I Made Arnawa. 2019. Development Of Learning Media Based On Interactive Multimedia In Mathematics Learning For Class VIII Junior High School In Indonesia. International Journal Of Scientific & Technology Research, vol. 8, no. 12,

[39] Krismadinata Krismadinata, Elfizon Elfizon, Tiara Santika. 2019. Developing Interactive Learning Multimedia on Basic Electrical Measurement Course. 5th UPI International Conference on Technical and Vocational Education and Training (ICTVET 2018), Bandung,

[40] Ahmad Qosyim and Ferit, V. P. 2017. Penerapan Media Pembelajaran Interaktif Menggunakan Flash untuk Materi Sistem Gerak pada Manusia Kelas VIII. Jurnal Penelitian Pendidikan IPA , vol. 2,