Validity of science edupark e-book based on scientific approach on the national geopark of *ranah minang silokek*, Indonesia

Khairul Ummah and Hamdi Rifai*
Department of Physics, Faculty of Mathematics and Natural Sciences, Universitas Negeri Padang, Indonesia

* rifai.hamdi@gmail.com

Abstract. The background of the design and manufacture of the e-book is a follow-up to the preliminary research. Based on preliminary research revealed: first, there is no learning tool related to regional potential. Second, learning tools are not based technology yet. Third, there are many facts, principles and concepts of science in The National Geopark of Ranah Minang Silokek. The purpose of this study is to produce a valid quality Science Edupark E-Book based on material substance, presentation feasibility, appearance feasibility, and language. This e-book is designed based on the 2013 curriculum by containing the scientific approach steps. This research uses the Plomp development model in the development phase and the Prototyping phase. Data collection is taken by a questionnaire technique. Validation is carried out through an e-book validation instrument sheet by three experts, containing material substance, feasibility of presentation, feasibility of display, and language. The data analysis technique used is the Likert scale and the validity value by using the Aiken's V formula. This research results in an e-book with valid criteria. The conclusion of this research is the e-book that is made is suitable as a source of learning science in junior high school.

1. Introduction
The Information technology and communication developments as time go by target various sectors of life and education is no exception. The 21st century, the world of education on age knowledge is marked by a rapid increase in knowledge. The changes of this time would require the general public to master the skills of the 21st century, that is understanding and capable of using information and communication technologies. Education has a crucial and strategic role in embody societies that mastered the skills of the 21st century. It must begin with preparing graduates of every level of education in particular a junior high school to master new ones such as data literacy, technological literacy and human literacy [1]. Data literacy is the ability to process data by reading, reviewing, and analyzing into information. Technological literacy is the ability to operate the workings of machines to make ends easier. Human literacy is a ready mental capacity for communicating, aborting, critical, creative, and innovative things that surround us.

These abilities can be perceived if the learning accomplished takes advantage of the development of information technology and communication [2]. In order to get this, the educators must carry out innovation in learning. Thus, it can actualize the curriculum and replace old literacy (reading, writing and mathematics) to new ones, among other things, resource innovation. Electronic books (e-books)
are a learning resource that educators and students can utilize in learning activities by tapping into the development of information technology and communication. The e-book should provide care for the preferred learning style of students, so that the accomplished learning is more effective and efficient in accomplishing its purpose [3]. The use of the e-book in learning can also be beneficial, among which a) students will be active during study because study activities are enjoyable and meaningful; b) students are able to connect new ideas with understanding of meaning, curiosity, to preconceived doubts; c) afford students the opportunity to work in collaborative; d) provides opportunities for students to be active and enthusiastic in realizing the established purposes of learning; e) creates a directional atmosphere of learning that can be directional; and f) gives students an opportunity to be sensitive about what they learned [4]. All of these benefits align with the purpose of the learning process in the 2013 curriculum that wants the learning to be done can walk with interactive, inspiring, fun, challenge, motivate students to be actively engaged, and provide a setting that allows them to advance initiative, creativity, to self-reliance based on talent, physical interest and psychic development [5].

The learning process based on curriculum 2013 can be divided over two kinds of learning processes. The indirect learning process is specifically unregulated and limited activity in the learning process, so there is only a value and attitude development. The direct learning process is the development of knowledge, skill, and thinking ability with direct interaction of learning resources. The learning activities of students include observing, asking, trying, analyzing, and communicating. A series of learning activities like these are a scientific approach to learning. Application of the scientific approach measures in learning and supported learning resources that are capable of making students carry out the direct learning process will be able to optimize the results that will be obtained. The direct learning form that students can do is only in edupark tourism (edupark), such as The National Geopark of Ranah Minang Silokek, Indonesia [6]; MiFan Water Park Padang Panjang, Indonesia [7]; Janjang Siribu and Merah Putih mountain, Sulit Air, Indonesia [8]; Geopark Canyon Sianok, Indonesia [9]; Geopark Harau, Lima Puluh Kota, Indonesia [10]; School Playground [11]; Public Hot Tub Semurup, Kerinci [12]; Padang Beach, Indonesia [13]; Carocok Beach, Painan, Indonesia [14]; Hydroponics of SMKN 2, Batusangkar, Indonesia [15]; Gadang Palace Rajo Balun Solok Selatan, Indonesia [16]; Sarasah Kajai Falls, West Pasaman, Indonesia [17]; Anai Land, Padang Pariaman, Indonesia [18]; and Chinangkiek Hill, Solok, Indonesia [19].

Preliminary research has been conducted at Junior High School of SMPN 7 Sijunjung, SMPN 23 Sijunjung and SMPIT Kuatsar Ilmi among eight educators and seventy-five students. The educators are still dominant in using printing rather than the non-print teaching material. The average educator's value in exploiting non-print teaching materials on learning is in insufficient categories. The same teaching material is not yet based on the potential of territory around students, whereas the learning style they want is the technology-based learning style and the technology-driven learning style that uses tourist attractions, both of which have good categorical value. The need for learning resources that capitalize on the potential of educational parks (edupark) in sustaining and increasing students' learning motivation is needed. Because students love to visit tourist attractions in very good categories. The National Geopark of Ranah Minang Silokek is the most popular tourist attraction visited by students. While students are measly can relate natural phenomena to science concepts. This condition indirectly affects the knowledge, skill, and ability of early students in less learning. Analysis is also done in Sijunjung tourist attractions which are The National Geopark of Ranah Minang Silokek. The tourist attraction is frequented by students both on holiday and after school, but its use is just for entertaining. Based on observations of the tourist attraction, there are many concepts, and principles of science that can be used in learning [6].

Based on these issues requires a non-print learning source that taps into potential areas. One of the sources of the study is the electronic book (e-book) The National Geopark of Ranah Minang Silokek. The e-book contained three game sets as edupark. It is hoped that students can dig up various information and carry out learning activities that deal with basic mastered competence. The e-book is also equipped with guidelines for using The National Geopark of Ranah Minang Silokek as edupark in
learning. The e-book is designed based on the steps of a scientific approach. Learning by a scientific approach, having analytic characteristics, questioning, trying, analyzing, and confirming [20]. The application of the scientific approach measures on these e-book is expected that students can actively participate in learning, improve students' scientific abilities in learning, and create delightful learning for students.

The purpose of this study is to produce a valid quality Science Edupark E-Book based on components of material substance, the worthiness of presentation, the worthiness of appearance, and the language. This e-book development will be able to address one of the challenges for development of the 21st century in the development of technology-based learning, as well as referencing educators and other relevant parties in the making e-book in needed.

2. Research Method
The kind of research carried out is development research (educational design research). The model of development used in research carried out is the Plomp model. The study is a preliminary research phase that was done earlier [6], which is the prototyping phase consisting of the design stage and the formative evaluation stage.

Type of study was chosen to produce a particular product and test its validation. The product developed was science edupark e-book in The National Geopark of Ranah Minang Silokek. This e-book is used as a source of well-adjusted natural sciences at The National Geopark of Ranah Minang Silokek. The development of this e-book includes the designing and creating of e-books and the validating of e-books to make them a viable e-book for development. The product testing process is assessed by a team of experts who are lecturer of physics, lecturer of education, and lecturer of language at Universitas Negeri Padang.

The process of validation involves two things: the validation of instruments and the validation of products. The validation of the instruments is done to know the level of validation and the instruments used, while the validation of the product is done to test the degree of truth of the material substance, the worthiness of presentation, the worthiness of appearance, and the language on the e-book. Product validation may be judged by experts or experts who are experienced in assessing the strengths and weaknesses of a product [21]. The data collection on instrument validation and product validation is carried out by a questionnaire and a suggestion column based on the Likert criteria. The score given on each answer item on the questionnaire includes a strongly agree (4), an agree (3), a disagree (2), and a strongly disagree (1). The total score of each validator is added up and judged as Aiken's [22].

\[
V = \frac{\Sigma s}{n(c-1)}
\]

Where:
- \( s = r - lo \)
- \( lo = \) The rate of lowest validity rank (in this case = 1)
- \( c = \) The rate of highest validity rank (in this case = 4)
- \( r = \) The rate was given by Validators

The validity categories from the e-book of science edupark that developed can be seen at Table 1.

| No | Rank | Criteria |
|----|------|----------|
| 1  | ≥ 0.6 | Valid    |
| 2  | < 0.6 | Not Valid|
3. The Results

The e-book edupark was designed as a source of study in Junior High School in Science subjects. Its writing of materials on these e-book is based on materials found in several The National Geopark of Ranah Minang Silokek adapted to a basic science study competency on the 2013 curriculum. Its content of the material can be seen on Table 2.

| Batang Kuantan River, Silokek | Forms of Energy                                                                 |
|------------------------------|--------------------------------------------------------------------------------|
|                              | a. Kinetic Energy                                                               |
|                              | b. The Potential Energy of Gravity and Its Relationship with Efforts            |
|                              | c. Recognizing Potential Disasters Through Energy Forms                         |
|                              | A Liquid Pressure                                                               |
|                              | a. Hydrostatic Pressure                                                         |
|                              | b. Archimedes' Principle                                                       |
| The Swing in Basurek Cave Park, Silokek | A Vibration                                                                 |
|                              | a. Amplitude                                                                    |
|                              | b. Period                                                                       |
|                              | c. Frequency                                                                    |
| Alam Talago Cave             | Wave                                                                           |
|                              | a. Longitudinal Wave                                                            |
| Sounds                       | a. Sound Frequency                                                              |
|                              | b. Resonant                                                                     |
|                              | c. Sound Reflection                                                             |
|                              | d. Hearing Mechanism in Human                                                   |
|                              | e. Hearing Mechanisms in Animals                                                |
| Light                        | a. The Traits of Light                                                          |
|                              | b. The Human Sense                                                              |
| Energy                       | a. Renewable Energy Sources Around Alam Talago Cave                              |

The design of the edupark e-book consists, first and back covers; half-title; preface; table of contents; figure list; tables list; e-book usage instructions; standards of graduate competence (SKL); core competence (KI) and basic competence (KD; competence attainment indicator; purpose of learning; introduction; content of subject science materials based on vehicles in The National Geopark of Ranah Minang Silokek, which is first, the energy form and liquid pressure in Sungai Batang Kuantan, Silokek. Second, the vibrations in Swing on Basurek Cave Park, Silokek. Third, wave, sound, light and energy in Alam Talago cave. Student’s worksheet; example task; practices; summary; competence test, references; index; glossary; answers key; assessment; and author's biography.

Enclosed on this edupark e-book assessment sheet involves a grid and a comprehensive assessment feature for attitude, knowledge, and skill. The content begins with the cover of each chapter, followed by a material map, and the prayer setting before studying. The material is also equipped with a video for observing steps on the learner's worksheet according to the scientific approach used.

The validity instruments that will be used to validate the e-book must be assessed first to know the instrument of validity level. This assessment sheet of this e-book is assessed by three validators equal to the validators of the product. The Instrument assessment is done by filling out a questionnaire's assessment sheet. Results of validating instruments of validity can be seen at Table 3.
Table 3. The Results of The Validating Instruments

| Number of Valued Aspect | Rank | Category |
|-------------------------|------|----------|
| 1                       | 0.89 | Valid    |
| 2                       | 0.89 | Valid    |
| 3                       | 0.78 | Valid    |
| 4                       | 0.89 | Valid    |
| 5                       | 0.89 | Valid    |
| 6                       | 1.00 | Valid    |
| 7                       | 0.78 | Valid    |
| 8                       | 0.67 | Valid    |
| 9                       | 0.89 | Valid    |
| 10                      | 0.89 | Valid    |
| 11                      | 0.78 | Valid    |

Table 3 states that the validity instruments used to validate the e-book of science edupark get valid categories on all aspects, it includes able to measure the level of validity, filling instructions, presentation, assessment aspects of the material substance component, presentation feasibility component assessment aspects, display feasibility component assessment aspects, language component assessment aspects, feedback, size and type of writing, order of questions and statements according to the product, it is easy to understand. It makes the validation instruments can be used. There is little revision in the experts' validation instruments, which the scientific approach has not yet been seen at the product validation toolsheet, and the used selection of words matches the correct English spelling so as not to be misconception or ambiguous. After an improvement on the instrument of product validity, it continues with a self - improvement phase aimed at checking the completeness of the components on the science edupark facility developed. This step is done by getting a peer's response by filling out a questionnaire of self evaluation.

The e-book of edupark science begin with writing the entire contents of edupark science using a Microsoft Word application. Writing the contents of this e-book is done with deformity of content tailored to the 2013 curriculum. In addition, the design of the e-book also provides a composite of the science-concept correlating with used in The National Geopark of Ranah Minang Silokek aimed at making it easier for students to connect the materials discussed with the selected spot attraction. The front and back cover section is designed to use the image format of a Corel Draw application. After all the covers and the contents of the e-book are finished, then combined to be copied from word format into PDF format. Then, the e-book of edupark science in PDF format is imported into Professional Pageflip 3D software to enter the edupark videos already available. This edupark learning video is used as part of the scientific approach on the e-book that is in the observing step. After a video is incorporated into e-book, the final phase is published to change e-book into 3D format for easy use on electronic devices.

Before the edupark science e-book is validated by experts by filling the validation instruments, it is done by validation of the ones to be used. The validity instruments use to validate the edupark science e-book get valid categories on all aspects, so the validation instruments can be used. Once the validation instruments have been declared valid, the eating is done in the product assessment at the validity level. Edupark science e-book validates back to three of the same validators. The results of the edupark science e-book validation are given by the validators to series components of material substance, the worthiness presentation, the worthiness appearance, and language. The value of validation analysis of the component of the material substance is 0.85 in valid categories. The value of the validation analysis of the component of the worthiness of presentation is 0.89 in a valid category. The value of validation analysis of the worthiness of appearance component is 0.84 in a valid category. Whereas, the value of validation analysis of language components is 0.81 in a valid
category. And so, the product validation is obtained that a valid high-validation edupark e-book of categorized science science with an average score of 0.85. Thus, the edupark science e-book can be continued at the next level of Plomp.

These e-book are produced using A4 paper (21 x 29.7 cm). The cover is equipped with a picture of the entrance to The National Geopark of Ranah Minang Silokek and a picture of the tourist attraction spots there used as edupark on this e-book, as shown in Figure 1.

![Figure 1. Display The Front and Back Cover of E-Book of Science Edupark](image)

The advice given by the validator on the cover of e-book does not give much change, just replacing patterns that initially have not described the relation to physical matter discussed in the e-book. Then, the e-book edupark science geopark national domain minang tok done evaluation. The e-book edupark science review is reviewed again if it still has errors in typing, writing, material content, pictures or illustrations, and videos. Then the edupark science e-book was validated back to the validator. The results of the edupark science e-book validation are given by the validator to series components of material substance, presentation worthiness, view worthiness, and language. The results of the edupark science e-book validation can be seen at Table 4.

| No | Validation component          | Average | Category |
|----|--------------------------------|---------|----------|
| 1  | The Material Substance        | 0.85    | Valid    |
| 2  | The Worthiness of Presentation | 0.89    | Valid    |
| 3  | The Worthiness of Appearance  | 0.84    | Valid    |
| 4  | Language                      | 0.81    | Valid    |
|    | **Sum of average**            | **0.85**| **Valid**|

Table 4 states that the average validity of science edupark e-book is 0.85 in valid categories so that the edupark science e-book can be continued at the next Plomp. As for validator’s critic and suggestion associated with this e-book, used to produce better e-book of science edupark. The revision does not affect the overall of the e-book, as for critics and suggestion of the validator can be seen on Table 5.
Table 5. The Validator’s Critics and Suggestion Based on Science Edupark E-Book

| Validator | Critics and Suggestion |
|-----------|------------------------|
| 1         | a. In questioning level as best students can do, for example, not all students who can swim and also felt are less relevant to the bottled experiment for example.  
           | b. Make sure of the use of a vector or scalar (the vector and scalar multiple concepts are essential in physical science).  
           | c. In the concept map, the grand title is such as the sound waves and the light in the natural cave at nature cave in Silokek, well it should reflect how the wave was if it were in the cave, whereas the introduction of your subject was unconnected.  
           | d. Since this book is not only local use, it is wise to have maps with identification.  
           | e. The cover does not illustrate the correlation between the material of physics discussed with images of Geopark. |
| 2         | a. The new e-book gives insight into the subject matter of physics and biology, whereas chemistry has not yet appeared.  
           | b. The picture used should always be accompanied by an obvious source. |
| 3         | a. The font size of the picture in the e-book should be proportionate, so it can be read.  
           | b. Make sure of the use of SVO/C in sentences, the use of interconnected words (sentence by sentence and clause by clause), letters, and punctuation that match the correct and proper Indonesian spelling.  
           | c. Arrange it an effective sentence. |

4. Discussion
The product developed begins with a preliminary analysis carried out in preliminary research that constitutes one of the stages in Plomp development model. The analysis is already done for aspects of educators analysis, students analysis, district potential analysis, and material analysis on The National Geopark of Ranah Minang Silokek [6]. Based on the analysis of the preliminary research phase, it is stated that it is necessary to develop a science edupark e-book based on a scientific approach in The National Geopark of Ranah Minang Silokek which has valid criteria. Validity is one of the criteria needed to produce quality products. It means correct, true and valid. The validity of a product developed can be generated because it takes into the accuracy and validity of the related elements [23]. Thus, the validity is needed in testing a study to produce a quality product. The validity that taken on science edupark e-book includes components of material substance, feasibility of presentation, feasibility of appearance and language.

Based on analysis in the preliminary research phase indicates the need for edupark e-book development by using scientific approach in The National Geopark of Ranah Minang Silokek. The natural science concept on the selected ride on The National Geopark of Ranah Minang Silokek and adapted to core competence (KI), basic competence (KD), Indicator of competence attainment (IPK), the purpose of learning, learning materials, and so forth found in Science Syllabus [6] [24]. The design and manufacture of edupark science e-book has gone through a phase adapted to plomp development model at the stage of development or prototype phase. The e-book of edupark science offers guidance to the user in tapping the ride in The National Geopark of Ranah Minang Silokek as educational park (edupark) with a scientific approach. The designing of edupark science e-book begins with the self analysis phase used to check the completed components at this e-book. This step is done by getting a peer's response by filling out a questionnaires-self evaluation.

The e-book of edupark science is designed in the form of non-printed books that can be read on electronic devices, as well as this edupark science e-book is equipped with a scientific approach to guide students in the learning process. (1) the observing process to target objects and problems; (2) the asking process to ask questions about information not yet understood in the observing process; (3) the process of trying to obtain data by treating an object and then seeing the result; (4) the process calls for numbering ideas and associates events to make them an experience; and (5) the communicating
process for reporting the results of inquiry is conceptual in the form of direct transmission as well as in written, in pictures, or other media.

The design and creation of science edupark e-book has been adjusted to the rules of scientific steps on the used in The National Geopark of Ranah Minang Silokek tourism object. Learning that is carried out will be more effective in its time, and can attract the attention of students in learning. One of the things that attracts the attention of students to science edupark e-book is about the display which is equipped with images, videos and material that is explained using scientific approach steps which include observing, asking, trying, reasoning, and communicating those related directly with tourist destinations in The National Geopark of Ranah Minang Silokek, which raises the enthusiasm of students to learn on their own. Given that teaching materials are equipped with a voice that provides instructions or directions in the steps of a scientific approach, students can independently engage in learning [25].

The design and manufacture of this e-book has been modified by experts' suggestions and input, thus showing that the science edupark e-book has been declared valid by the category of material substance, the worthiness of presentation, the worthiness of appearance, and language [26]. The results of validation which the experts have been made come into as prototype 1 of several existing prototypes at the Plomp model development stage. Then, this e-book will be declared as follows to the next phase.

5. Conclusion

The conclusion of this research is first, the material on science edupark e-book based on the spots in The National Geopark of Ranah Minang Silokek consists the energy forms and the liquid pressure in Sungai Batang Kuantan, Silokek. The vibrations in Swing in Basurek Cave Park, Silokek. The material is about wave, sound, light and energy in Alam Talago cave. Second, the design of the e-book of science edupark that is uses by using scientific approach in The National Geopark of Ranah Minang Silokek consists of: font and back covers; half-title; preface; table of contents; figure list; tables list; e-book usage instructions; standards of graduate competence (SKL); core competence (KI) and basic competence (KD); competence attainment indicator; purpose of learning; introduction; content of subject science materials based on vehicles in The National Geopark of Ranah Minang Silokek; student’s worksheet; example task; practices; summary; competence test, references; index; glossary; answers key; assessment; and author's biography. The results of the edupark science e-book validation performed by experts are being made prototype 1 of several existing prototype that is in the Plomp model development ready to be continued to the next phase.

References

[1] D. P. Sari and H. Rifai, “Design and manufacture of teaching edupark physics Mifan water park Padang Panjang, Indonesia with discovery learning model,” IOP Conf Ser. J. Phys. Conf, vol. 1481, p. 12097, 2020.

[2] Asrizal and Festiyed, dkk, “The Development of Integrated Science Instructional Materials to Improve Students’ Digital Literacy in Scientific Approach,” J. Pendidik. IPA Indones., vol. 4, pp. 442–450, 2018.

[3] S. Raihan, dkk, “Development of Scientific Learning E-Book Using 3D Pageflip Professional Program,” Innov. J. Curric. Educ. Technol., vol. 7, pp. 7–14, 2018, doi: Innovative Journal of Curriculum and Educational Technology.

[4] J. N. Cahyanto, “Pemanfaatan ICT dalam Membangun Jaringan Pembelajaran Internasional.” 2007.

[5] Kemendikbud, “Permendikbud No. 22 tahun 2016 tentang Standar Proses Pendidikan Dasar dan Menengah.” kemendikbud, 2016.

[6] K. Ummah and H. Rifai, “Preliminary analysis learning media based on edupark science with scientific methods in the national geopark of Ranah Minang Silokek of Sijunjung,” J. Phys. Conf. Ser., vol. 1481, p. 12065, 2020.
[7] D. P. Sari and H. Rifai, “Preliminary analysis of edupark fluid learning tool in MiFan Water Park Padang Panjang City,” IOP Conf. Ser. J. Phys. Conf., vol. 1185, p. 12091, 2019.

[8] S. Gusweri and H. Rifai, “Preliminary analysis based instructional materials edupark learning natural sciences method of travel work in Janjang Seribu and Merah Putih Mountain Sulit Air,” IOP Conf. Ser. J. Phys. Conf., vol. 1185, p. 12094, 2019.

[9] W. Ematifri and H. Rifai, “Ngarai Sianok as Physics Education’s Edupark,” IOP Conf. Ser. J. Phys. Conf., vol. 1185, p. 12123, 2019.

[10] Yulia and H. Rifai, “Preliminary study of edupark energy in geopark Harau Lima Puluh Kota Regency,” IOP Conf. Ser. J. Phys. Conf., vol. 1185, p. 12098, 2019.

[11] Afrinaldi and H. Rifai, “Evaluation of garden functions of SMAN 2 Lubuk Basung as science-based education park,” IOP Conf. Ser. J. Phys. Conf., vol. 1185, p. 12126, 2019.

[12] V. J. Anngara and H. Rifai, “The preliminary analysis of Edupark learning devices of temperature and heat physics of Air Panas Semurup Kerinci District,” IOP Conf. Ser. J. Phys. Conf., vol. 1185, p. 12095, 2019.

[13] G. O. Elvisa and H. Rifai, “Preliminary analysis learning media based on edupark physics with scientific methods on Padang beach,” IOP Conf. Ser. J. Phys. Conf., vol. 1481, p. 12094, 2020.

[14] N. Rahmadhani and H. Rifai, “Preliminary analysis learning media in the form of interactive multimedia based on edupark physics Carocok beach Painan Indonesia with the scientific method,” IOP Conf. Ser. J. Phys. Conf., vol. 1481, p. 12087, 2020.

[15] A. P. Sari and H. Rifai, “Preliminary analysis of learning resources for edupark physics in hydroponic cultivation of SMK N 2 Batusangsang, Indonesia,” IOP Conf. Ser. J. Phys. Conf., vol. 1481, p. 12085, 2020.

[16] Sadraini and H. Rifai, “Preliminary analysis of learning resources for edupark in the matter rigid equilibrium by destination Rumah Gadang Istana Rajo Balun South Solok Indonesia,” IOP Conf. Ser. J. Phys. Conf., vol. 1481, p. 12086, 2020.

[17] R. A. Yunita and H. Rifai, “Preliminary analysis of Edupark Sarasah Kajai Waterfall, Indonesia as a learning resources of works and energy,” IOP Conf. Ser. J. Phys. Conf., vol. 1481, p. 12047, 2020.

[18] M. Delvi and H. Rifai, “Preliminary analysis of integrated science teaching based on edupark of Anai Land,” IOP Conf. Ser. J. Phys. Conf., vol. 1481, p. 12121, 2020.

[19] N. V. Lestari and H. Rifai, “Preliminary analysis of Bukik Chinangkiek edupark’s potential as a learning resource for physics in senior high school at X Koto Singkarak Solok, Indonesia,” IOP Conf. Ser. J. Phys. Conf., vol. 1481, p. 12049, 2020.

[20] Kemendikbud, “Konsep dan Implementasi Kurikulum 2013.” Departemen Pendidikan Nasional, 2014a.

[21] Sugiyono, Metode Penelitian Pendidikan Pendekatan Kuantitatif, Kualitatif, dan R&D. Bandung: Alfabeta, 2010.

[22] A. Saifuddin, Reliabilitas dan Validitas, IV. Jogjakarta: Pustaka Belajar, 2015.

[23] Asrizal, dkk, "Pengembangan Bahan Ajar IPA Terpadu Pembelajaran Konstektual Tema Pemanfaatan Tekanan dalam Kehidupan untuk Meningkatkan Literasi Siswa Kelas VIII SMP,” Jurnal Pilar Pendidikan Fisika, vol 10, 2017.

[24] Permendikbud, “Peraturan Menteri Pendidikan dan Kebudayaan Tahun 2016 Nomor 24 tentang Kompetensi Inti dan Kompetensi Dasar pada Kurikulum 2013 pada Pendidikan Dasar dan Menengah.” Direktor Jenderal Peraturan Perundangan-Undangan Kementerian Hukum dan Hak Asasi Manusia Republik Indonesia, 2016.

[25] Yulkifli, dkk, "Pengembangan Bahan Ajar Interaktif dengan Pendekatan Saintifik Bermuatan Nilai-Nilai Karakter pada Materi Hukum Newton di Kelas X SMA/MA," Pillar of Physics Education, vol 12 (1) : 81-88, 2019.

[26] Sungkawo, Panduan Pengembangan Bahan Ajar Berbasis TIK. Jakarta: Kementerian Pendidikan Nasional Direktorat Jenderal Manajemen Pendidikan Dasar Dan Menengah Direktorat Pembinaan Sekolah Menengah Atas.