Design of edupark *bukik chinangkiek's* physics e-book with a scientific approach

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**Abstract.** *Alam takambang jadi guru* is a Minangkabau philosophy that suggests to us that everything in nature can be used as a learning resource, one of them is Bukik Chinangkiek. In the preliminary research, it was known that there are many physics concepts in Bukik Chinangkiek edupark, but they have not been packaged into the form of learning materials. Very rapid technological advances have changed the all-digital life, so learning materials must follow the times, namely in digital form or e-book. The aim of this research is to produce a edupark Bukik Chinangkiek’s physics e-book with a scientific approach to the valid. This type of research was a design research using a plomp development model in the prototyping phase. The validity test of the physical edupark e-book used a validity questionnaire to three experts with different expertise. The data analysis technique used a Likert scale with the Aiken's V formula. The conclusion of this research was that the edupark physics Bukik Chinangkiek's e-book developed was valid for use as learning material in schools.

1. **Introduction**

"*Alam takambang jadi guru*" (nature is a teacher) is a philosophy of Minangkabau [1][2] which suggests to us that everything in nature can be used as a learning resource [3] one of them is tourist attraction. Learning in educational units is carried out in an interactive, inspiring, fun and challenging. It motivates students to actively participate and provides sufficient space for initiative, creativity and independence according to the talents, interests and physical and psychological development of students [4]. Students must be equipped with the ability to find out, learn from various sources, construct knowledge based on natural phenomena that occur around them and take advantage of informatics and communication technology [5] to increase learning efficiency and effectiveness.

Physics as one of the subjects studied at the high school level is a subject that studies natural phenomena [6] through a series of scientific processes that are built on scientific attitudes and the results are scientific products. Physics learning should have a context by real conditions [7]. Guided by the 2013 Curriculum, physics learning can use existing resources in the area by observing objects and phenomena that occur in the surrounding environment [8] or material discussed in school close to the daily lives of students [9]. This is in line with Regulation of The Minister of Education and Culture of The Republic of Indonesia Number 22 of 2006, the utilization of regional potential can be done by
optimizing the environment around [10], including a tourist attraction as a learning resource [11]. Attractions that serve as a source of learning called the educational park or edupark [12].

Preliminary research that have been carried out were in the form of an analysis of teachers, students and material analysis. The analysis of teachers and students was carried out at SMA N 1 Gunung Talang, SMA N 1 X Koto Singkarak and MAN 2 Solok by giving questionnaires to 7 teachers and 192 students. The results of the analysis of the teacher questionnaire found that teachers had not prepared learning materials according to the needs of students and materials. Teachers had not made and used non-printed learning materials in learning and teachers had not applied digital-based learning and learning had not been integrated into regional potential in the form of tourist attractions. This causes students to still find it difficult to understand physics concepts.

The results of the analysis of students showed that students had a kinesthetic learning style. Kinesthetic learning styles are learning activities by moving, working and touching. Students like this are unique in learning to be always moving, sensory activity and touching. Students like this find it difficult to sit still for hours because their desire for activity and exploration is very strong [13]. To meet the needs of students’ learning styles, who are mostly kinesthetic, a learning material is needed to accommodate them to carry out learning outside the classroom or in nature so that they can directly conduct experiments related to the material being studied. The results of the analysis of learning resources used by students found that the dominant learning materials used in schools were books and worksheets from publishers that had not been integrated into regional potential in the form of tourist attractions and were not digital-based. Even if there are using non-printed learning materials, they still use the electronic book in the form of a pdf which only contains text and images and is not equipped with video and sound. The display of the electronic book is still monotonous in black and white so it makes students unattractive to study physics.

Analysis of material at the Bukik Chinangkiek tourism park used concept fitting technique [14]. The material analyzed is based on the objects and activities contained in the Bukik Chinangkiek edupark concept which are in accordance with the basic competencies of learning physics. The results of the material analysis show that there are many physics concepts in the rides of the Bukik Chinangkiek tourism park [15]. The concepts of physics are Newton's first law, Newton's second law, Newton's third law, friction force, gravity, rope tension force, work, kinetic energy, potential energy, energy conservation law, power, straight motion changes with order, circular motion, period, frequency, angular velocity, rigid object equilibrium and many others.

The development of integrated learning materials for tourist attractions (edupark) has been done before such as the dynamic fluid edupark textbook for senior high school based on Mifan Waterpark Padang Panjang [16], Geopark Ngarai Sianok Bukit Tinggi textbook [17], Semurup Kerinci Hot Water textbook and The Natural Science Edupark Textbook is based on the tourist attractions of Janjang Saribu and the White Mountain Sulit Air. However, the development of integrated learning materials for the Bukik Chinangkiek tourism park in digital form (e-book) has not been carried out.

Based on the reality in the field, one of the efforts that can be done is to develop learning materials that are in accordance with the needs and characteristics of students as millennial generations and integrate the learning materials into the potential of the areas around the students' lives. Learning materials that will be developed are in the form of books that are packaged following the development of technology and information that can be accessed anywhere and anytime [18] and set forth in a learning resource called edupark e-book. Edupark e-book is a non-printed learning material that can combine all media elements including: elements of text, images, sound, animation and video that are related to material and are integrated in tourist parks around the lives of students.

The development of an integrated e-book at tourist attractions or what is called an edupark e-book is in line with the regulation of the minister of education and culture No. 103/2014 which states that learning must be challenging and fun, context-based (natural surroundings as a learning resource) and present-oriented. In an Islamic education journal, it is said to teach your children the level or method according to the era [19], so the development of this edupark e-book is the right step in solving the problems described above. The purpose of this research is to produce
an edupark physics e-book with an integrated scientific approach to the potential of the Chinangkiek Bukik tourism park which is suitable for use as learning material in schools. It is hoped that the development of this edupark e-book can meet the needs of learning materials in schools in digital form and integrated with the potential of the Bukik Chinangkiek tourist park area.

2. Research Method
This type of research was design research by using models Plomp on stage prototype development phase [20]. This stage is a continuation of the preliminary research stage. At this stage, the design, self-evaluation and validity test of the edupark e-book was carried out. At the design stage, the edupark e-book was designed and made a validation instrument. The e-book was designed using a flip pdf professional which consists of three parts, namely the initial, the content and the final. The edupark e-book that has been designed is carried out self-evaluations to see the completeness of the e-book in terms of structure e-book, the accuracy of integrating physics material on vehicles, integrating the scientific approach, grammar and color harmony of the edupark e-book. Self evaluation was conducted with the supervisor using a checklist and revision notes.

The validation process was carried out in two ways, namely instrument validation and product validation. Instrument validation was done to see the feasibility of the instrument being made, while product validation was done to test the feasibility of the edupark e-book that has been developed in terms of material substance, presentation feasibility, appearance and language feasibility. The validity test of the edupark e-book was carried out by experienced expert lecturers to assess the strengths or weaknesses of the product [21]. Data collection at the instrument validation stage and product validation was carried out by providing validation instruments to expert lecturers. This instrument has an answer range of 1-4 with the categories never (1), sometimes (2), often (3) and always (4). The total score for each validator for all indicators is summarized and the validity value was using the Aiken’s V formula. Aiken (1985) formulated the Aiken’s V formula to calculate the content-validity coefficient which was based on the results of the assessment from a panel of n people on an item in terms of the extent to which the item represents the construct being measured [22], namely:

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

(1)

Where :
- \( s = r - lo \)
- \( lo = \) the lowest number of validity assessments (in this case = 1)
- \( c = \) the highest number of validity assessments (in this case = 4)
- \( r = \) Number given by the validator

The validity category of the developed physics edupark e-book can be seen in Table 1.

| No. | Score | Criteria |
|-----|-------|----------|
| 1   | ≥ 0.6 | Valid    |
| 2   | <0.6  | Invalid  |

3. Results and Discussion
The developed physics edupark e-book contains text, images, sound and video. For image editing using the CorelDRAW application. Text and images were compiled using Microsoft word and then converted into pdf format. Meanwhile, the video was edited using the Movavi Video Editor application. After that the pdf, sound and video files were combined using the Flip Pdf Professional application. Edupark e-books that have been designed using the Flip Pdf Professional application can be used online and offline and can be run on computers or on Android. Offline use on a computer can be run immediately without installing a special reader for this edupark e-book, while offline use on Android requires installing an additional application in the
form of an html reader which can be downloaded for free on Google Playstore. For online use, it can be run directly on both a computer and android.

The edupark e-book that was designed consists of the initial section, the content section and the final section. 1) The initial section consists of a cover, title page, prelim, foreword, table of contents, list of tables, list of figures, list of edupark laboratories, video list and introduction. 2) The content section consists of chapter titles, concept maps, Core Competencies, Basic Competencies, Competency achievement indicators, learning objectives, learning prayer, material exposure with scientific steps, physics pearls, sample questions and exercises (evaluation). 3) The final section contains a references list, glossary, index, about the author and back cover. The e-book cover is designed with a scenic backdrop of Bukik Chinangkiek and includes pictures of the rides related to the material discussed in the edupark e-book. In this display there is accompaniment music that is in accordance with the characteristics of students.

![Edupark Physics E-book Cover Design: (a) desktop version (b) android version](image)

**Figure 1.** Edupark Physics E-book Cover Design: (a) desktop version (b) android version

After completing the design of the edupark e-book, the next stage is self evaluation. This self evaluation is carried out before consulting and discussing the edupark e-book that has been designed to experts (expert review). Self evaluation was carried out together with the supervisor using a checklist and revision notes. The results of the self evaluation have several suggestions and improvements, such as adding a button on how to use the e-book on the cover so that readers can easily use the e-book, fixing the background color that is too bright so that it dazzles the eye when reading edupark e-book, improving the position of the image integrating physics concepts on Bukik Chinangkiek’s rides, added an online button to the evaluation so that the evaluation could be done online so that students could see directly the score obtained and could find out the wrong and correct parts of the evaluation that had been done. After it is believed that the Edupark e-book has no errors based on self evaluation, the next step is to test the validity of the e-book on expert lecturers.

Expert validation was carried out after revising the edupark e-book based on input and suggestions on the self evaluation. Validation is carried out online with the help of social media in the form of whatsapp by sending a validation sheet to three experts/validators, namely the validator of the material aspects, appearance, presentation and the language aspects. Before validating the edupark e-book, it is necessary to first evaluate the instrument that will be used to validate the edupark e-book that has been made to determine the validity level of the instrument. Instrument assessment is done by filling out an assessment sheet in the form of a questionnaire by three experts as validators. The result of the validity value of the instrument was 0.82. This means that the validity instrument to validate the edupark physics e-book product was valid and can be used.

The validation of the edupark physics e-book was carried out to find out whether the edupark e-book developed was valid or not valid to be tested. The validation of the physics edupark e-book was
carried out by three experts. This product validation assessment was carried out online using WhatsApp social media. Validators are asked to provide an assessment and opinion on the physics edupark e-book that has been designed. The edupark physics e-book validation relates to four main components, namely the substance of the material, presentation, appearance and language. After the validator validates, the author revises the edupark physics e-book based on the input and suggestions given by the validator. Validation is said to be complete if the edupark physics e-book has been revised according to input from the validator and the validator has stated that the edupark physics e-book developed is valid. The results of the analysis of the edupark physics e-book can be seen in Table 2.

| No. | Validation Components         | Average Value of the Validator | Average | Category |
|-----|-------------------------------|--------------------------------|---------|----------|
| 1   | material substance            | 0.93 0.70 1.00                 | 0.88    | Valid    |
| 2   | Serving Feasibility           | 0.99 0.67 0.92                 | 0.86    | Valid    |
| 3   | Appearance Feasibility        | 1.00 0.69 1.00                 | 0.90    | Valid    |
| 4   | Language                      | 1.00 0.67 0.97                 | 0.88    | Valid    |
|     | **Total Average**             | **0.88**                       | **Valid** |

Table 2 shows that the results of the edupark physics e-book validation from the four validation components, namely the material substance, presentation, appearance and language are declared valid. In the substance of the material, the feasibility of presentation and the feasibility of the appearance there is no revision from the validator, but in the language aspect there is a slight revision in the form of the use of prepositions, logical continuity of sentences and errors in word usage.

The developed physics edupark e-book is in the valid category because it has met the indicators of the e-book validation instrument which includes material substance, presentation feasibility, display feasibility, and language [24]. On the accuracy of the material, the Newton’s first law materials on edupark Bukik Chinangkiek, one of them on the slide rides. In fact, when the player slides on the slide, the player's body seems to be pushed back. This occurs because the player's body maintains a stationary state at the top of the slide. This is in accordance with the concepts and principles in Newton’s first law of inertia, that objects tend to retain their initial conditions if there is no external force acting on them. That is, if the resultant force acting on the object is equal to zero, then the still object will remain at rest and the object moving at a constant speed will still move at a constant speed [25]. The inertness of this object is what causes a person playing flying fox to bounce forward when the player's body moves at a certain speed when it touches the barrier wire at the end of the flying fox game.

The material on the edupark physics e-book in a coherent and properly structured, such as the motion dynamics of matter on edupark Bukik Chinangkiek begins with a general overview of the integration of the motion dynamics of matter on rides in edupark Bukik Chinangkiek. After that, proceed with Newton's first law, Newton's second law and Newton's third law which begins by watching videos, asking questions about videos related to matter, conducting experiments, reasoning, communicating according to the steps of a scientific approach [26]. Then the message and meaning of learning physics related to the material contained in the pearl of physics and ending with practice questions as an evaluation to train students' understanding of a concept that has been studied. The presentation of material in the e-book must be arranged in a coherent and systematic manner so that it can attract the attention of students to be able to learn more and learning objectives can be achieved properly [27][28]. Learning material or substance is a set of lessons are arranged in a coherent and systematic and display the full figure of the competence to be controlled by learners in learning activities [29][30].

Physics edupark e-book was developed with a scientific approach that includes observing, asking, trying, reasoning and communicating. The observing stage in the edupark e-book refers to learning
material, such as videos or images that are used as objects of observation. The video appearance at the observing stage is assisted by some navigation and text so that students are more focused in observing the video according to the learning objectives. So that the presence of videos or pictures helps students to get concepts from the subject matter. This is in line with the research of Trisma et al. (2020), observing this invites students to see phenomena directly or only through images presented in learning materials.

The second stage of the scientific approach is to ask questions. After students observe the video that is presented in the edupark physics e-book, the students are directed to ask questions about videos related to the material being studied. The questions presented in the edupark physics e-book are useful so that students focus on the learning objectives to be achieved and train students in asking questions. The activity of asking questions can be done by conducting questions and answers, gathering information, and formulating questions with the educator regarding the images or videos that are shown [31]. In line with Trisma et al's research (2020), in questioning activities students have the ability to give and ask questions, conduct discussions to understand information/data that they want to know and understand and stimulate students to ask information they want to know related to the material being studied.

The third stage of the scientific approach is trying. At the testing stage, students experiment with the procedures presented in the edupark e-book that has been developed. Experiments are carried out so that students explore and collect data and obtain direct information about the physics concepts being studied and the physical quantities involved in them. For example, in Newton's first law experiment, the experiment is presented so that students can know clearly how the effect of mass of objects on the inertia of objects so that students really understand the concept of Newton's first law. In line with the research of Trisma et al. (2020), in trying activities students are able to explore, carry out experiments, work together in groups to get good information.

The fourth stage of the scientific approach is reasoning. At this stage of reasoning, it trains students' thinking skills, connects the results of the experiment at the trying stage with the theories contained in this edupark e-book so that students get the concept of the material being studied. This is in accordance with the research of Trisma et al (2020), the reasoning stage contains material explanations so that students are able to process information, analyze data, connect information related to the subject matter discussed so as to produce conclusions that lead to the achievement of learning objectives.

The fifth stage of the scientific approach is to communicate. At this stage of communicating, students demonstrate the results of their work or thoughts in the form of reports or presented to the class in groups. This stage of communicating trains the courage and language skills of students both orally and in writing. In line with Trisma et al (2020), at the communicating stage, students are trained to have the ability to convey the results of activities in written and oral forms in the form of reports on the results of learning activities. The same thing was also found by Wina et al (2020), at the communicating stage, students were given the opportunity to display the results of their work both orally and in writing.

The material in the edupark e-book is supported by illustrations, pictures and videos that are given relevant to the daily life of students. This is very helpful for students in finding concepts in the material being studied. The existence of images and animations can help in explaining the meaning of the material being studied [32]. The presentation of the material should be accompanied by examples that are close to the daily lives of students in order to help deliver messages more quickly [33][34].

The feasibility of presenting can be seen from the title of edupark physics e-book. The title of the e-book is in accordance with the physics material contained in the edupark e-book so that the title section provides an overview of the content of the e-book. Writing the title of the e-book uses a more dominant and proportional size and a simple typeface with an easy to read font style and not too many variations [35]. Edupark e-book title writing must have a contrasting color with the background color so that the e-book title can be read clearly so that it can attract the attention of the reader [28]
Preparation of e-book edupark refers to the curriculum in 2013 that integrates existing rides on edupark Bukik Chinangkiek. The physics edupark e-book that has been developed was categorized as valid because it was in accordance with the core competencies, basic competencies, indicators of competency achievement and predetermined learning objectives [36]. This was in line with Pratiwi & Rochmawati's research (2019), the results of the validation of learning materials with an interpretation of "very feasible" because the learning materials in the dimension of knowledge have included the completeness of the material according to the learning objectives and basic competencies [37]. Edupark physics e-book was also equipped with physics pearls that contain messages, meanings and benefits for students. Learning materials need to be understood by students what the meaning and benefits are so that they will realize that what they are learning is useful for their lives [38].

The third indicator of validation of presentation feasibility is supporting the presentation of the edupark e-book. The edupark physics e-book was categorized as valid because it has met validity indicators such as the suitability of the sample questions with objects/vehicles, the question exercises in the edupark e-book are able to stimulate students to develop knowledge. At the presentation of the sample questions, sample questions tailored to the object or the vehicles that exist in edupark Bukik Chinangkiek. For example, an example of a problem in Newton's second law, determining the acceleration experienced by the sliding player. By using the physical quantities that exist in Newton's second law related to the slide vehicle, students can determine the intended acceleration. Through examples of questions like this it can help strengthen understanding of existing concepts in the material and improve student achievement [39].

The edupark e-book is equipped with several supporting presentations in accordance with the validity indicators of an e-book. This can be seen from the presentation of the edupark Physics e-book which is equipped with the identity of the compiler, reference sources, at a glance an overview of the contents of the e-book discussed, instructions for use edupark e-book, table of contents, list of figures, list of tables, list of edupark laboratories, video list, bibliography, glossary and index. In making learning materials, each photo, video referred to is always explained the reference source (includes a list of references) [40].

The cover design of a valid e-book must display layout elements on the front and back that have unity and consistency, display a good center point, have clear colors, have illustrations that describe the content/material in the edupark e-book, such as on the front and back covers of the edupark e-book being developed, there are Bukik Chinangkiek edupark vehicles integrated in the material discussed in the e-book. Meanwhile, the content design of the edupark e-book that has been developed has met all indicators of the validity of an e-book in the form of readable letters, has good composition, good color composition, and attractive appearance.

Edupark physics e-book that has been developed using the Flip Pdf Professional software. Edupark e-books that are produced using this software can be accessed either on a computer or on an android / smartphone both online and offline. The Flip Pdf Professional application has more advantages, namely that it is easy to use because it can be operated for beginners who do not know the HTML programming language [41]. This application can create interactive book pages by inserting multimedia such as images, videos from YouTube, MP4, audio video, hyperlinks, quizzes, flash, etc. which can make it an attractive interactive learning media so that learning is not monotonous [42][43].

Variable validity of the edupark physics e-book latter is the language. Edupark physics e-book has been prepared using language rules, the use of terms, symbols and icons in accordance with the general guidelines for Indonesian spelling (PUEBI), order and integration of thought flow, conformity to the level of development of students. A learning material is said to be valid if the standard of language or readability in the learning material includes the use of good and correct Indonesian, language clarity and readability, is effective and efficient [44][45]. In line with Khoiriah & Kholi ́q's research (2020), the validity of language criteria includes the use of language in accordance with the development of students, as well as grammar and spelling in accordance with the rules of good and correct Indonesian.
4. Conclusion

Development of edupark physics e-book with an integrated scientific approach to the Bukik Chinangkiek tourist park using flip pdf professional applications. Development of edupark Bukik Chinangkiek physics e-book referring to the curriculum 2013. Edupark e-book which was developed consists of a cover outside, inside cover, title page, Prelim, preface, table of contents, an overview of the edupark e-book, a glimpse of edupark Bukik Chinangkiek, exposure to material with scientific steps, sample questions, physics pearls, exercises, evaluation, bibliography, glossary, index, answer keys and author biography. The results of the self-evaluation with the supervisor and the validation results of the edupark e-book by three teams of experts found that the edupark Bukik Chinangkiek’s physics e-book was suitable for use as a physics learning material in schools.

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