

Development of comic-based electronic modules using canva design in elements periodic system material in class X SMA/MA

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Keywords

Comic-based electronic module
Canva design
Periodic system of elements
Senior high school

Abstract

This study intends to create comic-based electronic modules using Canva design with accurate elemental periodic system content and find out how learners react to comic-based electronic modules. The research is of the type known as research and development (R&D), which is based on the ADDIE model (Analysis, Design, Development, Implementation, and Evaluation). However, for small-scale trials, this step is only completed up to the implementation stage. The module developed is a comic-based electronic module using one of the applications, namely Canva Design to overcome the problems of students' difficulties in understanding the elemental periodic system material and increase students' learning motivation. Three validators, including two material experts and one media expert, evaluated the electronic module based on comic books. The validation of material specialists yielded a percentage of 98.44% in the valid category based on factors such as content viability, comic features, language, presentation, and graphics. A percentage of 98.86% was attained in the valid category for the media expert validation results based on a visual communication display and software usage. In the teacher response trials, students obtained an overall percentage of 87.66% while teachers received an 87% in the very good category. The comic-based electronic module created using a Canva design is legitimate and appropriate for use in content related to the elements of the periodic system, according to data analysis.

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Introduction

The effective use of information and communication technology to improve academic standards. Technological developments are needed to increase learning resources, such as taking advantage of current technological developments, one of which is electronic-based learning resources (Muhaimin et al. 2016). One of the learning resources developed electronically is the learning module. Electronic modules (e-modules) are systematic collections of digital, non-printed learning resources that students use independently (Hamzah and Mentari, 2017).

The results of interviews with chemistry teachers at Senior High Schools 2 and 5 in Pekanbaru indicated that the teachers used the module during the instructional process. However, the use of modules is rarely used, after the chemistry textbooks available in schools are sufficient. The module that was used by the teacher was a conventional printed module that contained a description of the material and a collection of questions. This causes teachers to still be fixated on printed teaching materials used in schools, as a result of which the availability of electronic-based teaching materials is lacking. Teachers can carry out transformations by utilizing current technology from printed teaching materials to electronic-based, especially in modules.

In addition, students generally enjoy reading comics as a form of entertainment, both printed and online comics. When asked, as many as 89.10% of students preferred reading picture story books such as comics. Comics are defined as a visual communication medium that can convey information in general by combining the power of writing with images placed in the storyline, so that information becomes easier to absorb (Minarni et al. 2019). The role of comics, namely guiding readers' interest in reading and increase the



vocabulary of readers' words so that later it can make it easier for students to grasp abstract concepts or formulas, especially in chemical material. One of the chemistry materials that are difficult for students in class X to understand is the periodic system of elements. This difficulty is indicated by the students' daily test scores which are still below 78.

This is the basis for the need to innovate the teaching materials used, especially modules. The creation of comic-based electronic modules on the periodic system of elements is an example of innovation that is possible. This is what motivates the need for innovative instructional resources, particularly modules. The needed innovation is the development of a comic-based electronic module for the material of the periodic system of elements. Student are shown numerous technologies that are relevant to contemporary technological breakthroughs. The educational system in general was not designed to demonstrate how to study throughout the advanced innovation period (Farsa et al. 2022), hence an electronic module is required to tackle the challenges of today's pupils. The electronic module becomes a guide that is used more than once, and it is not inconceivable that the usage of the present electronic module or module will no longer be appealing to pupils one day. To prepare for this, electronic modules must be innovative, such as by making them seem like comic books to capture students' attention while they are studying.

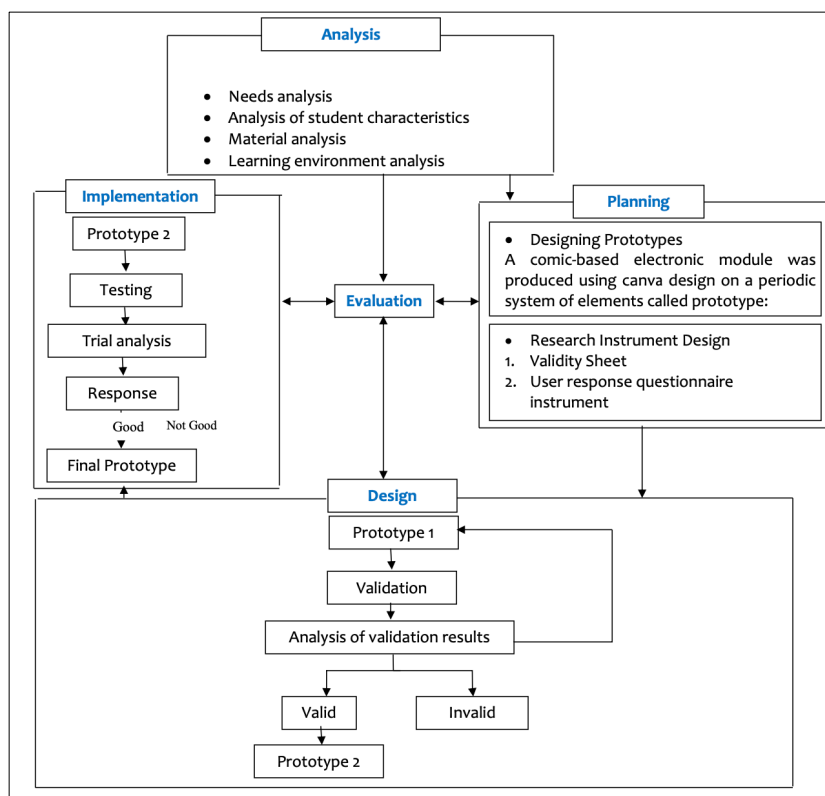


Fig.-1. Development Flow of Comic-based Electronic Modules on the Elemental Periodic System Material with a Modified ADDIE Model (Rusdi, 2018).

According to Amalia et al (2021), comics are a type of media that may be used as a tool as well as a pleasant learning resource for kids. Delivering instructional ideas through humorous media helps pique kids' interest in studying. Comics are also utilized as learning medium since they offer learning content in the form of graphical drawings that can be created, viewed, transferred, updated, and stored on an electronic device. Comics packaged in an electronic module offer several benefits over traditional comics, including being more economical, durable, interactive, dynamic, and easier to access (Rachminingsih and Hanif, 2020).

Creating educational resources in the form of comic-based online modules using the graphic design program Canva Design. Canva is an account for graphic design that links its users to make it easy to design all kinds of creative designs online. The advantage of Canva Design is that there are many attractive templates available, all you have to do is adjust it as you wish, such as choosing text, color, size, images, and so on (Monoarfa and Haling, 2021). After the comic-based e-module has been created, the next step is to publish the e-module in flipbook form in HTML format which can be accessed via laptops/PCs and Smartphones.

Much research has been carried out using teaching materials in the form of comics, including research conducted by [Farsa et al \(2022\)](#) entitled "Development of Comic-Based Electronic Modules with Factual Videos in Class VII Middle School Science Lessons" which shows that comic-based e-modules are valid. And suitable for use with a percentage of material validation of 95% and media of 82%. [Rahmatsyah and Dwiningsih \(2021\)](#) have also conducted research entitled, "Development of Interactive Electronic Modules as a Learning Resource on Elemental Periodic System Materials" indicating that the interactive electronic module is said to be very feasible in terms of the percentage validity with each acquisition, 90 % for content, 93% presentation, 84% language and 100% graphics. [Puspita et al \(2021\)](#) reported that, development of basic chemistry practicum electronic modules using canva design demonstrating the viability of using basic chemistry practical e-modules with an average percentage acquisition value of 91.48% in the very good category. These problems are the basis for researchers to develop comic-based electronic modules that aim to produce valid electronic modules and find out how users (teachers and students) respond to comic-based electronic modules.

Method

The study was carried out by the University of Riau's chemistry education faculty of teaching and education. The research was conducted from January through June 2022 during a period of six months. The method used is research and development design (R&D) which is used to produce certain products and test the effectiveness of these products as stated by [Sugiyono \(2015\)](#) by applying the modified ADDIE model from [Rusdi \(2018\)](#). The ADDIE development model, which is a development model consisting of five stages which include analysis, design, development, implementation, and evaluation ([Aldoobie, 2015](#)). The selection of the ADDIE model is based on systematic work steps and there is an evaluation of each activity.

The selection of the ADDIE model is based on systematic work steps and there is an evaluation of each activity. The design of the ADDIE model is presented in Fig.-1. To get student feedback on the comic-based electronic module that was created and scored using a Likert scale, one-to-one trials with three students and small group tests with two chemistry teachers and 20 students were conducted at Senior High Schools 2 and 5 in Pekanbaru.

Table 1. Validity Category ([Rohmad et al. 2013](#))

Percentage (%)	Category
75.00- 100	Valid
50.00-74.99	Quite Valid
25.00- 49.99	Not Valid
0.00-24.99	Invalid

Table 2. User Response ([Sari and Alarifin, 2016](#))

Percentage (%)	Category
75.00-100	Very Good
50.00-74.99	Good
25.00-49.99	Low
0.00-24.99	Not Good

The method of data analysis included user questionnaires and a validity examination by three validators, including two material experts and one media expert. Analysis of the validity of the data is processed and the percentage of the validation value is calculated. Data acquisition was processed using descriptive statistical analysis. The aim is to describe the results of the validity of the validator after being validated. The validity criteria are those shown in Table 1 and were proposed by ([Rohmad et al. 2013](#)). According to [Sari and Alarifin \(2016\)](#), positive attitude statements on a Likert scale with a score of 1-4 ranging from very positive to negative were analyzed from user responses from teachers and students, as shown in Table 2.

Results and Discussion

The result of this development research is an electronic module comic-based module on the periodic system of elements that uses Canva and can be used as a stand-alone teaching resource both inside and outside of the

classroom. The following is a description of the findings and a discussion of the developmental stages that have been completed.

Analysis Stage

This stage consists of 4 steps which include needs analysis, student character analysis, material analysis, and learning environment analysis. The needs analysis was built on the findings from structured interviews with chemistry teachers at Pekanbaru's Senior High Schools 2 and 5, as well as from student survey results. Information and data obtained related to teaching materials, learning materials, and students' difficulties when studying material on the periodic system of elements. Based on interviews with 2 chemistry teachers, information was obtained that the learning process was carried out in PTMT (Limited Face to Face Learning) and still used printed teaching materials in the form of chemistry textbooks, printed worksheets, and printed modules. As of now, textbooks are the only teaching resources used when studying material related to the periodic system of elements, so educators have no choice but to stick with printed resources rather than use their creativity to create more creative teaching resources, such as electronic versions of teaching resources in the form of electronic modules.

The results of the questionnaire distribution showed that students found it difficult to understand the material of the periodic system of elements, especially in the sub-matter of determining periods and groups and the periodic properties of elements as evidenced by the results of daily test scores which were still below 78. In addition, as many as 89.10% of students stated that they preferred the type of reading illustrated stories such as comics, to attract the attention of students in using teaching materials, comic-based electronic modules were developed by the character of students who like to read illustrated storybooks such as comics.

The results of the character analysis of students through interviews and questionnaires obtained information about the level of development of knowledge in students aged 15-17 years. At that age, most students are interested in reading material that is fictional in nature such as comics and novels which are booming in cyberspace. In line with this, 89.10% of students prefer to read picture story books such as comics rather than reading textbooks. Then the distribution of student questionnaires shows that the material of the periodic system of elements is material that is difficult to understand because most of it is theoretical in nature and requires an understanding of concepts, especially when determining the location of elements in the periodic table. Based on these circumstances, students agree that comic elements are included in teaching materials in the form of electronic modules.

Results of material analysis based on the 2017 SMA/MA chemistry syllabus from the Ministry of Education and Culture. Basic Competence (KD) was established based on the material analysis of the periodic system of elements, which was followed by a review of the material concept of the elemental periodic system, the formulation of Competency Achievement Indicators (GPA), and the description of learning objectives. Analysis of the learning environment is the most important part of the learning process (Rusdi, 2018). Currently, the learning environment is specifically designed to enable students to learn at a higher level of independence. The analysis was carried out to find out the facilities and infrastructure in schools, such as the availability of learning resources, information and communication technology facilities, and other supports.

Planning Stage

After conducting the analysis, the next step is to design prototypes in the form of comic-based electronic modules and research instruments in the validation sheets and user response questionnaires. The initial design of the comic-based electronic module includes a) The contents of the electronic module include a cover page, author bio, introduction, table of contents, instructions for using the electronic module, basic competencies (KD), Competency Achievement Indicators (GPA), learning objectives, and concept maps. b) The title of the electronic module includes learning activities consisting of Learning Activity I (History of the Development of the Periodic System of Elements), Learning Activity II (Classification of Elements), and Learning Activity III (Property of Elements and Periodicity of Elements); the electronic module material is packaged in the form comic story. The selection of comic characters is designed using the Pixton website which can be uploaded via www.pixton.com and using an application for making electronic modules, namely Canva Design, and then published in the form of HTML-formatted flipbooks using Canva's features, namely heyzine flipbook.

Development Stage

At the development stage, the storyboard from the design results that have been made becomes the basis for the development of comic-based electronic modules. Comic-based e-modules are packaged using the Canva Design

application. This application can make it easier for writers to combine text, design comic storylines, and determine layouts to make comic-based e-modules on elemental periodic system material according to what researchers have done. Its production went through several stages as follows: 1) creating educational resources in the form of electronic modules based on comics and created using storyboards; 2) after the comic-based electronic modules have been designed using Canva design, they are then exported in flipbook form so that they are easy to run, 3) then Comic-based e-modules were validated by validators, both media experts and material experts, then tested on a small scale.

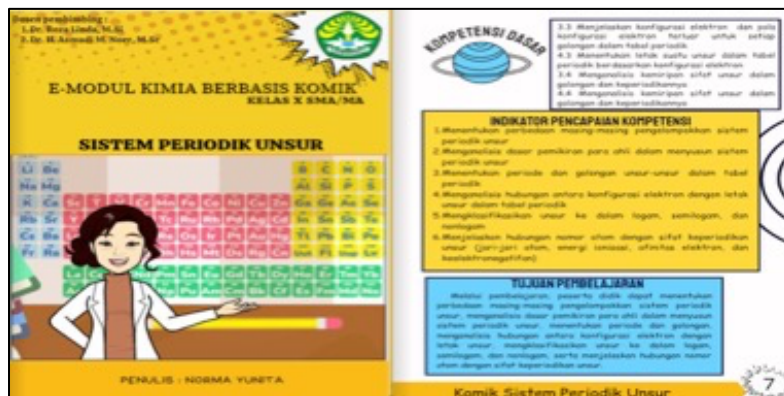


Fig.-2. Display of Comic-Based Electronic Module Using Canva Design

The sequence of contents for comic-based e-module products is cover, researcher profile, preface, table of contents, core competencies, basic competencies, learning objectives, character introductions in chemical comics, comic content containing material, and practice questions. Evaluation in this stage is carried out by researchers based on improvements from a team of experts in both material and media for the product being developed. The goal is to improve the product being developed. The display of comic-based electronic module products developed using Canva Design is presented in Fig.-2.

The next step is validation by material and media experts. A team of experts, consisting of two material experts and one media expert in total, will perform validation to obtain valid comic-based electronic modules. The second validation is based on the content viability, comedy features, language, presentation, and graphical aspects of the expert validation of the analyzed material. Likewise, the validation of media experts was analyzed based on aspects of visual communication display and software utilization. The second validation percentage diagram of various aspects by the material expert validators (Fig.-3) and media experts are presented (Fig.-4).

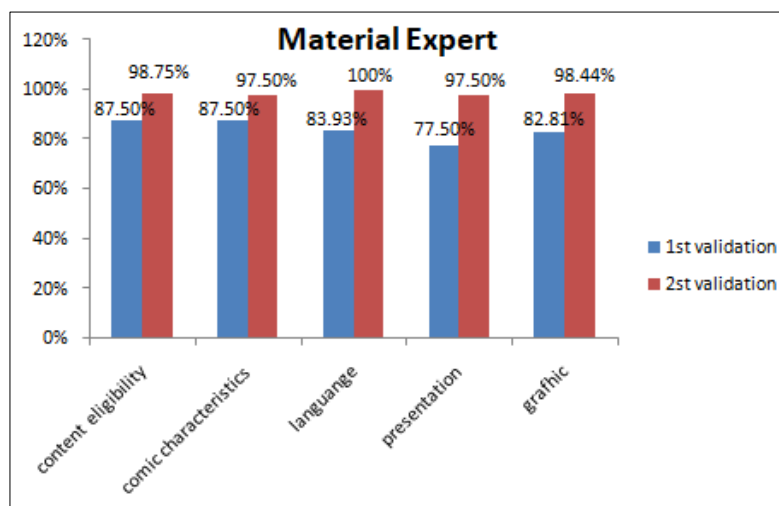


Fig.-3. Diagram Showing the Percentage Increase in the Material Validator's Ability to Validate Certain Aspects

The validation sheet is filled in at the end of the activity after completing 2 validation stages which indicate the activity has been fully completed. The validation sheet contains a column for comments/suggestions and suggestions for improvement. Therefore, revision and improvement guidelines are taken from the validation sheet.

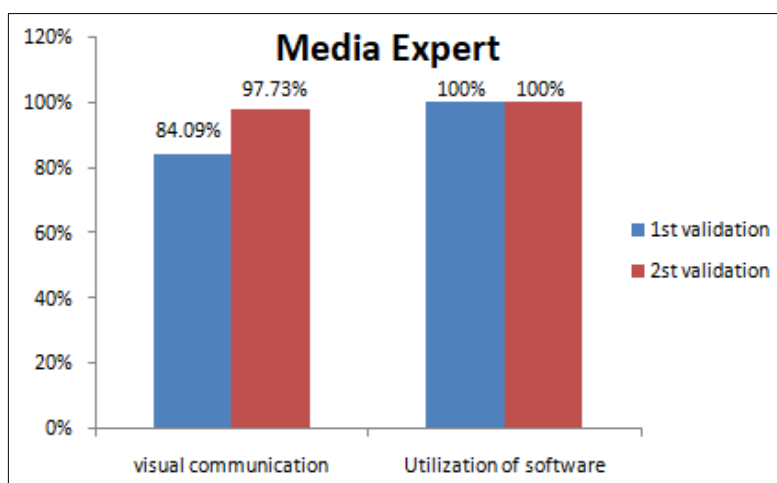


Fig.-4. Graph Showing the Percentage Increase in the Media Validator's Assessment of Certain Aspects

Based on the validator's assessment that the comic-based electronic module developed is valid based on aspects of content feasibility, comic characteristics, language, presentation, graphics, visual communication display, and software use. The role of comic-based electronic modules can help the learning process by utilizing comic media that can attract students' attention can generate interest and motivation in students (Fauziyyah et al. 2015; Nisa et al. 2022; Silaban et al. 2022). In addition, comic-based electronic modules have also facilitated students in learning the elemental periodic system through the characteristics of comics as an entertainment medium containing dense short stories to attract attention (Nurlatifah et al. 2015). Riwu et al (2018) stated that attractive designs in electronic-based teaching materials aim to make it easier for students to understand the material presented, the presentation of comic-based electronic modules has a pleasing aesthetic.

Implementation Stage

At the implementation stage, a one-on-one trial was conducted with three students of varying capacities to see if they could complete comic-based electronic modules that the validator had deemed genuine. Teachers also performed well on assessments, with an average percentage of 87.66% and extremely good criteria. In addition, experiments on 20 students in small groups from Senior High Schools 2 and 5 in Pekanbaru produced an average percentage of 87% with very good criteria when they were requested to develop an electronic module based on comics on their own and sent questionnaires to users. Students responded very well to the use of comic-based e-modules. This is evidenced by the simplicity with which students may access material on several occasions via cellphones, allowing them to train pupils to learn independently. Furthermore, the videos and images presented aid students' comprehension. The emergence of the e-module in tandem with comic media increases students' interest in reading reading content.

The utilization of comic-based electronic modules created with Canva Design has an impact on teachers who create instructional materials. This is noted while delivering implementation to the instructor. Teachers are interested in using the Canva platform to create e-modules because, in addition to being simple to use, there are templates available to aid in the creation of instructional materials.

Evaluation Stage

Comic-based electronic modules help students understand the periodic system of elements material because of the use of communicative and easy-to-understand language. The comic-based electronic module also contains videos and images that can explain material on the abstract periodic system of elements. The comic-based electronic module uses the Canva design on the elemental periodic system material to provide access for users to be active and motivated in learning. In line with this, some modules are presented in electronic form, so the electronic module is not bound by time and place, so it can be accessed anytime and anywhere (Mulyasari and Sholikhah, 2021).

The advantages of comic-based electronic modules compared to other teaching materials are as follows: 1) Has a distinctive feature, namely the material is packaged in story form with comic elements inserted, 2) Equipped with story text, images, audio video, and information links that can be accessed, 3) Can operate on all computer and smartphone devices, 4) Practical and interactive because there is no need to download supporting applications to access it.

Conclusion

The development of a comic-based electronic module with Canva's design on the elemental periodic system material in class X SMA/MA equivalent was declared valid with an overall percentage of 98.44% based on the material validation aspect and 98.86% based on media validation. The user response test for chemistry teachers was stated to be very good with a percentage of 87.66%. The student response test got a very good response with a percentage of 87%.

Conflict of Interests

The author (s) declares that there is no conflict of interest in this research and manuscript.

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