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Development of the "Let's Understand Emotions" Application for Students with Autism

Hartini Nara[1], Siti Nuraini Purnamawati[2], Lintang Almar'atus Sholihah[3], Afifah Nur Adzkia[4], Shabila Kairunisa[5]

[1,2,3,4,5] Faculty of Education, State University of Jakarta
Jl. R. Mangun Muka Raya No. 11, East Jakarta

Email : hartininara@unj.ac.id

Abstract: *This study aims to develop the "Let's Understand Emotions" application as a learning medium for students with autism in recognizing emotional symbols. Students with autism often have difficulties in language, communication, and emotional expression, so they need media tailored to the needs of students with autism. This application is designed with interactive features such as videos explaining emotional symbols, sounds, images, exercises, and games to introduce emotions in an easy-to-understand way. This study uses the Research and Development (R&D) method with the PPE (Planning, Production, Evaluation) model, which includes planning, production, and evaluation. Data were collected through validation questionnaires from media, material, and autism experts, as well as one-to-one trials on three students with autism at SD Islam Alam & Sains Al-Jannah. After going through a series of validations and trials, the validation results showed that this application was feasible to use, with a feasibility score of 82% from media experts, 73% from material experts, and 100% from autism experts. The trial on students obtained a score percentage of 89%, indicating that the application is very suitable for use in learning students with autism to recognize emotional symbols.*

Keywords: *Application, Emotional Symbols, Students with Autism, PPE*

Abstrak: Penelitian ini bertujuan untuk mengembangkan aplikasi *"Let's Understand Emotions"* sebagai media pembelajaran bagi siswa dengan autisme dalam mengenali simbol emosi. Siswa dengan autisme sering mengalami kesulitan dalam bahasa, komunikasi, dan ekspresi emosi, sehingga diperlukan media pembelajaran yang sesuai dengan kebutuhan mereka. Aplikasi ini dirancang dengan fitur interaktif berupa video penjelasan simbol emosi, suara, gambar, latihan, dan permainan untuk memperkenalkan emosi secara mudah dipahami. Penelitian ini menggunakan metode *Research and Development* (R&D) dengan model PPE (*Planning, Production, Evaluation*) yang meliputi tahap perencanaan, produksi, dan evaluasi. Pengumpulan data dilakukan melalui angket validasi dari ahli media, ahli materi, dan ahli autisme, serta uji coba *one-to-one* terhadap tiga siswa dengan autisme di SD Islam Alam & Sains Al-Jannah. Setelah melalui tahapan validasi dan uji coba, hasil penelitian menunjukkan bahwa aplikasi ini layak digunakan dengan skor kelayakan sebesar 82% dari ahli media, 73% dari ahli materi, dan 100% dari ahli autisme. Uji coba pada siswa memperoleh persentase skor sebesar 89%, yang menunjukkan bahwa aplikasi ini sangat sesuai digunakan sebagai media pembelajaran bagi siswa dengan autisme dalam mengenali simbol emosi.

Kata kunci: Aplikasi, Simbol Emosi, Siswa dengan Autisme, PPE

1. INTRODUCTION

The development of digital technology has had a significant impact on various fields, including education. This technology plays a crucial role in creating more inclusive, effective, and flexible learning environments, especially for children with special needs. For example, students with autism face specific challenges in understanding learning concepts that may be difficult to grasp through traditional methods. Therefore, appropriate learning approaches and media are needed to assist them. One effective solution is to utilize applications. As explained by Supriyanto, an application is a program that processes commands to carry out user requests according to specific objectives (Supriyanto, 2005). Meanwhile, Janner adds that an application is a program or collection of programs designed for use by end users (Janner, 2006). In an educational context, applications are highly beneficial because they

enable interaction between various learning components, thus supporting a more interactive and adaptive learning process for students with special needs. These applications are typically equipped with features that allow students to practice, explore, and assess their understanding of the material being studied.

The term "autism" comes from the Greek, *autos*, meaning "self" (Gopal, 2001). Eugen Bleuler first used this term to describe a person's lack of or absence of connection with others and the world around them. Today, autism is recognized as a developmental disorder that primarily affects communication and social interaction (Bottema-Beutel, 2017). Students with autism often have difficulty communicating and interacting, and tend to express emotions or feelings differently than typical children. This is caused by a neurological disorder that affects how they behave and interact with their surroundings (Tarigan & Marlina, 2019). Students with autism also face difficulties in recognizing emotional colors due to dysfunction in the limbic system, which regulates emotional processing.

Research shows that with autism have difficulty making affectionate contact and reading the emotional expressions of others (Castelli, 2005). However, emotions are typical responses that arise when a person is confronted with certain objects or situations (Wedge, 1995) and are a form of adjustment to the environment to achieve individual well-being (Crow & Crow, 1995). Emotions encompass a wide range of feelings, such as anger, sadness, fear, joy, love, surprise, irritation, and shame (Goleman, 2005). According to Paul Ekman's research, basic emotions such as fear, anger, sadness, and joy can be recognized through facial expressions and are recognized across cultures worldwide.

Due to the various barriers they face, students with autism require a specialized approach to learning. One effective method for helping students with autism understand material is to utilize digital learning media. Digital media allows for more interactive and engaging presentations, adapting them to the needs and learning styles of students with autism. Through a combination of elements such as audio, text, video, graphics, and animation, digital learning media can convey complex concepts, such as emotions and social interactions, in a way that is easily understood by students with autism. This media also provides opportunities for students to learn independently through activities that can be repeated as needed, thereby enhancing students with autism's understanding and facilitating more inclusive learning.

Based on results observation, interviews, and questionnaires which given to teacher in Al-Jannah Islamic School, the learning process carried out at the school, especially for students with autism customized with ability and students' needs. Teachers also conveyed that one of the skills that needs to be taught to students with autism is the ability to recognize emotions. A developmental disorder commonly experienced by students with autism is disturbance development emotion. This matter could be seen during at school, students with autism tend to experience emotional instability. There are variations in emotional instability among students with autism, which may manifest at different times. Sometimes students with autism may suddenly laugh without an identifiable cause, and at other times they may suddenly cry hysterically. Students with autism may express their emotions in unpredictable ways. When they feel angry or upset, they may engage in self-injurious behaviors, such as hitting parts of their own body. In some cases, they may also direct aggression toward others, for example by hitting when a peer teases them, whether during learning activities or during break time.

This matter also strengthened by opinion (Casteli, (2005) that students with autism experience inability to do affectionate contact with other people, difficulty reading others' expressions, having difficulty recognizing basic forms of emotion, and difficulty in expressing their emotions.

Therefore, media that can introduce emotions to students with autism is needed to assist teachers in conveying material that is often difficult for students to grasp. Interactive learning media can facilitate understanding by presenting simpler and more engaging explanations. With the support of information technology, this learning media can be implemented in the form of interactive applications, making the learning process more effective and better tailored to the needs of students with autism.

This study refers to several previous research sources, including journals related to the present topic. The first study is by Hartini Nara (2020), titled *Development of a Multimedia-Based Indonesian Language Learning Package for Students with Autism*. This research was conducted at Al-Jannah Islamic Elementary School for Nature and Science. The purpose of this study is to develop device learning Indonesian Language based multimedia for students with autism. The results of this study indicate the development of device learning can increase students' learning outcomes in effective way.

Based on the results of this study, learning devices can be recommended for use as alternative sources study.

The second research from Deddy Gusman and Nurmalina in 2021 with the title Improvement Ability Social Emotional Child Age Early Through Use Media Animation in Taqifa Kindergarten Bangkinang City. This study done in Taqifa Kindergarten Bangkinang City. The aim of this study is to examine the improvement of children's social-emotional abilities through the use of animation media at Taqifa Kindergarten. The results of this study show that improving children's social abilities can be supported by the teacher's use of animation media in accordance with established theories. These include selecting themes aligned with the targeted activities, preparing the media, directing the children's attention, providing dynamic learning experiences based on psychological, behavioral, and cognitive principles, offering activities that stimulate children's abilities, and conducting evaluations.

The third study by Magda Kowalska and Monika Wróbel in 2017 entitled *Basic Emotions*. This research was conducted at the University of Lodz, Poland. The objective of this study is to examine the concept of basic emotions. The findings indicate, first, that most researchers agree the number of basic emotions is limited. Second, although the specific lists vary, emotions such as happiness, sadness, anger, and fear appear consistently across most classifications. Third, there is considerable overlap regarding the 'basic criteria,' which many theorists identify as the universality of emotional expressions, unique physiological correlates, distinct subjective experiences, and adaptive functional characteristics. Overall, despite some differences, theories of basic emotions demonstrate significant similarities and thus provide a useful conceptual framework for future research in this field.

Different from previous research, this study presents an innovation in the form of developing digital learning media to introduce emotional symbols to students with autism through an interactive application. The application, titled "Let's Understand Emotions," is designed with an attractive visual display and dynamic animations, and is adapted to the characteristics of students with autism who are highly visual. This application prioritizes ease of use, so students can interact with the media independently. The existing features are designed to be easy to understand and access, making this application a learning medium that is not only relevant, but also effective in helping students with autism recognize and understand various emotions. This research aims to create innovative learning media to improve students' understanding of various emotions. With this approach, it is hoped that students with autism can more easily understand and express emotions, thereby supporting the social-emotional development of students with autism in a positive learning environment.

2. RESEARCH METHODS

This interactive application development study employs the Research and Development (R&D) method. The researcher selected this method because the study aims to produce a product and evaluate its effectiveness. The model used by the researcher in this study is the PPE model according to Richey and Klein (2009), which is an acronym for *Planning, Production, and Evaluation.* This model is analytical from start to finish, namely how to design a product, develop or produce the design, and evaluate the product's performance to produce a viable product. This development model consists of three steps, namely *Planning*, *Production*, and *Evaluation*. The research was conducted at Al-Jannah Islamic Nature and Science Elementary School, with respondents being students with autism. Media testing was conducted by three experts. The testing was intended to determine the quality of the media's content and presentation, its suitability to student needs, and any shortcomings in the developed media product. The following is the procedure for developing an interactive application for students with autism, adapting the PPE development model used by the researchers, as shown in the chart below:

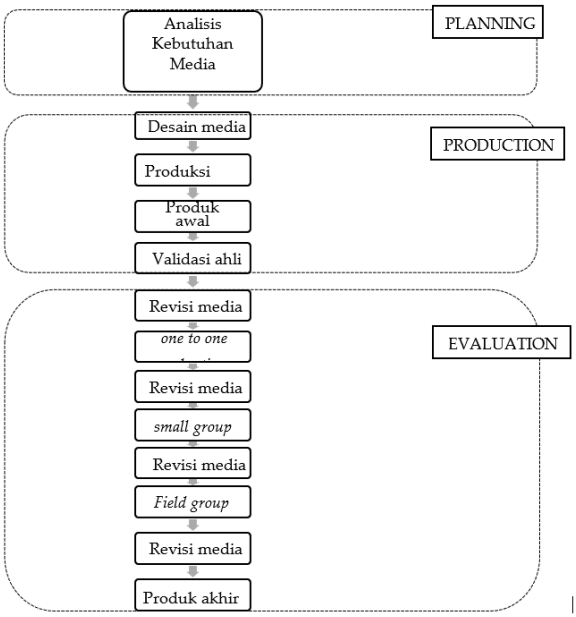

Figure 1. Stages of Development Procedures Carried Out by Researchers

The following are the research steps for developing an interactive application using the PPE development model: (1) **The Planning *stage* includes** an analysis of the needs of students with autism in understanding emotional symbols. This analysis is conducted through interviews with teachers and occupational therapists, as well as questionnaires to teachers regarding students' difficulties in recognizing emotions. At this stage, a literature study is also conducted to obtain the best method for teaching emotional symbols to students with autism. The learning objective to be achieved is the ability to recognize basic emotional symbols such as happy, sad, and angry. Planning also includes an autism-friendly interface design, including interactive features such as images, animations, and sounds, as well as activities that are adjusted to ensure a simple and non-overwhelming display. (2) **The Production *stage* consists** of content development, application creation, and content validation by experts. At the content development stage, the material to be displayed in the application is prepared, including illustrations of emotional symbols, descriptions of emotions, and instructions for use. Interactive application then developed in a *website format* that contains brief explanations and sounds about emotion symbols, complete with images. In addition, there are practice and game features to measure the level of student understanding after studying emotion symbols, complete with positive feedback for students who answer questions correctly. Media validation by experts is also carried out to ensure the application functions optimally. Responses and suggestions for improvement from experts will help improve product quality. (3) **The Evaluation *stage* involves a** *one-to-one* field trial involving three students with autism from SD Islam Alam dan Sains Al-Jannah. This trial aims to assess the developed application. After the trial, an evaluation is carried out by collecting data through a questionnaire to obtain input from students with autism regarding the effectiveness of the application.

The data analysis techniques used in this study included two approaches. First, an *expert review technique* , involving reviews from expert lecturers in learning media, autism experts, and content experts to evaluate the developed product. Second, a *one-to-one* assessment questionnaire was completed by students with autism using a *Likert scale* to measure their understanding and responses to the application.

3. RESEARCH RESULTS AND DISCUSSION

The product name resulting from the development of this innovative work is the "Let's Understand Emotions" application. This "Let's Understand Emotions" application was created and developed to introduce emotional symbols to students with autism. This *website -based media* consists of several

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features. The "Let's Understand Emotions" application is designed with various key features to help students with autism understand emotional symbols. On the main page, users can choose from several learning options. The first feature is basic material, which provides an introduction to basic emotional symbols such as happy, sad, and angry, accompanied by brief explanations and illustrations. Next, there is advanced material that offers deeper knowledge of more complex emotional symbols, helping students understand a wider variety of emotions. The practice feature allows students to practice identifying emotional symbols through various simple questions or activities that support understanding of emotional symbols. In addition, the application is also equipped with *games*, where students can learn while playing through interactive games designed to improve emotional recognition in a fun way. Then feature test formative testing of understanding students after studying, with questions that provide direct feedback. And available instruction use that provides guide short about method use This application allows students and teachers to with easy access and utilize all features provided. Finally, the application "Let's Understand Emotions" also features a **Developer Profile feature.** This feature provides information about the team or individual who developed the app, their educational or professional background, and their motivation behind the app's creation. This profile can include a brief description of the developer's experience in special education or learning technology for students with autism, as well as the app's primary goal of helping students understand emotional symbols. This feature aims to provide users with confidence that the app was developed by a competent party who understands the needs of students with autism. The following is a screenshot of the "Let's Understand Emotions" app that was developed:

Figure 2. Main Display of the "Let's Understand Emotions" Application

Figure 3. Features Available in the "Let's Understand Emotions" Application

The "Let's Understand Emotions" application offers various advantages that are specifically designed to help students with Autism helps students understand emotional symbols interactively and effectively. With a simple, autism-friendly interface, this app avoids excessive color or visual elements, allowing students to focus on the material without distraction. Features such as basic and advanced materials provide clear, step-by-step explanations, helping students recognize basic emotions and progress through more complex ones. The app also features interactive exercises and *games* designed to reinforce understanding in a fun way while providing positive feedback that increases students' motivation to

learn. Furthermore, a formative testing feature allows students to independently test their understanding, with simple, easy-to-understand user guides. Through an app-based approach that incorporates text, audio, and visuals, this app provides a comprehensive learning experience and supports students with autism in recognizing and understanding emotional expressions in a way that suits their needs.

The development of the "Let's Understand Emotions" application was carried out through three main stages: *Planning*, *Production*, and *Evaluation*. In the *Planning stage*, an analysis of the needs of students with autism in recognizing emotional symbols was conducted through direct observation, interviews with teachers and therapists at SD Islam Alam dan Sains Al-Jannah, and a literature review on effective learning methods for students with autism. This stage also included planning the application's interface and interactive features to suit the students' needs.

Next, in the *Production stage* of the "Let's Understand Emotions" application development, the content to be used in the application is compiled and created, such as basic emotional symbols along with illustrations, descriptions, and audio explanations appropriate for students with autism. This stage involves programming the application in the form of *a website*, where interactive features are added to allow students to click on the emotion symbols equipped with various media such as text, emotional sounds, and illustrative images. In addition, exercise and game features *are* designed to measure students' understanding after learning the emotion symbols. The application is also equipped with with positive feedback to encourage motivation successful students answer questions with right. As step at the end of this stage, it is done validation by experts, including media experts and special education experts from Jakarta State University, to ensure that all feature functioning well and the content is in accordance with student learning needs with autism.

Based on research conducted in July-August 2022, results were obtained through interviews and questionnaires using *Google Forms* to determine the effectiveness of the "Let's Understand Emotions" application for students with autism.

Table 1. Results of the Feasibility Test of the “Let's Understand Emotions” Application by Media Experts

Score Indicator	Total Score	Average	Percentage
Navigation buttons on media working with exactly according to its function, etc.	41	50 4.10	82%
%			82%

Based on the results obtained in the analysis of Table 1, it can be seen that slight improvements are needed to the navigation flow to make it clearer and simpler. After improvements were made by making the navigation flow clearer and simpler, the evaluation results from media experts obtained an average score of 4.10 or 82%, meaning this figure is in the good category and is worthy of being continued to the next stage, namely the *one-to-one test.*

Table 2. Results of the Feasibility Test of the “Let's Understand Emotions” Application by Material Experts

Score Indicator	Total Score	Average	Percentage
The material is in accordance with student competency autistic, etc.	73	100 3.65	73%
%			73%

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Table 2 then shows the results of the feasibility test for the "Let's Understand Emotions" application by subject matter experts. The feasibility test for the "Let's Understand Emotions" application, or evaluation by subject matter experts, was conducted twice. Based on the evaluation questionnaire results from subject matter experts, the average score was 3.65, or 73%, which is considered good and worthy of being continued to the next stage, namely the one-to-one test.

Table 3. Results of the Feasibility Test of the "Let's Understand Emotions" Application by Autism Experts

Score Indicator	Total Score	Average	Percentage
Use of sentences easy to understand according to with the ability of children's intelligence autism, etc.	65	5.00	100%
%	100%		

Based on the results of the feasibility test of the "Let's Understand Emotions" application by autism experts as shown in Table 3, an average value of 5.00 or 100% was obtained, which means that this figure is in the very good category, and is worthy of being continued to the next stage, namely *the one to one test*.

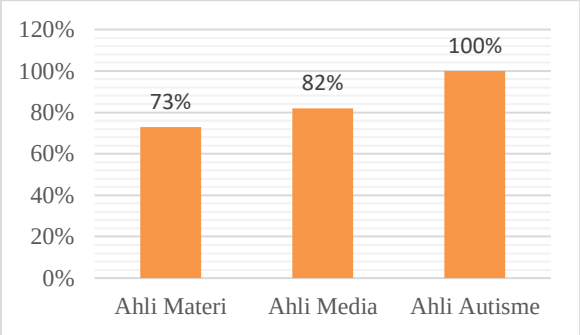

Figure 4. Graph of Expert Feasibility Test Results

The results of the study indicate that the feasibility test of the "Let's Understand Emotions" application for students with autism obtained the following percentages: 82% from media experts, 73% from material experts, and 100% from autism experts. Based on these results, it can be concluded that the developed learning media is very suitable for use in the next research stage, namely *one-to-one trial.*

During the *evaluation phase of the "Let's Understand Emotions" app development, a comprehensive evaluation was conducted to assess the app's effectiveness and feasibility. The evaluation began with one-to-one* trials, where the app was tested on several students with autism to assess their interaction with the app and their understanding of emotion symbols. The results were analyzed based on image quality, material presentation, and the appropriateness of the media for learning. Feedback from students, teachers, and therapists was collected to determine the difficulties students experienced and the effectiveness of the app's features. This data was used to refine the app before larger-scale testing.

One-to-one testing was conducted at Al-Jannah Islamic Nature and Science Elementary School on October 24, 2024, involving one student with mild autism and two students with Moderate autism. Students accessed the *website material* until completion and completed a questionnaire regarding their experience using the application.

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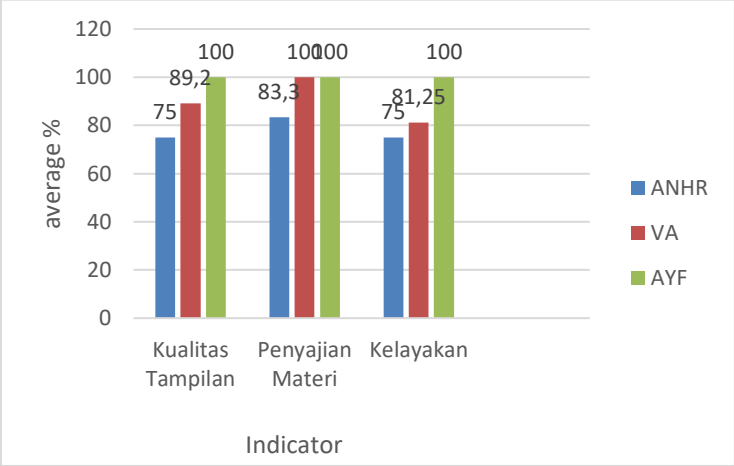

Figure 5. Graph of One to One Trial Results

Table 4. Percentage of Feasibility Value from *One to One* Trial Results

No	Indicator	Acquisition Score	Total Score	Average	Percentage
1.	Display quality	74	84	3.52	88%
2.	Presentation of material	68	72	3.78	94%
3.	Eligibility	41	48	3.41	85%

Based on the results of the evaluation questionnaire from students, on the display quality indicator of the "Let's Understand Emotions" application, an average score of 3.52 or 88% was obtained, which indicates that this media is included in the very good category and is very worthy to proceed to the next stage, namely testing the effectiveness of the media through small group tests and field tests. In addition, on the material presentation indicator, the average score reached 3.78 or 94%, which indicates the very good and very worthy category. to proceed to the next stage. Then, the media feasibility indicator obtained an average score of 3.4 or 85%, indicating a very good category and very suitable for use in learning to recognize emotional symbols for students with autism. The "Let's Understand Emotions" application has met the criteria for clear instructions for use, suitability of presentation with learning outcome indicators, media support in embedding concepts, and alignment of concepts with learning objectives. The concepts and theories in this developed application have also been adjusted to the cognitive domain expected in the competency standards (SK) and basic competencies (KD).

4. CONCLUSION

Based on the research results and discussion, it can be concluded that the development of the "Let's Understand Emotions" application as a learning medium for recognizing emotional symbols for students with autism is very feasible and can be used in classroom learning activities. The feasibility and effectiveness of the "Let's Understand Emotions" application are demonstrated by the results of feasibility tests from various experts. The feasibility test by media experts gave an average score of 4.10 or 82%, which is categorized as "good." The feasibility test by material experts produced an average score of 3.65 or 73%, also categorized as "good." The feasibility test by autism experts obtained an average score of 5.00 or 100%, which is categorized as "very good." After revisions based on input from experts, this application was tested on three students with autism at Al-Jannah Islamic Nature and Science Elementary School. In the *one-to-one trial stage*, a score of 88% was obtained for image quality, 94% for material presentation, and 85% for media feasibility. These results indicate that the media is in the very good category and is very suitable for use as a learning tool for recognizing emotional symbols for students with autism.

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