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RUBEE IMMERSION: VIRTUAL REALITY-BASED DIABETES EDUCATION MEDIA RUBEE SLIDE-TABS

Muhammad Zhafran Fakhri[1*], Siti Syarah Yuliska[2], Rania Gantari Pranoto[3], Afryansyah[4]
[1,2,3,4]Madrasah Aliyah Negeri Insan Cendekia Ogan Komering Ilir, South Sumatra, Indonesia
email: muhzhafranfakhri89@gmail.com[1*]

Abstrak: Diabetes Mellitus is a chronic disease with a prevalence that continues to increase every year, so effective educational efforts are needed to improve public understanding. This research developed Rubee Immersion, a Virtual Reality (VR)-based health education and literacy media that aims to provide an interactive understanding of the causes, symptoms, and management of diabetes. Apart from being a means of education, this media also functions as a means of dissemination to introduce Rubee-Dia Tabs, herbal products made from Brucea javanica and forest honey which have the potential to help manage blood sugar levels. With a VR technology approach, Rubee Immersion is expected to be able to increase public awareness, knowledge, and interest in treating diabetes naturally and preventively..

Keywords : Diabetes Melitus, Virtual Reality, Health Education, Rubee Immersion, Rubee Dia-Tabs

PENDAHULUAN

Diabetes Mellitus (DM) is often one of the health problems that occurs globally with the number continuing to increase significantly from year to year. Quoted from the journal [3] diabetes is a type of chronic metabolic disease as a result of abnormalities in insulin secretion, insulin performance, or abnormalities that occur in both. The symptoms of this disease are characterized by an increase in glucose levels in the blood or commonly known as hypoglycemia. DM is also categorized as a chronic metabolic disease which, if not treated properly, can cause serious complications such as kidney disorders, heart disorders, cancer, and nerves and it is not uncommon to find a spike in mortality due to diabetes mellitus. Based on data from the International Diabetes Federation (IDF) in 2021, there were 537 million people in various parts of the world with diabetes. It is estimated that in the next few years there will be an increase in the number of people with diabetes by 783 million people by 2045. Indonesia is ranked fifth as the country with the highest number of diabetics, the number reaches 19.27 million people, this shows that diabetes is not just an ordinary disease, diabetes is a serious challenge and problem in the national health system that must be treated comprehensively and sustainably [2].

The number of diabetes cases that is increasing every year is caused by various factors, for example, research obtained from the DM community is caused by genetic factors, unhealthy environment and lifestyle, poor diet and lack of physical activity that can lead to weight gain over time can lead to obesity and insulin resistance which can lead to diabetes. Genetic factors and age are also factors with the highest risk of developing diabetes [8].

The development of the times presents technological developments, in this case existing technology creates opportunities to present new innovations in educational literacy media that are more interactive, immersive and interesting. This technology is known as virtual reality (VR). Virtual Reality (VR) is a technology that allows users to experience and interact with digitally created environments, as if they were in the real world. Through devices such as VR headsets, sensory gloves, and motion controllers, users can enter immersive environments that stimulate the senses of sight, hearing, and sometimes touch. Burdea and Coiffet [6] explain that VR is an advanced user interface that allows simulation and real-time interaction through several key sensory channels [21].

In the VR world, the environments presented are usually designed in three dimensions (3D) and can be a simulation of the real world or a completely imaginary world [22]. This technology utilizes a combination of computer graphics, motion sensors, and data processing algorithms to create realistic and interactive experiences. According to Jensen and Konradsen [9], the use of VR in education can increase motivation, clarify abstract concepts, and increase student engagement through immersive learning experiences. Virtual Reality applications today are not only limited to entertainment such as video games or interactive movies, but have also developed widely in the fields of education, health, architecture, military training, and flight simulation. The development of virtual reality media is one of the efforts to realize educational goals [20]. [18] With the continued development of technology, Virtual Reality is seen as one of the innovations that has the potential to revolutionize the way humans work, learn, and communicate in the future.

In response to the need for more effective, interactive, and easy-to-understand learning methods in the healthcare sector, we present Rubee Immersion, a Virtual Reality-based educational platform specifically designed to deepen our understanding of diabetes. Rubee Immersion is an innovative solution that combines three-dimensional visualization technology with interactive simulations, to help users understand complex concepts related to glucose metabolism, the role of insulin, and the management of type 1 and type 2 diabetes. In it, users will be invited to understand the biological process of diabetes, risk factors, early detection, and healthy lifestyle simulations as an effort to control the disease.

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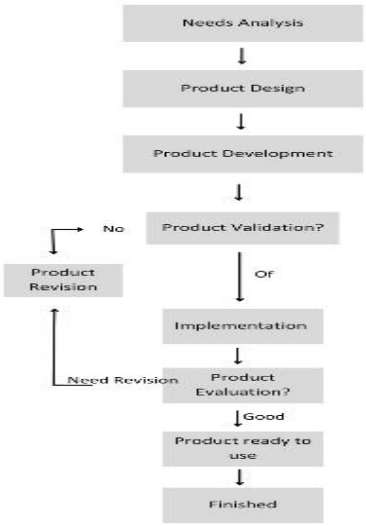
Hal. 694-702
Vol. 7; No. 2
Mei 2025

In the Rubee Immersion platform, users are presented with a variety of learning materials that are systematically and interactively designed to deepen their understanding of diabetes in a visual, engaging, and educational way.

METODE

This research was carried out using the Research and Development (RnD) method, where the researcher produces a new product or develops an existing product and validates it **[15]**. Researchers develop products based on research findings, then conduct tests, and revise them to correct deficiencies found during testing **[19] .** This study uses the ADDIE (Analysis, Design, Development, Implementation, Evaluation) development model **[4].**



Picture 1. Research Flow Framework

Data is collected and measured quantitatively. Data was collected through three stages of testing with questionnaire data collection. The researcher conducted a needs analysis by distributing a questionnaire to find out what is needed by the current community. This study uses data analysis in the form of expert validation. Needs analysis is an effort made to find out the needs of the community [11] , carried out by providing a questionnaire containing statements presented using a likert scale. The expert validation test is an assessment process carried out by experts in the related field to measure the feasibility of the developed product [14]. The experts in question were media expert Rosita, S. T, then material expert Umi Nadifa, S. Pd, and language expert Endah Desniarti, M. Pd. The second was an application effectiveness test to find out whether there was an increase in knowledge about diabetes and the usefulness of Rubee Dia-Tabs after playing the Rubee Immersion VR simulation. The effectiveness test was carried out on 22 students of class X of MAN Insan Cendekia OKI.Dalam penulisan rumus dan persamaan menggunakan *equation* disertai nomor seperti pada rumus (1).

The validity test and the data effectiveness test were measured using Likert scale measurements. The likert scale is a scale that contains five levels of answers that represent the level of approval of respondents to the statements given [16]. Data respondents chose one of four alternative answers. The questionnaire assessment score is presented using a likert scale with the conditions (4) Strongly Agree, (3) Agree, (2) Disagree, (1) Strongly Disagree. The formula for calculating the results of the respondents' questionnaire is:

$$P = \frac{f}{n} x\ 100\% \qquad (1)$$ (Asih and Muslim 2023)

Information :
$P = Percentage\ of\ respondents$
$f = Number\ of\ Score\ Obtained$
$N = Maximum\ Score$

The percentage results are then interpreted into criteria as in the following table:

Table 1. Respondent Response Analysis Criteria

Score	Criterion
0-20	Very (Practical/Effective)
21-40	Practical/Effective
41-60	Enough (Practical/Effective)

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Hal. 694-702
Vol. 7; No. 2
Mei 2025

61-80	No (Practice/Effective)
81-100	Very Not (Practical/Effective)

RESEARCH AND DISCUSSION

1. Analysis Stage

a. Needs Analysis

Based on the results of the analysis of questionnaire data conducted by the researcher on class X students of MAN Insan Cendekia OKI, there is a need for more interesting health learning media, especially for the topic of diabetes. Based on this data, respondents stated that they were very interested in learning about health topics through interactive visual media, then respondents admitted that they had difficulty understanding health materials that were only presented in the form of text, and based on the results of the questionnaire data, stated that respondents needed educational media that could help understand the risk and prevention of diabetes.

Adolescents need interesting diabetes education media, as evidenced by respondents who stated that they do not know much about things related to diabetes and do not understand enough about diabetes. So it is necessary to have an interesting and interactive learning media about diabetes today. And with the innovation of Rubee Immersion, which is a VR-based learning medium, users, especially teenagers, can be more interested and understand about diabetes and Rubee Dia-Tabs herbal products.

Table 2. Percentage of Respondents' Needs for Health Literacy Media

Yes	Statement	Percentage
1	I am more interested in learning health topics through visual or interactive media.	60%
2	I find it difficult to understand health material if it is only in the form of text	60%
3	Conventional learning (textbooks, articles) feels boring to me.	60%
4	I want there to be a learning medium about diabetes that is more fun and easy to understand	60%
5	I need educational media that helps me understand the risk and prevention of diabetes.	60%
6	I feel like I don't have enough knowledge about diabetes.	40%
7	I know how to help friends/family who have diabetes.	40%
8	I know how to help friends/family who have diabetes.	20%
9	I understand that diabetes affects not only the elderly, but also adolescents.	20%
10	I know how to prevent diabetes early.	20%

2. Design Stage

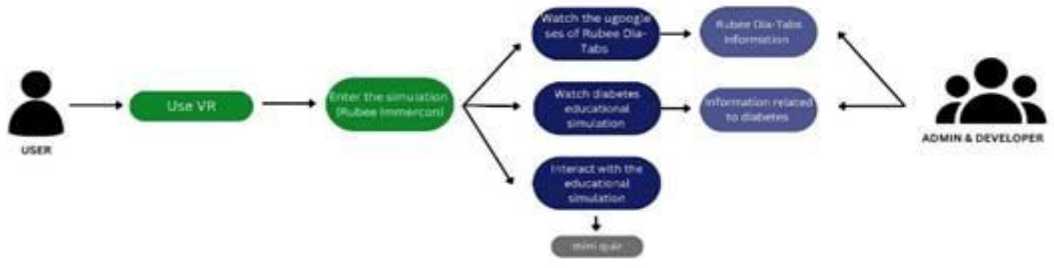

Figure 2. Use Case Diagram

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Hal. 694-702
Vol. 7; No. 2
Mei 2025

A Use Case Diagram is a depiction of a process that shows the relationship between the user and the developer in a simulated system that is designed. Use cases are used to find out what functions (use cases) exist in the system and who (actors) use the functions in the system [10].

3. Development Stage

a. Rubee Immersion and Rubee Dia-Tabs VR Simulation Creation

Figure 3. Rubee Immersion Logo

The design of the simulation flow was made using the Millea Lab platform. Information about diabetes and Rubee Dia-Tabs was developed by adding information juxtaposed with audio-visual elements and interactive elements.

Figure 4. Rubee Slide-Tabs

The manufacture of Rubee Dia-Tabs is carried out in the lab using the main ingredients, namely Brucea javanica and forest honey.

b. Uses of Rubee Immersion VR Simulation

Fig. 5. Clinic Background

Jurnal Informatika Teknologi dan Sains (JINTEKS)
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Hal. 694-702
Vol. 7; No. 2
Mei 2025

The use of simulation is carried out in a way, the user opens the simulation application (Millea Lab) on the smartphone, then the user will insert the smartphone into the VR headset. Once VR is installed, users can see a simulation being in a clinic that displays information about the dangers of diabetes.

Figure 6. Hospital Background

Then the user will move to the hospital background which contains information about diabetes mellitus.

Figure 7. Cafe Background

Then the display will move again to the background of a café that contains the causes of diabetes in young people.

Figure 8. Exhibition Background

Then the user will switch the display to the background of an exhibition, the user will see information and simulation images of the diabetes prevention herbal product, namely Rubee Dia-Tabs.

c. Application Expert Validation Test

a) Results of Media Member Assessment

Table 3. Media Expert Assessment

Indicator	Items	Scorch
Messages/information that appear on the icon/button display	1	4
Easy to learn how to use VR media	2	4

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Hal. 694-702
Vol. 7; No. 2
Mei 2025

Easy to understand the intent and purpose of media content	3	4
Convenience in the use of VR media	4	4
Portability	5	3
Clarity of VR media usage indicators	6	3
The level of interactivity in VR media	7	3
User satisfaction with VR media design	8	4
Total Score Obtained (f	29	4
Respondent response percentage (P)	90,60%	
Criterion	Very Practical	

Based on table 3 which is guided by the validity scale, the percentage value is at vulnerable 81% - 100% so it is declared very feasible. Therefore, the media aspect in VR Rubee Immersion is stated to be in the very decent category.

b) Results of Material Expert Assessment

Table 4. Results of Expert Assessment

Indicators	Items	Score
Purpose of VR Media	1	3
VR Media Material Selection	2	4
Benefits of VR Media	3	3
Total Score Obtained (f)		10
Respondent Response Percentage (P)		83%
Criteria		Very Practical

Based on table 4 guided by the validity scale, the percentage value is in the range of 81% - 100% so it is declared very feasible. So the material in VR Rubee Immersion is in the category of very feasible

c) Results of Linguist Assessment

Table 5. Linguist Assessment Results

Indicators	Items	Score
Font size and type	1	4
Language use	2	3
Presentation of features in VR media	3	3
Terms in VR media	4	3
Total score obtained (f)		13
Respondent response percentage (P)		81.25%
Criterion		Very Practical

Based on table 5 guided by the validity scale, the percentage value is in the range of 81-100% so it is declared very feasible. Therefore, the media aspect in VR Rubee Immersion is stated to be in the very decent category.

Jurnal Informatika Teknologi dan Sains (JINTEKS)
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Hal. 694-702
Vol. 7; No. 2
Mei 2025

Figure 8. Revision Based on Expert Validation Test

Based on expert assessment, it is necessary to add elements to VR media so that VR media can be used comfortably. Such as increasing the font size to make it more comfortable to read.

4. Implementation

a. Effectiveness Tests

The effectiveness test was conducted to find out the extent to which Rubee Immersion educational media was able to increase participants' understanding of diabetes mellitus and the introduction of Rubee Dia-Tabs herbal products. This test was carried out using pre-test and post-test methods for respondents who had used the media.

The respondents consisted of 22 classes X MAN Insan Cendekia OKI. The pretest was given before the respondent used the Rubee Immersion media, while the posttest was given after the respondent finished using the media.

The test instrument used was 10 multiple-choice questions, which had been validated by material experts and media experts. Pretest and posttest scores are compared to see the increase in knowledge that occurs.

a) Evaluation of the conceptual understanding of diabetes

Pre-test Evaluation

Table 6. Pre-test Evaluation

Principle	Items	(f)	Percentage Value (%)
Indicators of conceptual understanding of diabetes	1,2,3,4,5,6,7,8,9	266	0,74
Indicators of understanding diabetes products	10	14	0,7
PST Value (%) Total			0,72

Post-Test Evaluation

Table 7. Post-Test Evaluation

Principle	Items	(∑x)	PST Value (%)
Indicators of conceptual understanding of diabetes	1,2,3,4,5,6,7,8,9	340	0,94
Indicators of understanding diabetes products	10	18	0,9
PST Value (%) Total			0,92

showed a conceptual understanding of diabetes with a PST value of 74%, while the understanding of Rubee Dia-Tabs herbal products was 70%. Combined, the total PST score obtained before the educational media intervention was 72%. This value suggests that even though the participants already had basic knowledge about diabetes, their understanding of the introduced products was still relatively low.

After being given Rubee Immersion educational media, the posttest results showed a significant improvement. Participants' conceptual understanding of diabetes increased to 94%, while understanding of Rubee Dia-Tabs products also increased to 90%. Overall, the total PST score after the intervention increased to 92%.

This increase in value reflects the success of the educational media used in delivering material more effectively and interestingly. Participants not only gain a deeper understanding of diabetes, but also become more familiar with the benefits and concepts of Rubee Dia-Tabs products. Thus, it can be concluded that Rubee Immersion's educational media has high effectiveness in improving the overall understanding of participants.

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Hal. 694-702
Vol. 7; No. 2
Mei 2025

5. Evaluation

Evaluation in the study is divided into 2, namely formative evaluation and summative evaluation. Formative evaluation is carried out during the development of VR media, i.e. revision is carried out after receiving assessments from experts as shown in Figure 8. Furthermore, summative evaluation is carried out when implementing VR media directly to users, such as conducting an effectiveness test that shows the value of the effectiveness of VR media as evidenced by questionnaire data given to users and the results are very practical, as evidenced by an increase in value from post-test to pre-test.

6. Discussion

Rubee Immersion is an educational media innovation based on Virtual Reality (VR) technology developed to increase public literacy related to diabetes mellitus. VR technology was chosen for its ability to create a more immersive, realistic, and interactive learning experience. This innovation answers the challenges of conventional education methods that have dominated so far, such as brochures and one-way counseling that tend to be less attractive, especially for the younger generation. With Rubee Immersion, users are invited to understand directly and visually the biological mechanisms of diabetes, risk factors, early symptoms, to early detection and management measures through a healthy lifestyle. This interactive learning process is believed to strengthen understanding and increase public awareness of the importance of early prevention of diabetes.

Not only as an educational tool, Rubee Immersion also plays a strategic role as a tool for the dissemination and promotion of Rubee Dia-Tabs herbal products. This product is a natural supplement formulated from Brucea javanica and forest honey. The combination of the two ingredients has been scientifically proven to have the potential to be a complementary therapy to help manage blood sugar levels naturally. Brucea javanica is known to contain active compounds such as quassinoids and flavonoids that work by inhibiting the enzyme α-glucosidase, thereby reducing glucose absorption in the body. Meanwhile, forest honey functions as a natural antioxidant that can support the work of the pancreas and improve insulin sensitivity. Research by [1] showed that the combination of Brucea javanica and forest honey could significantly lower blood glucose levels in animal trials.

Learning media through VR media has also proven to be effective in learning activities because VR provides a more interactive and immersive learning experience, helps students understand abstract concepts through 3D visualization, and increases motivation and learning outcomes compared to conventional methods [5].

The integration of interactive educational media with the introduction of herbal products such as Rubee Dia-Tabs is a synergistic and strategic approach in efforts to promote and prevent diabetes. This approach not only conveys information, but also encourages behavior change and introduces real solutions based on potential and safe local wisdom.

The needs analysis carried out in this study shows that the community, especially the younger generation, needs more interesting and interactive educational media. Conventional educational methods are currently considered incapable of communicating health messages effectively, due to the lack of emotional and cognitive engagement of those messages

CONCLUSION AND SUGGESTION

Based on a series of research and development processes that have been carried out, it can be concluded that the Rubee Immersion educational media based on Virtual Reality (VR) is a very potential and effective innovation in supporting efforts to increase public knowledge and understanding of diabetes mellitus. This media is designed by integrating immersive technology that allows users to interact actively in a virtual environment, so that they not only obtain information passively, but also feel an experience that is close to the real situation. This provides significant added value compared to conventional educational methods that tend to be one-way and less attractive to the audience, especially the younger generation who are familiar with digital technology. The results of the feasibility test involving experts in the fields of media, materials, and language showed that Rubee Immersion obtained a very good score and was included in the "very feasible" category for use as a learning medium. Validation of the content presented in this media has met the standards of scientific accuracy, readability, and relevance to the educational needs of the community about diabetes mellitus. In addition, the effectiveness test conducted on target users, namely teenagers and the general public, showed a significant increase in their understanding of the basic concepts of diabetes, risk factors, prevention methods, and introduction to alternatives for managing blood sugar levels through the herbal product Rubee Dia-Tabs.

Rubee Immersion media not only functions as a means of health education, but also as an informative and ethical product promotion media. The integration between the delivery of scientific information about diabetes with the introduction of the Rubee Dia-Tabs product, a herbal supplement containing Brucea javanica and forest honey, creates a comprehensive educational approach. Thus, users not only gain knowledge about the disease and its prevention, but also get to know herbal product options that can contribute to managing their health naturally.

This innovation strategically supports the goal of disseminating health information more widely and evenly, in line with the national program in preventing and controlling non-communicable diseases such as diabetes. Given the high prevalence of diabetes in Indonesia, especially among the productive age group, VR-based educational media such as Rubee Immersion can be an interesting and adaptive alternative solution to current developments. The potential for further

development is also wide open, both in terms of expanding educational content, adjusting to age segmentation, and integrating other technologies such as augmented reality (AR) to enrich the user's learning experience. Thus, it can be concluded that Rubee Immersion is an innovative educational media that is not only feasible and effective, but also sustainable in order to improve public health literacy. The use of this media is expected to strengthen promotive and preventive efforts in preventing diabetes mellitus, while encouraging people to care more about their health by utilizing herbal products that have been proven to have benefits. The development and utilization of educational technology like this is a relevant strategic step in facing the challenges of globalization and digitalization in the world of health.

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