International Journal Of Artificial Intelegence Research
Vol 6, No 1, June 2022
ISSN: 2579-7298

Augmented Reality- Based Dojo Safety Handbook

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ARTICLE INFO

Article history:
Received24 March2022
Revised 6 May2022
Accepted13 June2022

Keywords:
Safety Dojo,
Learning media,
textbooks,
Installation Engineering,
Electric Power,

ABSTRACT

Study this aim to (1) Produce learning media in the form of textbooks entitled Augmented Reality-Based Safety Dojo Guidebook for Vocational subjects, (2) Knowing appropriateness from learning media in the form of textbooks , (3) knowing rating and feedback student related textbooks in the form of Book Guidelines Safety Dojo AR based .Type Study this including in Research and Development (RnD) research with use ADDIE approach which includes Analysis, Design, Development, Implementation, Evaluation stages .Study this conducted at SMK Hamong Putra Pakem . Then validation from product book this done by expert respective materials and media experts each totaling 2 people. Material expert involving 1 person from a vocational school teacher and 1 lecturer major electro, while from media expert involves 2 lecturers from major UNY electronics for testing product done by students Class X and XI Department of Electrical Power Installation Engineering at SMK Hamong Putra Pakem as many as 40 students . This research instrument is in the form of a printed questionnaire which is then distributed to respondents, and through direct interviews. Whereas for the data obtained in the form of qualitative and quantitative data which are then analyzed with analysis validity reliability .Study this produce : (1) Learning Media in the form of a textbook with the title "AR-Based Dojo Safety Manual", (2) eligibility from learning media this rated from aspect Theory got results with value 87.50% with category very deserve and media aspect get results with value 78.57% with category worth , (3) Assessment from students regarding the feasibility of learning media in the form of textbooks obtained a score of 85.17% so that it is included in the very feasible category..

I. Introduction

Man is a creature that has many excess from aspect physique nor mind, human will go through something profession in accordance with needs where they be, with method adapting to the current era of development it. According to the Behavioristic group, humans are reactive creatures and their behavior is controlled by external factors, namely their environment. Environment is the dominant factor that binds connection individual Therefore, humans also have weaknesses, ranging from lack of discipline, carelessness and committing violations. But in essence, humans are an important resource and asset for sustainable development. In the discussion that has be delivered that man is creatures who have carelessness or error, so that potency happening accident work on development technology also allows happen. Potency Accident Work will occur at each anytime and anywhere someone that work. Therefore, the potential for this work accident will be faced by humans if they immediately realize and respond in the form of self-protection. Protection self moment this appeared the named with safety and health work (K3), in its application K3 is often implemented in the industrial world, good industry home (homemade), industry manufacturing, industry crafts, industry technology and many other. Effort for avoid self from accident work need also applied to vocational students, where vocational students are candidate power new for work in this world industry. Understanding related Safety and Health Work (K3) is very important for SMK students use equip student related K3 understanding anticipation of work accidents and a good work culture in the industrial world. in line with government programs that is revitalization Vocational education where this program was launched by the Minister of Education and culture, sir nadiem Makarim for make vocational / vocational education in line with existing programs in the industrial world. Contribution from Vocational Education very important in print graduates to be absorbed in this world industry,

therefore the most important thing about having a good work culture for vocational students is to understand them to have work characteristics and an understanding of K3. The application of the Safety Dojo is something that needs to be understood by students and workers as a mandatory requirement before carrying out work activities, because inside it there is understanding K3 and prevention from accident work, thing this naturally could Upgrade quality SMK graduates for work in this world industry nor workers who can apply K3 with good.

We developed this media in the form of book guidelines AR based that can produce 3D effect at the moment taking pictures in books. We have developed this so that students more interested for understand good K3. Application of K3 at SMK Hamong Putra Pakem after researcher do observation short at the moment do PLP conclude that still need enhancement understanding related Safety work and introduction potency accident work, because at the SMK still not yet apply K3 with maximum Case this is what drives researcher for do planning book guidelines Safety Dojo AR based . References and books related to K3 science at Hamong Putra Pakem Vocational School are also still minimal, so that from here researcher try compose Book related K3 science as a learning medium for support understanding students and as book reference related K3 science.

II. Methods

A. Type Study

The type of research applied for the development of the AR-based Safety Dojo manual is using the Research and Development (RnD) type of research and using the ADDIE model approach. The research and development that researchers do will of course create a new product or refinement of an existing product so that it can then be useful for the community, especially the world of education. In essence research that will done by researcher is develop product in the form of book Safety Dojo training guide AR based as source learning for training Safety DNA Health Work (K3) for SMK students who will enter the world of work . Then do validity to product book guide Safety Dojo.

B. Time and Place Study

Time spent for study it's on the moon October specifically October 5 to 15 , 2021. The location used for this research is the Vocational High School (SMK) in the Pakem sub-district, namely Hamong Putro Pakem Vocational School.

C. Subject Research n

Subject Study from Development Book Guidelines Safety Dojo This AR based consist of 2 Material Experts who are Lecturer of Electrical Engineering Department of Education and teacher of Hamong Putra Pakem Vocational School, 2 Media Experts who are Lecturer of Education Department of Electrical Engineering and Students School Intermediate Vocational in the area districts grip namely Hamong Vocational School Putro Grip as many as 40 students. In the selection of test subjects, it was aimed at students of class X (10) and XI (11) SMK.

D. Procedure Study

Procedure development the book "AR -based dojo safety guidelines" follows steps of the developed ADDIE model as picture following this :

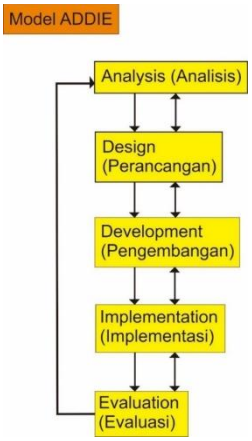

Figure 1 ADDIE method

1) Analysis

Stage analysis , researcher formulate problems in the field for determine needs by right . Analysis done through Step observation short at the moment implementation Practice Work Field at Hamong Putra Pakem Vocational School , analysis done with do interview to teachers majoring in TITL at SMK and observe condition location research . Stage analysis this then described in the explanation under this :

a. Analysis Beginning : Do preparation before make book with look for problems that exist in K3 learning received by students During this is at SMK Hamong Putra grip . Data collection with do observation to school then ask problem about K3 learning with majors teachers in accordance his field . Researcher do analysis Step beginning this with link learning majors that can entered with relevant K3 material .
b. Analysis Participant Educate : Researcher do observation to participant students at Hamong Vocational School son grip with observe how participant educate pay attention learning / K3 material delivered by the teacher.
c. analysis Requirements : Researcher do interview to power teacher who at this is a vocational teacher , where researcher ask regarding application of K3 in schools is already walk with good or still there is obstacle . Next research ask to what teaching staff with the existence of teaching media in the form of book could support learning and improving understanding student related the importance of K3 when do practice at school .
d. Analysis Ingredient Teach: Researcher next compose relevant and appropriate K3 concepts/ materials with K3 needs at school , with apply element element effectiveness material and can interactive so that student get lessons that don't boring . Theory in book arranged with adding mind maps and infographics so that expand view or framework think student for more absorb understanding related implementation of K3.

2) Design

Stage planning is Step after researcher do analysis Theory nor needs tree in arrangement teaching materials in the form of book guidelines . At stage this researcher do composing of them that is do design book guidelines Safety Dojo AR based . With do design cover , table of contents, K3 materials , Safety Dojo , compiling 3d view on AR applications , and layout whole contents book. Next researcher do Design application , At stage this researcher do design application The later Augmented Reality with application this could showing 3d view of the image scanned by students. Image to be ARkan chosen in accordance needs book.

3) Development

At the product development stage, the researcher will carry out the stage of making and developing an AR-based Safety Dojo manual into a more perfect form so that it can be used as a teaching medium that is truly feasible. The result of this development stage is a more effective book end product. At stage this researcher compiling a validation instrument to expert material (2 people) and media experts (2 people). Preparation of this instrument done To use knowing evaluation from expert materials and media experts later could done revision before later implemented to students .

4) Implementation

At stage this do application from teaching media in the form of book to respondent that is SMK students . At this stage the media design in the form of a book will be implemented or tested to a more real situation, namely the students of SMK Hamong Putra class X and XI. Book will rated from aspect design cover , content , material , knowledge of K3 that can be support learning , and AR technology that can showing 2D images into 3D. then after student evaluate will given sheet evaluation or questionnaire evaluation appropriateness book .

5) Evaluation

In this final stage, namely the evaluation stage, researchers collect assessment data from respondents who determine the feasibility of the book to be published. Then after rated eligibility at the stage this is also a researcher revise results input from expert Theory nor media expert and know response from student related evaluation from book In essence, the development stage will result in an assessment from the validators and respondents which will then be revised to get the final result of the book that is worthy and ready to be used as teaching materials or K3 science for readers.

E. Data, Instruments , and Data Collection Techniques

This study uses a questionnaire questionnaire method that was tested on respondents directly (offline) to collect data and interview methods to respondents of SMK teachers. Data collection is carried out for get information show work, eligibility aspect materials and media from experts, and know response student to product developed . The assessment of the instrument uses an ordinal scale with four answer choices, namely 4 (Very Good), 3 (Good), 2 (Less Good), 1 (Not Good). Study this use quantitative data analysis as well as descriptive data analysis qualitative in accordance with development from procedure performed . The data analysis technique was carried out after getting data from material and media experts, as well as students.

F. Data analysis techniques

Study this use quantitative data analysis as well as descriptive data analysis qualitative in accordance with development from procedure performed . In the early stages of development, this was done by collecting materials and references related to the Safety Dojo and K3. Stage next is making product book guide Safety Dojo and preparation of assessment instruments book . Stage final is rating . Study this use quantitative data analysis as well as descriptive data analysis qualitative with one variable is development book guidelines Safety Dojo AR based that has been lowered in lattice lattice assessment . Quantitative data could obtained from results scatter questionnaire validation to expert Theory media experts and distributed questionnaires to respondent student after do a test product . The data obtained is based on the distributed questionnaire is data in the form of an ordinal scale. The following is the classification of the ordinal scale used by researchers.

Table 1 Categories Percentage Appropriateness

Formula	Classification
85% < X ≤100%	Very Worthy
67.5 % < X ≤85%	Worthy
57.5% < X ≤67.5%	Enough
52.5% < X ≤57.5%	less worthy
25% < X ≤52.5%	Not feasible

III. Result and Discussion

A. Process Description

Research conducted by researchers related to AR-based Safety Dojo manuals at Hamong Putro Pakem Vocational School, Produced data in the form of an assessment of the feasibility of AR-based Safety Dojo textbooks from respondents in class X and XI majoring in TITL SMK Hamong Putro

Pakem totaling 40 students. The data obtained by the researcher through a questionnaire/questionnaire to the students of class X and XI then also to the teachers of the TITL department as many as 2 teachers of the majors.. Besides that this data is also obtained through activity interview to the TITL teacher at Hamong Putra Pakem Vocational School . Basically, the researchers made an AR-Based Safety Dojo Manual with the background that after making observations at the Hamong Putra Pakem Vocational School, the knowledge or references related to Occupational Safety and Health (K3) at the Hamong Putra Vocational School were still relatively few, so the school, especially the majors teachers, was still very require K3 references for practical learning that will be applied to students. Case this can occur because in high school itself K3 learning indeed not yet could isolated to Theory vocational other , because K3 learning is included in Theory lesson vocational certain . So that delivery K3 material to student counted still minimal.by therefore researcher try give impact benefit to school in the form of book/ reference science related to K3 for could support learning practice specifically for students who want endure practice industry . So that hope with existence Book guidelines Safety Dojo this AR based student more understand will safety work and protect herself moment do practice vocational nor learning in the room practice .

Development model from study this using the ADDIE model which includes a number of Step of them that is Analysis , Design, Development, Implementation, Evaluation. From taking data through this model, it produces quantitative data which will then be analyzed using descriptive analysis. The data we get will processed until Step evaluation.next is description and description from the data obtained by the researcher . (1) Stage of Analysis (Analysis) . Stage analysis is Step beginning study where researcher explain result in accordance explanation following: (A) Analysis early. Stage this researcher try get initial data that is got information to school related knowledge and application of K3 at HAMong Vocational School son especially in the TITL department, which is the application of K3 should in accordance with standard industry nor company in general. Then the researchers directly examined the existing problems related to K3 learning that had been carried out in previous schools. Analysis beginning this involving vocational teachers that is majoring in TITL, with existence interview for dig information beginning related application and implementation of K3 in schools .

From the results of the initial analysis by conducting interviews with vocational teachers, and short observations observing, asking, and studying the conditions at school, it resulted in a conclusion that the application of Occupational Safety and Health (K3) in Hamong Putro Pakem Vocational School is still relatively low. Could seen from understanding student related the importance of K3, not yet maximum K3 material delivered, because only limited remind only, and the lack of K3 symbols at school nor laboratory practice. Analysis beginning this Becomes a the problem that makes background behind held research and development book guidelines Safety Dojo based on this AR by researchers at SMK Hamong Putra Pakem. (B) Analysis Participant educate . Analysis participant educate this done by researcher with do interview to head the TITL department of Hamong Putra Vocational School , namely father arief sutono and observation by direct to student During PPL period at Hamong Putra Vocational School in the month of July – September 2020. Information obtained from brief interviews and observations during the PPL period resulted in the conclusion that students' knowledge related to understanding and applying K3 was still relatively low. because students when doing practicum have not paid attention to the safety of the work that is in themselves and the surrounding environment, besides the opinion of Mr. Arief Sutono that K3 in schools cannot be developed optimally due to limited advice and infrastructure. (C) Analysis need . Analysis needs with do interview to the teacher especially TITL teachers, regarding the need for teaching media that has been used for support K3 learning in schools. After doing interview related teaching materials for K3 learning turns out of course reference Safety and Health Work at school still correct really minimal, only limited reference from the internet. There are also no books that support K3 learning, so from this problem the researchers finally carried out research related to the development of AR-based Dojo Safety Guidelines textbooks to help support learning as a K3 reference that can be used when doing practice in the laboratory or delivering K3 materials. (D) Analysis Materials / Teaching Materials . Analysis next that is existence analysis Theory or related teaching materials Safety and Health The work that will developed by researcher To use produce book for teaching materials and reference for SMK Hamong Putra Pakem . On analysis this Researchers also pay attention previous teaching materials To use Becomes reference for composing book guidelines Safety Dojo AR based . Analysis teaching materials needed for Becomes guidelines arrangement book , which will developed . (2) Stage design is Step second of the ADDIE model. The design stage begins with the design of teaching materials, namely the AR-Based Dojo Safety Manual that the researcher developed, at this design

stage the researcher determines the elements needed in the preparation of the book such as a table of contents for books, teaching materials, cover and back pages, relevant images, schematics minmap, infographics, Augmented reality images, Augmented reality applications, and the subject matter of Safety Dojo. Researcher design book guidelines Safety Dojo AR based can explained in the explanation following this : (a) Design draft or framework book . Compilation this started with Compile draft or framework the book that will developed . Book this designed with containing Theory Safety Health Work (K3), materials world industry , material Safety Dojo. Safety Dojo is explanation from the place training safety work), material potency accident work , K3I materials , and pictures that will be made AR for interaction more effective. (b) Design of table of contents . Do table of contents design is Step beginning in collection material on the book guidelines Safety Dojo AR based , design this aim for gather appropriate teaching materials with material to be developed in the book . material that has been collected then arranged into the a number of chapter big of them that is Introduction , Safety and Health Work (K3), Guidelines training Safety Dojo, Closing, and glossary. Materials that have been arranged then added some example picture relevant , infographics , and AR images. This thing done for spur imagination participant learn and understand Theory related safety work .

The images presented in this book also aim to provide an overview or example of the application of work safety with simple examples and easily understood by students. (c) Design application Augmented Reality. as application to be showing 2d image becomes appearance 3d image. application this arranged with use Unity app 2019. The AR application serves to increase the imagination of students when viewing images related to work safety in order to better understand the images that can be scanned and then displayed in the form of 3D images. before do planning apps , things to do previously that is do flowchart design for making application . After doing planning flowchart design , then do design/ design AR applications include namely application logo , main menu display , display explanation application , how to work , composer applications, and the AR scan menu. After stage planning next that is Step development . (3) Development Phase (Development). Stage development is Step next from the addie model . Stage this data is obtained from expert material , media expert . Data obtained from expert materials and media experts will distinguished into the two category namely qualitative and quantitative data . Quantitative data obtained from evaluation in shape numbers by expert materials and experts media after deployment questionnaire validation carried out by researchers . This data then will converted into the shape presentation . While the data in the form of qualitative data that is in the form of classification the feasibility of book teaching media guidelines Safety Dojo AR based, In accordance with the percentage of quantitative data along with suggestions or input given by material experts and media experts.

Revision from media expert and expert Theory later will Becomes repair for book for content nor appearance book guidelines Safety Dojo based on ar Becomes more good again before used as a learning medium for students at SMK Hamong Putra Pakem . At stage this too of course revision from expert materials and media experts will correct correct noticed To use as input for repair book more worth a try to students . (4) Implementation (Implementation). Stage implementation is Step fourth of the ADDIE model. Book learning that has been through Step expert rated development stage are assessed materials and media experts with conclusion worthy used then book will applied/ implemented as a K3 teaching medium in schools that have Becomes object study namely SMK Hamong Putra Pakem . After going through Step revision from expert material and media experts who concluded book this worthy tested , then a book entitled " Books " Guidelines Safety Dojo AR based ” will tested for learning media to participant educate the eyes lesson practice vocational, so that could increase understanding nor knowledge safety work for participant educate. Along with distributing books, researchers will also distribute book assessment questionnaires to students in class X and XI majoring in TITL to obtain data on the feasibility assessment of textbooks from students. Object study from implementation book this that is There are 40 students in Class X and XI majoring in TITL at SMK Hamong Putra Pakem . (5) Stage of Evaluation (Evaluation). At stage this is Step final of the ADDIE model. Where researcher will do revision end to textbook , namely book guidelines Safety Dojo AR based which will developed based on rating and feedback from respondent (participant learn) that is obtained from scatter questionnaire assessment . The evaluation stage aims to ensure that the textbooks developed are in accordance with the needs of the school and of course can be used by schools as references and teaching media for students related to K3 so as to improve understanding and application of good and correct work safety in schools when carrying out practical majors. The evaluations obtained include the addition of relevant images, attractiveness of presentation, and the

cover of the book. After this evaluation, the researcher will improve to the maximum so that it can increase the development of the AR-based Safety Dojo manual in order to provide benefits for K3 learning at Hamong Putra Pakem Vocational School.

B. Description Product

Product end from study this in the form of textbook entitled " Books " Guidelines Safety Dojo AR-based ” as a learning medium for SMK students , especially at SMK Hamong Putra Pakem. Besides it is also application Augmented Reality is 51Mb in size. With existence product this in the form of textbooks and learning media application AR is expected could Upgrade understanding and knowledge student related Theory about Safety and Health work , Safety Dojo , Industrial K3, and potential accident work . So that later could the creation of zero accidents and safety work. following is picture appearance from product end research.

Figure 2 Products End in the form of AR Textbooks and Apps

The developed manual contains a cover, consisting of IV material chapters, a bibliography and a glossary. The fourth chapter of the material consists of introduction, occupational safety and health, dojo safety training, and closing. Whereas subab from book this load about Understanding K3, 5S/5R Concept , Safety First, Tools protector self (PPE), tools extinguisher fire light (APAR), lane color floor , K3I, K3I symbols , understand the potential for work accidents, and industrial occupational safety and health. Then for the application developed, namely in the form of an application with an APK file extension, which includes the main page, a menu of understanding safety dojos, understanding AR, how to use applications, AR scans, and developer profiles. This application has a size of 51 Mb. Applications compiled by developers can be accessed via the link that the developer has included in the textbook.

C. Statistical Data Analysis

Study this done with existence validation before book tested to participant educate , validate this done to expert materials and media experts. Validation this done To use knowing appropriateness book , revision books and messages as well as suggestions submitted by experts material , media expert as repair book for more worthy for tested to students . validation this in the form of the questionnaire that will filled by validaror , and then will known quantitative data in the form of Mark appropriateness books , and qualitative data in the form of suggestions or message from the experts. Validation expert Theory carried out by 2 validators , namely 1 lecturer Department of Electrical Engineering Education at UNY , namely Dr. phil Nurhening Yuniarti , S.Pd.,MT. and 1 teacher majoring in TITL SMK Hamong Putra Pakem that is Arief Sutono, S.Pd. Expert validation results This material will be used as a book revision related to several aspects of the assessment including learning materials, the role of learning materials, the function of learning materials, clarity of materials, completeness of materials, accuracy of material sources, and display of 3D AR images as

supporting material. With existence validation Theory so book this will revised so that could serve material that has been got repair Ari expert material , before later tested to hamong high school students son grip

Aspect	Average value	Maximum Value	Average Percentage	Category
Learning materials	15.5	16	96.87%	Very Worthy
The Role of Learning Materials	28	32	87.50%	Very Worthy
Learning Material Function	17	20	85.00%	Very Worthy
Material Clarity	7	8	87.50%	Very Worthy
Material Equipment	3.5	4	87.50%	Very Worthy
Source material accuracy	3.5	4	87.50%	Very Worthy
AR 3D Image Display	13	16	81.25%	worthy
TOTAL	87.5	100	87.50%	Very Worthy

Figure 3 Assessment by experts Theory

Based on the table above, it can be seen the data on the results of the assessment by material experts one and two. The following picture shows a graph of the average results of the assessment by material experts on the product.

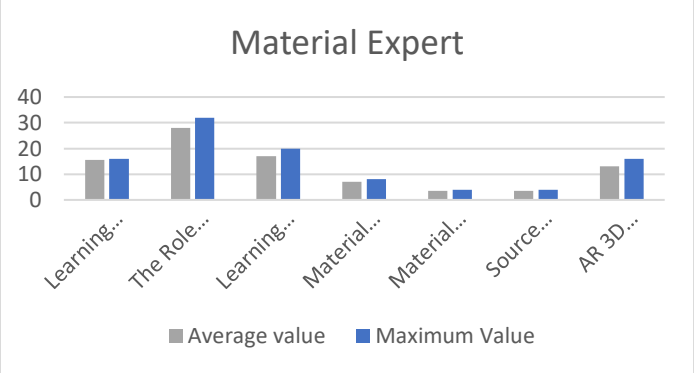

Figure 4 Percentage Diagram Rating by Material Expert

Based on the research instrument that has been filled in by the validator covering all of the above aspects, it can be concluded that the learning material in the form of a textbook with the title "AR Dojo Safety Guidebook" from the aspect of assessment by material experts gets an average value of 87.50%, with a score of 87.50%. the max is 100. After presenting got score end by 87.50% so that including in category Very Worthy .

The validation of media experts was carried out by 2 validators, namely a lecturer in the Department of Electrical Engineering Education, namely Drs. Totok Heru Tri Maryadi, M.Pd. and Sigit Yatmono, ST., M.T. The results of the media expert validation will be used as book revisions related to textbook media, more specifically on the design, display of books, covers, and the AR technology used. With existence media validation then book this will more repaired before later tested to hamong high school students son grip.

Aspect	Average value	Maximum Value	Average Percentage	Category
Serving Function	22	28	78.57%	Worthy
Serving Design Eligibility	8.5	12	70.83%	Worthy
Study Presentation	6.5	8	81.25%	Worthy
Language Compatibility	6	8	75.00%	Worthy
Language Nature	6	8	75.00%	Worthy
Word Selection	7	8	87.50%	Very Worthy
AR 3D Image Display	10	12	83.33%	Worthy
TOTAL	66	84	78.57%	Worthy

Figure 5 Assessment by media experts

Based on the table, it can be seen the data on the results of the assessment by media experts one and two. The following figure shows a graph of the average results of the assessment by media experts on the product.

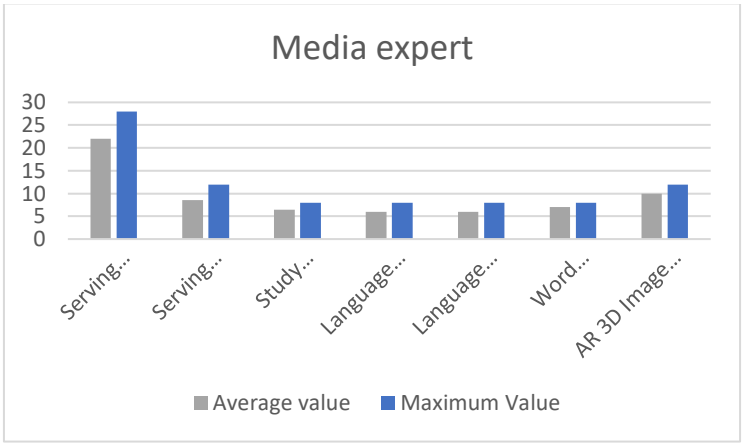

Figure 6 Percentage Diagram Rating by Media Expert

Based on the research instrument that has been filled in by the validator covering all of the above aspects, it can be concluded that the learning media in the form of a textbook with the title "AR Dojo Safety Guidebook" from the aspect of assessment by media experts gets an average value of 66, with a maximum value of 84. is After being presented got score end by 78.57% so that including in category Worth .

Product teaching materials in the form of the book that has been through Step validation by expert materials and media experts later tested to student class X and XI majoring in TITL SMK Hamong Putra Pakem . For respondents who become object study as this test totaling 40 students. students who become respondent the assessing learning media into 6 components of them that is Theory learning , role teaching materials , functions presentation , function ingredient learning , language suitability , presentation and design study , and appearance 3D AR images.

Aspect	Average value	Maximum Value	Average Percentage	Category
Learning Materials	23.87	28	85.27%	Very Worthy
The Role of Teaching Materials	10.1	12	84.17%	Worthy
Serving Function	16.92	20	84.63%	Worthy
Learning Material Function	13.47	16	84.22%	Worthy
Presentation and study design	13.35	16	83.44%	Worthy
Language Compatibility	10.32	12	86.04%	Very Worthy
AR 3D Image Display	14.17	16	88.59%	Very Worthy
TOTAL	102.2	120	85.17%	Very Worthy

Figure 7 student assessment

Based on the table above, can see result data assessment by students . The following picture shows average yield graph assessment by students on the product .

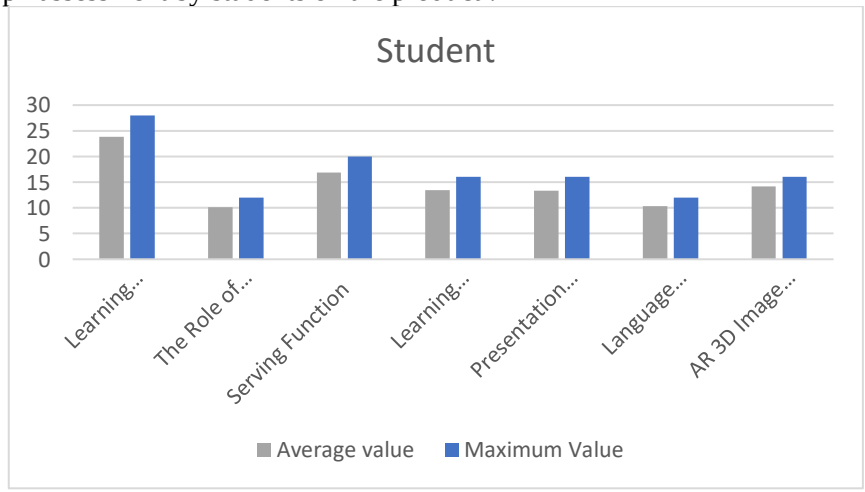

Figure 8 Percentage Diagram Rating by Media Expert

Based on all aspects that are assessed for feasibility on the assessment instrument to the respondents (students). It can be concluded that the AR-Based Dojo Safety Manual got an average score of 102.2 from a maximum score of 120, with an average percentage of 85.17% after being converted into percentage form. So that Book Guidelines Safety Dojo AR based including in category Very Worth.

Discussion

After going through Step teaching media design with title " Book " Guidelines Safety Dojo AR based ” done so Step next is development book with compose Questionnaire that will be validated to expert materials and media experts . As evaluation appropriateness book before later tested try it to students of SMK Hamong Putra Pakem Class X and XI. Development this done to 2 members Theory i.e. 1 from vocational teachers and 1 i.e. Sir Arief and 1 of lecturer UNY's electronics are mother Nurhening . Then for own media expert that is 2 people from JPTE UNY lecturer , namely father full-blooded hero and father bite . The results of the validation of material experts and media experts are quantitative assessments indicated by percentages and qualitative ones indicated by suggestions and input from experts. Assessment of learning materials in the form of textbooks with the title "AR-Based Dojo Safety Guidebook" received an assessment of 83.43% which had been presented. with results this so book including in category worth . Meanwhile, qualitative data is in the form of input and suggestions aimed at improving this textbook. Which we have fixed according to suggestions from validators.

After going through Step development with existence validation to expert materials and media experts , stage next that is implementation textbooks that will tested to student that is student class X and XI majoring in TITL SMK Hamong Putra Pakem . Try this out done offline at SMK Hamong Putra Pakem on 7 to 15 October 2021. Implementation Step this with spread questionnaire evaluation appropriateness book to student class X and XI majoring in TITL as many as 40 students. This textbook assessment is carried out after explanation, presentation of the contents of the book, and student observations of the material, book design, 3D AR images and presentations from researchers. Based on the trial results of the AR-based Safety Dojo manual, it received an assessment of 85.17% with a very decent category. The following is an explanation of several aspects of student assessment that show the quality of the AR-Based Dojo Safety Manual that was developed: (a) Assessment Appropriateness Book guidelines Safety Dojo AR based from aspect Theory learning get score the end that has been presented by 85.27% so that including in category very worth . (b) Rating Appropriateness Book guidelines Safety Dojo AR based from aspect Role teaching materials get score the end that has been presented by 84.17% so that including in category worth . (c) Assessment Appropriateness Book guidelines Safety Dojo AR based from aspect Function Presentation get score the end that has been presented by 84.63% so that including in category worth . (d) Assessment Appropriateness Book guidelines Safety Dojo AR based from aspect Function Ingredient learning get score the end that has been presented by 84.22% so that including in category worth . (e) Rating Appropriateness Book guidelines Safety Dojo AR based from aspect Presentation and Study Design obtained score the end that has been presented by 83.44% so that including in category worth . (f) Rating Appropriateness Book guidelines Safety Dojo AR based from aspect Language compatibility gain score the end that has been presented by 86.04% so that including in category very worthy (g) Rating Appropriateness Book guidelines Safety Dojo AR based from aspect 3D AR Image Display acquire score the end that has been presented of 88.59% so that including in category very worth . Based on these several aspects, it can be concluded that the textbook with the title “Book Guidelines Safety Dojo AR- based ” which has been tested to student class X and XI majoring in TITL SMK Hamong Putra Pakem get total rating of 85.17% including in category Very Worth . Instrument We describe this data collection into the chart variable relationship that will Becomes guidelines in making research instruments on books this. Following is instrument variable relationship

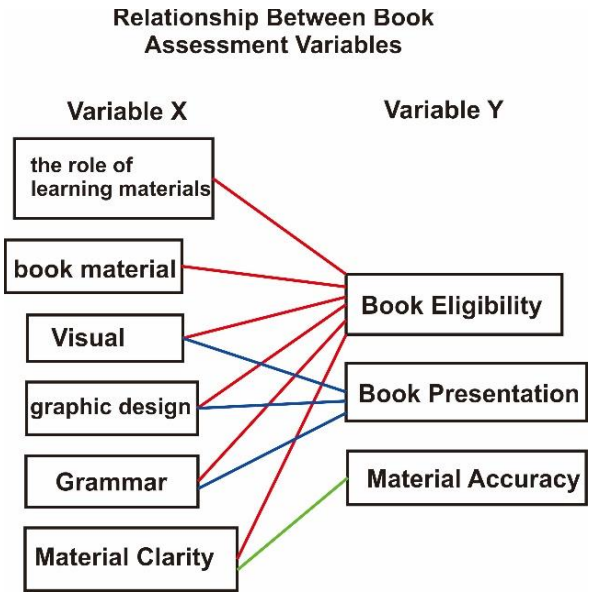

Figure 9 Relationship Between Book Assessment Variables

IV. Conclusion

A. Conclusion

The final product in the form of learning media is a textbook with the title "AR-Based Dojo Safety Guidebook" after going through the research and discussion stages, it can be concluded that: (1) Learning media in the form of a textbook with the title "AR-Based Dojo Safety Manual" which was designed and developed was declared feasible to be used as a reference and learning media for Occupational Safety and Health (K3) for students of Hamong Putra Pakem Vocational School in the TITL department.. Statement this based on from results whole analysis evaluation validation expert materials, media experts , and trials to student class X and XI majoring in TITL SMK Hamong Putra Pakem. (2) Textbooks with title " Book Guidelines Safety Dojo AR based ” compiled from some of the chapters that is Introduction , Safety and Health Work (K3), Safety Dojo / Safety Center Training Guidelines , Closing . Book the containing about base Safety and Health work , K3 in industry , Tools Protector Self , the symbol of OHS in the industry , Tool extinguisher fire light (apar), potential accident work and how prevention from existence potency accident work , as well example picture relevant related Safety work that can shown use technology Augmented Reality so that seen appearance 3D AR images . (3) Assessment results appropriateness book on expert Theory got score that has been presented of 87.50% with category Very Worth , and on media experts get score by 78.57% with category Worth . (4) Trials related to the assessment of the feasibility of books for students in class X and XI majoring in TITL SMK Hamong Putra Pakem get responses obtained from the distribution of questionnaires. Evaluation this got percentage by 85.17% so that including into the category Very Worthy for could used as a medium of learning and reference related Theory Safety and Health Work (K3) at SMK Hamong Putra Pakem .

B. Suggestion

Need development forward related more safety dojo books and guidelines complete and interactive so that student correct correct could understand K3 and can apply it when learning practice

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