New Smart Virtual Content for Hanzi Characters in Mandarin Laboratories

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ABSTRACT
Industrial technology is developing rapidly accompanied by learning technology, especially in some virtual applications. Virtual Laboratory is one of the virtual learning applications that is currently being developed in the 4.0 industrial revolution. The use of virtual laboratories in Revolution 4.0 made major contributions in several educational institutions especially inadequate facilities and infrastructure. Recent years of virtual laboratory research have been carried out. Media, models, and materials in the laboratory are some of the things that are mostly developed in virtual laboratories, but the learning developed is limited to one direction. One weakness is the user/user cannot develop content in a virtual laboratory. This research develops intelligent virtual content for virtual laboratories. This intelligent virtual content is developed based on content material that matches the capabilities and expectations of users in the virtual laboratory. Virtual laboratory users are lecturers, students, and third parties. Test smart virtual content in virtual laboratories at Chinese Language University Malang State University students with Hanzi Character material. The results of trials using intelligent virtual content in this virtual laboratory obtain an accuracy value of 90.4%.

Keywords: *Virtual Content, Virtual Laboratory*

1. INTRODUCTION

The industrial revolution 4.0 caused the use of information technology in human life to increase. This affects the interaction model between humans. The impact of the industrial revolution 4.0 is not only developing in manufacturing, information technology, management, business, but also in education. In the field of education, it can be proven by the large number of Indonesian students who are interested in improving their academic education. This is a challenge for universities in Indonesia to prepare quality learning and provide technological developments to be able to compete globally. Therefore, the role of Malang State University in the Mandarin Language Study Program is expected to increase competitiveness in competition in Indonesia [1-3].

In the field of education, particularly the 4.0 revolution is a special challenge to improve the quality of learning by utilizing technology to achieve effective and efficient learning goals, able to improve the ability of Indonesian students to improve their abilities and competencies, specifically increasing the ability to speak Mandarin. This requires learning innovation in learning Mandarin on basic Hanzi topics. Hanzi is a character in Mandarin, several Hanzi can form more than 6000 characters. This is a major problem for Mandarin learners. Memorizing large numbers of Hanzi certainly makes students often forget in understanding the meaning and how to read it. Basic Hanzi is the basic component of forming Hanzi, by understanding basic Hanzi, students can understand it, so it can be implemented in the use of language. Therefore innovation on Hanzi's basic topics is deemed necessary to develop [4-5].

Mandarin language learning needs to be facilitated with information technology especially Hanzi character material, for this reason a Mandarin language laboratory is needed to achieve Mandarin language competence. The development of language laboratories in virtual form has been widely developed but has little content restrictions without development, content development is only on the part of the creator, content creation resources are still very closed, there is no verification module and content on each module in several virtual laboratories.Content in virtual laboratories is needed for

developing and dealing with Mandarin language development [6-8].

Content development in virtual laboratories has been done a lot but there is no interaction with users where users can develop content. Users of virtual laboratories are students, teachers, and other parties. Students are expected to develop the desired content according to their abilities, desires, and language styles. For this reason, user-generated content must conform to the correct model and method. For this reason, experts are needed who can accurately create content created in virtual form in virtual laboratories. The use of the latest interactive technology in content creation is urgently needed in the era of industrial learning 4.0 to make it easy and interesting to learn Mandarin [9-12].

This research develops smart virtual content based on feedback from all users in the virtual laboratory. Intelligent virtual content created by all users, namely lecturers, students, and native Mandarin. This content creation is smart because it pays attention to models, media, and material about the Character of Hanzi and is verified by every expert in the field of models, media, and material. This research was tested on mandarin language students at Universitas Negeri Malang. This smart virtual content is integrated with SIPEJAR web learning at Universitas Negeri Malang so that it is tested on all users.

2. METHOD

This research uses experimental methods with a qualitative approach. Making the media in this study using the classroom action method. The stages of the research started from the study of saliva, assessment to produce a prototype which was tested in small groups and to users [13-22]. The experimental method stages in this study are as follows: (1) review of literature studies; (2) making prototypes and content; (3) initial prototype development; (4) small group testing (5) prototype improvement; (6) testing on small groups and users; (7) functional improvement of the prototype; (8) Perform field testing; (9) final product improvement; and (10) Product dissemination. research steps as shown in Figure 1 [13-15].

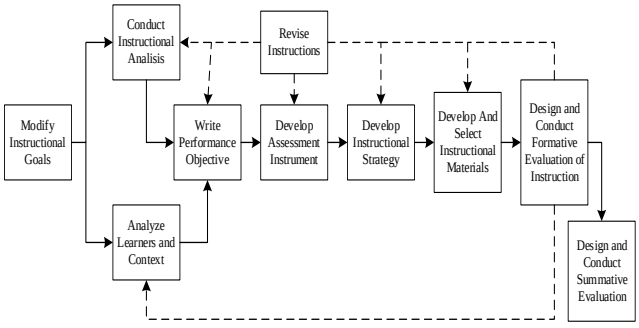

Figure 1 Research method

This study uses an instrument in the form of a questionnaire in the form of a questionnaire. This questionnaire is used to validate the virtual contents contained in the system. This questionnaire is distributed to material, media and virtual laboratory learning models to obtain content validation. Questionnaires are also used to see feedback from users on the product being developed, starting from the prototype to the product being disseminated. The questionnaire format in this study uses a questionnaire model or a closed questionnaire. This closed questionnaire provides alternative answers so that users and content validation only need to choose the existing answers. The answers to the questionnaire have a calculated score on each given question. Each answer to the question has a score consisting of 4 choice categories.

Analysis of the data in this study using a percentage model. This percentage model is based on the calculation of the feasibility of the aspects of the content to be assessed, be it media, models or materials and user responses. The percentage calculation is based on the percentage of eligibility for which the indicator is assessed. The equation in determining the percentage where the data equation per item is as shown in Equation 1 [13-15].

$$P = \frac{\sum x}{\sum x_i} x\ 100\ \% \qquad (1)$$

In equation 1, the value of P is the value where P is the score where x is the amount of feedback in a question while the value of xi is the ideal total value. While the percentage results to determine whether the criteria are feasible or not feasible use equation 1 as shown in Table 1.

Table 1. Eligibility Level Criteria

Percentage (%)	Qualification	Information
80-100	Match	Valid
60-79	Enough	Valid
50-59	Less Match	Rev
0-49	Not Match	Rebuild

The working principle of this system is shown in Figure 2. The contents of this virtual laboratory use basic Hanzi learning. This virtual content also provides facilities in the form of teacher and user interaction. The teacher is the provider of the learning material content, while the user verifies the content in the laboratory. The teacher can interact and evaluate online and offline learning.

The working principle of virtual content is as follows:

1) The user interacts with a virtual laboratory in which the material contains Hanzi.
2) Hanzi content is stored in a database. Some Hanzi material can be customized.

3) Hanzi content that can be customized is included in the virtual content module.
4) Users, students, teachers, or other parties can customize content by utilizing AR technology.
5) Customize results are verified by media experts, models, and Hanzi material. If valid content is created using virtual content with AR technology, then the content can be used in a virtual laboratory and tested on users and stored
6) Users use content that is valid and provides feedback on the results of Hanzi material that is made by users, students, teachers, or other parties.

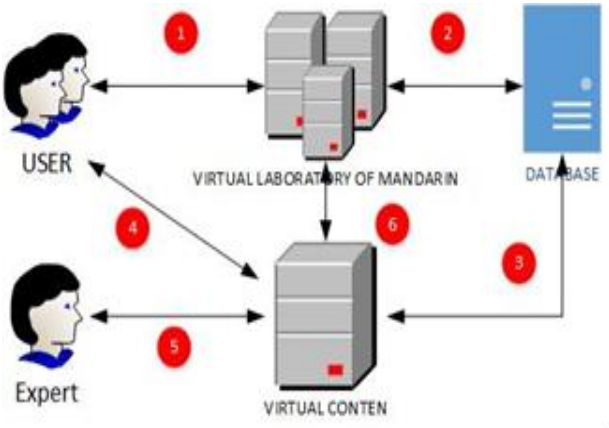

Figure 2 The Working Principle of this system.

3. RESULT AND DISCUSSION

Virtual content is designed in the form of a product as shown in Figure 3. Virtual content consists of 2 Hanzi modules where users and teachers can collaborate on content improvement in the virtual laboratory. Before users customize modules and join modules, users conduct pre-tests to verify the understanding of each module in the virtual laboratory. The user accesses the module then customizes the module with virtual content with AR technology. The results of the customized modules are evaluated by media, model, and content experts. The results of this evaluation are tested on users who use the Post Test module in small groups of users.

Figure 3 Virtual Content in Virtual Laboratorium

Modules 1 and 2 contain the characters Hanzi [人、口、木、田、月、日、山、火、水、雨]. Module 1 explains material about forming new vocabulary from one Hanzi character. One Hanzi character will form thousands of new vocabulary words. Module 2 will contain several sub-modules, each of which contains one Hanzi character and its new vocabulary. Each vocabulary sub-module is equivalent to HSK 3 [23-24].

Virtual content in the Virtual Laboratory has a questionnaire feature to carry out content validation testing based on the skills of each content, namely media experts which are given to lecturers who teach Chinese language courses, material experts which are given to lecturers who teach Chinese language courses, model experts which are given to lecturers who have the ability in educational technology. Another questionnaire feature is validation testing on a small group of registered virtual content. This small group was drawn from Mandarin language students. While the last questionnaire feature is a questionnaire for final product testing in the form of testing in real conditions where students as a whole are students of the Chinese language study program.

3.1. Experimental Results from Learning Media Experts

Table 2. Experimental Data From Media Expert

No	Evaluation	Aspect	Amount Percentage
1	Effectiveness of Learning Media	9 aspects of assessment	98.5%
2	The Interest of Learning Media	6 aspects of assessment	100%
3	The Efficiency of Learning Media	5 aspects of assessment	96.9%
Amount		20 aspects of assessment	98.5%

Data validation from media experts was obtained from Virtual Laboratory media which were recorded as lecturers or material providers through a web-mobile questionnaire on the basic material of Hanzi instructors from 2 instructors. The results of data validation are shown in Table 2.

The data analysis in Table 1 is as follows: The average result of all aspects of the assessment obtained from media experts is 98.5%. The conclusion from table 1 data is that it is valid and there is no need to revise the virtual content.

3.2. Experiments Result from Learning Materials Expert

Data analysis in Table 3 which is the reference in Table 1, namely the criteria for the feasibility level

Table 3. Experimental Data From Learning Materials Expert

No	Evaluation	Aspect	Amount Percentage
1	Media Learning Material	10 aspects of assessment	85.75%
2	Effectiveness of Learning Media	2 aspects of assessment	90.7%
3	The Efficiency of Learning Media	8 aspects of assessment	96.3%
Amount		20 aspects of assessment	90.1%

It is found that the average percentage of all aspects of the evaluation of the three material experts is 90.91%. The conclusion from table 3 is that virtual content is valid and does not need to be revised.

3.3. Experiments on Experimental Learning Model Experts

Testing of the design and learning model of virtual content was carried out on 3 expert lecturers in the field of educational technology who understand virtual laboratories and content development in virtual applications. The analysis of Table 4 is based on the references in Table 1 as follows, the result of the average percentage obtained is 93.1%. The conclusion is that virtual content is valid and does not need to be revised.

Table 4. Experimental Data from Experimental Learning Model Expert

Aspect of Assessment	Purpose (%)	Content (%)	Technology (%)	Message Design (%)
Effectiveness	100	100	100	95
Interests	75	100	100	90
Efficiency	100	100	83.3	94.3

3.4. Small-Group Trial Results

Testing of virtual content application users is carried out in small groups. This small group is 10 students of Mandarin language education at the University of Malang. These students were taken randomly, starting from semester 1 students to semester 5 students. These students had received material on listening, writing and reading Chinese. Data on the results of small group validations are shown in Table 5

Table 5. Data From The Result of Field Trials

No	Evaluation	Aspect	Amount Percentage
1	LMS	13 aspects of assessment	84.3%
2	Content of LMS	5 aspects of assessment	78%
Amount		18 aspects of assessment	81.2%

The analysis of the virtual validation test for Hanzi Characters content is as follows:

1) Media experts, aspects of media appeal assessment with a percentage of 100%, while for media efficiency with a percentage of 96.9% due to lack of completeness, and learning effectiveness 98.5%. There is a 2% increase after repair.
2) Material experts, material evaluation aspects with a percentage of 85.75% due to deficiencies in the use of less communicative language, evaluation aspects with a percentage of 90.7% caused by the feedback process, while the efficiency aspect with a percentage of 96.75% is caused by interests and motivation, there is 3% improvement after repair.
3) Expert model, the attractiveness aspect with a percentage of 90% in objectives is due to lack of targets and the efficiency aspect with a percentage of 94.3% in technology due to lack of flexibility, there is a 2% increase after improvement.
4) Small group, LMS with a value of 84.3% due to lack of tutorials while LMS material with a percentage of 78% lack of use of images. After repairs there was a 6% increase.

The results of the overall validation test on this virtual content in the form of products are as follows: media validation of 98.5%, material validation of 90.91%, validation of learning material models of 93.1%, validation of learning models of 81.2%. small group validation and the real situation was 88.4%. The overall validation was obtained at 90.4%. The results of the validation are shown in Figure 4, where each validation is shown in graphical form. The conclusion of this virtual content is valid and does not need to be revised.

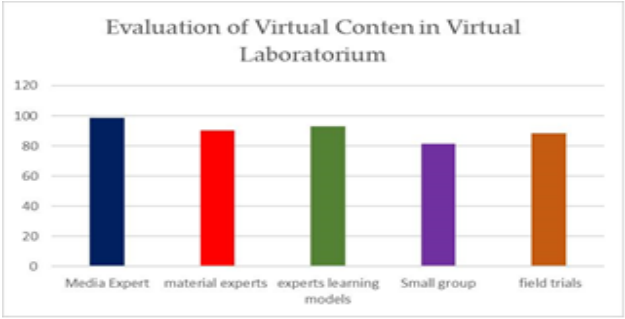

Figure 4 Diagram of Trial Results

4. CONCLUSION

This research develops intelligent virtual content based on feedback from all users in the virtual laboratory. Smart virtual content created by all users, including Mandarin lecturers, students, and other parties. This content creation is smart because it pays attention to models, media, and material about the Character of Hanzi and is verified by every expert in the field of models,

media, and learning materials. This research was tested on Mandarin students at Malang State University. This smart virtual content is integrated with SIPEJAR web learning at Universitas Negeri Malang so that it is tested on all users. The results of this research test obtained an average accuracy of 90.4%.

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