Designing Artificial Intelligence-Based Materials Integrated into Learning Management System

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Teaching Materials Design, artificial intelligence, learning management system, research and development

ABSTRACT
This study aims to design the mechanism for preparing teaching materials based on Artificial Intelligence (AI) integrated into the Learning Management System (LMS) that suits the needs of the Japanese Minori Education Center, construct a format of teaching materials that can accommodate AI features, and integrate an AI-based evaluation system to measure the final ability of the Minority Education Center's learning residents. This research applies the research and development method in the design phase of the FOUR D model. The research results show that the mechanism of designing AI-based teaching materials integrated into the LMS is content compilation, writing description, designing LMS, selecting LMS Features, and integrating AI. AI-based teaching material formats integrated into the LMS include documents, images, videos, PDF files, and JPEGs with automation systems. Integrating the evaluation system into AI-based teaching materials integrated LMS applied are quizzes, discussion forums, and assignments supported by AI smart content equipment, presentation translation, virtual mentors, turnitin, and automatic assessment. The design of AI-based teaching materials integrated with LMS is able to create rich learning resources, ease of access, and accurate assessments.

1. Introduction

One of the greatest innovations in the field of education for children of the Indonesian diaspora in Japan is the establishing of the Minori Education Center educational institution (Introduction of Minority Education Center, 2024). This institution is here to address concerns Indonesian Citizen, especially the Indonesian diaspora community that experiences cultural, linguistic, and religious barriers, including addressing parents' concerns about the proper education for their children (Nurhadi, 2024). Therefore, this institution accommodates the wishes of the diaspora community in general for all ages by providing language deepening for children and adults, tahsin and tahfiz, reading and writing the Qur'an, and Islamic Religious Education studies for all citizens to learn. Especially for Islamic Religious Education (PAI), this institution provides Shirah, Worship, Aqidah, Morals, and Fiqh (Rurisman et al., 2024)

Unfortunately, learning resources that describe the entire PAI curriculum and the mechanism for preparing content have not been designed systemically and systematically. Even though the existence of the teaching materials in question is very *Urgent* and vital. It is said to be urgent because the teaching materials are very urgent to meet the needs of the learning curriculum offered to all learning residents (Hudiah, 2022). Likewise, the vital role of teaching materials as a support for the implementation of educational programs. It is said to be vital because the teaching materials contain three main aspects, namely content, strategy, and assessment (Afifah et al., 2018). In terms of content, teaching materials provide a variety of knowledge; factual knowledge, conceptual, procedural, and metacognition needed to build the academic ability of learning citizens (Msekelwa, 2024). In terms of strategy, teaching materials provide a variety of learning activities both individually and in groups or carried out in *Online*, *offline*or *blended* (Nkereuwem & Nkemdilim, 2023). The variety of strategies used makes it possible to reach various characteristics of diverse learning citizens, it is very effective if the Learning Management System (LMS) is integrated as well as the teaching material format model can be adjusted to the features available in the LMS in question (Firat, 2023).

The integration of artificial intelligence into LMS is seen as the best solution to overcome the scarcity of learning resources, the effectiveness of the learning process to support the expected learning outcomes. Especially seen from the rapid development of technology *Artificial Intelligence* (AI) in recent years has had a positive impact on the progress of education and learning, although there is no denying its negative influence. The various positive impacts can be shown by the great interest in implementing AI-assisted learning personalization (Yang & Wen, 2023), the implementation of an AI-based evaluation system (Bhatia et al., 2024), and AI-based student

engagement (Hamid et al., 2022). The use of AI in learning is also very attention-grabbing. In relation to the provision of learning resources, AI offers a range of resources that provide a comprehensive curriculum, practical experience, and support for continuous learning. Among the many resources available, the best AI learning resources for learning are Online Courses, Online Platforms, and community and support resources (Chan & Colloton, 2024).

Especially for online courses, AI integration is very effective in content creation and efficient in the use of time to develop learning materials, without reducing the breadth or depth of the content. In addition, the use of Generative AI has shown promising results in preventing conventional cheating methods, demonstrating the presence of academic integrity (Dickey & Bejarano, 2023; Pedro, F., Subosa, M., Rivas, A., & Valverde, 20-19). In addition, student involvement in online learning can be supported through the provision of *discussion board*, interactive quizzes, and collaborative task execution that are automatically embedded in the LMS application platform (Robertson, 2024).

Realizing the vital existence of teaching materials in learning, designing Artificial Intelligence-based Materials -based integrated into learning management system is very urgent to produce. What more if it is associated with the vision and mission of the institution about its Islamic learning, namely the formation of human learners who are pious, noble, progressive and superior in science and technology as the embodiment of a peaceful Islamic life (Bano, 2020). To accelerate the realization of this vision and mission, it is necessary to have adequate support for learning resources, especially artificial intelligence-based PAI teaching materials

A qualitative study related to teaching materials was conducted by Coşkun which focused on the selection of religious education discussion materials for German courses taught at the university. It can be seen that this study focuses on the macro content of the oral discourse of religions, including Islam, Christianity, Judaism, Buddhism and Hinduism as discussion material in German. The content of Islamic studies studied tends to be directed to general content that is not touched by the Islamic education curriculum (Coşkun, 2021). Likewise with the study conducted by Sahin examines two sets of interrelated issues in contemporary discussions on Islam and education in the context of Muslim majority and minority. This study found that there was conceptual ambiguity in the depiction of the field; Islamic Pedagogy, Islamic Nurturing, and Islamic Religious Pedagogy (Sahin, 2018).

Another study was conducted by Bahiyah et al., which found that Application of prayer in the form of *Mobile Learning* impact on engaging and interactive learning, easy access anytime, anywhere (Bahiyah et al., 2022). However, this teaching material only touches on the aspect of worship, namely prayer, but does not touch other study materials. In contrast to this study, which is directly focused on the design of Islamic religious education teaching materials, based on LMS with artificial intelligence content (Sidik, 2022), which is intended for the Minori Education Center, includes materials Shirah, Worship, Aqidah, Morals, and Fiqh with research and development methods that use the FOUR D development model to produce LMS-based PAI teaching materials that meet the criteria of validity, practicality, and effectiveness to be used comprehensively for Indonesian diaspora children and other young generations of Muslims in Japan.

Departing from the background of the above problems, the subject of this study is designing artificial intelligence-based materials integrated into learning management system. This material is intended for Minory Education Center Japan which is currently experiencing difficulties in obtaining resources that can be accessed anytime and anywhere. This research is directed to find a mechanism for designing teaching material content that integrates an artificial intelligence-based learning management system that is in accordance with the needs of the Japanese Minori Education Center, a teaching material format that can accommodate the features of the artificial intelligence-based learning management system for easy access for Minority Education Center learners, and the integration of the evaluation system into the artificial intelligence-based learning management teaching materials system to measure the final ability of residents to learn Minority Education Center.

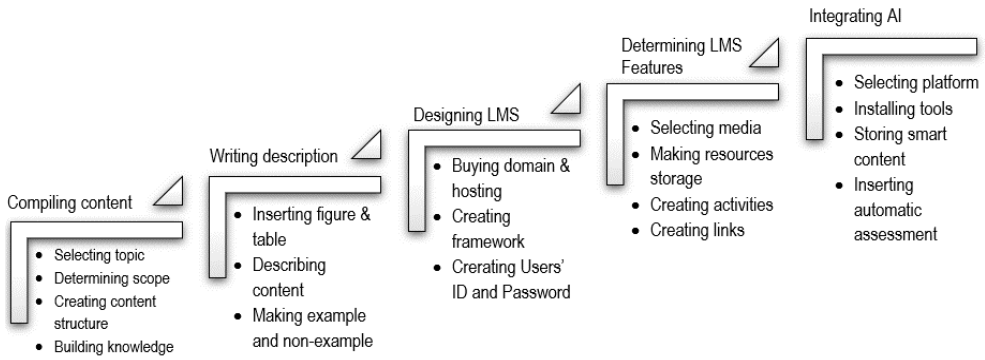
2. Methods

To solve various problems of scarcity of PAI learning resources in the context of minority Muslim communities with a multicultural environment, an interdisciplinary approach is needed. From a scientific perspective, this study is based on the discipline of (1) educational technology to direct the design mechanism, teaching material format, and test integration model; (2) Islamic Religious Education Discipline to determine the curriculum and content standards; and (3) Information and Communication Technology to determine *platform* Learning Management System based on artificial intelligence, such as those done by O'Kane and Tully which combines

disciplines *Engineering*, *Creative Arts* and *Business* in designing educational products according to needs (O'Kane & Tully, 2018; Bouchrika, 2024). From a methodological perspective, this study uses a combination of qualitative data for content preparation and determination of teaching and quantitative material formats (*mixed method*) to test the validity and reliability of test instruments integrated into teaching materials, as exemplified by Flagg and dick, cary, & Carey in producing teaching materials (Chan & Colloton, 2024; Flagg, 2013).

In designing teaching materials, researchers (a) search for printed and non-printed sources, (b) collect materials relevant to PAI teaching materials, (c) classify based on scientific structure, (d) categorize based on type of knowledge (factual, conceptual, procedural, and metacognition), (e) compile materials according to material description patterns, (f) upload and manage in learning management systems) as suggested by Dick et al., (2021). This study applies the method *research and development* (R&D) by following the FOUR D model, namely *Define*, *Design*, *Develop*and *Disseminate* (Yaumi, 2024) which is divided into three proposer teams in the consortium (Dick et al., 2021).

This study is a longitudinal study that lasts for three phases except for the disseminate phase. In this part, the researcher focuses on the design phase of the four phases of the FOUR D model, namely the phase of designing and creating artificial intelligence-based teaching material products that are integrated into the LMS. Several stages in designing teaching materials can be illustrated into a flowchart in the design phase by following these steps.



Data was collected by browsing documents, in-depth interviews, and Focus Group Discussions. Researchers search for authoritative sources such as books, journal articles, and other sources that are relevant to Islamic religious education materials. In source tracing, researchers use web-based search engines like Yahoo and Google to find relevant information. Researchers also use national library search engines, especially on e-resources and other search engines such as Google Scholar, ERIC Database, DOAJ, Garuda, and Research Gate to collect eBooks, articles, magazines, journals, and newspapers. In tracing the source through the tracking engine, we use two approaches. The first approach involves three common descriptors for the topics of "Artificial intelligence-based material," "Learning Management System," and "Islamic Educational." Descriptors designing artificial intelligence-based materials integrated into learning management system do not produce much information. Combining two terms; "Artificial Intelligence and Instructional Materials" yielded a lot of results. The second approach involves the incorporation of descriptor subtopics: "designing materials and learning management system", "learning management system and instructional materials", "Islamic education materials and LMS.

In addition, the researcher also conducted in-depth interviews with three vice principals who have Islamic religious education subjects as informants to obtain data related to the primary and secondary education curriculum. In addition, the researcher held an FGD with educators at the Minory Education Center which was conducted online coupled with an FGD with teachers of Hikari School in South Tangerang where this school is affiliated with the Japanese government in Indonesia.

The various documents that were successfully collected were then analyzed using qualitative data analysis, as suggested by Miles, Huberman, & Saldana (2014) which included data condensation, data presentation, verification of conclusion drawing and verification. Data condensation (not data reduction) refers to the process of selecting, focusing, simplifying, abstracting, and transforming data that appears in documents and other empirical materials. The condensation of data in this study occurred continuously during this study. Even before

the data was actually collected in its entirety, the condensation of the anticipatory data had been done. Once the data is collected, researchers summarize, code, develop themes, create categories, and write analytical memos.

The next analytical activity is the presentation of data, which refers to an organized and compressed collection of information that allows conclusions and actions to be taken. The presentation of data in this study is presented through matrices, graphs, charts, or networks. All of them are designed to gather organized information into a concise, instantly accessible form so that the reader can see what is happening and illustrated in the illustrations. The data analysis ended with conclusions and verification. Drawing conclusions refers to the interpretation of meaning by paying attention to patterns, explanations, series of events, and postulates or propositions while maintaining openness and skepticism. The goal is to draw conclusions gradually starting with a rather vague conclusion, then gradually improving and finally becoming the final conclusion. Meanwhile, verification is to trace back data sources, field records, including data collection methods to test plausibility, robustness, and confirmability, or what is called validity (Sgier, 2012).

To track the accuracy of various existing sources, the researcher triangulation the data as suggested by Li & Zhang (2022) including the time of data collection, place, and people participating in this study to determine the credibility of the data. The researcher also paid attention to video activities about the implementation of learning at the Minori Education Center so that data on the actual teaching of Islamic religious education could be known. As for obtaining data reliability, the researcher checked and verified handwritten sources, digital, and field observation results in the form of replication. Finally, the researcher conducts a correctness audit of all data sources and activities to obtain confirmation of data that needs to be tested for correctness.

3. Results

3.1Teaching Material Design Mechanism Based on Artificial Intelligence Integration

In the preparation of teaching materials based on artificial intelligence as integrated in the learning management system, it can differ from one platform to another. Two educational institutions affiliated with the Japanese government have been interviewed, namely (1) Minori Education Center and (2) Hikari School. This study successfully conducted an online FGD with six informants as educators at the Minori Education Center and interviewed seven informants from Hikari School. All informants are high-ranking officials in the two educational institutions.

Especially regarding the *platform* used in learning, it is generally left to the teachers concerned. They do not have a special platform institutionally because the learning is directly provided by the teachers, moreover they only meet face-to-face online with students. The learning model is also carried out in *halaqah*, where the learning is in small groups consisting of *murabbi* (coaches) and *mutarabbi* (fosters). Halaqah is a learning process carried out by students by circling the murabbi who guides them. However, it is done online, as said by the following murabbi.

We do not have adequate learning resources, only given virtually with *the halaqah* method. The platform used only relies on the transfer of knowledge from the original source, namely murabbi. Sometimes we rely on google and the book that we are down from Indonesia. For the use of the platform, we leave it directly to teachers who want to save the resources. However, due to technological limitations, some of us use google classroom, weblogs, and google sites. The mechanism for making it, naturally, is such as searching for materials, uploading on google drive, and sharing google drive links that are integrated into google classroom (FGD with MEC Japanese educators, August 4, 2024).

In the FGD, although the learning management system platform is not instructed by any institution based on instructions from educational institutions, some of them have used the google classroom and google sites platforms with a natural preparation mechanism and do not follow certain tutorials. The preparation of materials into the LMS can be done by (1) searching for materials, (2) uploading them on google drive, and (3) sharing the google drive link that is integrated into google classroom. The same thing was also said by the deputy principal who was used as an informant from the following Hikari school.

As our teachers said, at Hikari school, the use of LMS depends on the creativity of each teacher. In general, we make the most of Google Classroom even though some of them use Edmodo, Canva, and Sakai. What's more, we here have received grants from several sources to get digital classes, especially high classes such as grades IV, V, and VI elementary school they learn using Ipod. When it comes to the mechanism for compiling an LMS, it's normal to follow normal steps in general such as providing materials, organizing sources, uploading, creating

links, and sharing links to students (Interview with the Vice Principal of Hikari School, October 7, 2024).

The statement illustrates that the mechanism for preparing teaching materials in LMS is carried out through the stages of (1) providing materials, (2) organizing learning resources, (3) uploading materials, (4) creating links, (5) sharing links. The drafting mechanism as outlined in the interview shows different ways from each other, depending on the needs.

Seeing the complexity of the material to be developed by considering the platform that suits the needs of users, the mechanism for designing teaching materials based on the integration of artificial intelligence in the learning management system can be carried out with a mechanism that includes five steps consisting of (1) compiling content, (2) writing description, (3) designing LMS, (4) selecting LMS Features, and (5) integrating AI. In the preparation of AI-based teaching material content, it is carried out based on the existing curriculum in MEC which is described based on themes, subject matter, content structure, and knowledge structure, as seen in table 1 below.

Table 1: Content Construction

THEME	SUBJECT MATTER	CONTENT STRUCTURE	KNOWLEDGE STRUCTURE
LIFE	Getting to Know the Pillars of Faith	Definition of Faith, Pillars of Faith, Evidences about the Pillars of Faith	Factual knowledge, conceptual, and procedural knowledge
MORALS	Become Personal Integrity with Trust and Honesty	Definition of trust and honesty, scope of trust and honesty, benefits of trust and honesty	Factual knowledge, conceptual, and procedural, metacognition
WORSHIP	Fardlu Prayer 5 Times	Definition, legal basis, mandatory and legal requirements, and implementation procedures	Factual knowledge, conceptual, procedural, and metacognition
JURISPRUDENCE	Halal Provisions and The Haram of Food	Halal and haram Food and Beverage Provisions; Each discusses the definition, types, and benefits.	Factual knowledge, conceptual, procedural, and metacognition
SIRAH	The Prophet Muhammad (peace be upon him) as a blessing for the entire universe	The struggle of the Prophet Muhammad in Mecca and in Medina, the da'wah movement, and getting to know the person of the Prophet Muhammad.	Factual knowledge, conceptual, procedural, and metacognition

The construction of LMS-based teaching material content as shown in table 1 is built from a combination of the distribution of themes contained in the MEC curriculum obtained through online interviews and documents accessed from the MEC website with Hikari School, a school in South Tangerang affiliated with the Japanese government and society. The subjects, content structure, and knowledge structure are built and developed based on the sources and curriculum in elementary and secondary schools in Indonesia with the consideration that the teachers who teach at MEC are all from Indonesia and students come from the Indonesian community. Another consideration, there is no source that has ever been developed that can be the main reference in designing IA-based PAI teaching materials that are integrated in the LMS.

In writing descriptions, the preparation of teaching materials follows a pattern in general, by accommodating the reader's and students' learning styles, namely describing systematically to accommodate the complete reader's style and auditory learning style, illustrating with pictures, tables, charts, or flow charts to accommodate visual styles, and presenting examples and non-examples, as well as procedural steps to accommodate kinesthetic reading styles. This is based on the results of the online FGD with MEC teaching staff who want if LMS can be made to accommodate the diversity of students from elementary school age to high school age.

Similarly, when designing an LMS, learning developers choose a platform based on the consideration of ease of access, ease of editing to adapt the format and form of the material, and affordability of the installation cost. Based on the results of the FGD with prospective users from MEC, Moodle Cloud was created because it is integrated with hosting and domains. The web address can be accessed here https://lms.katalis-minori.com/. The address was created based on discussions with prospective users in the form of FGD with prospective users. The display of the lms can be seen in figure 2 below.

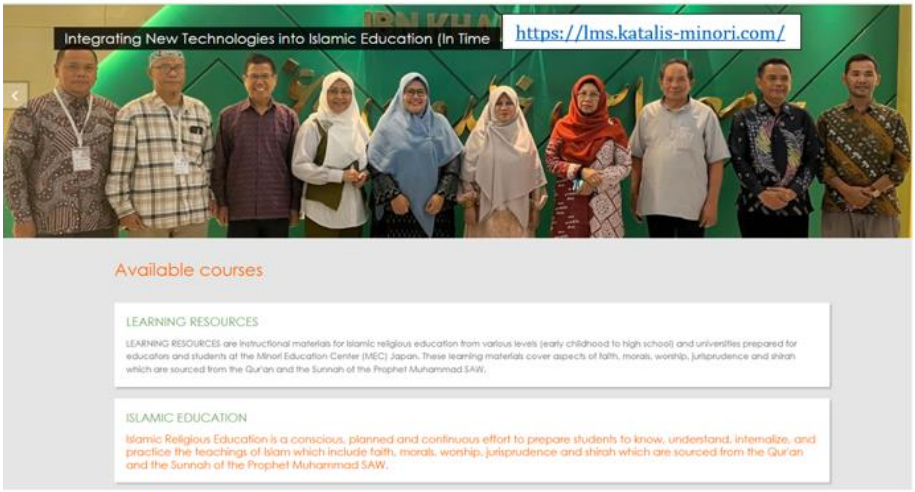


Figure 2: Front Page of AI-Based Materials

The front view of AI-Based Materials integrated LMS provides available courses that have been successfully developed, namely first, learning resources to provide all Islamic religious education resources ranging from early childhood education to PAI learning materials in universities. Second, Islamic religious education consisting of material on creed, ahlak, fiqh and shirah which is selected based on age considerations and religious understanding.

In selecting features, there are two main components contained in the LMS that allow AI to be integrated into it, namely activities and resources. Activities are features that can be used to build activities such as assignments, attendance, forums (discussion boards), chats, virtual conferences, lessons, quizzes, and surveys. The resources are various features to store smart teaching materials such as books, files, folders, pages, URLs or the like that are useful for storing various sources.

In integrating AI into an LMS, there are seven features that can be considered, namely virtual mentors, voice assistants, smart content, translation tools, global courses, automatic assessments, and personalized learning. Taking into account the complexity of activities and resources such as those integrated into the LMS, to integrate AI, only choose translation tools to translate from Indonesian into English and Japanese, smart content to store and access learning resources, and automatic assessment to measure learning achievement through quizzes, discussion boards, and assignments. The integration of these features can help users to improve the automation system in AI-based learning.

3.2Format of Teaching Materials Based on Artificial Intelligence

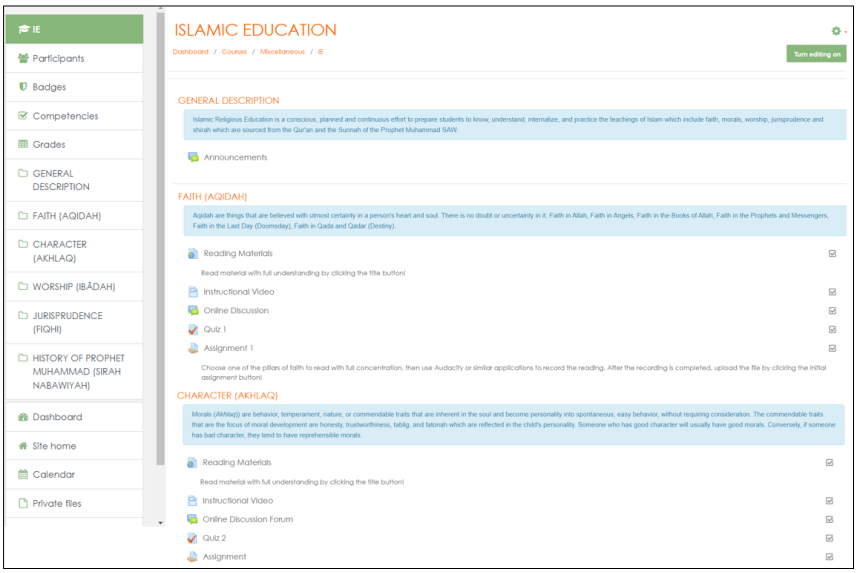
The format of the teaching materials referred to in this study is the way digital information is compiled and presented. The format can be applied to a wide variety of file types, including documents, images, videos, including file formats that include portable document format (PDF) for documents, composite photography expert group (JPEG) for images, and MPEG-4 Part 1 4 (MP4) for video.

Artificial intelligence-based teaching materials integrated in LMS are designed based on considerations of student characteristics, material distribution, and presentation strategies. The majority of students studying at MEC are children from the Indonesian diaspora community who live in Japan. This PAI teaching material is intended for those who are Muslims where students come from different age groups and different school levels. Therefore, the material is general in nature, covering several scientific fields, as said by the following murabbis:

Actually, the learners who study Islamic Religious Education at MEC consist of several different age groups and different levels of education. Usually we serve to study Islamic religious education from different groups and their formal grade levels, but we unite them in the same study group. Therefore, we ask for general material that reaches the differences in question. However, we provide different scientific fields, including learning the Qur'an and Hadith, materials on creed, ahlak, worship, fikhi and shirah (FGD with MEC Japanese educators, August 4, 2024).

In the MEC curriculum document, there are fields such as the Qur'an and Hadith, materials on creed, ahlak, worship, fikhi and shirah. Especially for the Qur'an, the learning community is still learning to read and write

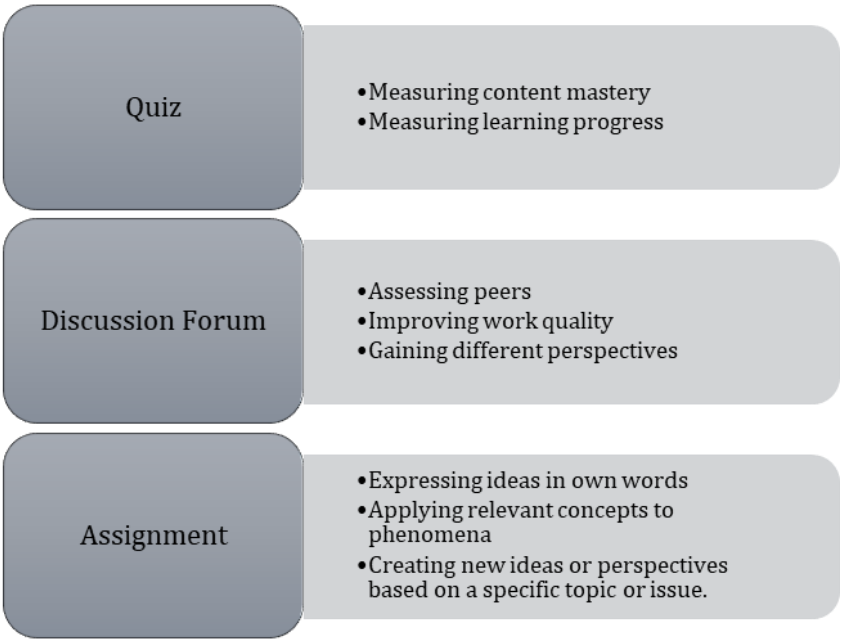
the Qur'an and has its own book to teach. Likewise with the Hadith material which can be directly shown based on its own book. In addition to considering the characteristics of students and the distribution of materials, the format of teaching materials is also directed to accommodate diverse presentation systems such as text materials, PowerPoint slides, and learning videos. Text is automatically saved in the file and folder save page. There are also text materials with external storage through links and external websites that make it easier to track automatically in the form of smart content. Non-text materials such as learning videos are linked via external links such as Youtube videos or other platforms, but can be played within the LMS page, as illustrated in figure 3.



The virtual mentor in the form of Jitsi aims to present oral material (voice) and chat room to convey text messages synchronously. Meanwhile, Turnitin, which is integrated into an AI-based LMS, is very useful for detecting plagiarism when conducting online discussions. The format of teaching materials is also equipped with AI tools such as automatic assessment to automatically check quizzes, answers from online discussions, and assignments. Thus, the format of artificial intelligence-based teaching materials includes smart content, presentation translation, virtual mentor, turnitin, and automatic assessment. Smart content aims to store teaching materials consisting of text, images, videos, and in the form of links; Presentation Translation to automatically translate documents from Indonesian, to English and Japanese.

3.3Integration of Evaluation System in Artificial Intelligence-based Teaching Materials

In integrating the evaluation system into teaching materials based on artificial intelligence integrated *learning management system*, developers use three types of assessments, namely through (1) quizzes, (2) discussion forums, and (3) assignments. The main purpose of implementing quizzes is to measure the level of cognitive learning achievement related to mastery of learning content or materials. The discussion forum was to assess their involvement in building social interaction between learning residents and teachers, between learning residents and other learning residents, and with learning resources. This is to build an attitude of care, empathy, and mutual help through working collaboratively and cooperatively. Meanwhile, the assignment is intended to assess the performance that can be shown by learning residents both in direct practice and to assess their competence in solving various social problems that occur. All of these features are equipped with an automation system.



The integration of quizzes, discussion forums, and assignments into LMS-based teaching materials is not only oriented to the ability measurement and assessment of students' attitudes and performance, but also has an impact on the quality of the learning process and outcomes. In addition, educators can also assess the success of the learning carried out. The integration model can be done integratively, separately, and combined from both. First, integrative integration means that every time learning is carried out, the three types of assessments are given to measure the achievements of each learning process. Second, separate integration means that when the teaching materials are accessed and studied independently, they can also work on them anytime and anywhere, without waiting for every learning. Third, the integration model can blend between the two. During the implementation of learning, they will be given quizzes, on other occasions they can do assignments and discuss separately.

4. Discussion

The mechanism for preparing AI-based teaching materials integrated into the LMS that suits the needs of the Japanese Minori Education Center is compiling content, writing description, designing LMS, selecting LMS Features, and integrating AI. The preparation of AI-based teaching material content is described based on themes, subject matter, content structure, and knowledge structure. There are two main components contained in an LMS that allow AI to be integrated into it, namely activities and resources. Activities are features that can be used to build activities such as assignments, attendance, forums (discussion boards), chats, virtual conferences, lessons, quizzes, and surveys. The resources are various features to store smart teaching materials such as books, files, folders, pages, URLs or the like that are useful for storing various sources.

The construction of teaching material formats that can accommodate AI features. AI-based teaching material formats integrated into the LMS include documents, images, videos, PDF files, and JPEGs with automation systems. The format of teaching materials is equipped with AI tools such as automatic assessment to automatically check quizzes, answers from online discussions, and assignments. Thus, the format of artificial intelligence-based teaching materials includes smart content, presentation translation, virtual mentor, turnitin, and automatic assessment. Smart content aims to store teaching materials consisting of text, images, videos, and in the form of links; Presentation Translation to automatically translate documents from Indonesian, to English and Japanese.

Integration of an AI-based evaluation system to measure the final ability of Minority Education Center learning residents. Integrating the evaluation system into AI-based teaching materials integrated *LMS* applied are quizzes, discussion forums, and assignments supported by AI smart content equipment, presentation translation, virtual mentors, turnitin, and automatic assessment. The design of AI-based teaching materials integrated with LMS is able to create rich learning resources, ease of access, and accurate assessments. The integration of quizzes, discussion forums, and assignments into AI-based teaching materials integrated with LMS is oriented towards measuring students' abilities and assessing attitudes and performance and has an impact on the quality

of the learning process and outcomes.

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