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SPECIAL FEATURE

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DEVELOPMENT OF AN APPLICATION TO FACILITATE REMOTE MEDIATION

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Abstract

Remote mediation has become an urgent need in today's digital era, particularly in the context of dispute resolution and business meetings. This article explores the development of an application specifically designed to facilitate the mediation process effectively in a virtual environment. The aim of this research is to investigate the challenges faced in remote mediation and how application technology can overcome these obstacles. The application development method involves user needs analysis, integration of teleconferencing technology, data security, and an intuitive user interface. This article also describes the implementation and testing of the application prototype to validate its effectiveness in providing a reliable and user-friendly platform for mediators and mediation participants. The research findings indicate that this application can enhance mediation efficiency by reducing travel costs, facilitating global accessibility, and improving the security and confidentiality of the mediation process. The implications of this research highlight the importance of technology in transforming traditional mediation paradigms into ones that are more inclusive and adaptive to current global needs.

Keywords: remote mediation, application technology, mediation efficiency, data security, user interface

1 INTRODUCTION

Mediation is a widely used alternative dispute resolution method in various fields, such as business, law, and international relations. It involves a neutral third party, known as a mediator, who helps disputing parties reach a voluntary agreement (Moffitt & Bordone, 2005). However, with the rapid growth of globalization and technological advancements, the limitations of traditional face-to-face mediation, such as geographical constraints and logistical challenges, have become more pronounced. In this context, remote mediation offers a solution by allowing mediation to occur without the need for all parties to be in the same physical location. Remote mediation leverages teleconferencing and digital platforms to facilitate the dispute resolution process, making it possible for mediators and disputing parties to engage from different geographic locations. Research by Rifkin, Millen, and Cobb (1991) suggests that technology can broaden access to mediation, particularly in cross-border disputes involving participants

from diverse regions. Additionally, remote mediation can enhance efficiency by reducing travel-related costs and time, compared to traditional in-person mediation (Katsh & Wing, 2006).

Despite these advantages, remote mediation also faces several challenges. One of the primary concerns is data security and confidentiality. As McGinnis and Michels (2019) explain, the technology used for online mediation must ensure that sensitive information exchanged during the process is secure and protected from unauthorized access. Another challenge is the lack of face-to-face interaction, which can affect the quality of communication and the level of trust between disputing parties (McAdoo & Welsh, 2002). To address these challenges, this research focuses on the development of an application specifically designed to facilitate remote mediation. The application not only serves as a communication platform but also integrates advanced security features, such as end-to-end encryption, to ensure confidentiality. Additionally, it aims to enhance user experience by incorporating an intuitive interface that makes it easy for both mediators and participants to navigate.

The development of this application involves several key steps, including user needs analysis, integration of teleconferencing technologies, and rigorous testing to validate its effectiveness. By exploring how this application can help overcome the challenges associated with remote mediation, this study contributes to the growing body of knowledge on technology's role in transforming traditional mediation practices. This paper also examines how such technology can make mediation more inclusive by providing access to participants from various geographical and cultural backgrounds. By leveraging the capabilities of this application, the goal is to create a more efficient, secure, and accessible mediation process that aligns with the demands of the global digital age. Thus, this article aims to offer insights into the application of technology in the mediation process and its potential to address traditional limitations while fostering innovation in the field.

2 METHODOLOGY

The development of a remote mediation application requires a structured approach that balances both technical and user-centric considerations. This section outlines the methods used in creating a platform capable of addressing the specific challenges of remote mediation, including user needs analysis, technology integration, security protocols, and interface design.

By employing a combination of qualitative and quantitative research methods, this development process is designed to ensure that the application not only functions effectively but also meets the practical demands of its users. The foundation of any successful application development process is a thorough understanding of the end-users' requirements. In the context of remote mediation, the primary users include mediators, legal professionals, and disputing parties. To capture their needs, a mixed-methods approach was employed, including surveys, interviews, and focus group discussions. These methods helped identify key user requirements, such as ease of use, seamless communication, document sharing capabilities, and a strong emphasis on confidentiality and security.

1. Surveys and Interviews

Quantitative surveys were distributed to mediators, lawyers, and disputing parties to gather broad insights into their preferences and pain points in existing mediation technologies. In addition to quantitative data, qualitative interviews were conducted with key stakeholders to gain deeper insights into the unique challenges faced during remote mediation. Mediators, for instance, expressed concerns about the lack of natural interaction in virtual environments, while disputants emphasized the need for simplified interfaces to avoid unnecessary technical complexity.

2. Personas and Use Case Scenarios

Based on the data collected, user personas and detailed use case scenarios were created to guide the design and development process. These personas represent different types of users with varying levels of technical expertise and mediation experience. By simulating real-life mediation scenarios, use cases helped identify potential friction points in the user experience and informed the creation of features tailored to specific needs, such as the ability to manage multi-party mediations across time zones.

3 FINDINGS AND DISCUSSION

Developing a remote mediation application requires a clear and structured methodology to ensure it meets user needs, complies with legal standards, and functions efficiently.

Below is a step-by-step methodology for developing a remote mediation application:

1. Project Planning and Requirements Gathering

- Objective Definition: Define the purpose of the mediation app (e.g., to facilitate conflict resolution remotely through video calls, messaging, document sharing, etc.).
- Stakeholder Identification: Identify the stakeholders (mediators, clients, legal professionals, administrators).
- Requirements Elicitation:
    - User Requirements: Identify user needs through surveys or interviews (e.g., easy scheduling, secure communication).
    - Legal/Compliance Requirements: Ensure adherence to relevant regulations like data privacy (GDPR, HIPAA) and local mediation laws.
    - Technical Requirements: Define platform compatibility (web, mobile), security protocols, and integration needs (payment systems, document storage).
    - Feasibility Analysis: Evaluate technical, legal, and financial feasibility.

2. System Design

- User Interface (UI) Design:

    - Design user-friendly interfaces for clients and mediators.

- Create mockups and wireframes (use tools like Figma or Sketch) for core functions such as login, session booking, video conferencing, document sharing, etc.

- User Experience (UX) Design:
  - Focus on easy navigation, intuitive scheduling, and secure document exchange.
  - Ensure accessibility for people with disabilities (compliant with WCAG standards).

- System Architecture:
  - Define the technology stack (e.g., Node.js for the backend, React or Flutter for the front end, WebRTC for video calls).
  - Create the data flow diagrams and design the back-end architecture (server-client interaction, APIs, databases).
  - Plan for scalability and cloud integration (AWS, Azure, or Google Cloud).

3. Development

- Front-End Development:
  - Build the user-facing parts of the application using the designed wireframes.
  - Ensure responsive design for mobile and desktop compatibility.

- Back-End Development:
  - Develop server-side logic and APIs to handle functionalities like user authentication, video call handling, chat, and file storage.
  - Integrate third-party APIs (e.g., Twilio or Zoom for video, Stripe or PayPal for payments).

- Database Development:
  - Develop databases for user data, case information, and document storage.

  - Implement security measures (encryption, hashing of sensitive data) and backup protocols.

- Real-Time Features:

  - Implement real-time messaging and notifications using WebSockets or Firebase.
  - Develop secure video conferencing functionality using WebRTC or similar technologies.

4. Security and Compliance

- Data Privacy: Ensure compliance with regulations like GDPR, HIPAA, or other regional data privacy laws.
- Authentication and Authorization:

  - Implement multi-factor authentication (MFA) and role-based access control (RBAC) to restrict access to sensitive information.

- Encryption: Use SSL/TLS for data in transit and encrypt sensitive information in storage.
- Logging and Monitoring: Set up logging and monitoring for mediation sessions for transparency and compliance.
- Security Audits: Conduct regular security audits and vulnerability assessments.

5. Testing

- Unit Testing: Test individual components (e.g., login, scheduling, video conferencing).
- Integration Testing: Ensure all modules work together correctly (e.g., booking a session and initiating a video call).
- Performance Testing: Check the performance of the application under different load conditions, especially during high-traffic periods.
- Security Testing: Conduct penetration testing to identify vulnerabilities.
- User Acceptance Testing (UAT): Have real users test the app in a staging environment to ensure it meets their needs and works as intended.

- Cross-Platform Testing: Ensure the app works smoothly across various devices, operating systems, and browsers.

6. Deployment

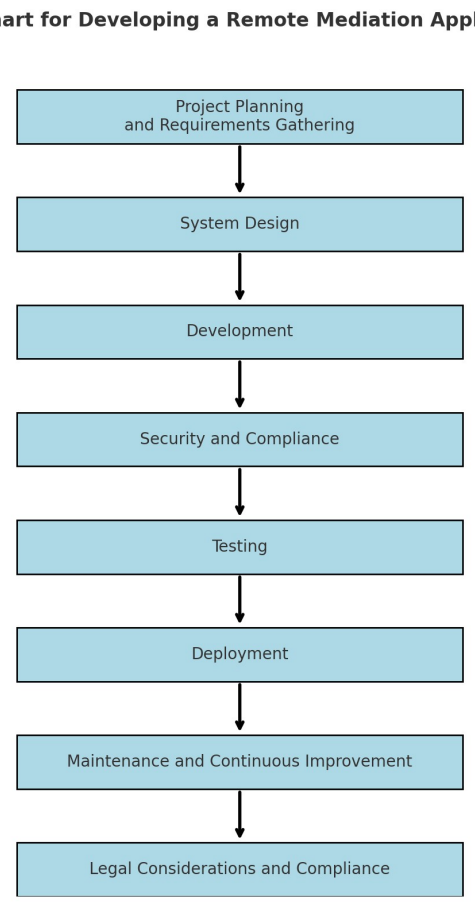
- DevOps Integration: Use CI/CD pipelines for automated testing, building, and deployment.
- Cloud Hosting: Deploy the app on a cloud platform (e.g., AWS, Google Cloud) for scalability and flexibility.
- Version Control: Use Git or another version control system to manage code changes and updates.
- Monitoring: Implement monitoring and alert systems to track uptime, server health, and user activities.

7. Maintenance and Continuous Improvement

- Post-Launch Support: Provide ongoing technical support to fix bugs, optimize performance, and update security features.
- User Feedback Integration: Regularly gather feedback from users to improve features or add new functionalities.
- Regular Updates: Continuously update the app to fix bugs, improve UX/UI, and stay compliant with evolving legal requirements.

8. Legal Considerations and Compliance

- Legal Documentation: Ensure the app includes proper legal documentation (terms of service, privacy policy, informed consent forms).
- Mediator Accreditation: Allow for mediator verification or accreditation to ensure legitimacy.
- Dispute Resolution Policies: Embed procedures for handling disputes within the app.



The results of the research indicate that this remote mediation application provides several significant advantages, including. With mediation conducted virtually, the need for physical travel is drastically reduced, saving both time and costs for all parties involved. This is particularly beneficial for mediations that would have otherwise required significant travel. The application enables participation from various countries and time zones, enhancing flexibility in resolving cross-border disputes. This global accessibility broadens the reach of mediation services and allows for more inclusive participation. With the implementation of data encryption and other security features, the application ensures that information discussed during mediation remains confidential and is not subject to leakage or misuse. This boosts trust among users, making the platform reliable for sensitive discussions. The application offers a more efficient solution compared to traditional mediation, as all processes can be organized and executed more easily and quickly. The ability to schedule and conduct sessions remotely contributes to its convenience, making it a highly practical tool for modern dispute resolution.

4 CONCLUSION

The development of the remote mediation application has demonstrated clear advantages in terms of reducing travel costs and time, enhancing global accessibility, ensuring security and confidentiality, and improving overall efficiency and convenience. By allowing participants to engage in mediation sessions from anywhere in the world and at any time, the platform significantly modernizes the dispute resolution process. Additionally, with robust security measures, users can trust that sensitive information is protected. This application is a valuable tool for addressing the growing demand for flexible and efficient solutions in conflict resolution, particularly in an increasingly interconnected global environment.

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WEBINAR TUTORIAL TO IMPROVE STUDENTS' ABILITY TO WRITE SCIENTIFIC ARTICLES

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Abstract

Scientific work courses are mandatory courses that must be taken by all Open University students after graduating a minimum of 125 credits for non-SIPAS services, while for SIPAS service students, this course can be taken according to the available packages. However, many students experience difficulties in writing scientific articles, especially in determining article titles, writing introductions, compiling methods, writing results, and compiling discussions and bibliographies, which has an impact on the quality of their research and publications. This study aims to analyze students' ability to write scientific articles and identify factors that affect these abilities. The subject of this research is a student of the Educational Technology Study Program of Open University Semester who takes a scientific work course. Data was obtained from assignments collected by students, ranging from the first task to the fourth task, which were observed using an assessment sheet. The results of the study showed that students' abilities improved after participating in the webinar tutorial four times, thus emphasizing the importance of technology-based learning in improving students' scientific writing skills.

Keywords: Scientific articles, online tutorials, webinars.

1 INTRODUCTION

The ability to write scientific articles is one of the important skills that must be mastered by students, especially in an academic environment that continues to evolve with adaptation to technological advances (Jo, 2021; J. Li & Mak, 2022). Scientific writing not only functions as a requirement for completing studies, but also as a means to convey research results, share knowledge, and contribute to the development of science (Alkamel & Alwagieh, 2024; M. Li & Pei, 2024). The Open University as a higher education institution that provides access to education widely, is committed to improving the competence of its students, especially in the field of research and scientific writing (Indrawan et al., 2020; Wu et al., 2024). In this context, students need to have a deep understanding of good and correct writing procedures and techniques, so that their work is in accordance with academic standards and can have a positive impact on society (Tobon & Lozano-Salmorán, 2024).

One of the efforts that can be undertaken to enhance students' scientific article writing skills is the implementation of specially designed webinar tutorials. This webinar will equip students with the knowledge and skills needed to write quality scientific articles (Budiarso et al., 2022) as well as being an effective platform for sharing information and experiences. This activity allows students to explore various important aspects of scientific writing, from topic selection, data collection and analysis, to drafting and editing techniques (Muskitta et al., 2023). By presenting competent speakers in their fields, this tutorial is expected to help students understand the writing process holistically so that they can produce scientific papers that not only meet academic standards but also positively impact the wider community.

This webinar tutorial will provide in-depth insights into effective writing techniques, scientific article structure, and how to structure logical and data-driven arguments (Werdiningsih et al., 2023). Programs like this are considered effective in improving students' ability to write and compile articles that meet academic standards, with a focus on strengthening logical and structured evidence-based arguments. In addition, this activity also serves to encourage students to be more active in participating in the scientific community, expand their academic network, and increase motivation to continue working (Hadianti, 2023). Participation in scientific webinars can hone students' critical skills and understanding of various aspects of academic research and writing. With this in-depth approach, it is hoped that Open University students can increase their confidence and produce high-quality writing, ready to contribute to academic and research fields that have an impact on the wider community. Thus, webinar tutorials not only act as a learning tool, but also as a means to develop writing and scientific research skills that are beneficial to the public.

Writing scientific papers is a very important skill for final year students to master (Rahmatullah, 2022). Scientific papers are research papers that aim to solve problems based on scientific theories and methods. In the Educational Technology Study Program, students are required to take scientific work courses after graduating with a minimum of 125 credits. Although this course has a weight of 0 credits, students cannot graduate without completing it. The learning process is carried out through online tutorials, where students are required to take part in webinar tutorials sebanyak 5 kali. Tujuan dari webinar tutorials is so that students are able to write scientific articles that are ready to be published.

However, the use of webinar tutorials by students is still not optimal. Some of the problems that arose during the implementation of Tuweb included (1) students were often late, (2)

students were present but did not listen properly, (3) students did not turn on the camera, so it was difficult for tutors to control activities, (4) students were passive, and (5) students had difficulty conducting research because the time given was very short. The observation results showed that students still had difficulties in completing the assigned assignments, including: (1) writing the title of the article, (2) writing the introduction, (3) writing the method, (4) writing the research results, and (5) writing the bibliography. Therefore, the purpose of this study is to analyze the difficulties of students in making scientific papers that are worthy of publication. The purpose of this study is to identify and analyze the difficulties faced by Open University students in writing scientific articles, including in writing titles, introductions, methods, research results, and bibliography.

2 METHODOLOGY

This research uses a qualitative method with instruments using assessment sheets based on article assignments collected by students. The collected data is analyzed using descriptive statistical techniques displayed in the form of tables. The article rating grid is as seen in Table 1.

Table 1. Student article assessment grid

No	Kriteria Penilaian
1	Accuracy in writing titles
2	Accuracy in writing the author's name and email
3	Accuracy of abstract writing
4	Accuracy of writing an introduction
5	Accuracy of writing methods
6	Accuracy in writing results and discussion
7	Accuracy of writing conclusions
8	Accuracy in writing bibliographies

The subjects of this study consisted of 15 students of the Educational Technology Study Program who were taking the Scientific Work course, selected purposively to ensure relevance to the research objectives. Through this approach, this research aims to provide a comprehensive understanding of the phenomenon being studied, as well as present reliable and relevant results for scientific development in the field of Educational Technology.

3 FINDINGS AND DISCUSSION

3.1 Result

The results of the research related to common mistakes made by students in completing the final project of scientific work can be seen in Table 2.

Tabel 2. Common mistakes students make in writing scientific articles

No	Criterion	Frequent errors
1	**Accuracy in writing titles**	1. The title is written like a research report 2. The title is not written concisely and clearly, instead resembling the title of an irrelevant research report
2	**Accuracy in writing the author's name and email**	1. The names of authors, supervisors, and agencies are not written in completely and are not following the proper format 2. No email address
3	**Accuracy of abstract writing**	1. The abstract is too long 2. Background is unclear 3. The problem has not been identified 4. The purpose of the study is not in line with the results 5. Written does not represent the content of the article as a whole
4	**Accuracy of writing an introduction**	1. An overly generic background 2. Unclear issues 3. There are no explicit research objectives 4. Novelty is not conveyed 5. Irrelevant theoretical foundations 6. Lack of comprehensive literature review 7. Claims that are not supported by evidence
5	**Accuracy of writing methods**	1. Does not describe population and sample 2. Lack of explanation of data analysis techniques: 3. Use of improper methods 4. Not by the purpose of the research 5. Too many theories
6	**Accuracy in writing results and discussion**	The results of the study were not corroborated by statistical data or measurable evidence
7	**Accuracy of writing conclusions**	1. The conclusions written are not by the purpose of the research 2. Conclusions made are not under the results and discussions
8	**Accuracy in writing bibliographies**	The bibliography does not follow the correct writing format, there are many errors in the writing of the author's name, year of publication, title, and publisher

3.2 Discussion

This study's results show several significant weaknesses in writing scientific articles, especially in important parts such as titles, abstracts, introductions, methods, results and discussions, and conclusions. In the title section, it was found that many titles were written to resemble research reports, which did not fit the format of scientific journal articles. This shows that writers tend to understand less about the importance of concise, clear, and informative titles (El-Sulukiyyah & Mardiningsih, 2023). A good title should reflect the essence of the research appropriately and grab the reader's attention, so this mistake indicates the need to improve the author's understanding of title writing techniques.

In addition, in the section of writing the author's name and email, the results of the study show that many articles do not include the names of the author, supervisor, and agency completely according to the format that should be (Syihab & Wijiharta, 2022). This inaccuracy can reduce the author's credibility in the eyes of readers, as well as create the impression that the writing guidelines are not followed properly. In the abstract section, it was found that the abstracts written tended to be too long, unclear in presenting the background, and did not show a strong relationship between the research objectives and the results achieved (Nurlaili et al., 2023). An abstract that does not reflect the content of the research well can reduce the appeal of the article and cause the reader not to understand the essence of the research (Syaputra et al., 2024).

Written introductions are also often too general, with research problems that are not explicitly explained and objectives that are less clear (Mahsusi & Hudaa, 2022). In addition, the novelty of research is rarely conveyed well, so that the contribution of research to the scientific field becomes invisible. The method section is also not spared from weaknesses, with many authors not explaining populations, samples, or data analysis techniques in detail. Methods that are not in accordance with the research objectives can reduce the validity of the research results obtained.

In the results and discussion section, many articles do not reinforce the findings with clear statistical data, which in turn can reduce confidence in the results of the study. Results that are not supported by adequate statistical data will be difficult to assess their validity (Putra, 2020). In addition, the conclusions presented often do not answer the purpose of the research, making the research seem directionless. A good conclusion should be able to summarize the results of the research and answer the research question clearly. Finally, in the bibliography section, there

were many errors in the writing of the name, year, and publisher, which showed that the author was not careful in following the correct format.

Overall, this study reveals that the writing of scientific articles still needs to be improved in various aspects, especially in terms of clear writing structure, use of valid data, and preparation of arguments that are following the research objectives. Further training and guidance regarding good scientific writing techniques will be very helpful in improving the quality of scientific articles in the future (Sulfa Saguni et al., 2024). This study reveals a number of critical weaknesses in the writing of scientific articles, which provide a new view of the quality and consistency of academic writing, especially in the parts that greatly affect the acceptance of articles in scientific journals. One of the standout findings is that common errors occur consistently in the writing of titles, abstracts, and introductions, leading to a lack of appeal and clarity of the article for readers. Additionally, the study showed that many authors failed to align the research objectives with the methods and results they presented, significantly impacting the credibility and validity of the research.

4 CONCLUSION

Based on the results and discussions presented, it can be concluded that webinar-based tutorials are effective in enhancing Open University students' ability to write scientific articles, particularly in the areas of title preparation, introduction, methods, results, and discussion sections. However, students still face challenges in adhering to academic formatting and using statistical data appropriately. Therefore, more intensive guidance is required to help overcome these challenges. This study highlights the importance of technology-based learning in supporting scientific writing skills and recommends more comprehensive training for students.

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TRACER STUDY FOR MASTER OF MANAGEMENT GRADUATES UNIVERSITAS TERBUKA MEDAN

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Abstract

The aim of this tracer study is to find out how the learning process of postgraduate students at Universitas Terbuka Medan, Masters in Management study program is, this is important because it is an effort to improve the quality of learning and services to students and the impact after completing postgraduate education at UT. Data collection was carried out using a survey method by distributing questionnaires to alumni online. The results of the data obtained are that the reason for registering at UT is because they didn't need to leave their work, after completing their education it doesn't have an impact on promotion but they get a salary increase or additional salary, teaching and learning aspects are widely applied in the workplace and have an impact on increasing knowledge and skills and changing attitudes. This is in accordance with the opinion of superiors where there is an increase in work in terms of personal development, leadership, contribution to the institution.

Keywords: Increasing Knowledge and Skills, Job Promotion, Master of Management Graduates, Tracer Study, Universitas Terbuka Medan

1 INTRODUCTION

The Master of Management Program is one of the Six Master's Programs offered by Universitas Terbuka. The Master of Management program was offered for the first time in 2004 together with the Master of Public Administration Program. This program is designed to provide opportunities to continue education to the Master's level to graduates of Bachelor (S1) of Economics, Management, Accounting or Bachelor (S1) of other relevant scientific fields, or Diploma IV (D-IV) in relevant professional fields such as STAN, STIE and non-Teacher status. The objectives of this program include:

1. Producing graduates who have professional abilities and insights in the field of management
2. Producing graduates who are able to develop and apply expertise in the field of management to solve business problems comprehensively and integratively

3. Producing graduates who are able to anticipate and manage changes in internal and external business factors for
4. Producing academic works and research findings oriented to the development of management science to answer managerial problems
5. Producing graduates who have high ability and commitment to apply research findings in the field of management for community empowerment

The Distance Learning Program Unit of Universitas Terbuka, Universitas Terbuka (UT) Medan, is one of the Regional UT's office that accepted new students for the Master of Management Program in 2004. Until 2021, UT Medan has produced 238 graduates of the Master of Management Program, but until now UT Medan has not received information regarding the performance of graduates and graduate satisfaction with the knowledge gained during the Master of Management Program at UT Medan. This information is very necessary for the preparation of the accreditation form for the Master of Management Program of UT Medan and also to convince the people of North Sumatra about the success of graduates of the Master of Management Program of UT Medan in the field of work.

Based on the background described above, the problems in this study are as follows:

1. What is the profile of graduates of the Master of Management of UT Medan
2. How satisfied are graduates of the Master of Management of UT Medan with the knowledge they have obtained compared to the needs of their work.
3. How is the quality of the performance of graduates of the Master of Management of the Medan in carrying out their duties and positions
4. What is the position and role of graduates of the Master of Management of UT Medan in the workplace, family and society.
5. Is there communication between alumni and between alumni and institutions.

2 METHODOLOGY

The implementation of this tracer study is divided into 3 (three) stages, namely: a. The first stage is determining the concept and survey instrument. The purpose of the tracer study of the UT Medan Master of Management Study Program has been explained in the background of this study. The target population is graduates of the UPBJJ-UT Medan Master of Management Program from 2006 to 2017. In 2018, there were no graduates of the UPBJJ-UT Medan Master of Management program so that a tracer study could not be conducted for graduates who were 2 (two) years from graduation. The instrument to be used is a questionnaire for graduates and

superiors of graduates developed by Ginting et al. (2014) b. The second stage is data collection and recapitulation The initial step that will be taken at this stage is to track data on graduates, colleagues of graduates, and superiors of graduates (home address, cellphone/telephone number, email). The next step is to provide direction to the survey officer who is responsible for contacting respondents to fill out the questionnaire. The next step is to notify respondents through various media such as the Alumni WAG Group, Instagram, email. The final step is to send the questionnaire online to graduates and graduates' superiors and summarize the collected questionnaire data for further processing. c. The third stage is data analysis and reporting The initial steps at this stage are translating the code system in the questionnaire, data entry and data editing, data analysis, report preparation, and socialization to all UPBJJ-UT Medan staff and to the head of the UT Medan Master of Management Study.Program. The subjects of this tracer study were all graduates of the UT Medan Master of Management study program from 2006 to 2017, totaling 228 people. All of these graduates came from 20 SK Yudisium. Graduate data of the Master of Management study program UPBJJ-UT Medan is tracked from the UT database. If there is a change in the personal data of graduates such as telephone/cellphone numbers, addresses, and emails, it will be tracked to classmates whose data is known. Personal data of superiors will be traced through graduates. The data obtained was analyzed descriptively by considering the tendency of answers from each variable. The data was presented in frequency and percentage.

3 FINDINGS AND DISCUSSION

3.1 Graduates

3.1.1 Graduate *Profile*

In this tracer study, the respondents were alumni based on the Graduation Decree from 2006 to 2017. The total number of respondents was 228 alumni spread throughout North Sumatra. The profile of graduates was reviewed from the following aspects: (1) gender, (2) gender, (3) educational background, (4) reasons for registering at UT. After collecting the questionnaire data that was distributed, the description of the graduate profile is as follows:

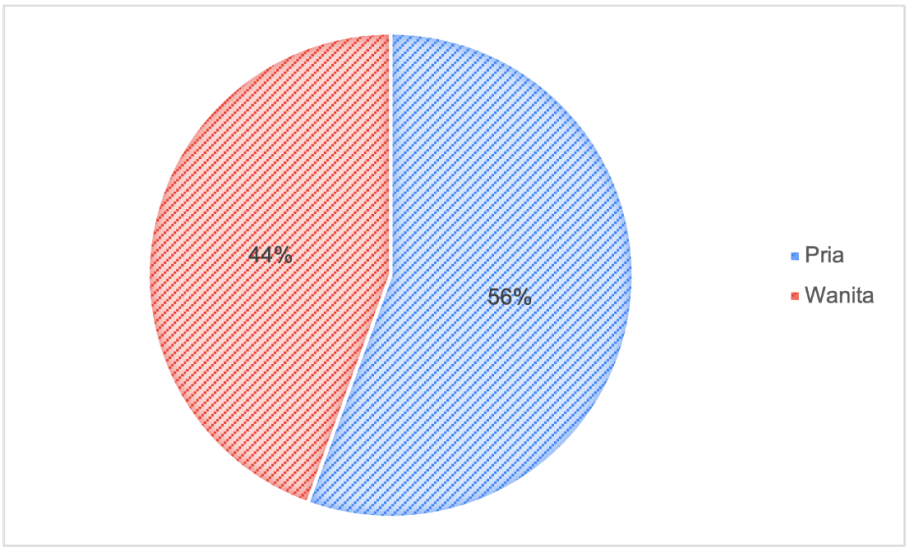

Figure 1. Distribution of Alumni Based on Gender

From the data above, respondents who participated in this study were 56% female and 44% male. In terms of the reasons for choosing UT in the postgraduate program of the Master of Management study program, 71.1% were because of affordable costs, PTN and flexible learning, 18% of the main reasons were because it was a state university and 11% were because of a recognized diploma.

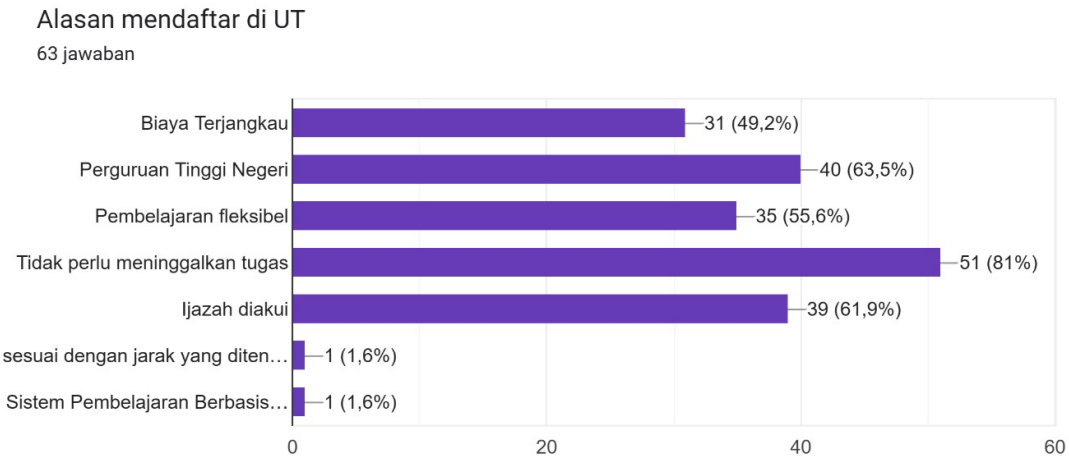

Figure 2. Reasons for Choosing UT

3.1.2 Teaching and Learning Aspects

In this study, it is necessary to know to what extent the teaching and learning aspects at UT have a positive impact on graduates in terms of practical knowledge, theory and concepts, attitudes and communication skills, tutorials, tutors as the main source of communication, printed teaching materials as the main teaching materials, non-printed teaching materials as the main source of information, TAPM writing, and exam schedules.

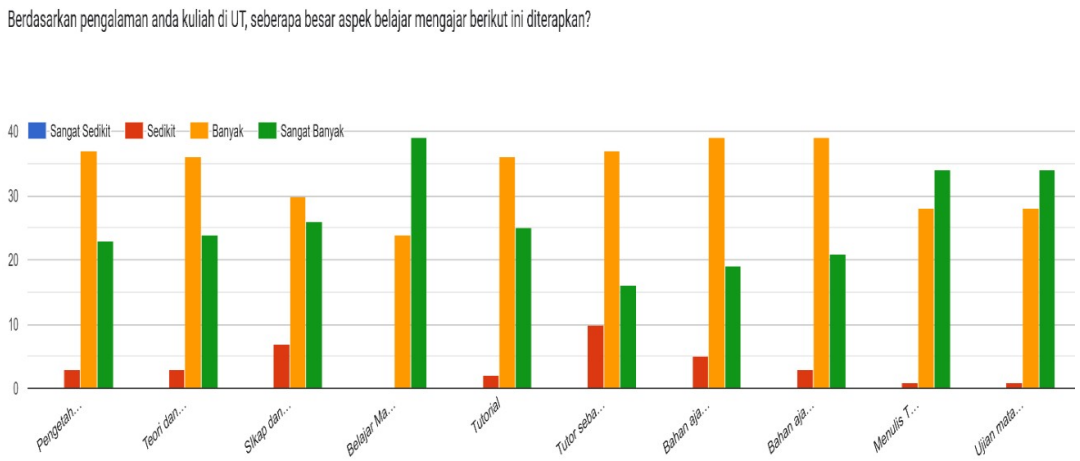

Figure 3. Teaching and Learning Aspects

Independent learning is the biggest aspect in the teaching and learning process with a percentage of 60%, this shows that independent learning during the teaching and learning process is very helpful in the success of learning at UT. Tutorials (both tutorials and face-to-face) are the highest aspect in teaching and learning, namely 66.7%, although face-to-face is carried out every 3 weeks but has the greatest impact on the teaching and learning process and this shows that tutorials are still very much needed in the teaching and learning process. Writing TAPM and exams also have a big impact, namely 48.9%, this is because there is guidance in writing TAPM, from the exam side this is also a big aspect with a percentage of 48.9% because it is an evaluation of the ongoing learning process.

3.1.3 Aspects of Facilities and Learning Conditions

The facilities provided by UT during the teaching and learning process are one of the supporting factors for success in pursuing education at UT. The facility aspects in this case include (1) academic guidance, (2) guidance in facing final exams, (3) course material, (4) the diversity of study programs offered, (5) assessment system, (6) quality of learning, (7) communication with tutors/supervisors, (8) library book collections, (8) availability of teaching materials, (9) quality of the facilities offered by UT.

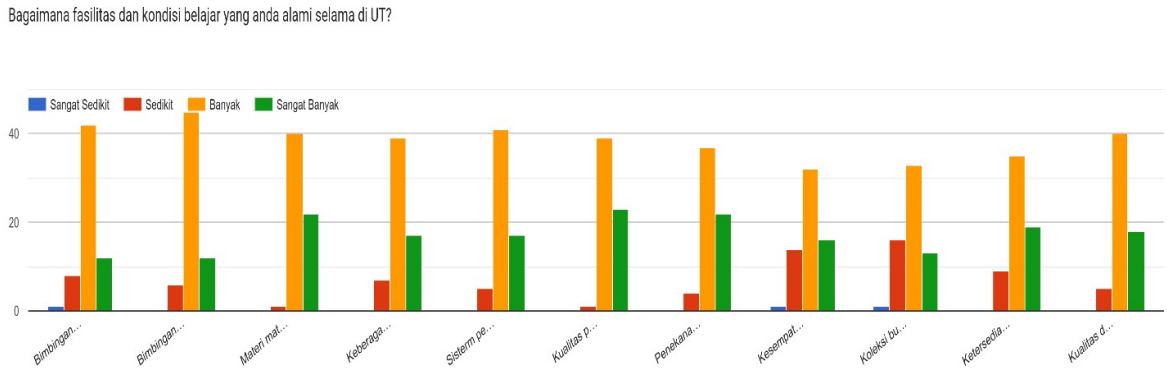

Figure 4. Learning Facilities and Conditions

Course materials provide the most positive impact on the teaching and learning process, which is 33%, for the guidance process, both in general and facing the final exam, it is a major impact felt by alumni, which is an average of above 60%. On the other hand, the availability of teaching materials provides the smallest impact on the teaching and learning process. This needs to be a concern for UT regarding the limited teaching materials or additional books in supporting the teaching and learning process.

3.1.4 Impact of Learning Experience

Based on the experience of taking postgraduate education at UT, the impact of learning experiences is reviewed from the aspects of (1) knowledge, (2) skills, and (3) attitude. Skills in this case include communication skills with superiors, subordinates and colleagues, communication skills in formal and informal forums. Skills in utilizing technology and supporting tools in work are also aspects that are assessed. Attitudes in this case include independence and self-confidence.

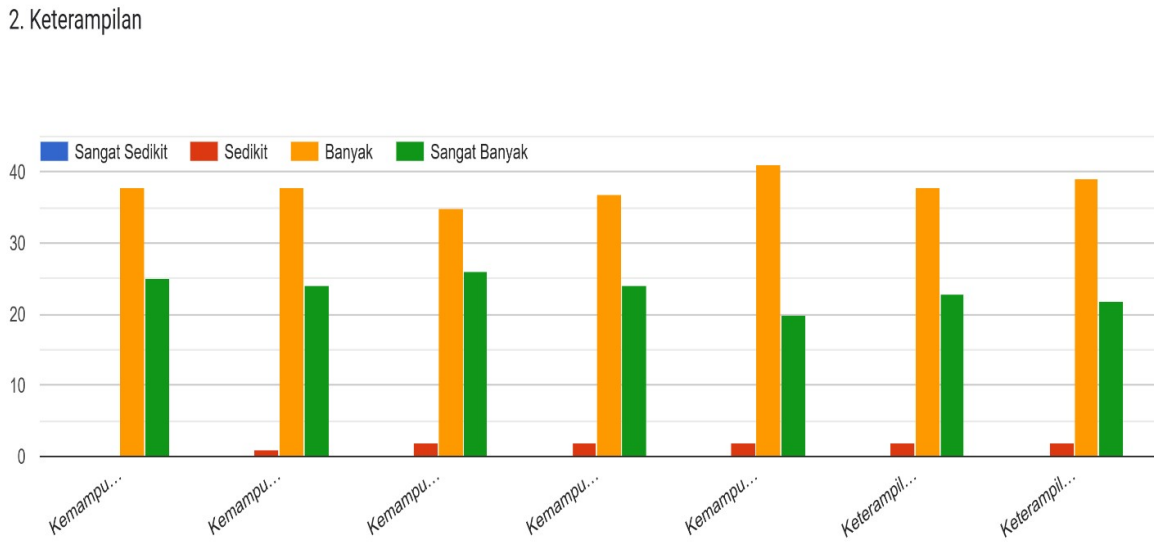

Figure 5. Impact of Learning Experience

Independent learning has the greatest impact on the learning experience at UT. Increased independence is felt to have the greatest impact on the learning experience at UT with a large percentage of 64%. In addition, communication skills, especially with superiors, are improvements obtained from the learning experience at UT. From the above findings, it shows that the learning experience at UT has a great impact on alumni, where alumni feel an increase in communication skills, increased skills, independence and self-confidence.

3.2 Superior

The purpose of finding out how far the alumni have improved after participating in the study at UT is reviewed from the following side

3.2.1 Skills

In this case, it is the ability to communicate from alumni, based on the data collected it looks like the following

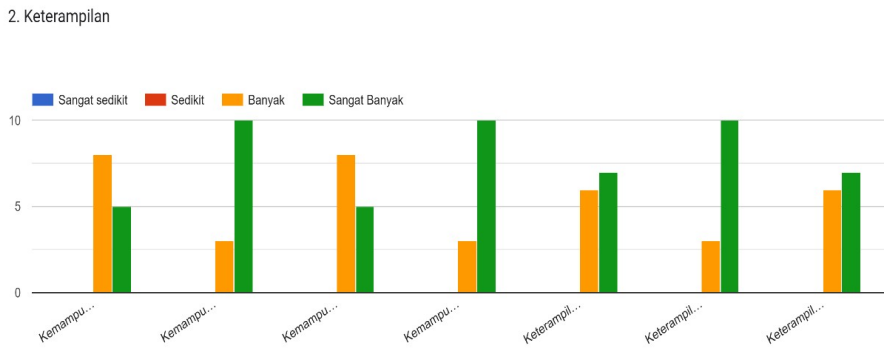

Figure 6. Communication Skills

According to the superiors, the communication skills of alumni are considered to have a great influence, especially in communicating with peers and communication in forums, both formal and informal.

3.2.2 Competence in the field of work

The ability of alumni is also measured by the ability to improve competence in their field of work, with the results of the data collected as follows:

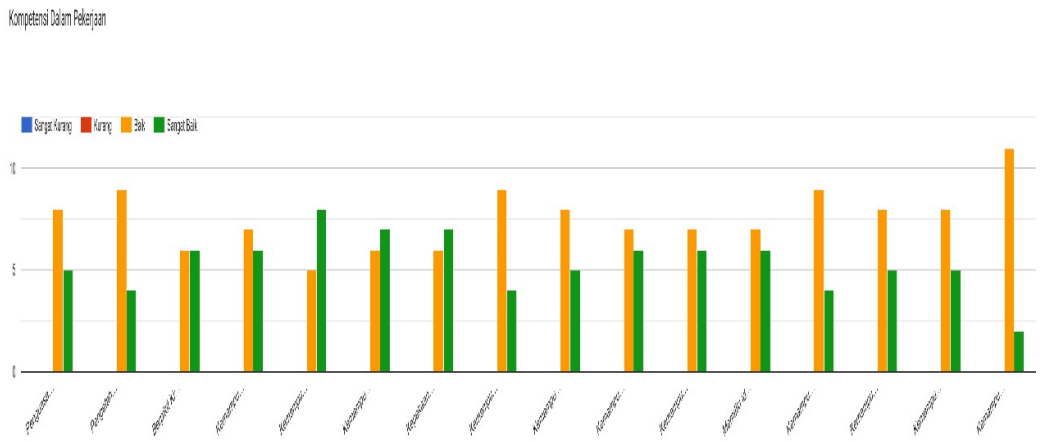

Figure 7. Competencies in the Job

In general, the diagram above shows that competence in work achieves good. This is reviewed from several sides but from another side very good such as the ability to negotiate, be able to work under pressure and be sensitive to new things shows that there is a very good performance.

3.2.3 Leadership

The ability of alumni is also measured by looking at leadership skills in their field of work, with the results of the data collected as follows:

Figure 8. Leadership

From the diagram above, we can see that in general, the ability of alumni in terms of leadership is very good both in terms of planning, management and in terms of monitoring and evaluating a job.

3.2.4 Public Speaking Ability

The public speaking ability in expressing opinions in meetings, presentations and so on with the following data processing results:

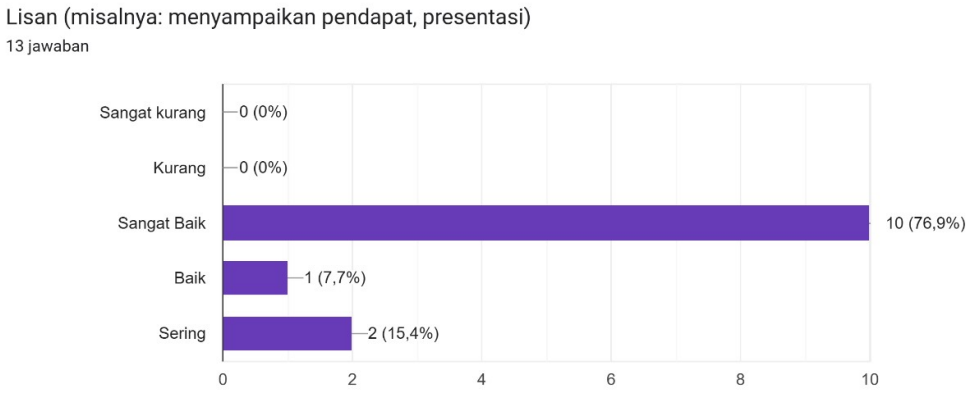

Figure 9. Public Speaking Skills

It can be seen from the diagram above that the ability of alumni to convey opinions and presentations is considered good by their superiors. This is because alumni are used to present assignments while studying at UT.

3.2.5 Utilization of Technology

The ability of alumni to utilize technology according to their superiors is as follows

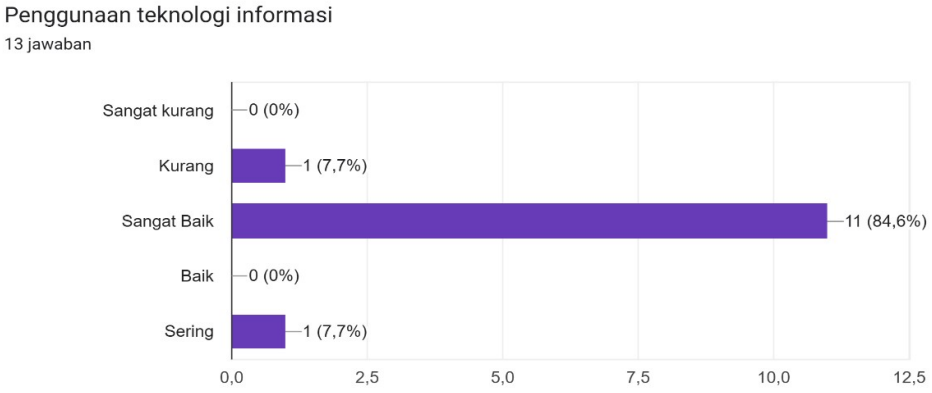

Figure 10. Utilization of Technology

The mastery or use of technology by alumni is very good considering that this is very important in supporting work. The use of this technology has been used in the learning process at the Open University.

4 CONCLUSION

UT graduates stated that the learning experience of the Master of Management Graduate Program at UT has had a positive impact in increasing independence and confidence in learning and working, improving skills in using technology, and the ability to communicate with superiors and peers. This graduate's statement is supported by the opinion of superiors who state that UT graduates are able to communicate well with their superiors and peers in both formal and informal forums. UT graduates' superiors also argue that UT graduates have excellent performance in terms of leading in terms of planning, management and in terms of monitoring and evaluating a job, also UT graduates have the ability to utilize technology, negotiate, work under pressure and be sensitive to these new things.

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THE DEVELOPMENT OF E-COMIC FOR SOCIAL ARITHMETIC LESSON AT THE ELEMENTARY SCHOOL LEVEL USING THE ETHNOMATHEMATICS APPROACH OF MAKASSAR CULTURAL PRODUCTS

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Abstract

Mathematics learning activities guided by teachers still need to meet expectations. Educators still need to implement various innovations in learning media and focus on only one source: textbooks. As a result, students experience difficulties understanding the material because object interpretation differs from reality. Educators have also begun to appreciate the use of cartoons or comics in class, which have become popular media among students. This is because reading comics or picture books that are visually appealing can attract students' attention, thereby fostering a sense of imagination in their thinking. In addition, mathematics education can be interpreted as a method to inspire students to master mathematics by connecting the mathematics material taught with local culture or existing cultural practices. This study focuses on community activities in Makassar, South Sulawesi Province, and the cultural product taken is Jalangkote. This study uses a Makassar cultural ethnomathematics approach to create an e-comic design for elementary school social arithmetic material. The ADDIE model is a development model used in e-comic Design, and the research method used is Research and Development (R&D). The ADDIE model comprises five phases: analysis, Design, development, implementation, and evaluation. The five stages are summarized into three components: planning, development, and evaluation. The initial component of this study relates to planning. Needs analysis and Design consist of the planning phase. The needs analysis stage involves gathering information to identify potential problems associated with developing electronic comic learning media. This is achieved through surveys and interviews with mathematics subject instructors. The design stage involves e-comic product planning and integrates Ethnomathematics into the storyline framework. Electronic/digital comics (e-comics) are one form of learning media that can be incorporated into everyday life and used to communicate scientific messages visually appealing or distinctively.

Keywords: e-comic, social arithmetic, learning media, ethnomathematics.

1 INTRODUCTION

Innovation in education is essential to foster student creativity. In the field, mathematics learning activities carried out by instructors are different from the expected results (Aprilla, 2020). Teachers still need to implement significant innovations in learning media and still depend on one source: textbooks. As a result, students have difficulty understanding the material because their understanding of the object is incomplete (Januarisman & Ghufron, 2016; Nurhasanah et al., 2016). The utilization of learning media in elementary schools is a critical aspect that needs the attention of educators because students at this level have limitations in understanding abstract concepts (Musafanah, 2017). Understanding the variety and characteristics of learning media is very important so that it can be used appropriately (Rohmanurmeta, 2019). Using appropriate learning media can achieve successful learning (Putri, 2017). Conversely, educators must evaluate the selected learning media's attractiveness (Lailiyah, 2020). Learning media must be selected according to student needs.

Students' cognitive abilities and structured communication skills will be enhanced through active learning. Educators also consider the use of cartoons or comics in the classroom, as they have the potential to increase understanding and interest, increase motivation to learn, improve behavior, and increase productivity and creativity. Furthermore, it has the potential to relieve tension and anxiety, increase student engagement in the learning process, and reduce boredom during learning and teaching activities (Aiman, 2020).

Students are fond of comics because they attract their attention through exciting illustrations, fostering a solid imagination (Siregar, 2019). Comics are an exciting learning medium that consists of images. Students are more involved in reading and acquiring abstract mathematical concepts when they use comics as a learning medium (Pardimin & Widodo, 2017). Comics are also permanent reading materials encouraging readers to foster curiosity (Ntobuo et al., 2018). Comics can now be accessed in electronic format along with technological advances. Electronic comics, or *e-comics*, are digital comics used to communicate scientific messages in a visually appealing and unique way (Rivai, 2021). One way to utilize learning media is to package it as a comic (Apriliani & Radia, 2020). Research by Indriasih et al. (2020) revealed that children can be encouraged to learn through *e-comic* learning media. According to Indarsih, e-comic learning media is suitable for improving the life skills of elementary school students. The application of e-comics can also facilitate access to learning materials for students in distance learning. According to the research of Adeliyanti et al. (2018), the creation of

technology-based math *e-comics* and functioning as a learning supplement for quadratic function applications developed using the 4D development model is considered a practical, effective, and valid medium for teaching mathematics.

Although technology is now more advanced, our culture must be nurtured so contextual learning can work well. The learning process can be influenced by math and culture. Indirectly, people have applied math in their daily lives. Math is one of the components of culture. Ethnomathematics is a term used to describe the application of mathematics in everyday life in a society. According to D'Ambrosio (in Dominikus, 2018), Ethnomathematics is the application of mathematics in specific cultural groups, such as ethnic groups, labor groups, professional classes, and children of a certain age. In Ethnomathematics, the culture of a society contains mathematical concepts (Sroyer, 2018). D'Ambrosio argues that Ethnomathematics in mathematics education can be defined as a method to encourage students to acquire mathematics by linking mathematical material with local culture or pre-existing cultural practices.

Social arithmetic is a math subject that examines basic number operations relevant to everyday life. If presented with educational media, this material is quite interesting for students and teachers (Friantini et al., 2020). Learning social arithmetic provides its own experience for elementary school students related to financial literacy. The science of arithmetic, social arithmetic, examines the basics of addition, subtraction, multiplication, and division and the properties of numbers (Harahap, 2010). Thus, students can implement it in their daily lives.

This study focuses on community activities in Makassar, South Sulawesi Province. The Ethnomathematics taken is Jalangkote. Jalangkote is a traditional food from the Makassar tribe in South Sulawesi. It looks like a pastel cake and is usually eaten with *samla*, a mixture of chili and vinegar. Jalangkote is a prevalent Makassarese food known since the 19th century, and it is found very easily in various places in Makassar City because of its popularity. This traditional snack is also usually sought after as a souvenir. Residents often make it a breakfast menu and a dish at various events and celebrations, not only as a snack.

Several researchers have conducted several related studies. Zaenuri and Dwidayati (2018) have started an ethnomathematics analysis and obtained the result that the concept of social arithmetic can be found as a cultural product from Semarang City. Wulandari (2020) conducted an ethnomathematics analysis on Jambi's specialties to obtain learning instruments for social

arithmetic material. The same findings were presented by Pramesti and Rasmanto (2021), who mentioned that the mathematical concept that can be integrated into the activities of the coastal community of Wonokerto, Pekalongan Regency, is social arithmetic. These findings show that social arithmetic can be found in several buying and selling activities, so further research is needed. Fitriza's research (2018) intends to reveal the mathematical concepts in the ornaments found in *Rumah Gadang* and the development of these ornaments. The study findings show that the ornament design in Rumah Gadang has the characteristics of symmetry and similarity. Rahmawati's research (2020) intends to determine junior high school student's understanding of using the Pythagorean Theorem in *Rumah Gadang*. The results showed that Minangkabau traditional houses were built using mathematical elements and concepts, especially the Pythagorean Theorem.

The formulation of the problem in this study is how to design an *e-comic* on learning social arithmetic at the elementary level with an ethnomathematics approach. This research is expected to contribute to developing interactive and fun learning media in the form of *e-comics* to facilitate a meaningful educational process for students. The ethnopedagogical approach is also used in the Design of this *e-comic*, which can increase the contextualization of learning. Based on previous studies, this designed media is the latest step in using comics with an ethnomathematics approach to Makassar cultural products, especially Jalangkote.

This research proposes an *e-comic* learning media design for elementary school social arithmetic education using an ethnomathematics approach as an open learning resource. The novelty of this research is the development of feasible and enjoyable learning media, with an ethnomathematics approach to Makassar culture with a focus on elementary school social arithmetic learning. Students' interest influences their choice of e-comic when reading comics or books with exciting illustrations that stimulate their creative thinking. Learning is also based on Ethnomathematics to foster character values. Love for one's own culture is the character value being discussed. Students can engage with the culture that is the subject of Ethnomathematics through learning mathematics associated with cultural elements that can provide new experiences.

2 METHODOLOGY

Research and Development (R&D) is a methodology used to develop e-comics. Sugiyono (2017) states that research and development is a methodology used to produce products and

evaluate their efficacy. The ADDIE model, one of the systematic learning design models, is the development paradigm for this development. This paradigm was chosen due to its systematic development and theoretical foundation in learning design. The model is structured in a way that is consistent with the requirements and characteristics of learners and is organized in a systematic sequence of activities to address learning challenges related to learning resources. This paradigm consists of five stages: (1) analysis, (2) design, (3) development, (4) implementation, and (5) evaluation. The five stages are divided into planning, development, and evaluation. The initial component of this investigation relates to the planning process. The planning part includes two stages: *analyzing* in *the* form of a *need assessment* and *designing*. The duration of this investigation is two years. In 2024, the first year will be dedicated to planning and development. The evaluation phase will be conducted in the following year. Subsequent investigations will include development, implementation, and evaluation stages.

The needs analysis stage entails gathering information to identify problems related to learning media development. This process includes interviews with math teachers to understand learners' needs in learning social arithmetic. This analysis also includes an assessment of material needs, learning objectives, and student needs and an analysis of Makassar culture related to the subject matter. Furthermore, the analysis stage involves gathering information to identify potential problems in developing e-comic learning media. Data and information collection were conducted through field observations, surveys, and interviews with mathematics subject teachers to find out the continuous learning needs of elementary school students, deliver social arithmetic materials, and gather information about their preferences and needs for social arithmetic content and relevant cultural aspects (Ethnomathematics) of Makassar. An analysis phase was conducted during this phase, including examining students' needs, learning objectives, and materials.

The next stage is Design. The design stage is an advanced phase of the analysis stage. The design stage will plan an *e-comic* product and integrate Ethnomathematics within the storyline framework. At this stage, a contextual flow is made related to integrating Makassar Ethnomathematics with social arithmetic material. To start developing *e-comic* learning media, it is necessary first to ascertain the discussion material used. At the design stage, researchers will prepare reference books, search or collect materials related to concepts and materials about elementary school social arithmetic, and compile exercise questions that will be included in the *e-comic* learning media. In addition, it is necessary to prepare the learning flow and

implementation plan of *e-comic* learning media about elementary school social arithmetic to be developed.

Data collection has been conducted based on the results of the needs analysis of teachers and students through the distribution of questionnaires and needs analysis from experts based on interviews. The next stage, which involves planning, was informed by the data acquisition results in a needs analysis. Furthermore, a literature review was conducted during this initial stage. The aim was to identify theoretical concepts that would facilitate the identification of appropriate phases of product development (Sukmadinata, 2006).

3 FINDINGS AND DISCUSSION

This research results in e-comic learning media that can be accessed using a *smartphone* named "Ethnomathematics *E-Comic*: Sahabat Jalangkote." The e-comic was made with an ethnomathematics approach to Makassar culture, namely Jalangkote. In the e-comic, a storyline raises several mathematical problems related to social arithmetic material at the elementary school level. The following section describes the research process during the first year, emphasizing the planning phase.

3.1 Student Needs Analysis

The student needs analysis stage was carried out on 35 PGSD FKIP UT Study Program students who filled out the questionnaire. The data collection stage was carried out on July 1-15, 2024, at the Universitas Terbuka, Makassar. All respondents understood social arithmetic well and could teach it effectively. Reported teaching methods included discussion (50%), lecture (50%), presentation (50%), and practice problems (100%). These diverse methods reflect the teachers' efforts to tailor teaching to students' different needs and learning styles.

Despite this high level of understanding, there needs to be more between understanding the material and effective teaching practices, as reflected in the difficulties encountered in teaching the material. This shows that theoretical understanding only sometimes goes hand in hand with the ability to communicate these concepts to students effectively. This is shown through the results of the questionnaire, where 70% of teachers use discussions, 30% use lectures, 50% use presentations, and 80% use practice problems. In reviewing the teaching approaches used, teachers generally place a strong emphasis on practice problems to deepen students' understanding. One factor that hinders students' ability to understand spatial geometry material is the number of exercises and monotonous discussions they consider less attractive.

Most teachers already use technology in teaching with tools such as whiteboards and markers, which all respondents use, and PowerPoint or ICT by 60%. However, 20% of teachers have not integrated technology into their teaching. Although most teachers already use some form of technology, such as ICT and PowerPoint, responses show these technologies have not been fully effective in overcoming the problem of students' aversion to the material. This suggests that it is essential to use technology and integrate it into teaching strategies. In using technology, it is also necessary to highlight the diversification of learning media to increase student engagement.

In the questionnaire results, all teachers experienced obstacles with the main issues, including difficulty applying concepts at 30%, students' difficulty calculating multiplication by large numbers at 30%, and a lack of exciting learning media at 40%. These difficulties highlight the importance of developing more engaging and supportive learning resources that can help overcome these barriers and enrich students' learning experiences. Introducing more engaging and innovative learning methods, such as *e-comics,* could provide a more immersive and engaging learning experience. The process of learning mathematics involves the reconstruction of concepts and principles; it is not limited to static and static learning; instead, it is a dynamic and active process (Rusnandi et al., 2016).

This shows that creative efforts are needed to adopt more interactive and exciting methods to improve student understanding. Turmudi (2008) argues that students have yet to be actively involved in learning mathematics. Furthermore, mathematics teaching is delivered in an informative way, resulting in low "engagement" among students, who receive all information from the teacher. As the subject of learning, students are less involved in identifying the concepts of the lesson that they must understand. This results in the concepts taught to students not being firmly embedded in their memories. It causes them to forget quickly and often get confused when faced with problems different from those exemplified by their teachers. Therefore, educators must develop and distribute teaching materials that encourage students to engage actively and dynamically in acquiring and understanding mathematical concepts.

Most students find math boring (Nuraini & Edy, 2017). This results in more abstract math material, which results in a more abstract learning experience. Educators need to be able to facilitate engaging, innovative, and inventive math learning activities. Learning media is one of the factors that can increase the enjoyment and interest of mathematics education. *E-comic*

media is one of the options in the learning process. Innovative learning media provides a more exciting and efficient learning experience that increases the effectiveness of the learning process (Huang et al., 2016).

Respondents' answers were also very supportive of using *e-comics,* with 90% of teachers agreeing that e-comics on social arithmetic could be used as a learning medium. These teachers were simultaneously interested in using *e-comic* in the learning process, signaling their readiness to integrate this innovative approach into their teaching. In the contemporary era, the use of technological media in the learning process dramatically impacts the learning process (Sakat et al., 2012). As a result, advanced technology can be used to create more innovative and inventive learning media. Teachers also agreed that features such as learning videos and practice questions in educational games would be helpful.

In addition, integrating social arithmetic material in *e-comics* with an ethnomathematics approach - using elements of local culture - was seen as an innovative way to make the material more relevant and exciting for students. Respondents strongly supported integrating Ethnomathematics in the e-comic through the questionnaire results, with all teachers agreeing that this approach could facilitate understanding of the material and increase students' interest in learning. In addition, all respondents agreed that social arithmetic materials should be linked to local culture or traditions through media, such as e-comics. This has proven that Ethnomathematics examines the culture of the surrounding community to bring mathematics to life in learning (Setiana et al., 2021). This makes it easier for students to understand mathematical concepts to improve their math learning outcomes.

This analysis shows teachers' strong support for using ethnopedagogy and technology in teaching social arithmetic. Creating *e-comics* focusing on aspects of local culture and economy could be an effective way to facilitate more in-depth and enjoyable learning of social arithmetic. In addition, integrating local culture through e-comics and diverse teaching approaches shows the potential to improve students' understanding and engagement.

3.2 Expert Needs Analysis

Based on interviews with experts, learning social arithmetic is considered quite tricky because it depends on numeracy and language comprehension factors.

"Currently, teaching Arithmetic at the elementary school level often still uses conventional methods, with some illustrations that are not sufficient to facilitate understanding. This calls for a more concrete method. Good numeracy skills and problem understanding are necessary to understand arithmetic material effectively. Moreover, social arithmetic taught in elementary school is closely related to mathematics used in everyday life, which is important to learn because it has many uses, including facilitating transactions in various economic activities."

This statement is consistent with research that shows students' challenges in social arithmetic are a result of their lack of language skills, which include the inability to understand or interpret questions and retell them in language. Then, there are also student challenges in the prerequisite aspect, particularly in the language aspect, which results in students failing to record what is known and required, failing to understand the concept, and failing to determine the formula. Lastly, students need help with applied aspects, specifically in the calculation process, which prevents them from concluding their responses to questions (Dila & Zanthy, 2020). Therefore, using effective learning media to understand social arithmetic material is essential. Incorporating engaging learning media into the educational process can inspire students to develop new interests and desires, increase their motivation to learn, and even introduce psychological influences (Azhar, 2017).

According to the expert's explanation, the things needed to learn social arithmetic material are the ability to read and calculate operations in dealing with the questions given.

"There are several skills needed in learning arithmetic material, namely literacy and numeracy skills, analytical skills (critical thinking), problem solving skills."

Numeracy literacy is essential for students because it can help them understand social arithmetic material. Numeracy literacy is a valuable skill that is essential for students to excel in various fields and compete on a global scale. Numeracy literacy applies to *Science, Technology, Engineering, and Mathematics* (STEM). *The Program for International Student Assessment* (PISA) is one of the international standards that can be used to assess or measure numeracy literacy (Lane et al., 2019). The latest results for 2023 were released by the *Organization for Economic Cooperation and Development* (OECD), the institution that organizes the PISA program. Indonesia did improve its math and numeracy literacy by five places; however, the score decreased by 13 points compared to the 2018 score. Indonesia's math score was 366, 106 points lower than the global average. Math literacy and numeracy are

the areas with the most limited proficiencies below level two. The percentage is *82%* (OECD, 2022). This indicates that there is still a significant need for development in numeracy literacy and mathematics education, as these are essential skills required by all individuals in the contemporary era. Numeracy literacy enables individuals to acquire, describe, analyze, use, and communicate mathematical symbols. These mathematical symbols can be used to solve problems, make determinations, and make decisions (Perdana & Suswandari, 2021; Rakhmawati & Mustadi, 2022; Sari et al., 2021).

The learning process was evaluated against the completed spatial structure material in several ways. For example, expert statements:

"The main evaluation is that most learning processes are still guided by printed books and lecture methods...Learning is also not creative because it does not utilize media or technological developments."

The material in printed books is considered less relevant because concrete examples are needed to understand social arithmetic material, which cannot be obtained only through text and images. Using *e-comic* as a creative tool to assist educators in delivering material with conventional comic visualization is expected to increase its attractiveness and facilitate understanding (Abdillah et al., 2020). This problem can be solved by utilizing e-comics as a learning medium that increases students' interest in learning and exploring abstract mathematical concepts (Pardimin & Widodo, 2017). Research by Indriasih et al. (2020) revealed that using *e-comic* learning media can arouse children's enthusiasm for learning. Indarsih also emphasized that *e-comic* learning media is appropriate for improving the life skills of elementary school children.

From the interview process, the informant (expert) gave an opinion about learning interesting social arithmetic material, namely the exploration process through concrete things to reduce learning boredom.

"Using media in accordance with technological developments."

"Interesting social arithmetic learning is by applying directly in real life reinforced with interesting props."

"Making learning interesting and meaningful for students can be done with something that is close and remembered by them, namely by utilizing gadgets and students are interested in

reading material about social arithmetic because the age in this technological era is very supportive of it."

"Arithmetic learning will be more interesting if done by utilizing interesting media that can provide illustrations to students so that learning looks more concrete."

"Learning interesting social arithmetic material should use learning media that is in accordance with the characteristics of elementary school children."

"Constructivist, reality-based learning (problem solving)."

The constructivist perspective is consistent with the concept of meaningful learning in mathematics education, as students are said to understand if they generate meaning from their experiences by establishing cognitive connections between new experiences and prior mathematical knowledge rather than simply memorizing formulas or propositions (Gazali 2016). Z.P. Dienes (in Bossé et al.) revealed that students can only fully understand a mathematical concept or principle if it is initially presented to them in a concrete form that allows them to understand the importance of manipulating objects in mathematics learning.

In addition, expert informants argue that further consideration is needed to use the ethnomathematics approach in designing materials on the learning media made.

"This is very good because through the Ethnomathematics approach it can teach local wisdom to students. Besides, it can also give appreciation to citizens in the area by promoting culture."

"Learning with ethnomatics using cultural products is also very important, but of course you have to pay attention to the suitability of the material with these cultural products. For social arithmetic material, there are several subs that can be related to cultural products and this can make learning more concrete."

This is in line with the statement that Ethnomathematics plays an essential role in the integration of technological progress and the preservation of local wisdom through the application of science (Nur et al., 2020; Nuryadi et al., 2020; Permata et al., 2021). According to Putra and Mahmudah (2021), ethnomathematics-based learning is essential in advancing science, especially for students. Using Ethnomathematics in mathematics learning will facilitate abstraction, idealization, and generalization of mathematical concepts (Widada et al., 2018). Ethnomathematics is the right choice for mathematics teachers because it integrates

local culture to ensure that mathematics can be applied in a cultural context (Ilyyana & Rochmad, 2018; Irawan et al., 2018; Manoy & Purbaningrum, 2021).

The features needed to learn e-comics material in *mobile learning* are good learning features.

"Comics must be colorful, have characters. In addition, the e-comic needs to be equipped with other media so that the e-comic is not just a comic, but a learning comic that can be used as a learning medium."

Students are very fond of comics because they attract their attention through the use of interesting illustrations, which in turn fosters a strong imagination (Siregar, 2019). Comics are also timeless reading materials that encourage readers to foster curiosity (Ntobuo et al., 2018). Thanks to technological advances, comics can now be accessed in electronic format. E-comics are used to communicate scientific messages in a visually appealing and unique way (Rivai, 2021).

After conducting the data collection stage through needs analysis from teachers and experts, the next stage is planning. The planning stage shows that e-comic media is needed for social arithmetic material to facilitate learning, improve students' math skills, and explore abstract concepts interestingly.

3.3 E-Comic Media Creation Planning

The e-comic media to be developed includes e-comics used in learning social arithmetic at the elementary school level using the Makassar cultural ethnomathematics approach. Students are allowed to choose the place and time that suits their level of learning preparation. The e-comic media offers alternative times and locations for students to learn without external pressure, which aligns with the principle of enjoyable learning. This is the advantage of digital media in terms of time and location because it allows students to access materials and information anytime and anywhere (Ally, 2009). This is because *e-comic* is a learning media that utilizes technology so that students can access information and learning materials easily wherever they are.

Utilizing the concept of *e-comic* animation to present mathematics is one approach to broaden students' horizons and accelerate the learning process. An e-comic capsule contains an entire series of stories and images. Due to their engaging educational capabilities, e-comics can increase the attractiveness of learning for students and positively impact their academic

performance. Material is more accessible for students to understand when presented in text and images designed to arouse their interest in reading. Thus, there is a need for learning media that significantly facilitates the learning process, such as e-comic learning media. The *e-comic* created explores the concept of social arithmetic by discussing various mathematical problems adapted to the narrative. The narrative produced by *e-comics* is more straightforward for students to remember and understand (Meilani et al., 2022).

4 CONCLUSION

The study findings show that using e-comic as a learning medium has great potential to increase motivation and understanding of mathematics among students by presenting materials that are not only educational but also interesting and contextual to local culture. This research enhances fun and interactive learning media design references, offering a new perspective on integrating technology and culture in mathematics education. The use of e-comic is expected to support a more in-depth and multicultural learning process by utilizing local wisdom in presenting subject matter to make the material more relevant and exciting for students.

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MOOCS: A SOLUTION OF LEGAL LITERATION FOR INDONESIAN MIGRANT WORKERS

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Abstract

Indonesian migrant workers (PMI), as Indonesia's foreign exchange heroes, require guarantees of rights, opportunities, and protection from discrimination in the implementation of employment in their host country. The implementation of PMI work in the country of employment is hampered by several legal challenges. According to data from the Indonesia Migrant Workers Protection Agency (BP2MI), the total number of PMI placements from 2024 to June 2024 was 160,496 people, with 763 complaints. PMI's legal troubles arise from a lack of legal awareness in the country of employment. Legal literacy is required for providing practical understanding about recruiting, rights and obligations, living conditions, labour, and the cultural context of the employer's home country, as well as legal aid available in the country of employment. PMI offers legal literacy classes beginning with pre-employment and progressing through pre-departure, post-arrival, repatriation, and reintegration. The present reality is that PMI still requires information to assist with adaptation in the country of employment. This is exacerbated by a lack of information for non-procedural migrant workers who wish to work without a work visa. The lack of knowledge is what leads to many legal issues for migrant workers in the country where they work. Massive Open Online Courses (MOOCs) are a revolution in the world of education. MOOCs exist to provide new learning methods and chances for potential learners to participate in learning. The widespread availability of MOOCs provides several chances for migrant workers dispersed throughout Indonesia and their home country, without regard for age, time, profession, and distance. Document review, focus group discussions, and a 'test-trial' will be used in methods. All information will be sourced from training materials, PMI Legal Literacy trial results, and the MOOCS transmission mechanism. The FGD segment will include material developers and MOOCs-related reviewers in the content preparation process.

Keywords: Massive Open Online Course, Indonesia Migrant Workers, Legal Literacy

1 INTRODUCTION

Placement of Indonesian Migrant Workers in the country of domicile often encounters various problems, both for Indonesian Migrant Workers who have permits and those who do not have permits. These problems are caused by the lack of legal literacy regarding positive national labor law in Indonesia and labor law in the country of domicile. This is exacerbated by the limited information from the PMI service company in providing the legal knowledge needed by PMI. Provision of information related to legal literacy can be done during the administrative selection process until departure.

The legal literacy education and training program for PMI has been designed with a delivery system using the 'Open and Distance' platform by adopting a 'blended-mode of learning process'. Meanwhile, strengthening the capacity of this legal literacy education program on the MOOCS platform refers to the administration system, management, delivery strategy, teaching materials, learning outcome evaluation system that has been developed and will be modified according to the specific needs of the MOOCS platform. The development of this legal literacy education program for PMI will be through MOOCS transmission offered to the wider community.

2 METHODOLOGY

This study uses an empirical methodology by considering the lack of literacy of Indonesian Migrant Workers in dealing with legal phenomena in their country of domicile. The research is strengthened by a questionnaire filled out by Migrant Workers related to gender issues and the social environment.

The population in this research and development is determined to involve Indonesian Migrant Workers spread throughout the world. A purposive-sampling system will be applied related to the MOOCS trial and the learning outcome evaluation system applied to the tutor and student groups.

The purpose of this study is to minimize the problems of Indonesian Migrant Workers in the destination country by increasing legal literacy for Indonesian Migrant Workers.

The research questions in this study are:

RQ1. What are the legal literacy needs of Indonesian Migrant Workers?

RQ2. How does the Legal Literacy Moocs system for Indonesian Migrant Workers meet the knowledge of Indonesian Migrant Workers?

3 FINDINGS AND DISCUSSION

3.1 Legal Literacy Needs for Indonesian Migrant Workers

Current technological developments have made learning based on the use of the internet (Internet of Things). The Internet of Things is a concept that aims to expand the benefits of continuously connected internet connectivity. Wide internet accessibility reaches individuals in every part of the world that is connected to the internet network. One of the means that can be utilized in the use of the internet network is to provide teaching through Massive Open Online Courses (MOOCs). MOOCs are a type of inclusive interactive education that allows students to get free access that requires students to pay attention to the information presented, read reading sources, watch interactive videos, and complete evaluations according to the specified deadline. The achievement of the material is determined by the speed of the students in receiving the material. The learning approach through the speed of each student (self-paced learning) is carried out by introducing easy concepts before entering more complex concepts.

In general, migrant workers have problems understanding legal issues related to work with their employers. The low legal literacy of migrant workers in their work relationships is a factor in the decline of migrant workers. Through Open Education and Distance Learning1 is considered appropriate to meet the expectations of PMI. Utilization of innovative learning models with easy access to wide-ranging education can be done through the open-distance learning process. Through the use of distance learning platforms, students are required to be independent and responsible in the learning and teaching process. Based on the questionnaire distributed to 110 Indonesian Migrant Workers spread across 50 countries, there are data findings that legal literacy for Indonesian Migrant Workers is important and very important to influence the comfort of Migrant Workers in Indonesia in carrying out their duties in the country of domicile with 53.6% stating it is important and 35.5% stating it is very important.

Pengetahuan gender & lingk sosial di negara domisili	Frequency	Percent	Valid Percent	Cumulative Percent	
Valid	Sgt tdk ptg	10	9.1	9.1	9.1
	Kurg ptg	2	1.8	1.8	10.9
	Penting	59	53.6	**53.6**	64.5
	Sgt penting	39	35.5	**35.5**	100.0
	Total	110	100.0	100.0	

Indonesian Migrant Workers Moocs have a positive influence in providing increased legal skills that can be developed through the UT free Moocs scheme so that its impact can be widely felt by Indonesian Migrant Workers. This is because the training provided to Indonesian Migrant Workers currently only focuses on technical work training, according to the questionnaire given to 110 Indonesian Migrant Workers, there are 62 Migrant Workers who have received training while becoming Migrant Workers, including:

No	Nama Pelatihan
1	Pelatihan Pekerja Magang Jepang
2	Upgrade Skill
3	PAP di Kantor BP3MI di Negara Asal
4	Pelatihan,Bimbingan, Pengenalan dari BP2TKI Sebelum Keberangkatan sebagai Pekerja di Negara Tujuan, Pada Tahun 2016-2017
5	Pelatihan Bahasa dan Pelatihan Praktik Kerja
6	Pelatihan Bahasa Jepang
7	Cara Memeberaihkan Kamar Mandi,Cara Beberes Rumah,Kamar Tidur,Vacum,Pasang Sprei,Cuci Wastafel,Menyetrika,Menjemur Baju Memakai Galah,Memebersihkan Jendela,Memebuat Susu Utk Bayi,Membersihkan Bitol Bayi,Memberikan Susu Kebada Bayi,Memandikan Bayi
8	Pelatihan Mesin
9	Pelatihan Bahasa Jepang
10	Ausbildung
11	Bahasa Dan Praktek Pekerjaan Rumah Yang Baik Dan Benar
12	Bahasa Dan Budaya Domisili Pekerjaan
13	Bahasa Mandarin
14	Latihan Fisik, Latihan Pembelajaran Bahasa Jepang
15	Belajar Budaya Negara Tersebuat Dan Memahami Peraturan-Peraturan Di Negara Tersebut
16	Enrich Dengan 5 Kelas,First AID St Paul, Fire Service FSA Pemadam Kebakaran HK, Dllfsa Pemadam Kebakaran HK,Kesehatan Mental,S

17	Budaya, Aturan, Dan Bahasa
18	Magang Jepang
19	Tentang Hukum,Konseling Dan Evalusi Baik Secara Online Dan Offline
20	IM Japan
21	Sebelum Berangkat Ke SG Saya Mengikuti Pelatihan Di Jakarta Tentang Safety ,Hak Dan Kewajiban PMI Dan Juga Saat Di PT Dibekali Keterampilan Bekerja Seperti Belajar Bahasa Inggris, Cara Memasak,Merapikan Rumah Dan Lain Lain.
22	Pelatihan Bahasa Korea,BST,K3
23	Pelatihan Merawat Orang Tua
24	BP2MI
25	Menjaga Diri Dari Serangan Org Jahat Dan Melakukan Pekerjaan Dengan Baik
26	Cara Kerja, Pengenalan Budaya Dan Kultur
27	Tidak Banyak, Salah Satunya Yang Masih Saya Ingat, Saya Pernah Mengikuti Training Manajemen Keuangan (TMK) Kusus Bagi PMI. Dan Itu Sangat Berguna Bagi Saya.
28	Pelatihan Dasar PMI
29	PAP
30	Rerum Novarum Center
31	Pelatihan Menjadi ART Di Hongkong
32	Saya Pernah Mengikuti Sebuah Pelatihan Di BLKDLN (Balai Latihan Kerja Dalam Dan Luar Negri
33	Cara Membersihkan Jendela Di Rumah2 Flat Atau Condominium
34	TITP
35	Pelatihan Bahasa Jepang
36	Norma" ,Bahasa ,Tata Tertib
37	Tentang Money Laundry
38	Pelatihan yang Berkaitan Dengan Pekerjaan Saya sebagai PMI/Helper
39	Seperti PAP yang diadakan Oleh BP2MI
40	Perlindungan PMI dan yang terkait dengan Nya
41	Pemagang
42	Pelatihan Bahasa,
43	Pengenalan Serta Penempatan
44	IM JAPAN
45	Training
46	Disiplin ,Jujur Dan Bertanggung Jawab dalam Membuat Kerja
47	Bahasa Jepang
48	Aturan-aturan dan Budaya Kehidupan Di Jepang
49	Pengoperasian Alat Berat
50	Norma, Budaya, dan Hukum
51	Pelatihan Budaya dan Bahasa
52	Tentang Hospitality

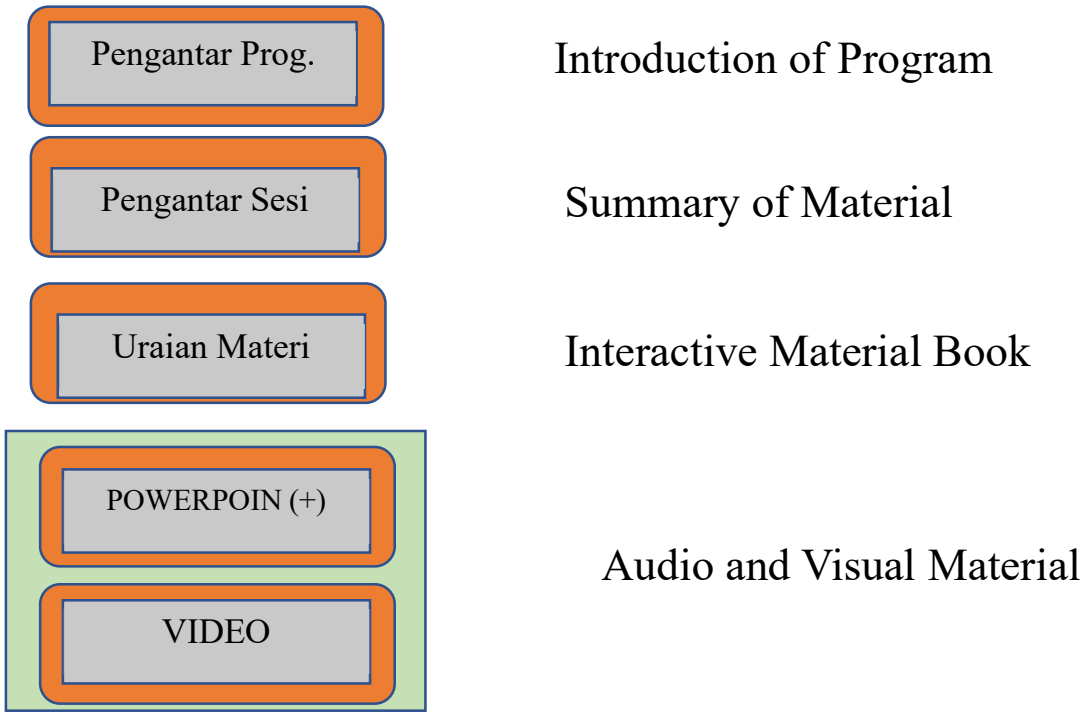
53	Hanya Dasar Tentang Menjadi Pembantu Rumah Tangga, Seperti Cara Untuk Menyapu, Mencuci, Menjemur Baju, serta Cara Untuk Membersihkan Jendela
54	Bahasa Korea
55	Pelatihan Fisik, Bahasa, dan Pelatihan Keperawatan Untuk Lansia
56	Etos Kerja Orang Di Perusahaan Jepang
57	Pelatihan Bahasa Jepang
58	Pelatihan Bahasa dan Budaya
59	Keterampilan Berbahasa Asing
60	Pelatihan Budaya, Peraturan Dan Perlindungan PMI selama Di Luar Negeri
61	Pelatihan Pemberangkatan PMI seputar Negara Malaysia
62	Safety Works

Based on the questionnaire, out of 62 Indonesian Migrant Workers who underwent training, only 10 trainings specifically explained the legal and socio-cultural literacy needs needed to deal with legal problems while in the country of domicile.

3.2 Legal Literacy MOOCS System for Indonesian Migrant Workers

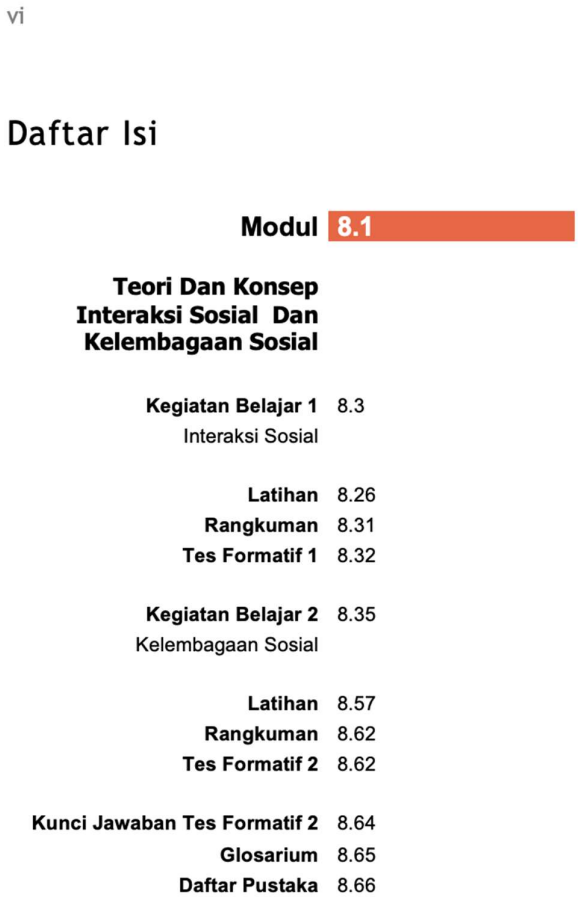
The effectiveness and sustainability of the legal literacy program for Indonesian migrant workers is highly dependent on the suitability of the curriculum, delivery system, professionalism of managers and tutors, adequacy of infrastructure and affordability of education costs, are some of the determinant factors that influence. To produce the effectiveness and sustainability of the legal literacy education program for migrant workers, the basis for its management and implementation must be based on the strength of resource utilization and internal cooperation as well as external partnership networks in overseeing the management and implementation of this literacy program. The strategy for developing and strengthening the capacity of legal literacy education programs for migrant workers requires the accuracy of innovation in the utilization of various delivery platforms such as MOOCS. The utilization of various resources, platforms and educational program schemes including methods and media in the teaching and learning process as interactive learning models will have an impact on the sustainability of the education program. The use of MOOCS can improve the self-efficacy of Indonesian Migrant Workers in dealing with problems in the country of domicile. This self-efficacy is a belief in carrying out their duties in the country of domicile in accordance with applicable regulations. This self-efficacy arises through positive generating stimulation to complete tasks or problems faced. Indonesian Migrant Worker MOOCs are designed with a Self-Paced Learning model for 8 sessions by providing Interactive Learning Materials for

students to read, after finishing reading students can continue by watching videos broadcast by content experts in the field of Migrant Workers. Students can take an assessment through a Formative Test of 7-10 questions in sessions 1-8, and a Summative Test in session 9 to get a certificate of completion.



3.2.1 Interactive Learning Materials

Indonesian Migrant Workers MOOCS uses Interactive Learning Materials that are packaged to be studied independently (self-instructional), with limited interactivity and equipped with examples so that they are easy to understand (self-explanatory). In the Interactive Learning Materials, visual or audio materials are provided to make it easier for students to carry out independent learning. Interactive Learning Materials are available in each session (8 sessions).



vi

Daftar Isi

3.2.2 Interactive Learning in Interactive Teaching Materials

lain, Aristotels salah seorang filsuf kemudian menamakannya sebagai makhluk bermasyarakat atau *zoon politicon* (SBMI, 2015).

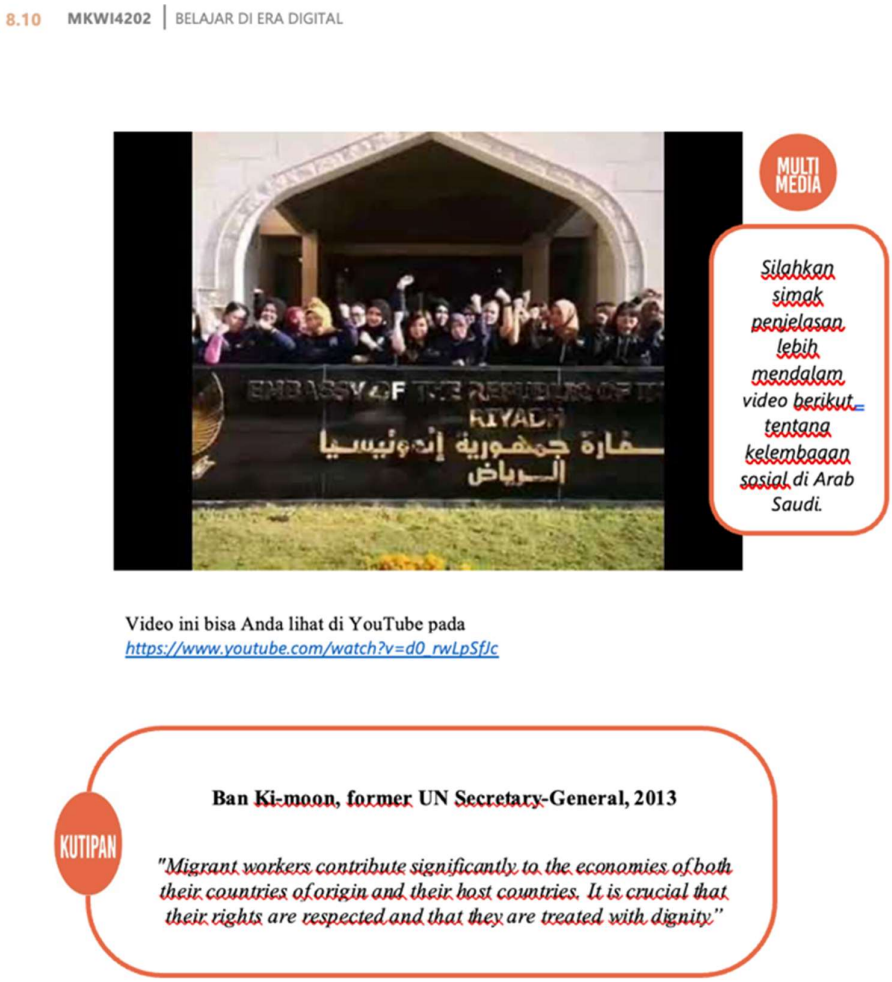
LINK

https://heinonline.org/HOL/LandingPage?handle=hein.journals/jils3&div=24&id=&page=

MULTIMEDIA

INTEXT ACTIVITIES

Setelah Anda memahami uraian materi tentang Urgensi Kelembagaan Sosial, silakan uji hasil belajar Anda dengan kerangka konsep kelembagaan sosial dikaitkan dengan urgensinya bagi TKI dan terutama peran SBMI di Arab Saudi.



3.2.3 *Learning Videos*

Videos are materials that students must complete before completing the formative test in each session.

4 CONCLUSION

The need for MOOCS is very much needed by Indonesian Migrant Workers based on a questionnaire given to Indonesian Migrant Workers, stating that legal literacy training is very important in providing comfort for Indonesian Migrant Workers to work in their country of domicile. The Moocs system offered uses a self-paced learning method that adjusts the speed of students in carrying out independent learning. Students will complete interactive teaching materials followed by videos that will end with formative and summative tests.

MODERNIZING THE UT REGIONAL ARCHIVAL LAB WITH THE CONTINUUM RECORD CONCEPT FOR VOCATIONAL STUDENTS

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Abstract

This study explores the modernization of the archival laboratory at Regional Universitas Terbuka (UT) using the Continuum Record concept to enhance the practical skills of students in the Vocational (D4) Archival program. Employing a qualitative research approach, the study examines the implementation of the Continuum Record concept within the laboratory setting, focusing on its impact on the students' archival work practices. Data were collected through interviews, observations, and document analysis involving students, instructors, and laboratory staff. The findings reveal that the integration of the Continuum Record concept significantly improves students' understanding of archival processes, facilitating a more seamless transition from theory to practice. The modernization efforts not only enhance the practical learning experience but also ensure that the laboratory meets contemporary archival standards, thereby better preparing students for professional roles in the field of archiving. This research underscores the importance of aligning educational infrastructure with current industry practices to support effective vocational training.

Keywords: Archival Laboratory Modernization, Continuum Record Concept, D4 Archival Program.

1 INTRODUCTION

Universitas Terbuka (UT), established under Presidential Decree No. 41 of 1984, is Indonesia's 45th state university and pioneers in open and distance learning (ODL). As a public institution, UT aims to democratize access to higher education across the vast archipelago, including marginalized and remote communities, as well as Indonesian citizens living abroad. This mission aligns with the global trend toward increased accessibility in education, reflecting findings by Guri-Rosenblit (2005), who highlighted the transformative potential of ODL in promoting educational equity.

The flexibility of UT's educational system is facilitated by advancements in information and communication technology (ICT), which allow students to engage with learning materials anytime and anywhere (Kirkwood & Price, 2014). However, while UT provides a diverse range of academic programs through its four faculties, including the Faculty of Law, Social Sciences,

and Political Science (FHISIP), the quality of practical learning experiences remains critical for vocational programs, particularly in the field of archiving.

The D4 Archival study program at UT emphasizes practical learning, with 60% of its curriculum focused on hands-on experience. This approach is supported by the standards set by the National Archives of the Republic of Indonesia (ANRI), which outlines necessary competencies for effective archival management (UU No. 43 Tahun 2009). Previous studies, such as those by Singh (2018), underscore the importance of practical training in archival education to prepare students for the demands of the profession. However, a gap exists between the theoretical knowledge imparted in academic settings and the practical skills required in real-world archival environments.

To address this gap, the modernization of the archival laboratory at the Jakarta Regional UT is essential. By implementing the Continuum Record concept, which emphasizes the ongoing management of records throughout their lifecycle, the proposed laboratory aims to create a comprehensive training environment that enhances students' practical skills while ensuring compliance with national archival standards. The significance of this approach is corroborated by research conducted by O'Leary (2017), which advocates for innovative archival education models that integrate modern technology and methodologies.

Thus, this study seeks to explore the potential of a modernized archival laboratory to facilitate effective practice opportunities for D4 Archival students at Universitas Terbuka, ensuring that they are well-equipped to meet the challenges of contemporary archival management.

2 METHODOLOGY

This research employs a qualitative approach, focusing on the experiences and perspectives of D4 Archival students at Universitas Terbuka (UT). Qualitative research is particularly suited for exploring complex phenomena, allowing for a deeper understanding of participants' insights and experiences (Creswell & Poth, 2017). In this context, the study aims to investigate the challenges students face in accessing practical training opportunities within the archival program, as well as the potential benefits of modernizing the archival laboratory.

The study utilizes descriptive qualitative analysis, which seeks to provide a comprehensive overview of the current state of archival practice education at UT. According to Mohamad Ali (1982), descriptive research is effective for understanding contemporary issues by systematically gathering and analyzing data. This method enables researchers to capture a rich,

contextual understanding of students' experiences, highlighting specific challenges and needs related to practical training. The target population for this study includes all D4 Archival students enrolled at Universitas Terbuka. A purposive sampling technique is employed to select participants specifically from the UT Jakarta campus, which has been identified as having the necessary infrastructure and standards for archival practice. This focus allows for a detailed examination of a specific context where the modernization of the archival laboratory is particularly relevant.

Data collection involves the use of semi-structured questionnaires designed to gather qualitative insights from students. The questionnaire includes open-ended questions that encourage participants to express their thoughts and experiences regarding several aspects. Students are asked to describe their experiences in obtaining practical training opportunities and any challenges they face in doing so. Additionally, participants are invited to share their expectations for a modernized archival laboratory and how it could enhance their practical learning experiences. They are also prompted to discuss their understanding of the Continuum Record concept and its perceived value in their education and future careers. The questionnaires are distributed online using Google Forms, facilitating easy access for participants and ensuring a wider reach. The online format also allows for anonymity, encouraging students to provide honest and candid responses.

After collecting the complete questionnaires, the data undergoes a systematic analysis process. Initially, open-ended responses are transcribed for analysis to ensure that participants' voices are accurately represented. The responses are then coded using thematic analysis, a method that involves identifying patterns and themes within the data. This process helps categorize students’ experiences and insights, making it easier to draw conclusions. Key themes emerge from the coded data, reflecting common challenges faced by students and their expectations for a modernized archival laboratory. This thematic approach allows the researcher to organize findings meaningfully and to present them in the context of existing literature on archival education.

The study adheres to ethical guidelines to ensure confidentiality and anonymity of participants. Informed consent is obtained before distributing the questionnaire, and students are assured that their responses will be used solely for research purposes. This ethical framework fosters trust and encourages participation, ensuring the validity and reliability of the findings. While

qualitative research provides rich insights, it also has inherent limitations. The findings may not be generalizable to all D4 Archival students across Indonesia due to the specific focus on UT Jakarta. Additionally, the reliance on self-reported data may introduce biases, as participants may present their experiences in a manner they perceive as favorable.

3 FINDINGS AND DISCUSSION

The survey conducted at UT Jakarta revealed several key findings regarding the state of the archival laboratory and students' experiences with practical training. These findings provide valuable insights into the challenges faced by D4 Archival students and highlight the potential benefits of modernizing the archival laboratory using the Continuum Record concept. One significant finding is the successful implementation of Official Document Management (TND) within the archival laboratory at UT Jakarta. The laboratory has established proper procedures for managing official documents, which is crucial for ensuring the integrity and accessibility of archival materials. This finding aligns with the importance of standardized document management practices highlighted by Roper (2016), who emphasizes that effective document management is essential for maintaining the authenticity of archival records.

Another notable result is the presence of a systematic classification approach for organizing and storing archives. Students reported that this classification system significantly enhances the usability of archival materials, allowing for efficient retrieval and management. This observation is consistent with the work of Duranti (2015), who argues that a well-defined classification system is vital for compliance with legal and regulatory requirements in archival practice. The study also found that UT Jakarta has enacted a retention schedule for archival materials. This includes processes for transferring archives to the archives unit and systematically destroying obsolete records. Such practices are aligned with the principles outlined in the National Archives Regulation, which stresses the importance of managing the lifecycle of records (UU No. 43 Tahun 2009). Kahn and Lentz (2019) support this finding, showing that adherence to retention schedules is critical for preserving the authenticity and reliability of archival materials.

Furthermore, the laboratory has established an access security classification system that allows authorized personnel to validate and access important documents. This security measure is vital for protecting sensitive information and ensuring controlled access to archives. Previous studies, such as those by Bastian (2014), underscore the necessity of implementing robust

security protocols to safeguard archival collections and maintain public trust in the archival process.

Despite these positive findings, the study revealed several challenges that hinder students' practical training experiences. Many students reported difficulties in securing adequate practice opportunities in external organizations due to logistical issues and the limited availability of certified archival facilities. This gap between theoretical knowledge and practical application reflects findings from previous research. For instance, a study by Tallman and Robinson (2018) emphasizes the importance of hands-on training in archival education, noting that many programs fall short in providing students with sufficient real-world experience. The students' challenges at UT Jakarta highlight the need for a dedicated and modernized archival laboratory that can serve as a practical training ground, bridging the gap between classroom learning and practical skills application.

The modernization of the archival laboratory, particularly through the implementation of the Continuum Record concept, presents a viable solution to these challenges. This approach emphasizes the continuous management of records throughout their lifecycle, aligning with contemporary archival practices focused on accessibility and usability (Webber, 2019). By adopting this framework, the proposed laboratory can provide students with an integrated learning environment that reflects real-world archival scenarios and enhances their readiness for future employment. Moreover, the findings underscore the importance of collaboration between educational institutions and archival organizations. Previous studies have shown that partnerships between academia and professional organizations can significantly enhance educational outcomes by providing students with access to resources, mentorship, and networking opportunities (Voss & Skagen, 2020). Establishing partnerships with local archival institutions could further enrich the practical training experiences of D4 Archival students at UT, ensuring they graduate with the necessary skills and competencies demanded by the job market.

In conclusion, while the findings reveal a solid foundation for the archival education program at UT Jakarta, they also highlight significant challenges that need to be addressed. Modernizing the archival laboratory using the Continuum Record concept and fostering partnerships with professional organizations can significantly enhance the practical training experiences of D4 Archival students, ultimately preparing them for successful careers in the archival field.

4 CONCLUSION

In summary, Universitas Terbuka (UT) has established a solid foundation for its D4 Archival program, with practices that align with national standards and international best practices. The successful implementation of official document management, a systematic classification approach, a retention schedule for archival materials, and a security classification system reflects the institution's commitment to providing high-quality archival education. However, despite these positive attributes, significant challenges persist, particularly regarding students' access to practical training opportunities in external organizations.

The findings of this study have significant implications for both the D4 Archival program at UT and the broader field of archival education. The identified challenges highlight the need for a modernized archival laboratory that aligns with contemporary practices and enhances the practical training experiences of students. Moreover, the successful implementation of the Continuum Record concept within the laboratory could serve as a model for other archival education programs seeking to integrate innovative approaches into their curricula. Additionally, fostering collaborations between UT and local archival institutions may create more opportunities for students to gain hands-on experience and build professional networks. This collaboration is critical for bridging the gap between theoretical knowledge and practical skills, ultimately enhancing the employability of graduates in the archival field.

This study has several limitations that must be acknowledged. Firstly, the research focuses specifically on the D4 Archival students at UT Jakarta, which may limit the generalizability of the findings to other regions or institutions within Indonesia. Additionally, the reliance on self-reported data through questionnaires may introduce biases, as students may provide responses that they believe are favorable or that align with expected norms. The qualitative nature of the research also means that findings are interpretative and may not capture the full spectrum of experiences among all students.

Based on the study’s findings, several recommendations can be made. First, it is essential for UT to prioritize the modernization of the archival laboratory by adopting the Continuum Record concept. This initiative should include the development of state-of-the-art facilities and resources that facilitate practical training and ensure that students are well-prepared for their future careers. Second, UT should actively seek partnerships with local and national archival organizations. By establishing these collaborations, the university can provide students with

opportunities for internships, mentorships, and networking that are vital for their professional development. Such partnerships can also enhance the practical training curriculum, aligning it with industry needs and best practices. Lastly, ongoing research should be conducted to evaluate the effectiveness of the new laboratory and training programs once implemented. Continuous assessment will provide valuable insights into the evolving needs of students and the archival profession, ensuring that the D4 Archival program remains relevant and effective in preparing graduates for successful careers in the field.

In conclusion, while the D4 Archival program at UT has made commendable strides in archival education, addressing the identified challenges through modernization, collaboration, and ongoing evaluation will significantly enhance the practical training experiences of students. By doing so, UT can continue to fulfill its mission of providing accessible and high-quality education, ultimately contributing to the growth and development of the archival profession in Indonesia.

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TRANSFORMATION OF AUDIO VISUAL USES FOR DISTANCE LEARNING MEDIA

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Abstract

Audiovisual media in archival science are archives containing images, sounds, or video recordings that can be seen and heard. Audiovisual media are included in non-textual archives and are collected in audiovisual archives. According to Law Number 43 of 2009 concerning Archives, static archives are archives of historical value originating from various archive-creating institutions to be preserved, such as archives about the history of the establishment of institutions, tasks, functions, organizational structures in various forms and formats, printed or electronic.

Audiovisual media is one way for educators to optimize the learning process. Audiovisual media can help educators to make it easier to convey material to students. By utilizing these audiovisual archives, students can understand the journey of social change, environmental change. The purpose of this study is to describe the function of audiovisual archives in the learning process, especially regarding environmental and social changes that occur in Indonesia. The research methodology used is library methodology. The author collects various kinds of data related to audiovisual-based learning media in distance learning, then summarizes and includes them in this article. The results of data processing show that the use of audio visual archives is very necessary in learning, because the material in this audio visual displays the reality of its time, so that social and environmental changes can be known from the chronology of events that occur and the changes that exist.

Keywords: audio visual archives, use of audio visual archives, social and environmental changes, and distance learning media

1 INTRODUCTION

The world of education from time to time continues to experience evolution in terms of curriculum, learning design, and even learning devices. This is done because of the increasingly complex educational situation in this case, students, both due to their environment and the effects of globalization. During the Covid-19 pandemic, including in the world of education, the changes that occurred had a major impact. Formal educational institutions from

kindergarten to university level have transformed their learning methods, from conventional methods that often conduct face-to-face sessions in class to implementing online learning methods or distance learning (PJJ). Based on the law on higher education number 12 of 2012, article 31 explains that distance learning (PJJ) is a teaching and learning process that is carried out remotely through the use of various communication media. Distance learning really needs the help of technology to support the learning process.

Online learning is learning that utilizes multimedia technology, video, virtual classes, animated online text, voice messages, email, conference calls, and online video streaming. The process of implementing information technology in learning certainly requires human resources who can design systems by pouring out ideas for the digitalization process of education. In designing a digital education system, reference sources are needed that can be understood by students and educators and this is where the role of audio-visual archives or new media archives is in providing teaching materials that will be used by educators.

The use of technology in education begins with the selection of learning media based on information technology in the learning process so that the process of introducing technology can be carried out systematically. Learning media is an intermediary tool between educators and students in learning, (Mustaqim, Ilmawan, 2016). Basically, learning media has the main function of being a source of learning and becoming a distributor, conveyor, connector and so on. (Rohman and Amri, 2013).

One of the learning media that can be used in the learning process is audio visual. Audio-visual media is a type of media that in addition to containing sound elements also contains image elements that can be seen, for example video recordings, films, sound slides, and so on, (Wina Sanjaya, 2010 in Yulianti 2016). The learning media applied in learning can be adjusted based on the learning material taught using audio-visual media.

By utilizing audio-visual archives stored in the UT Archives Institute, social and environmental changes that occur can be known. Social changes, for example, learning methods to agricultural management methods that can be said to be still traditional. These audio-visual archives can provide a concrete explanation of people's lives in 1985 where communication was still limited to equipment that used cables such as telephones, facsimiles. While today's communication media is very modern and complex.

Problem formulation: how are audio-visual archives utilized in the distance learning process?

2 LITERATURE REVIEW

2.1 Audio Visual Archives

Audio visual archives or commonly called audio archives are archives in the form of images and/or sounds of any shape and pattern, which can be seen and heard. This type of archive is then grouped into:

1. Moving image archives, namely archives whose information is recorded in moving image media such as motion pictures and videos;
2. Static image archives, namely archives whose information is in the form of still images such as photos, slides, pictures, and posters;
3. Sound recording archives, namely archives whose information is recorded in sound signals using a certain recording system;
4. Microform archives, namely media containing miniatures or microform images. This form is called microfilm and microfische.

Based on the understanding and description above, what is grouped into audio visual archives is:

1. Sound recording/cassette archives,
2. Photo archives,
3. Film and microfilm archives,
4. Video archives.

2.2 Utilization of Audio Visual Archives as a Means of Tracing Social and Environmental Changes

Social and environmental changes in society basically experience a cyclic or repetitive process, although not exactly the same. In prehistoric times, people used oral/auditory and visual modes, directly and simultaneously when communicating with each other. In the following period, humans began to develop analog scratches from various objects they saw in the surrounding environment. For example, animal-shaped scratches carved on rocks in caves, or human figure carvings on temple stones. Drastic changes occurred when humans began to use symbols and textual codes to represent a communication message.

When the printing press was invented, the developments that occurred in society were so rapid, graphic media such as newspapers, books, magazines, posters and so on were easily distributed across regions. Before the invention of the telephone, voice recorder, and then radio, the reach

of audio as a mode of communication was very limited by the ability of people to shout on one side and the ability of people to hear on the other. However, when the telephone, voice recorder, and radio were invented, the messages that people wanted to convey could be conveyed across unlimited distances. Similar to graphic media, the invention of the sound recorder also allows audio messages to be used across time.

When images and sound can be recorded simultaneously (film, video), and can be transmitted (television), then we seem to return to the era when people communicated with oral/auditory and visual modes, directly and simultaneously. It's just that the mode can now be done across space and across time.

The development of technology and information at this time is very advanced and modern as explained above, has an impact on the world of archives. Where this causes changes in the use, storage, management and utilization of archives by the community. Currently, archives can be in the form of digital archives or new media archives, which in other words can be called audio-visual archives.

The use of audio-visual archives cannot be separated from the importance of documentation of an event in capturing important realities in the daily life of a community. Through audio-visual media, all social and environmental changes that occur can be archived and used on other occasions.

In the management of audio-visual archives, especially since UT was founded, there is various information that illustrates the state of society in the 1985 era, learning methods to methods of agricultural management that can be said to be still traditional. This audio visual archive can provide a concrete explanation of people's lives in 1985 where communication was still limited to equipment that used cables such as telephones, facsimiles. While today's communication media is very modern and complex. By using wireless electronic devices, someone can communicate, do work wherever they are. Regarding agricultural management, agriculture in 1985 was still traditionally managed, but currently agricultural management has shifted to the level of agricultural industry. Where with relatively few human resources but large volume agricultural products.

2.3 Transformation of Audio Visual Utilization in Distance Learning Media

According to the Big Indonesian Dictionary (KBBI), the word transformation means a change in terms of appearance (physical, benefits, and so on). The word transformation comes from the word transform in English, which means control from one form to another. It can be said that transformation is a change from its original form to a better form, due to certain factors. Meanwhile, Audiovisual is a media that contains elements of images and sound. The advantages of this one media will certainly seem more communicative, because the output can be seen visually and heard auditorily. Another definition of audiovisual is a set of tools that can project moving images and sound. From the brief description above, it can be concluded that the transformation of audiovisual utilization is a change in the tools for conveying information or material from teachers to students from conventional or traditional forms to forms that can be heard and seen simultaneously online from separate places and there is no direct face-to-face interaction/communication so that it requires digital media technology. Distance Learning/Education was first introduced in 1728, in Boston, United States for a stenography course. Caleb Philipps advertised in the Boston Gazette a private stenography course for those who wanted to learn through weekly lessons via post. The presence of the Postal Service was the main key in Distance Education at that time. Then in 1840 Sir Isaac Pitman, known as the Father of Distance Learning, offered a short correspondence course, the method of which is still used today.

When information and communication technology developed, educators used radio and film to distribute educational content. The University of Wisconsin coined the term 'distance education' in 1892, and began recording lectures and sending phonographs in 1906. Telephone technology also played a key role; a telephone-based instructional course for doctors was introduced in 1965 by the University of Wisconsin.

Radio became the first medium to facilitate distance learning on a mass scale, various licenses were issued to create educational radio broadcasts that allowed students to learn from different and distant locations to study simultaneously, and learning support materials were sent via post, students then listened to the explanations given by the teacher at the time provided. The University of Iowa broadcast instructional content as early as 1934. In 1953 the University of Houston made distance learning history by offering the first televised lecture class on KUHT (now HoustonPBS). KUHT ran distance learning materials every week on the program "The Channel That Changes You". Many courses were broadcast in the evening so that participants

who worked during the day had time to view the materials. In 1969, the Open University was established for the first time by the British Labor government under the leadership of Harold Wilson which was dedicated exclusively to the implementation of distance learning and changed the face of British higher education.

In 1983, when ARPANET became public consumption, computer users increased rapidly, including Educational Institutions, the first online learning program was launched in 1985, and started from a virtual university organized online by the Open University of Catalonia. then in 1991. Before the outbreak of the Covid-19 outbreak, the Distance Learning system was not yet very popular among Educational Institutions, and was only limited to Educational Institutions that had initially organized a distance education or learning system, for example the Open University (UT). Educational Institutions at that time still used conventional methods, namely through face-to-face learning where students and teachers were in the same class, but since the outbreak of the Covid 19 outbreak throughout the world, the concept of Distance Learning (PJJ) has become commonplace in the world of Education, where in a situation that threatens the health of the entire community requires all teaching staff to teach online or online, and this is in accordance with the circular of the Ministry of Education and Culture (Kemendikbud) No. 4 of 2020 concerning the implementation of education policies during the emergency period of the spread of Coronavirus Disease (Covid-19) related to the learning process states that learning from home through online/distance learning is carried out to provide meaningful learning for students. Online learning is learning that utilizes multimedia technology, videos, virtual classes, animated online texts, voice messages, emails, conference calls, and online video streaming. The use of various distance learning media opens up new opportunities to create diverse, interesting, and interactive learning experiences. By utilizing this technology effectively, distance education can be more inclusive, inspire students to learn, and help them reach their full potential in the digital age.

3 RESEARCH METHODOLOGY

Literature Review is a research method used by the author in this article. In this article, the author examines the utilization and use of audio-visual learning media in distance learning media. The data presented by the author is obtained from data sources such as modules, articles and scientific journals. The data obtained by the author will be reviewed and written in this article after going through the Analysis process.

The results of this study indicate that audio-visual-based learning media can make it easier for students or learners to understand learning and can make it easier for educators to deliver lessons. And the material in this audio-visual displays the reality of its time, so that social and environmental changes can be known from the chronology of events that occur and the changes that exist.

4 RESULTS AND DISCUSSION

4.1 Selection of Learning Media

In the learning process, educators must plan and prepare in advance before creating learning media. Learning objectives are the objects that are used as the main reason for presenting learning media. Learning objectives can certainly be maximized if the learning model carried out or applied by educators is carried out properly. The correlation between learning media and learning models is certainly very close in order to achieve learning objectives. Some criteria in selecting learning media include:

1. Learning media must be in accordance with the learning objectives to be achieved.
2. Affordable price.
3. Skilled human resources
4. Grouping the right targets from learning objectives

4.2 Audio Visual Media

Audio-visual based media has an important role in the learning process. Audio visual media is used to make it easier for students to understand a teaching material.

4.3 Audio Visual Learning Media

Audio-visual based learning media has several examples:

1. Reality media, this media is a real object that does not have to be presented in the classroom but students are able to see the object directly. Like the atmosphere outside the classroom.
2. Model, this learning media is a three-dimensional imitation object that is a representation of the real object.
3. Graphic Media, This media provides learning through visual symbols, such as photos, sketches, diagrams, charts, and graphs.

4.4 Development of Audio Visual Learning Media

Development of learning media is the process of designing, creating, and developing a product that aims to channel lesson information (learning materials) from the sender in this case educators to the recipient of the message in this case students so that it can attract the attention of the students.

4.5 Use of Audio Visual-Based Learning Media

Among the functions of visual learning media is to facilitate learning and attract students' interest in teaching and learning activities or processes.

5 CONCLUSION

In today's technological era, learning media plays a very important role in the education process. Learning media is now transformed into a more modern one, namely using network technology devices, which utilize the internet. The existence of this new media can be utilized in the world of education as a tool that can carry out virtual learning or virtual classes. This phenomenon brings education to a new color, learning that is usually carried out in a real room at school, but with virtual classes, learning can take place in each room or house with a distance. (Abd. Rahim Mansyur, "The Impact of COVID-19 on Learning Dynamics in Indonesia", in the Eljuour Journal: Education and Learning Journal, Vol. 1, No. 2, July 2020, 119.)

The use of audio-visual media in distance learning is related to the senses of sight and hearing of students so that it can make the abilities of students' senses more effective and easily capture material raised in the audio-visual media so that it helps educators to achieve learning goals. The use of audio-visual media in distance learning certainly has advantages and disadvantages. Therefore, it is necessary to consider several important aspects that can support the maximum success of this method.

To achieve success in the learning process using audio-visual media, it is recommended that:

1. Provide learning experiences for students;
2. If you are going to use audio-visual media, the video should be adjusted to the material and development level of the students;
3. Prepare the condition of the students before showing the video;
4. Follow up by giving questions to students related to the video.

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UNLOCKING THE FUTURE: HOW EDUCATIONAL DATA MINING IS SHAPING MARKET SEGMENTATION

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Abstract

In an organization that wants to remain sustainable in its business, one of the important factors is to have good data management. Many of the organizations that have big data are "rich in information but poor in knowledge". Data processing that is complex and difficult to predict is a challenge in the field of data mining. A lot of data is available in the education system but there is a lack of effective analysis tools to find hidden relationships and trends in a data. The use of various techniques can be done to produce valuable information that can support a decision in an organization. The data calculation uses the Growth Ratio and Naïve Bayes Classifiers (NBC) data mining techniques. The method proposed in this study utilizes data obtained from the data of the national high school of the Ministry of Education and Culture. Based on the results of the analysis through the calculation of the growth ratio of grouping per region nationally with the projected percentage of absorption of high school graduates nationally of 1.2%, so that the projected absorption of high school graduates in 2024 is 7.2% and in 2025 of 8.4% and 9.6% in 2026, reflecting the increase in the projection of new students of the Universitas Terbuka that occurred in that period.

Keywords: Data Mining, Growth Ratio

1 INTRODUCTION

In the era of increasingly advanced technology, especially the development of Artificial Intelligence, it makes it easier to complete work, especially those related to data. The level of accuracy of a data is needed in daily life. Every information that exists is important to determine every decision in a certain situation. This causes the provision of information to be a means to be analyzed and summarized into knowledge from data that is useful when making a decision. Data mining is the extraction to obtain important information that is implicit and previously unknown from a data (Witten, 2011). Data mining is an activity that includes the collection and use of historical data to find regularities, patterns and relationships in large data sets (Santosa et al., 2007). Data mining is an activity that includes the collection and use of historical data to find regularities, patterns and relationships in large data sets. Data mining is also an extraction of interesting (non-trivial, implicit, previously unknown and potentially useful) pattern of

knowledge from huge amount of data (Han et al., 2006). By using data mining, each data collection or warehouse can provide important knowledge that becomes very valuable information for an organization, such as in an educational organization.

The Open University is a Legal Entity State University established by the government with the status of an autonomous public legal entity. UT has achieved the highest class in the form of a state educational institution through Government Regulation No. 39 of 2022 concerning State Universities, Legal Entities of Open Universities, Open Universities are now increasingly strengthening their milestones to become an institution that provides distance education with increasingly high quality. Especially since UT has changed its status to a Legal Entity State University (PTN-BH). Currently, many universities are implementing education by implementing a distance learning system because after the post-COVID-19 pandemic and the community's attitude towards education that implements a distance learning system has become better. As has been conveyed by Prof. Ojat Darojat, M.Bus., Ph.D that the implementation of distance education is no longer a monopoly market of the Open University, which has become a perfect competition market for other universities. Currently, the distance education system is an education trend because with increasingly advanced technology, it can make it easier for all educational institutions to implement a distance learning system. Accuracy in market segmentation in getting prospective new students is very necessary where market segmentation is an effort needed to improve the accuracy of marketing in an organization or company so that it can make it easier for businesses to run marketing programs or approach customers (Kotler, 2012). To face technological developments and the growing development of every higher education institution in implementing a distance learning system, the Open University must be quick in responding to these changes, one of which is by utilizing its big data which is an important asset for the university. The big data must be managed properly in order to provide important information and knowledge, especially in the main sectors, namely the recruitment of prospective new students.

The recruitment process is one of the important functions of the human resources department and is the first step towards the creation of competitive strength, while in campus recruitment it is the main recruitment mode for new talented graduates (Sivaram et al., 2010). In fact, a lot of data that is Big Data in a system in an organization has not been utilized optimally and converted into more useful knowledge, especially for predicting the future. Most of them are

just statistical data to see the development of a data. For this reason, further research related to data mining on big data is needed. Data mining is a tool to strengthen the perception of data.

This study aims to analyze and process national data that has graduated from high school which is a national big data that may be rarely touched and is expected to describe an important and useful information for the recruitment process of new students at the Open University. All data in the national data of high schools is used as data attributes. In this study, analysis and processing using data mining techniques with Growth Ratio. The expected benefit of this research is to provide knowledge to the Open University in mapping prospective new students from various regions in Indonesia.

2 METHODOLOGY

The research uses a quantitative approach that aims to achieve an understanding of how it is properly constructed and built and how it works (Berndtsson et al., 2008). The type of data used in this study uses primary and secondary data. Primary data in this study were obtained directly through the process of interviews, observations, triangulation, surveys and questionnaires. As for secondary data, it was obtained through coordination with the data team of the Ministry of Education, Culture, Research and Technology. The data was processed using the growth ratio formula to see the growth of the data. The subject of this study is data operators. Meanwhile, the object of the research is national graduate data for Senior High School. In data analysis, the steps used in this study use analysis with data collection at the beginning of the study, reduction of collected data, data processing of data presentation of reduction results, and finally drawing conclusions or called verification.

In this study, the data used used is data from the Ministry of Education and Culture's National High School graduates, and is time series data from 2021 to 2023 and projection data for the next 3 years, namely 2024 to 2026. In looking at the growth of data in each series, the growth ratio calculation is used to see the percentage growth of data variables in a period of time. The growth ratio equation is as follows:

Growth Ratio = ((Present – Past)/Past) x 100%

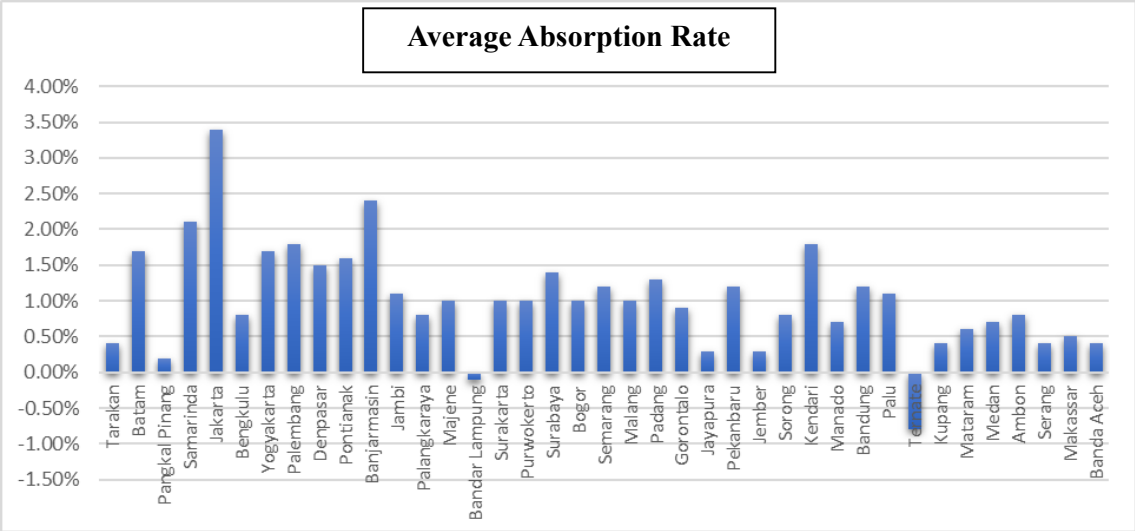
Present is the value of a current data or present value, while Past is the value of a data in the past. The result of the growth ratio is a reflection of the growth of a data.

The data collection technique was carried out by participatory observation, interviews, reviewing documents, as well as the results of triangulation or the results of the combination of data collection techniques used by the author. The data collection technique in this study is through primary data collection. The process carried out by the author is the processing of national big data, as well as reviewing documents related to high school big data. There are various techniques to perform data analysis procedures with three main methods, namely interpretive, recursive abstraction, and mechanical techniques (Oun et al., 2014).

3 FINDINGS AND DISCUSSION

The time series data processed is data on National High School graduates and data on new students of open universities for the last 3 years with the period 2021 to 2024. The data is divided into components to be used as projections for the future. The time series is based on data that has the same components in time, namely semesters and years, so it is expected to produce forecasts for the next year. The following are the results of data cleansing trends for the absorption of high school graduates per Regional UT.

Graph 1. Average Graduate Absorption Rate



Source : Data from the Ministry of Education and Culture, processed data

Based on the results of data processing shown in the average development graph of the absorption rate, the highest absorption rate of high school graduates is in the UT Jakarta area with an average absorption rate of 3.40% during the 2021-2024 period, and the second and third places are in the UT Banjarmasin and UT Samarinda areas with an average absorption

rate of 2.4% and 2.1%. But not all regional UTs experienced an increase in that period, there were several regions that experienced a decrease in the absorption rate of high school graduation during that period such as what happened at UT Ternate which experienced a decrease with an average absorption rate of high school graduation of -0.8% and UT Bandar Lampung by -0.1%. If viewed from the entire regional UT, the average high school graduation absorption rate nationally is 1.2% with details of the period 2021-2024 as shown in table 1.

Table 1. Comparison of High School Graduates and UT New Students

Senior High School Graduate Year	Amount	Number of New Students	% Absorption of High School Graduates	Average Absorption Rate
2021	3.366.588	123.078	3.7%	1.2%
2022	3.463.453	160.955	4.6%	
2023	3.449.918	207.187	6.0%	

Source: Data processing

Based on the data shown in the table above, UT's absorption rate nationally during the 2021-2023 period has increased with details in 2021 the number of graduates was 3.36 million students with the number of new students in that year of 123,078 or 3.7% of the absorption of high school graduates nationally. In 2022, the number of high school graduates increased to 3.46 million students, when viewed from the absorption trend in UT new students from the previous year there was an increase of 0.9% so that the % absorption became 4.6% in 2022. In 2023, high school graduates experienced a downward trend to 3.44 million students, when viewed from the absorption trend in UT new students, there was an increase in absorption with the number of new students at 207,187 or an increase of 1.4% from 2022 to 6.0%.

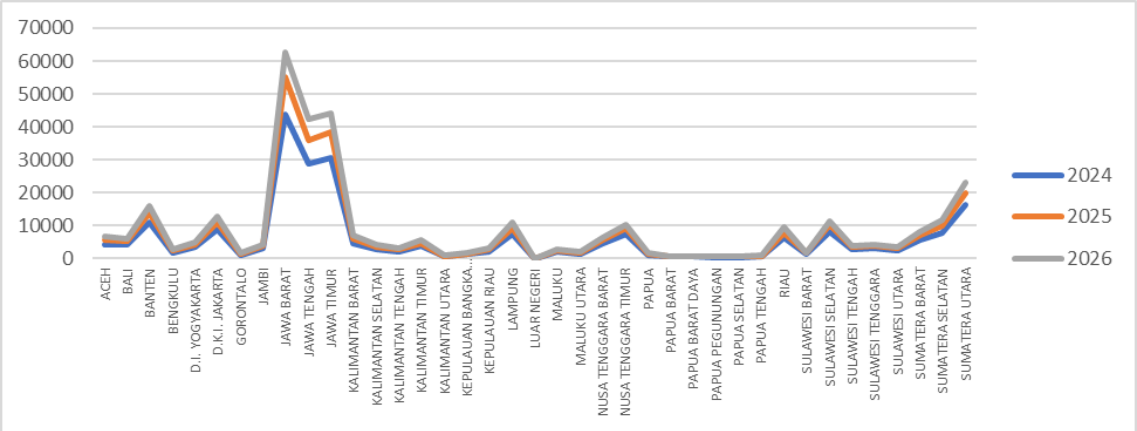
Table 2. Projection of UT High School Graduates and New Students

Year of graduation	High School Graduates	Projected Absorption of High School Graduates	UT New Student Projections
2024	3,331,960	7.2%	239,901
2025	3,579,941	8.4%	300,715
2025	3,626,150	9.6%	348,110

Source: Data processing

Based on the calculation of the projected trend of absorption of high school graduates for the next 3 years, the projected absorption value of high school graduates which will later be absorbed by UT is 7.2% in 2024 or as many as 239,901 students, the projected absorption value will increase to 8.4% in 2025 or as many as 300,715 students and 9.6% in 2025 or as many as 348,110 students. The average annual increase trend during the 2024-2025 projection period is 1.2%.

Graph 2. Projected Absorption of High School Graduates in 2024-2026



Source: Data processing

Based on the calculation of the projected trend of absorption of National High School graduates per region in Indonesia, it can be seen that National High School graduates and the highest absorption during the projection period of 2024-2026 are found in 3 regions in Java Province, namely West Java, Central Java and East Java. With a projected absorption in 2024 of 7.2% in

West Java Province, a total of 43,962 prospective new students were obtained, in 2025 it was 8.4% or a total of 55,368 prospective new students and in 2026 it was 9.6% or a total of 62,804 prospective new students in the projected absorption in that year. Meanwhile, the lowest absorption in 2024 is in the North Kalimantan region, which is a total of 653 prospective new students with a projection rate of 7.2%, in 2025 there are 863 prospective new students with a projection rate of 8.4%, and in 2026 there are 998 prospective new students with a projection rate of 9.6%.

4 CONCLUSION

Based on the results of grouping per region nationally with the projected percentage of high school graduate absorption in 2024 of 7.2% and in 2025 of 8.4% and 9.6% in 2026, reflecting the increase in new student projections that occurred in that period nationally. If you look at the regional results, the largest dominance of the projected absorption rate of new students is in the West Java, Central Java, and East Java regions, while the lowest absorption projection is in the Papua and North Kalimantan.

With the information generated from this study, recommendations can be made that in increasing the absorption rate of students in the region there are several ways that can be considered.

a. Increase socialization and promotion by conducting intensive information campaigns regarding study programs, facilities, and learning benefits in the region. Use social media, local media, and community events to reach prospective students. Then collaborate with high schools by holding seminars, workshops, or presentations that explain the benefits of continuing higher education at the Open University.

b. Provision of Scholarships and Financial Aid Local scholarships by providing special scholarships or financial aid for prospective students from underserved areas. This could include tuition discounts, living allowances, or transportation cost assistance. Then the Fee Waiver Program by offering tuition fee waiver programs for outstanding students or students who are experiencing financial difficulties.

c. Improving the quality and relevance of study programs in the form of Curation of Study Programs by offering study programs that are relevant to the needs and interests of the local job market. Do research on fields that have good job prospects in the region. Then

use the latest curriculum periodically to stay relevant to the latest industrial and technological developments.

d. Development of infrastructure and facilities by improving educational facilities such as laboratories, libraries, and study rooms. Adequate facilities can attract more prospective students. Then improve connectivity such as fast internet access and transportation services to facilitate student mobility.

e. Collaboration with industry and the government in the form of building partnerships with local companies and industries to create internship programs, industry visits, and job opportunities for students.

For regions that are already high, they can manage and maintain superior quality of education while continuing to attract students and maintain the good reputation of the educational institution

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STUDENTS' SCIENTIFIC WRITING ABILITIES IN DISTANCE LEARNING: THE IMPACT OF METORING AND ONLINE RESOURCES

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Abstract

This research examined students' experiences, abilities and challenges in writing scientific articles, especially in the context of distance education in scientific writing courses. The background of this research is based on the importance of scientific writing skills for students, especially in learning environments that rely on online technology. This research aims to understand the extent of the impact of online resources, such as online libraries, artificial intelligence, and e-learning platforms, as well as mentoring through distance learning methods, on students' scientific writing abilities. This research was conducted using a mixed methods design, which combines descriptive qualitative and quantitative approaches to describe students' abilities in writing scientific papers. The instruments used were questionnaires covering various aspects such as writing experience, ability to write articles, use of resources, and effectiveness of mentoring through distance learning. Questionnaires were distributed to 84 students at the Faculty of Teacher Training and Education at Universitas Terbuka who had taken scientific writing courses. The research results show that even though students feel they have basic skills in scientific writing, they still face significant challenges, including difficulties in time management, finding relevant references, and technical problems during guidance in distance learning. This research concludes that quality support in the form of structured guidance and improving the quality and accessibility of online resources is vital to helping students write quality scientific articles.

Keywords: scientific writing course, distance learning, mentoring, online resources

1 INTRODUCTION

In the digital era, which continues to experience rapid development, education is no longer bound by the boundaries of physical classrooms. Distance educationis now rapidly developing into a widely recognised learning model, mainly because it offers flexibility in terms of time and location. This is relevant nowadays, where accessibility and convenience are the primary needs (A. Martin et al., 2024). However, amidst these conveniences, new challenges arise,

especially in maintaining the quality of education, including mastery of scientific writing skills for students. Scientific writing skills have a crucial role not only as an indicator of academic ability but also as a reflection of students' ability to think critically and analytically and convey ideas systematically (Imania, 2016). In distance learning, developing these skills often faces various challenges, both from the side of students and lecturers who provide guidance. These challenges include the lack of face-to-face interaction and technical obstacles in mentoring, which require more structured learning strategies and more adequate resource support.

Distance learning has become a topic that has received significant attention in the last few decades, especially with advances in communication and information technology (Munir, 2020). Distance learning utilises digital technology to connect students and lecturers virtually, enabling broader access to education. The Open University (UT) is one of the universities that has implemented a distance learning system (Masruroh, 2020). UT pioneered the implementation of distance learning in Indonesia (Zuhairi et al., 2020). By offering flexibility for students located throughout the archipelago and abroad, UT allows them to access quality education without being physically present on campus. UT uses digital technology and printed teaching materials to support learning (Zuhairi, 2019). Along with technological advances, UT increasingly integrates Learning Management Systems (LMS) to enrich student learning experiences (Amastini, 2020).

In the distance learning system, students are expected to develop greater independence, especially in academic skills such as writing scientific papers. Scientific writing skills are critical because they reflect an individual's ability to convey ideas systematically and based on evidence and demonstrate critical and analytical thinking skills (Wicaksono, 2021). This ability becomes even more crucial in a distance learning context, where face-to-face interaction with lecturers and peers is limited. Good scientific writing is not just the ability to write but also requires a deep understanding of research methodology, the ability to analyse data, and skills in organising and presenting research results clearly and logically (McDougall, 2015).

Quality scientific writing includes various aspects, from mastering writing techniques and preparing solid arguments to using relevant and accurate references(Curry, 2023). Students must also be able to carry out literature reviews effectively, which requires skills in finding and evaluating reliable sources of information (Zarlis et al., 2018). In an increasingly competitive

academic world, this ability is an essential indicator of a student's success in completing their studies and contributing to their scientific field (Setiawan, 2022).

Furthermore, the skill of writing scientific papers is important not only in an academic context but also in the professional world. Scientific writing is crucial for conveying research findings and knowledge to the scientific community and the general public. This enhances the academic reputation of individuals and institutions (Absah et al., 2024). Therefore, it is important for educational institutions, including the Open University, to provide adequate support in developing these skills through effective mentoring and the use of quality online resources (Darojat et al., 2023). Thus, students are equipped with theoretical knowledge and practical skills that will help them in the future.

However, in a distance learning environment, several factors often hamper the development of these skills. On the one hand, students have broad access to various online resources, such as digital libraries, scientific journals, and artificial intelligence-based writing tools. These resources should make it easier for students to find references and research support materials. However, previous research shows that not all students can utilize these resources optimally (Tressyalina et al., 2023b). Difficulties in filtering relevant information, understanding appropriate methodology, and limited access to quality references are still significant obstacles (Rahmawati, 2019). Although technology can provide better accessibility, structured guidance is still needed to help students navigate their writing process.

Guidance or mentoring in context is also a key element in developing scientific writing skills (Li, 2019). The interaction between students and lecturers in distance learning not only functions as a medium for delivering material, but also as an important means of academic coaching and mentoring (Stillman-Webb, 2016). Distance tutoring involves using technology such as video conferencing, e-learning platforms, and email to assist students in compiling their scientific work (Tatminingsih, 2023). Even though technology allows for more flexible communication, many studies show that students often feel they receive less in-depth and personalized guidance compared to face-to-face guidance (Pratama, 2022). Time management problems, technical difficulties, and limited direct interaction often hinder the effectiveness of remote mentoring (Saghir Ahmad et al., 2019).

The main problems faced in developing scientific writing skills in distance learning are limited access to quality guidance and difficulties in utilizing online resources effectively. Even though

technology has opened wider access to various reference sources and writing support tools, many students still feel overwhelmed by technical challenges and have difficulty understanding scientific literature. (Munir, 2020) found that students who study online are more susceptible to time management problems, lack of timely feedback from lecturers, and difficulty compiling scientific articles that meet academic standards. Research conducted by (Tressyalina et al., 2023) states that writing a scientific paper requires direct feedback from the lecturer, both verbally and in writing; however, in distance education, students sometimes do not receive it directly. This state-of-the-art research aims to identify the extent to which remote mentoring and online resources can influence the development of students' scientific writing skills, especially in distance higher education environments.

This research aims to describe students' scientific writing skills in the context of distance learning, determine the challenges students face, and describe the impact of long-distance guidance and the use of online resources on students' scientific writing abilities. Using a descriptive approach, this research will analyze data from students at UT, in faculty Teaching and Education Faculty who have taken scientific writing courses. This research will not only provide an overview of students' experiences and challenges. However, it will also offer recommendations that can improve the effectiveness of mentoring and the accessibility of online resources in distance learning environments. The urgency of this research lies in the importance of supporting the development of students' scientific writing skills in the fast-paced digital era. In the distance learning context, where face-to-face interactions are limited, students need more structured support in the mentoring process and access to quality scientific resources. It is hoped that the results of this research can contribute to improving the quality of distance learning, especially in terms of developing scientific writing skills, which will ultimately improve the overall academic quality of students.

2 METHODOLOGY

This research uses a mixed methods design, which combines descriptive qualitative and quantitative approaches to describe students' abilities in writing scientific papers. It is called descriptive research because a variable is explained without comparing it with other variables (Abubakar, 2021). The research was conducted on 84 students at open universities' teaching and science faculties in 2024. The sampling technique used was Non-Probability Sampling, namely Purposive Sampling. The sample was chosen deliberately based on specific criteria,

namely students who had taken the Scientific Work course, so they were considered to have experience writing scientific papers.

The research procedure involves several stages, from preparing research instruments, data collection, and data analysis to reporting results. Data was collected through a questionnaire distributed via Google Forms. The questionnaire contains statements in the form of a 1-5 Likert scale consisting of a range of answers from Strongly Agree (SA), Agree (A), Neutral (N), Disagree (D) and Strongly Disagree (SD). The questionnaire also contains open questions to dig deeper into students' experiences while taking scientific work courses. Before collecting data, this questionnaire was tested for validity using Spearman Brown and reliability testing using Cronbach Alpha. The questions asked in the questionnaire aim to find out the experiences and challenges students face while writing scientific papers. Descriptive analysis was conducted for qualitative data based on frequencies and percentages as applicable. Quantitative analysis was carried out using the chi-square test to see the extent to which age differences, area of residence and experience influence respondents' confidence in writing scientific articles.

3 FINDINGS AND DISCUSSION

3.1 Respondent Demographic Data

84 respondents are students from the Faculty of Teacher Training and Education at Universitas Terbuka. Here is their demographic data.

Table 1. Respondent Demographic Data

Data	Category	Amount	Percentage
Gender	Man	22	26,2 %
	Woman	62	73,8%
Age Range	17-25 years old	22	26,2 %
	26-35 years old	25	29,8%
	36-45 years old	30	35,7%
	46-55 years old	7	8,3%
UT Region of Origin	Western Indonesia	53	63%
	Central Indonesia	25	30%
	Eastern Indonesia	6	7%

The total number of respondents in this study was 84 students from the teaching and science faculties who had previously taken scientific work courses. As shown in the data above, 73.8% of respondents were women, and 26.2% were men. This aligns with the UNESCO report 2019, which shows that women are more interested in education and teaching than men. If you look

at the age distribution, the 35-45-year-old range is the most numerous, namely 35.7%, then 26-35-year-olds are 29.8%, 17-25-year-olds are 26.2%, and the least are those aged 46-55 years by 8%. Based on this data, it can be seen that most students are adults with many other responsibilities outside of education, such as working and raising a family (Stone & O'Shea, 2019). People of this age find distance learning more appealing because of its flexibility. On the other hand, they may rely more on mentoring and online resource support to improve their scientific writing skills.

More than half of the respondents, namely 63%, live in western Indonesia, and the rest live in central and eastern Indonesia. These regional differences are important in the context of access to digital infrastructure and online resources. Existing facts show a disparity in educational attainment between western Indonesia and central and eastern Indonesia (Amin et al., 2020). Apart from that, other research also shows that the distribution of internet use in Indonesia is increasing yearly. However, there is still inequality between provinces in Indonesia, especially those in the western and eastern regions (Mohammad & Maulidiyah, 2023). Better internet access will certainly enable students to more easily access teaching materials, scientific journals and online mentoring programs

3.2 Questionnaire Validity and Reliability Test Results

The validity of the questionnaire was tested using the SPSS application with the Pearson Correlation method. Data from instrument validation results were analysed by comparing values rxy count with rxy table. If value r count $\geq r$ table, then the correlation is considered significant, which means the test instrument is valid. Based on tests carried out by researchers, it was found that all question items had value r calculated greater than r table, so it can be concluded that these items are valid. To test the reliability of instrument items, the following results were obtained:

Table 2. Questionnaire Reliability Test

Part	Cronbach Alpha value
Students' experience using e-learning	0.875
Students' perceptions of implementing webinar tutorials	0.895
Students' challenge to write scientific articles	0.748
Students' self-evaluation in writing scientific article	0.940

An instrument is said to be reliable if a value is obtained from *Cronbach's Alpha* > 0.60 (Ghozali, 2016). Based on the table above, all values *Cronbach's Alpha* obtained are greater than 0.60, which means that all question items in the instrument can be said to be reliable.

3.3 Scientific Writing Experience

Based on the diagram shown above, it can be seen that of the 84 respondents, as many as 61 students or 61%, had never had experience writing scientific articles before taking scientific work courses, and only 23% had had experience writing scientific articles. For students who had previously taken this course, as many as 20 respondents (23.8%) had failed it and had to repeat it. These data show that most students start the process of learning scientific writing from a basic level of understanding or without previous experience.

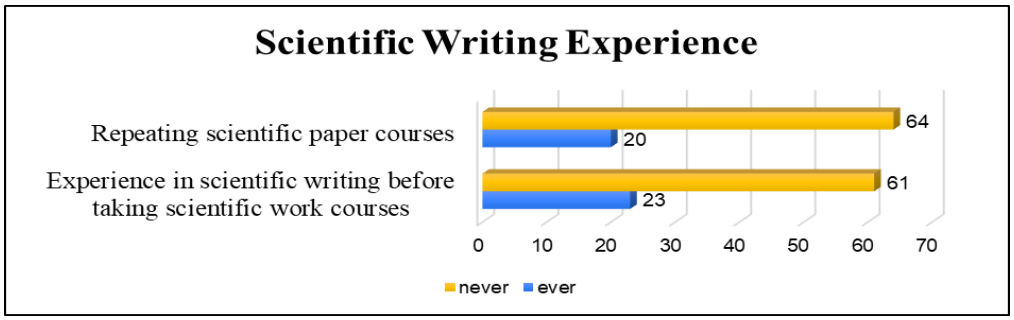

Figure 1. Scientific Writing Experience

Students often face significant challenges in scientific writing, largely caused by a lack of experience compiling scientific papers (Nam Chi et al., 2024). This lack of experience can not only affect technical writing skills. However, it can also affect students' psychological aspects, including causing their low self-confidence in expressing ideas and arguments, which is necessary for writing a scientific article (Anaktototy et al., 2023).Writing skills are not something someone can have instantly but result from a systematic and continuous learning process. To develop effective writing skills, individuals must undergo a series of exercises and practice consistently (Heriyudananta, 2021). Students without experience writing scientific

papers often feel anxious or unsure when faced with academic writing assignments (Nam Chi et al., 2024).

The existence of students who do not pass the scientific work course and have to repeat it shows that it is not easy to produce scientific work. Based on research conducted by (Widodo et al., 2020)stated that the culture of writing scientific papers among Indonesian students is still very low. This can be seen from the small number of students involved in publishing scientific papers in Indonesia. Repetition of courses is often caused by various factors, including inadequate understanding of writing structure, difficulty in organizing ideas, and inability to use online resources effectively for research (Hashim et al., 2022). Their inability to utilize academic guidance and online resources can also cause this (Sitompul & Anditasari, 2022).

3.4 Students' Experience Using E-Learning

Based on the table 3 below, it is known that most participants agreed (28.6%) and strongly agreed (47.6%) that they often used the discussion feature during elearning to hold discussions with lecturers and other students. Interaction between students and between students and lecturers in the online learning environment is important. It is a critical factor in determining student satisfaction in the learning process (Alqurashi, 2019). This aligns with research stating that discussion forums in asynchronous learning enable relevant interaction between students and instructors, fostering a deeper understanding of academic writing (Neha & Kim, 2023). Discussions on e-learning platforms create a collaborative environment, allowing students to exchange ideas, solve problems, and get real-time feedback.

Table 3. Studeny experience using elearning

No item	Questionnaire	SA (n) (%)	A(n) (%)	N(n) (%)	D (n) (%)	SD (n) (%)
D1	I often use the discussion feature on the e-learning page to discuss with lecturers or friends.	24 (28.6)	40 (47.6)	15 (17.9)	5 (6)	0 (0)
D2	I often get feedback from lecturers via the e-learning page	45 (53.6)	30 (35.7)	6 (7.1)	2 (2.4)	1 (1.2)
D3	the time I spend on e-learning pages is effective in improving my abilities	31 (36.9)	37 (44)	12 (14.3)	4 (4.8)	0 (0)

Most respondents also stated that they often received feedback on the scientific article writing assignments they were working on from the lecturers concerned, with 53.6% strongly agreeing

and 35.7% agreeing. Providing feedback, especially in the distance learning process, is very important. Providing feedback promptly from lecturers regarding the assignments carried out makes the students' learning process much better (F. Martin & Bolliger, 2018). Feedback is an important part of the learning process because it helps students recognize deficiencies in their understanding and correct them to improve their abilities (Cavalcanti et al., 2019). In this context, e-learning provides easier and faster access to feedback from lecturers, which significantly helps students improve their writing skills.

From the data displayed, it is also known that the majority of respondents, namely 36.9% strongly agree and 44% agree that the time they spend on e-learning pages effectively improves their ability to write scientific articles in scientific work courses. E-learning platforms allow students to learn independently and access various resources, contributing to increased independence and writing skills (Al-Yafaei & Mudhsh, 2023). Additionally, the flexibility of online learning environments supports time management and productivity, which is important for developing academic writing skills (Kabylzhanova et al., 2024).

3.5 Students' Perceptions of Implementing Webinar Tutorials

Based on the data displayed in the table below, most respondents stated that webinar tutorial sessions at UT positively impacted their ability to write scientific articles.

Tabel 4. Students' Perceptions of Implementing Webinar Tutorials

No item	Questionnaire	SA (n) (%)	A(n) (%)	N(n) (%)	D (n) (%)	SD (n) (%)
E1	I often attend webinar tutorial mentoring sessions with supervisors.	51 (60.7)	26 (31)	4 (4.8)	2 (2.4)	1 (1.2)
E2	Webinar tutorial mentoring sessions helped me overcome difficulties in writing scientific articles.	52 (61.9)	23 (27.4)	5 (6)	3 (3.6)	1 (1.2)
E3	The interaction during webinar tutorial coaching sessions is as effective as face-to-face coaching.	32 (38.1)	42 (50)	7 (8.3)	3 (3.6)	0 (0)
E4	I am more motivated to write scientific articles after attending the webinar tutorial session.	34 (40.5)	39 (46.4)	9 (10.7)	2 (2.4)	0 (0)

Based on the table displayed above, it is known that most respondents actively participated in webinar tutorial sessions while attending scientific work lectures. Webinar tutorials are conducted online synchronously (real-time) at Universitas Terbuka. As many as 61% strongly

agreed, and 27.4% agreed that the webinar tutorial guidance session helped them overcome difficulties writing scientific articles. This supports the argument that synchronous (real-time) guidance can provide direct and specific support to students(Sugilar, 2020). Synchronous interaction in online learning, through the implementation of webinar tutorials, can help create a sustainable dialogue between lecturers and students; this is, of course, very important in clarifying difficult concepts and providing immediate feedback for students. Apart from that, recordings can also be made available through webinar tutorials, which students can watch repeatedly(Gegenfurtner, 2020).

Apart from that, the majority of respondents strongly agreed (38%) and agreed (50%) that interactions during webinar tutorial coaching sessions were as effective as face-to-face coaching. Webinar tutorials enable multi-user two-way communication or create classes in cyberspace with tutors and students so that interaction can occur as in face-to-face learning (Muflikah et al., 2022). This shows that synchronous technology in distance education can effectively replace traditional tutoring. Synchronous learning in distance education allows interactive two-way communication, providing greater flexibility for students and lecturers even though they are separated by distance. This is in line with previous research, which states that students have a good perception of the implementation of webinar tutorials in terms of accessibility, interactivity and so on; apart from that, it also allows the use of multimedia and collaborative tools, which enrich the learning experience (Wijayanti et al., 2022).

As many as 40.5% strongly agreed, and 46.4% agreed they were more motivated to write scientific articles after attending the webinar tutorial session. This indicates that the synchronous guidance approach in distance education helps in technical understanding and provides a motivational boost for students. Support provided through positive interactions during learning can increase intrinsic motivation. Synchronous guidance through webinar tutorials can offer a sense of togetherness even though it is done online, which helps increase students' self-confidence and enthusiasm to achieve their academic goals (Zakirman, 2023).

3.6 Use of Online Resources

Based on the diagram below, it is known that some students often use sources in the form of online journals and online libraries to look for references in writing their scientific articles rather than using artificial intelligence such as GPT chat.

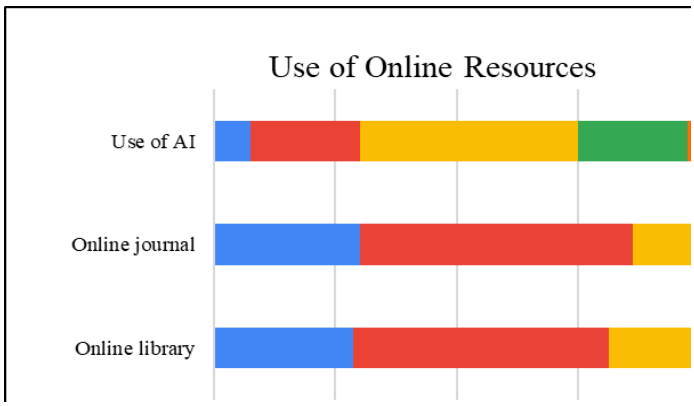

Figure 2. Using Online Resources

The group that often uses online journals and online libraries is quite significant compared to those who never use them, although some answer sometimes or are neutral. Online journals are a vital resource for learning, especially in academic contexts requiring access to the latest scientific literature. The high use of online journals is in line with findings from previous research, which states that students tend to use online journals more often to search for relevant information due to better accessibility and the latest sources available (Kumar, 2023). Online journals allow students to access scientific articles anytime and anywhere without being tied to a physical location like conventional libraries (Mariia, 2023). As with online journals, the frequent use of online libraries shows that students rely more on digital sources to obtain learning materials. According to previous research, online libraries have become integral to student learning because of easy access, various collections, and the ability to obtain resources without visiting a physical library (Aziz et al., 2015).

Meanwhile, using artificial intelligence, such as chat GPT, is still not frequent compared to the other two sources. The graph shows that most participants only use AI occasionally. Meanwhile, the group that often and always uses AI is relatively smaller than the other resources.

No item	Questionnaire	SA (n) (%)	A(n) (%)	N(n) (%)	D (n) (%)	SD (n) (%)
F1	Artificial Intelligence (AI) helps me complete scientific articles more quickly and in a structured manner.	8 (9.5)	21 (25)	35 (41.7)	13 (15.5)	7 (8.3)

From the table, known the usefulness of artificial intelligence in helping them complete scientific articles more quickly and in a structured manner, the majority chose to answer neutral, namely 41.7% of respondents. This reflects that although AI technology is increasingly being used in education, its acceptance and utilization are still limited to a few specific contexts. Learners face challenges such as inadequate understanding, lack of skills, and technological infrastructure readiness, which hinder the use of AI (Sain et al., 2024). In addition, understanding and trust in AI's ability to produce valid and quality academic writing may still be developing (Rane et al, 2024).Other research states that students may feel more comfortable using traditional sources, such as journals and online libraries, which are more familiar and have long been relied on in the research process(Costa, 2024)

3.7 Students' Challenge to Write Scientific Articles

Based on the data described in the table below, many respondents still experience technical difficulties while attending lectures, such as slow internet connections, unsupported devices, and other technical problems. Apart from obstacles, there are also those who experience difficulty managing time to write scientific articles.

Table 5. Students' Challenge to write scientific articles

No item	Questionnaire	SA (n) (%)	A(n) (%)	N(n) (%)	D (n) (%)	SD (n) (%)
C1	I experienced technical difficulties while attending scientific work lectures	7 (8.3)	28 (33.3)	23 (27.4)	16 (19)	16 (19)
C2	I feel that technical challenges affect my writing ability.	11(13.1)	27 (32.1)	23 (27.4)	17 (20.2)	17 (20.2)
C3	I find it difficult to manage my time writing scientific articles	6 (7.1)	21 (25)	35 (41.7)	17 (20.2)	17(20.2)

The number of respondents who stated that they experienced technical problems was 33.3% agreeing and 8.3% strongly agreeing. Of course, these technical obstacles can hinder students' learning process in taking scientific work courses. 32.1% agreed and 13.1% strongly agreed

that the technical challenges they experienced could affect their ability to write scientific articles. Technical obstacles, such as slow internet connections, unsupported devices, or instability of e-learning platforms, can reduce the effectiveness of online learning (Roy & Al-Absy, 2022). In the context of scientific work courses, these obstacles can affect students' access to important sources such as online journals, digital libraries, and other writing support tools, as well as communication with supervisors. Limited access to technology can exacerbate gaps in learning, especially in learning that requires intensive interaction and access to learning resources, such as lectures on scientific papers. Other research states that lack of internet access and other technical challenges significantly affect student engagement and motivation in online learning(Ramli et al., 2022).

Apart from technical obstacles, another thing that needs to be considered is students' ability to manage time. As a distance learner, the ability to manage time is very important to support the success of their studies. As many as 25% of students agreed, and 7.1% strongly agreed that they experienced difficulty in managing time during lectures. Meanwhile, the majority (41.7%) answered neutral. Research conducted by (Joshi et al., 2024) states that the flexibility offered in open and distance learning requires greater independence and discipline, which can challenge students not used to self-regulation. Time management is one of the key skills that influences success in online learning. Students not used to manage their time effectively tend to have difficulty completing assignments and maintaining consistent learning. Students who manage their time well tend to achieve higher academic rankings (Kanwal et al., 2024).

3.8 Students' Self-Evaluation in Writing Scientific Article

After attending lectures on scientific work courses, students are asked to evaluate or assess themselves, as shown in the table below.

Table 6. Student Self-Evaluation

No item	Questionnaire	SA (n) (%)	A(n) (%)	N(n) (%)	D (n) (%)	SD (n) (%)
A1	I able to compose clear and interesting titles	9 (10.7)	47 (56)	23 (27.4)	4 (4.8)	1(1.2)
A2	I able to write concise and informative abstracts.	12 (14.3)	48 (57.1)	18 (21.4)	4(4.8)	2(2.4)
A3	I understand the structure and format of article writing	20 (23.8)	46 (54.8)	13 (15.5)	3(3.6)	2 (2.4)
A4	I able to collect and analyze data	14 (16.7)	47 (56)	19 (22.6)	3(3.6)	1 (1.2)
A5	I able to compose logical arguments and support research objectives.	13 (15.5)	49 (58.3)	20 (23.8)	2(2.4)	0(0)

A6	I able to write appropriate Conclusions	14 (16.7)	51 (60.7)	17 (20.2)	2(2.4)	0 (0)
A8	I feel confident that the articles written meet academic standards	25 (29.8)	42 (50)	14 (16.7)	3 (3.6)	0 (0)

Based on the data displayed in the table above from the eight self-evaluation questions asked, the majority of respondents agreed and strongly agreed that they were able to compose clear and interesting titles, were able to write concise and informative abstracts, understood the structure and format of article writing, were able to collect and analyze data, be able to prepare logical arguments and support research objectives, be able to write appropriate conclusions, feel confident in your ability to write articles, feel confident that the articles written meet academic standards.

This shows that implementing distance learning in scientific work lectures by combining online resources, e-learning, and webinar tutorials makes them feel capable of compiling a scientific article that meets academic standards. This aligns with research conducted by (Taffs & Holt, 2013) which states that students' confidence in writing scientific papers indicates that all resources, such as lecturer involvement, e-learning design and appropriate media, align with their needs. Research conducted by (Nappu et al., 2022) also states that online learning positively influences students' writing skills; synchronous meetings conducted online are one of the reasons for improving their abilities.

3.9 Analysis of Demographics and Experiences with Students' Satisfaction in Writing Scientific Article Course at Distance Learning

The data displayed in the table below shows the relationship between student satisfaction after attending scientific work lectures in distance learning and several indicators, namely age, regional distribution, and experience writing articles.

Table 7. Analysis of Demographics and Experiences Vs Students' Satisfaction

Indicator	Category	Less satisfied (n)	Satisfied (n)	P Value
Age	20-35 Years	15	32	0.006
	over 35 years old	2	35	
Regional Distribution	Western Indonesia	17	36	0.001
	Central and Eastern Indonesia	0	31	
Article Writing Experience	Never	12	49	0.064
	Ever been	5	18	

Based on the data, there are significant differences in two indicators, namely age and regional distribution, while article writing experience does not show a significant difference. The age indicator, based on statistical tests with chi-square, shows a p-value of 0.006 (<0.05), which means that there is a relationship between age and student satisfaction after attending scientific work lectures in distance education. Research conducted by (Ke & Kwak, 2013) states that age differences impact student performance in distance learning; older students require greater effort to understand learning in online learning than younger students.

Meanwhile, on the indicator of article writing experience, although there is a difference between students who have written articles and those who have not, the results of the significance test show that this difference is not significant, with a P value of 0.064. This means that the experience of writing articles does not significantly influence student satisfaction after taking scientific work courses. A p-value of 0.001 (<0.05) was obtained in the regional distribution indicator, which means a relationship exists between the distribution of domicile areas and student satisfaction after attending scientific work lectures. Research conducted by(Lembani et al., 2020) states that in distance learning, students in urban areas have a much better learning experience than those with limited access to technology and facilities.

4 CONCLUSION

The conclusion needs to be concise and coherent. Based on the research results described above, it can be concluded that, overall, scientific work lectures remotely have had a positive impact on students' ability to write scientific articles. Most students felt they could master important skills such as writing abstracts, constructing arguments, analyzing data, and writing appropriate conclusions, even though most had never written scientific articles. This is possible thanks to support from e-learning platforms, implementation of webinar tutorials, and access

to online resources, such as digital libraries and academic journals. This research also identifies obstacles students face, such as technical problems related to internet access, availability of facilities and infrastructure, and challenges in time management. Quantitative analysis using the chi-square test shows that age and regional distribution significantly influence student satisfaction after attending scientific work lectures on distance learning.

As a recommendation, it is important to increase access to technology and resources that support distance learning and provide effective time management training for students. In addition, more targeted support programs need to be prepared for students from various age groups and regions so that all students can maximize their potential in writing scientific articles in this digital era.

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THE IMPACT OF DISTANCE LEARNING SKILLS TRAINING AND MOTIVATION ON ASSESSMENT

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Abstract

This study shows that the number of new students who enroll in the Open University increased by 10% during one semester, while the number of students who re-enroll decreased by 15%. The Open University offers an attractive distance education program for new students. based on the phenomenon of distance learning, which has become a topic of discussion for many students. Students experience increased anxiety and stress as a result of their ignorance of distance learning methods. The Open University has a strategy to introduce distance learning success support services (LPKBJJ) to overcome this problem. The results of the study showed that distance training, which was intended to help students create effective learning strategies and increase their confidence in distance learning, had a positive and significant impact of 0.05. The purpose of this study was to evaluate how learning skills training and student motivation affect their academic achievement at the Open University (case study of UT Medan students). The results of the distance learning skills training hypothesis have a positive effect and 95 percent affect the assessment. The results of the learning motivation hypothesis also have a positive effect. Increasing learning motivation by ten units will have an impact on increasing the assessment by 1.4 percent.

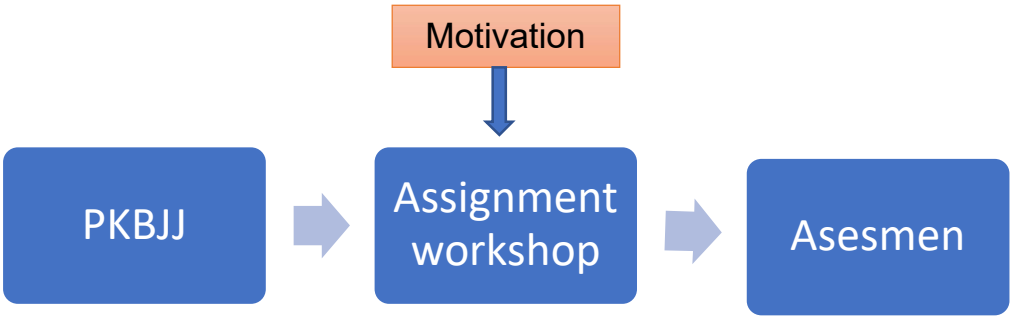
Keywords: Motivation, Academic Achievement, Distance Learning Skills Training.

1 INTRODUCTION

Distance Education is a learning method in which the teaching and learning process occurs without the physical presence of lecturers and students in the same room. According to the Catalog, (2023) explains that the university that implements the distance education system is the Open University. To support and improve the learning process with a distance system, the Open University has a Regional Open University office in each province and abroad. The number of Open University students fluctuates from year to year. The number of Open University students who increased during the 2022.2 to 2023.1 registration period was 26.71%, while during the 20232 registration period it decreased to 19.7%. The Open University (UT) which is one of the pioneers of learning with an open and distance learning system, where the meaning of open does not limit the age of studying at the Open University, while distance

means that the learning process does not have to be face-to-face, but with the help of media, both print and non-print media. Printed learning materials are in the form of Main Material Books (BMP), while non-printed materials are in the form of online tutorials, UT TV, UT radio, UT Sanctuary and others that support the independent learning process. One of the policies of Universitas Terbuka to improve students' understanding in the learning process is the distance learning success support service (LKPJJ). The distance learning success support service aims to improve distance learning skills, assignment workshops and Examination clinics. The abilities of distance learning training students include effective learning skills through time management skills, effective reading, utilizing UT online services, and various learning resources. The Assignment Workshop includes student skills in working on academic assignments including tutorial assignments, course assignments, writing scientific papers, and working on practical/practical assignments. Examination Clinic to improve readiness skills and success in facing exams (figure 1)

Figure 1. Flow of Support Services for Distance Learning Success



Universitas Terbuka Medan is one of the open universities that manages open university students in North Sumatra Province, during the 20221 registration period the number of UT students in the Medan area was 14,757 students, while during the 20222 registration period it was 15,119. During the 20231 registration period the number of UT Medan students increased by 20.4% while during the 20232 registration period it decreased to 1.6%., with the increase in on-going students at the Open University not continuing their studies. One of the tools to improve understanding of the distance learning process is motivation. One of the instruments to increase learning motivation at the Open University is Providing regular and constructive feedback on student assignments can help them feel appreciated and know where they need to improve their abilities. Motivation is one of the factors that greatly determines the achievement

of student education, for that high motivation is needed to be able to achieve good achievements.

From the background above, this research is entitled the impact of distance learning skills training and motivation on assessment. The general purpose of this research is to find out the impact of distance learning skills training and motivation on assessment (Case Study of Medan Regional Open University), specifically this research aims to (1) analyze the impact of practicing making study plans and schedules on assessment, (2) analyze the right way to read and record reading results on assessment, and (3) analyze the impact of distance learning skills training on assessment, and (4) analyze motivation on assessment.

2 LITERATURE REVIEW

2.1 Assessment

According to Terry Overtun (2008), that Assessment is a process of collecting information to monitor progress and if mentioned in my definition of a test, this assessment can consist of a test, or it can also consist of various methods such as observation, interviews, behavior monitoring, and so on.

2.2 Motivation

Learning motivation divides actions intrinsically and extrinsically which are able to regulate the course of learning independently (Chan et al., 2021). In Rachmavita's research (2020) there is a statement that learning motivation operates to encourage someone to act and determine their determination towards learning (Sadiman, 2009). Learning motivation is an activity that contributes significantly to the actions and behavior of a student as a basis in certain settings and conditions (Rafiola et al., 2020)

Kathryn R. Wentzel and Jere E. Brophy, (2010) explain that motivation explores various theories of motivation and how they are applied in the classroom context. This book also offers practical strategies for teachers to improve student motivation. There are various definitions of learning motivation presented by experts. For example, Petri (1981) as quoted by Cetin (2015) stated that learning motivation is a maintainer or guide of behavior and innate strengths of students. McCoach & Siegle (2003), in Garn & Jolly (2014) said that learning motivation is one of the factors that can distinguish students who maximize their learning potential from students who are less academically successful. According to Makmun (2003) there are eight

important indicators to measure learning motivation, namely learning duration; learning frequency; persistence in learning activities; fortitude, tenacity and ability to face obstacles and difficulties; devotion and sacrifice to achieve goals; level of aspiration to be achieved with the activities carried out; level of achievement qualification/product (output) achieved from the activities carried out; and direction of attitude towards activity targets.

2.3 Distance Education System

According to Adwi S, (2023), explains that Distance Education (PJJ) is a learning method that allows students and teachers to interact and communicate without having to be in the same location physically, education that bridges the separation between educators and students through the use of technology can be interpreted as distance education (Based on the literature review above, it can be concluded that interest and motivation to learn play an important role in achieving maximum learning outcomes. Effective learning in producing good learning outcomes is not only a process of understanding existing and new ideas but is also related to interest and motivation to learn (Cheng, 2016). The following is a description of the relationship between the variables reported in this article

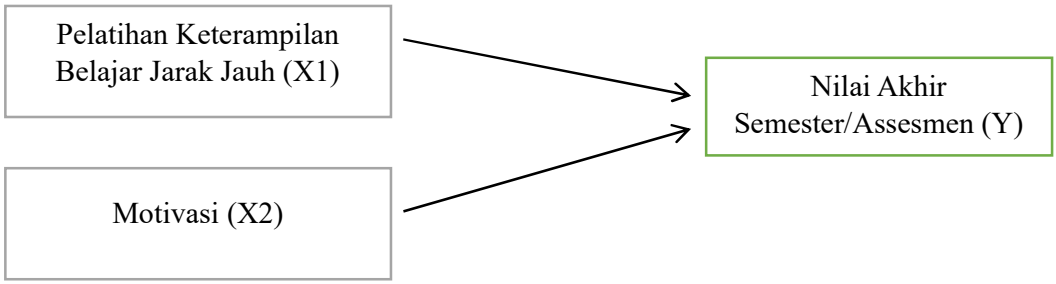


Figure 2. Conceptual Framework of the Impact of Distance Learning Skills Training on Assessment

3.2.1 Hypothesis Statement

Based on the background description, the hypotheses are as follows: (1) H1: There is a positive influence of distance learning skills training on assessment, H2: There is a positive influence of motivation on assessment,

Methodology

The research methodology is basically a survey method using quantitative correlation. This study examines and analyzes a phenomenon of a decrease in the number of students who re-register, for this reason this study is to find information about distance learning skills training

(X10 and motivation (X2) whether it affects the final semester grades (Y). The data sources obtained are primary and secondary data. The population in this study were UT students who were domiciled in Medan City and attended PKBJJ in 2023. The population was 150 students, the sampling technique used was the purposive sampling technique which means that the sampling technique was carried out intentionally by looking at the characteristics of the respondents who were UT students who were domiciled in North Sumatra Province, while the data collection technique used in the study was by distributing questionnaires. The questionnaire answers were based on a Likert scale from 1-5. The inputted data is then processed using multiple linear regression analysis by applying SPSS Version 25. The multiple linear equation model of the impact of distance learning skills training, motivation on the learning process at the Open University is as follows:

$$Y_t = a_1 + a_2 x_1 + a_3 x_2 + e_t \quad \text{..... (1)}$$

where; Yt = assessment results in year t

X2 = number of participants in distance learning skills training in year t (people)

X3 = number of those motivated to study at the Open University in year t

3 RESULTS AND DISCUSSION

3.1 Results

The results of the distribution to all research objects were first tested on the research instrument of 150 respondents. The results of the trial were Cronbach Alpha > 0.86, and all statements had a correlation coefficient value of $p < 0.05$, (Ghozali, 2011) meaning that the research instrument was worthy of being continued.

3.2 Distance Learning Training

The indicators of distance learning skills training are (1) making a study plan, (2) a quick way to record reading results, (3) tips for success in following online tutorials, (4) accessing UT Online and (5) a quick way to do assignments. The results of the distance learning skills training indicator instrument (Table 1.)

Table 1. Results of the Distance Learning Skills Training Instrument

Question Description	%				
	STS	TS	N	S	SST
I have made a study plan for one semester.	13	18	10	56	35
I have understood how to quickly read and record the results of reading	10	8	20	72	40
I have understood how to successfully follow online tutorials.	8	5	12	98	45
I understand how to access UT online	12	8	10	85	35
I understand how to quickly do assignments	7	5	8	90	48

Source: Processed data, (2024)

The results of respondents as many as 150 students who participated in distance learning skills training, obtained the following results that as many as 41.6% and 31.6% who agreed and strongly agreed who made a study plan in one semester. After participating in PKBJJ activities as many as 48% and 26.6% who agreed and very strongly agreed who understood how to quickly read and record reading results, after participating in PKBJJ as many as 58.6% and 26% who agreed and very strongly agreed, understood how to successfully follow online tutorials. For participants who understand how to access UT online as many as 63.3% and 24.6% who agree and very strongly agree, while as many as 56.6% and 32% who agree and very strongly agree understand how to quickly do assignments.

3.3 Motivation

Indicators of motivation in learning include (1) interest and curiosity for knowledge, (2) independence in lectures, (3) time management, (4) Enthusiasm for Achievement. Results of learning motivation instruments (Table 2.)

Table 2. Results of Learning Motivation Instrument

Question Description	%				
	STS	TS	N	S	SST
I am interested and curious for knowledge	13	18	10	69	40
I am independent in college	10	8	20	72	40
I manage my time in college	5	5	11	84	45
I am enthusiastic about achieving knowledge	12	11	3	85	39

Source: Processed data, (2024)

The results of motivational respondents of 150 students who participated in distance learning skills training explained that students had made a study plan in one semester in distance learning skills training to register online (sia.ut.ac.id) as much as 71%. Respondents also explained that students understood the features on the sia.ut.ac.id page as much as 63%

meaning that students were able to register independently without going through the pokjar administrator. Distance Learning Skills can develop distance learning skills independently as much as 80%.

3.4 Assessment

The assessment indicators are as follows: (1) completion of discussions and participation, (2) completion of assignments, (3) taking the final semester exam (Table 3.)

Table 3. Assessment Instrument Results

Question Description	%				
	STS	TS	N	S	SST
I follow the discussions and participate in online tutorials.	10	18	7	72	43
I did assignments 1,2 and 3 in the online tutorial	8	8	8	72	52
I am taking the final semester exam	5	5	9	84	47

Source: Processed data, (2024)

The results of the assessment respondents of 150 students who participated in the distance learning skills training explained that students had made a study plan in one semester in the distance learning skills training to register online (sia.ut.ac.id) as much as 71%. Respondents also explained that students understood the features on the sia.ut.ac.id page as much as 63% meaning that students were able to register independently without going through the pokjar administrator. Distance Learning Skills can develop distance learning skills independently as much as 80%.

The results of the estimated assessment equation obtained a determinant coefficient (R2) of 0.8432, this indicates that the independent variables of distance learning skills training (PKBJJ), and motivation (MT) can explain 84.32% of the variance in the student assessment variables. (Table 1). The results of data processing using SPSS Version 25 obtained validity and reliability tests, where if r count> t table then the instrument data can obtain a significant correlation with the total score (significant 0.05). If r count < r table then the instrument does not correlate significantly with the total score. In relation to the validity test of distance learning skills training and motivation.

Tabel 4. Model Sammary R

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.835[a]	.8432	.8432	1.25079	.697	234.722	3	306	.000

Data: processed, 2024

The results of the estimation show that the independent variables of registration services, learning assistance services and academic administration services have a significant effect on the final semester grades (F = 234.722, sig F = 0.000). From Table 2 it is explained that academic administration services have the largest contribution of 66%, while learning assistance services are 5%, and registration services are 6%. The Regression Equation of the impact of the Distance Learning Skills Training policy on the Learning Process is as follows:

$$AMS_t = 1.483 + 1.553 PKBJJ_1 + 0.144 MT_1 + 0.365$$

……..(3)

where: AMSt = assessment

MTt = learning motivation in year t

PKBJJ = Distance Learning Skills Training in year t

Tabel 5. t Test Result

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
ASS	B	Std. Error	Beta		
(Constant)	1.483	.365		6.802	.000
PKBJJ	1.553	553	069	1.018	.310
MT	.144	044	078	1.038	.300

Source: Processed data, 2024

3.5 The Effect of Distance Learning Skills Training on Assessment

The results of the distance learning skills training hypothesis have a positive and significant effect of 95% on the assessment. An increase in distance learning skills training by 10 units will increase the assessment by 15.53%. A simulation is carried out if the registration service is increased by 10 units, it will have an impact on increasing the assessment by 15.5% units., this is in accordance with the results of Jamil's research, (2022. This finding is consistent with the results of respondents as many as 82% of students have made study plans and understand the learning process at Universitas Terbuka,

3.6 The Effect of Motivation on Assessment

The results of the learning motivation hypothesis have a positive and significant effect on the assessment. The simulation is carried out by increasing learning motivation by 10 units, it will have an impact on increasing the assessment by 1.4%. This finding is in accordance with the results of respondents that students are enthusiastic about achieving knowledge by 80%.

4 CONCLUSION AND SUGGESTIONS

1. The results of the distance learning skills training hypothesis have a positive and significant effect of 95% on the assessment. Increasing distance learning skills training by 10 units will increase the assessment by 15.53%. A simulation is carried out if the registration service is increased by 10 units, it will have an impact on increasing the assessment by 15.5% units., this is in accordance with the results of Jamil's research, (2022. This finding is consistent with the results of respondents as many as 82% of students have made study plans and understand the learning process at Universitas Terbuka,
2. The results of the learning motivation hypothesis have a positive and significant effect on the assessment. The simulation is carried out by increasing learning motivation by 10 units, it will have an impact on increasing the assessment by 1.4%. This finding is in accordance with the results of respondents that students are enthusiastic about achieving knowledge by 80%.

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THE EFFECTIVENESS OF THE NETWORK MODEL IN BLENDED LEARNING OF UNIVERSITAS TERBUKA'S LMS

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Abstract

This research aims to evaluate the effectiveness of the network model in implementing blended learning in the Learning Management System (LMS) at the Open University. Blended learning, which combines face-to-face learning and online learning, has become an increasingly popular approach to distance education. The network model implemented in the LMS is expected to improve the quality of interaction and collaboration between students and lecturers, which is often a challenge in distance learning.

The research method used is qualitative with a survey approach. This approach was chosen to gain an in-depth understanding of the experiences and perceptions of LMS users. Data was collected through an open questionnaire distributed to students and lecturers who actively use LMS in their learning process. This questionnaire is designed to collect information about various aspects of LMS use, including ease of access, interaction, collaboration, and impact on learning outcomes.

The research results show that the network model implemented in the Open University LMS can increase interaction and collaboration between students and lecturers. Students report that they feel more connected to their lecturers and peers, despite being in various locations. In addition, this model also helps in overcoming geographic and time barriers that are often faced in distance learning. Students can access learning materials and communicate with lecturers anytime and anywhere, which increases flexibility and comfort in learning.

These findings suggest that the network model in blended learning can be an effective solution for improving the quality of education at the Open University. This model not only increases interaction and collaboration, but also provides the flexibility needed in distance learning. Recommendations for future research include further development of more adaptive network models and comparative studies with other institutions. Further research could also explore how these network models can be integrated with innovative technologies, such as artificial intelligence and learning analytics, to further enhance the student learning experience.

Keywords: Blended Learning, the Network Model, Universitas Terbuka's LMS

1 INTRODUCTION

In the modern educational landscape, Blended Learning has emerged as one of the most popular and effective approaches to improving the quality of learning (Fernando et al., 2024; Simonova et al., 2023). Blended Learning combines traditional face-to-face teaching with online learning activities, creating a more flexible, interactive and personalized learning environment (Prasetya

et al, 2020). This approach allows students to access course materials at their own pace and convenience while still benefiting from direct interaction with instructors and peers. However, despite the many advantages of Blended Learning, its implementation often faces challenges related to connectivity, collaboration, and resource optimization (Bervell & Arkorful, 2020).

Despite increasing interest in the Blended Learning approach and its potential to enhance the learning experience, there is still a significant gap in understanding how the frameworks contained within it, such as the Network Model, remain. Although the Network Model emphasizes the importance of connectivity and collaboration between various elements of the learning process, research exploring its effectiveness in the specific context of the Open University Learning Management System (LMS) is still limited.

Existing literature mainly focuses on the general application of Blended Learning and Network Models, and often in diverse learning process environments or with different technology platforms. This results in a lack of detailed insight into how the Network Model operates within the LMS. The Open University LMS, however, has unique challenges and opportunities due to its specific structure, including user demographics, and institutional goals. A detailed insight into how the Network Model operates in the Open University LMS makes for an interesting study.

Additionally, existing research often does not adequately address the practical implementation challenges and outcomes associated with integrating Network Models into Blended Learning environments. There is a need for research that investigates how this model influences various dimensions of student engagement, academic performance and satisfaction especially in the context of the Open University LMS.

Addressing this gap is critical to developing a differentiated understanding of how the Network Model can be applied effectively to enhance Blended Learning within the Open University LMS. This will also provide valuable insights for other institutions with similar LMS frameworks and educational goals.

The Network Model is a learning process framework that focuses on creating a dynamic and collaborative network between various elements involved in the learning process, including students, educators, content, and technology. By connecting all these elements into an integrated network, the Network Model facilitates more intensive and sustainable interactions, thereby encouraging more effective knowledge exchange and collaboration (Gislev, Thestrup,

& Elving, 2020). This model emphasizes the importance of connectivity and collaboration in creating richer and more meaningful learning experiences.

This study focuses on the effectiveness of the Network Model in the context of Blended Learning, aiming to evaluate how this model can improve the quality of education in various dimensions, such as student engagement, academic outcomes, and overall satisfaction with the learning process. Given that the Network Model seeks to strengthen connectivity in Blended Learning, this research will explore how the model can be implemented effectively and its impact on the overall learning experience.

This research is motivated by the increasing need for optimization of the Blended Learning model amidst the rapid progress of educational technology and the increasing need for a more flexible and adaptive learning environment. As student learning needs and preferences become increasingly diverse, it is important to assess how Network Model integration can offer more comprehensive and responsive solutions to the challenges faced in Blended Learning.

Therefore, this research aims not only to assess the effectiveness of the Network Model but also to provide practical insights and recommendations for educators and educational institutions in implementing a more connected and effective Blended Learning environment. It is hoped that the findings of this research can make a significant contribution to the development of more advanced and relevant learning methods to meet future educational needs.

The urgency of this research comes from several important factors that influence the educational landscape at the Open University. As more and more higher education institutions adopt Blended Learning models to improve learning outcomes and accommodate diverse student needs, understanding how specific frameworks, such as the Network Model, can optimize this approach is critical. Here are the benefits.

1. Institutional Relevance: The Open University, as a leading provider of distance education, faces unique challenges and opportunities in implementing Blended Learning. The effectiveness of the Network Model in its LMS can have a significant impact on an institution's ability to offer a more flexible, engaging and effective learning environment tailored to the needs of its students. This research addresses the urgent need to evaluate and refine teaching strategies that align with institutional goals and technological infrastructure.

2. Improve Learning Outcomes: There is increasing demand for educational models that not only provide flexibility but also increase student engagement and academic success. By examining how the Network Model can improve the Blended Learning experience in the Open University LMS, this research aims to provide actionable insights that can lead to better learning outcomes, higher student satisfaction, and more effective use of educational resources.
3. Adapt to Technological Advancements: The rapid evolution of educational technology requires continuous adaptation of learning models to effectively utilize new tools and platforms. Understanding how the Network Model integrates with the Open University LMS can help in adapting the Blended Learning approach to emerging technology trends, ensuring that the Open University remains at the forefront of educational innovation.
4. Meet the Diversity of Learner Needs: As student populations become increasingly diverse in terms of learning preferences, schedules, and geographic locations, it is important to develop and evaluate learning models that meet these diverse needs. This research discusses the importance of adapting Blended Learning strategies to better support students through models that emphasize connectivity and collaboration.
5. Inform Policy and Practice: The findings of this research will provide valuable information for educators and policy makers at the Open University and similar institutions. By demonstrating the effectiveness of the Network Model, this research will offer evidence-based recommendations for improving Blended Learning practices, which can influence institutional policies and improve the overall quality of education.

Research on "The Effectiveness of Network Models in the Open University's Blended Learning LMS" introduces several new elements that differentiate it from previous field research. By examining the effectiveness of the Network Model specifically in the context of the Open University LMS, this research offers a unique contribution to the existing body of knowledge. The following are the differences between this research and the five previous studies.

Application of Specific Contexts: Different from previous research (Cahyani, Suyitno, & Pujiastuti, 2022) which explored the Blended Learning Learning Model in Increasing Students' Creative Thinking Abilities and Curiosity in Learning Mathematics, this research focuses specifically on the Open University, a leading institution in distance education. This context-specific application provides insight into how Network Models in Blended Learning can be

adapted and optimized for unique learning environments that combine traditional and digital methodologies.

Network Model Integration with LMS: Although previous research may have examined the general implementation of Blended Learning or the effectiveness of LMS platforms (Fakhruddin et al., 2022), this research is new in the integration of Network Model with the Open University LMS. This approach allows detailed analysis of how a dynamic network of interactions and resources can enhance the Blended Learning experience within a specific technological framework.

Focus on Connectivity and Collaboration: Previous research has often discussed the effectiveness of Blended Learning in terms of flexibility and student outcomes (Rahayu et al., 2022), but this research places a unique emphasis on the role of connectivity and collaboration as facilitated by the Network Model. This research explores how creating a cohesive network between students, educators, and content can result in more intensive and meaningful interactions, which has not been thoroughly investigated in previous research.

The novelty of this research lies in its specific focus on the Open University LMS, the integration of the Network Model to improve connectivity and collaboration, and the detailed evaluation of student engagement, satisfaction, and personalized learning. These elements offer new insights and practical recommendations that go beyond the scope of previous research.

2 METHODOLOGY

This research is to identify, evaluate and synthesize relevant literature regarding Network Models in blended learning, especially in the context of the Open University LMS. This analysis aims to understand existing theoretical frameworks and best practices, as well as identify gaps in research that can serve as a basis for further research.

The references selected for this analysis were based on the following criteria: (i) relevance, that is, studies that directly discuss the Network Model in the context of blended learning or LMS; (ii) quality: publications appearing in leading journals or conferences; (iii) year of publication: focus on recent literature (last 5-10 years) to ensure that the analysis covers the latest developments in the field.

Data Collection Methods include: (i) Literature Search: use of academic databases such as Google Scholar and Research Gate to search for relevant articles, books and research reports. Keywords used include "network model", "blended learning", "LMS", and "Open University"; (ii) screening: after data collection, initial screening is carried out to eliminate references that

do not meet the relevance and quality criteria. The abstract and keywords of each article are analyzed to determine their suitability.

The selected references are then categorized into several main themes, namely: (i) Blended Learning Theory: references that discuss the basic concepts and theories underlying blended learning; (ii) Network Models in education: studies that explain the implementation of network models and their impact on learning; (iii) case studies: research showing the implementation of network models in LMS in educational institutions, including the Open University; (iv) challenges and limitations: articles that identify the problems and challenges faced in implementing network models.

Analysis and Synthesis are carried out in stages: (i) Qualitative Analysis: Each reference is analyzed to understand its contribution to the understanding of network models in blended learning. Aspects analyzed include the methodology used, key findings, and implications for educational practice; (ii) Synthesis: Integrating findings from various references to build a more holistic understanding. This synthesis also includes identifying gaps in existing literature, such as aspects of social interaction, the impact of technology, and the role of lecturers in the network model. To ensure the validity and reliability of reference analysis,: (i) triangulation: using various sources and types of literature to strengthen findings and conclusions; (ii) feedback: request input from colleagues who have knowledge in the fields of education and technology to improve the quality of the analysis.

3 FINDINGS AND DISCUSSION

3.1 Blended Learning

Blended Learning represents a contemporary educational approach that synthesizes face-to-face teaching in a webinar network with online learning activities, creating a hybrid model that enhances the learning experience (Abdullah, 2018). By integrating face-to-face methods in webinars and digital networks, Blended Learning offers a more flexible, interactive and personalized educational environment that meets various learning needs and preferences (Cahyani, Suyitno, & Pujiastuti, 2022).

1. Flexibility and Accessibility:

   One of the main advantages of Blended Learning is its inherent flexibility. Students can access course materials, lectures and assignments online at any time, allowing them to organize their study schedule based on their personal commitments and varying time zones. This flexibility is especially beneficial for students who may have busy work

schedules, family responsibilities, or who are studying remotely from different geographic locations. By removing the constraints of fixed schedules and physical classrooms, Blended Learning opens up educational opportunities to a wider range of students.

2. Increased Interaction and Engagement:

   Blended Learning creates a dynamic and interactive learning environment by combining the best aspects of face-to-face and online interactions. In class, students engage in real-time discussions, collaborative group projects, and hands-on activities that encourage active participation and immediate feedback. Online components, such as discussion forums, video lectures, and interactive simulations, further enrich the learning experience by allowing students to explore topics in depth and at their own pace. This combination of synchronous and asynchronous learning modalities increases student engagement and helps maintain motivation throughout the course.

3. Personalized Learning Experience:

   The integration of online resources in Blended Learning allows for a highly personalized learning experience. Students can customize their learning path by choosing from a variety of online resources and tools to suit their individual needs and learning style. Adaptive learning technology, which adjusts the difficulty and focus of content based on student performance, enables a customized educational experience that addresses each student's strengths and weaknesses. This personalization increases learning effectiveness by accommodating different learning speeds and preferences.

4. Improving the Quality of Education:

   Blended Learning contributes to improving the quality of education by utilizing a variety of teaching methods and technologies. The online platform provides access to a variety of multimedia resources, including interactive modules, educational videos, and virtual laboratories, that can complement and extend classroom learning. Educators can leverage these resources to create richer and more varied curricula that support deeper understanding and retention of course material. Additionally, the ability to continuously update online content ensures that students have access to the latest information and advances in their field of study.

5. Efficient Use of Resources:

Blended Learning also encourages more efficient use of educational resources. By incorporating digital materials, educators can reduce reliance on physical textbooks and printed handouts, which not only lowers costs but also reduces environmental impact. Online assessments and feedback mechanisms simplify the evaluation process, providing timely and actionable insights for both students and instructors. This efficient use of resources contributes to a more sustainable and cost-effective educational model.

6. Support for Diverse Learners:

   Blended Learning supports a wide range of learners by offering a variety of teaching and interaction modes. Students who benefit from visual aids, hands-on activities, or verbal explanations may find appropriate resources in a blended model. Additionally, the flexibility of the online component allows students to revisit challenging topics or undertake additional practice at their own pace, ensuring that all students can succeed.

Blended Learning represents a forward-thinking educational approach that combines the strengths of face-to-face classroom teaching with the advantages of digital learning tools (Susilawati, Yasin, & Hambali, 2020). UT applies the power of face-to-face classroom teaching in the webinar network. By providing a flexible, interactive and personalized learning experience, this model helps students achieve a balanced and effective educational experience, making it an increasingly popular choice in modern education.

3.2 Network Models

The Network Model is an educational framework that emphasizes the interconnectedness of various elements in the learning environment. This model harnesses the power of both digital and social networks to create a more dynamic and collaborative learning experience (Lavanya, Kumari, and Padmambika, 2024). In an educational context, the Network Model integrates various resources, technologies, and participants (such as students, educators, and content) into a cohesive system that encourages interaction, knowledge exchange, and collective learning (Networked Learning Editorial Collective, 2021).

The Network Model operates based on the principle that learning is not a linear process but a complex and interconnected network of relationships and experiences (Senk, et al., 2022). By leveraging digital platforms and social networks, this model enables seamless communication and collaboration between students and educators, breaking down traditional barriers in time and space. This allows for the sharing of diverse perspectives, co-creation of knowledge, and development of critical thinking skills through collaborative problem solving.

In an educational environment, the Network Model is very effective in facilitating a Blended Learning environment (Nikolopoulou, & Zacharis, 2023). It supports the integration of face-to-face learning activities in webinars and online networks, ensuring that students can engage with content and peers in a variety of formats. This approach not only increases the flexibility and accessibility of learning but also enriches the educational experience by combining real-time interactions and asynchronous exploration.

The Network Model's focus on connectivity and collaboration is in line with the needs of modern education, where students are increasingly required to navigate complex and information-rich environments (Saif, 2022). By embedding Network Model principles into Blended Learning, educators can create more responsive, interactive, and personalized learning experiences that meet students' diverse needs.

3.3 Network Models in Blended Learning

The combination of Network Model with Blended Learning represents a powerful educational paradigm that utilizes the strengths of both approaches to create a comprehensive and adaptive learning environment (Dziuban et al., 2018). Although Blended Learning combines traditional face-to-face teaching with digital learning activities to offer flexibility and personalization, the Network Model enhances this framework by embedding a deeper level of connectedness and collaboration into the learning experience (Johler, 2022).

In a Blended Learning environment, students engage in synchronous (real-time) and asynchronous (self-paced) learning activities. The Network Model reinforces this by ensuring that these activities are not isolated but are part of a larger, dynamic network of resources, interactions and feedback loops (Persada, et al., 2022). For example, in Blended Learning, students might participate in face-to-face discussions in a webinar network and then continue those conversations online through discussion forums, group chats, or collaborative projects. The Network Model facilitates this expanded interaction by providing the necessary infrastructure and platforms that seamlessly connect students, educators, and content (Hehir, 2021).

This synthesis creates a learning environment where knowledge is co-constructed rather than passively consumed. The Network Model’s emphasis on connectivity ensures that students can tap into a variety of resources ranging from peer insights to expert contributions and multimedia content at any time, making learning more engaging and relevant. By connecting various elements of the Blended Learning experience, the Network Model also encourages

continuous learning and reflection, allowing students to build their understanding progressively (Bouilheres, et al., 2020; Liu, & Wang, 2022).

In addition, the integration of the Network Model in Blended Learning supports differentiated teaching. The Network approach enables the use of adaptive learning technologies that adapt content and learning pathways to individual student needs. This personalization is further enriched by the network's ability to connect learners with similar interests or challenges, fostering peer support and collaborative problem solving. As a result, students not only learn at their own pace but also benefit from the collective knowledge and experiences of their peers.

In summary, the synthesis of Network Model and Blended Learning creates a flexible and interconnected educational ecosystem. It leverages the advantages of digital tools and social networks to enhance traditional learning methods, resulting in a more powerful, engaging and personalized learning experience. This integrated approach is well suited to the complexities of modern education, where students must navigate diverse learning pathways and develop the skills to collaborate and think critically in a connected world.

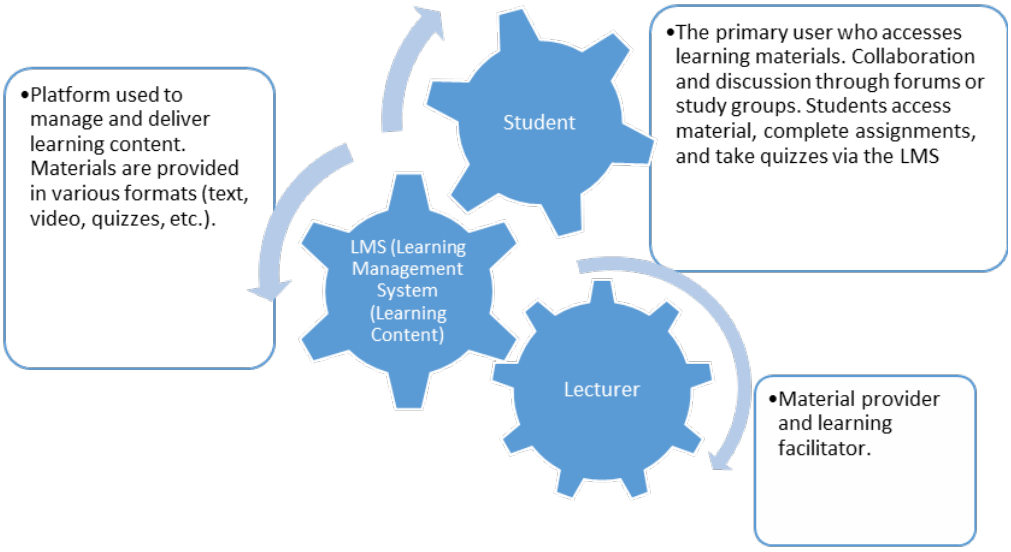

Figure 1. The Relationship between the Performance of Lecturers, Students and LMS

3.4 Network Model in Blended Learning at the Open University LMS

In the current digital era, blended learning has become an increasingly popular learning method, especially in higher education institutions. The Open University, as one of the distance

education institutions in Indonesia, integrates technology through the Learning Management System (LMS) to facilitate more flexible learning. One interesting approach in this context is the network model, which offers a new way to increase interaction and collaboration between students.

The network model focuses on collaborative learning, where students can interact with each other and with lecturers in a digital ecosystem. In the Open University LMS, this model allows students to build stronger connections and networks, which in turn can increase their understanding and engagement in the learning material. Through discussion forums, study groups, and project collaboration, students are encouraged to share knowledge and experiences, creating a more dynamic learning environment.

The effectiveness of the network model in blended learning can be seen from increasing student participation in learning activities. By utilizing LMS features, such as discussion forums and video conferencing, students feel more involved and motivated to contribute. It also provides an opportunity for students to learn from each other, making the learning process more interactive and collaborative. Research shows that learning that involves social interaction can improve understanding and retention of information.

However, implementing network models is not without challenges. One of the main obstacles is the difference in digital skill levels among students. Some students may find it difficult to adapt to the technology used in the LMS, which may hinder their participation. Therefore, it is important for the Open University to provide adequate training and technical support so that all students can exploit the full potential of this network model.

Apart from that, the success of the network model also depends on the role of the lecturer as a facilitator. Lecturers need to be active in encouraging interaction and discussion among students, as well as providing constructive feedback. With the right approach, lecturers can create an inclusive learning atmosphere and support effective collaboration. This is important so that students feel appreciated and motivated to participate in learning activities.

Furthermore, the results of implementing the network model in blended learning in the Open University LMS show an increase in student satisfaction with their learning experience. Many students report that they feel more connected to fellow students and lecturers, and more confident in expressing opinions and ideas. This creates a strong learning community, where students can support each other in achieving their academic goals.

Overall, the application of the network model in blended learning in the Open University LMS provides many benefits, both for students and institutions. By facilitating better interaction and collaboration, this model can improve students' learning experiences and academic outcomes. Going forward, it is important for the Open University to continue to evaluate and develop strategies that support the effectiveness of the network model, to ensure that all students can benefit from this integrated learning.

4 CHALLENGES AND RECOMMENDATIONS

4.1 Challenges

Although overall positive results were seen from implementing the Network Model in the Open University LMS, several challenges emerged during the research. These challenges impact students and instructors and require careful consideration for future improvements.

4.1.1 Technical Issues

One of the main challenges faced was the technical difficulties associated with the integration of the Network Model in the LMS. Issues such as platform crashes, slow loading times, and occasional system outages impact the smooth running of a networked learning environment. These technical problems disrupt the continuity of learning activities and cause frustration among users.

4.1.2 Initial Resistance to Adoption

Another significant challenge was the initial resistance from students and instructors to the implementation of the new Network Model. Many users are used to the traditional Blended Learning approach and are hesitant to accept the changes introduced by this new model. This resistance was partly due to a lack of understanding of the new tools and the complexity of the Network Model.

4.1.3 Learning Curve

Network Model introduces a variety of new features and functions that require users to adapt their learning and teaching methods. Both students and instructors face a learning curve in understanding how to use new collaborative tools and networking resources effectively. This adjustment period causes a temporary decline in engagement and effectiveness as users adapt to the new system.

4.1.4 Resource Constraints

This study also highlights several obstacles regarding the resources available for implementing the Network Model. Limited technical support and inadequate training resources for students and instructors were identified as barriers to successful implementation and optimal use of the model. Inadequate support systems impact users' ability to fully utilize new features and resolve issues promptly.

4.2 Recommendation

To overcome these challenges and increase the effectiveness of the Network Model, several recommendations are proposed:

4.2.1 Improve Technical Support

To mitigate technical problems, strengthening technical support infrastructure is essential. Providing a dedicated technical support team and establishing clear channels for reporting and resolving issues will ensure that technical issues can be resolved quickly. Regular system maintenance and updates should be scheduled to minimize disruptions and improve overall platform reliability.

4.2.2 Provide Comprehensive Training

To overcome resistance and facilitate implementation of the Network Model, a comprehensive training program must be implemented for both students and instructors. This training program should include practical workshops, tutorials, and user guides that cover the use of new tools and features. By familiarizing users with the functions and benefits of the Network Model, resistance to change can be reduced, and users can transition to the new system more smoothly.

4.2.3 Support Continuous Learning and Adaptation

Recognizing the learning curve associated with the Network Model, it is important to provide ongoing support and resources for ongoing learning and adaptation. This can include regular refresher courses, access to online resources, and opportunities for users to seek help and share experiences. Encouraging a culture of continuous improvement and adaptation will help users become more adept at using new models over time.

4.2.4 Optimize Resource Allocation

Overcoming resource constraints involves optimizing the allocation of technical and training resources. Ensuring that sufficient resources are allocated to support the implementation and maintenance of the Network Model is critical to its success. This includes investing in a strong technical infrastructure, expanding support services, and providing adequate training materials.

4.2.5 Cultivate a Supportive Community

Building a community that supports the Network Model can increase its effectiveness. Encouraging collaboration between users, creating forums to share best practices, and promoting peer support can help users overcome challenges and harness the power of the model. Building a community of practice will provide ongoing encouragement and assistance, facilitating a more positive and productive learning environment.

CONCLUSION

In conclusion, although the Network Model has demonstrated significant benefits in enhancing Blended Learning at the Open University, addressing the identified challenges is critical to optimizing its effectiveness. By improving technical support, providing comprehensive training, supporting continuous learning, optimizing resource allocation, and cultivating a supportive community, the Network Model can be more effectively integrated into the LMS, resulting in improved learning outcomes and greater satisfaction among users. Implementing these recommendations will contribute to smoother and more successful adoption of the Network Model, which will ultimately benefit the broader education community.

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ANDROID-BASED TALENT & INTEREST ALLOCATION APPLICATION

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Abstract

Someone needs soft skills to achieve success in society. Every organization implements a strategic planning model according to its characteristics. Higher education is an organization that forms generations and has a role in preparing future leaders of the nation. Thus, education has a strategic role in building student character. The implementation of character education for students can be through three activity paths: curricular, co-curricular, and extracurricular. The extracurricular path aims to develop activities for students' talents, interests, and hobbies, including reasoning, sports, arts, and special interests. Therefore, an application must identify and allocate student characteristics based on their intelligence-type tendencies. So that higher education can create targeted policies.

People use smartphones in every daily activity. So that applications that make it easier for users and provide benefits will be used and needed by the community. In this study, the application to detect student intelligence types is named Android-Based Talent & Interest Allocation (TIA). The research use 200 new students of Universitas Terbuka Padang. Based on data processing, 95% of respondents said the test results followed their daily character. Moreover, 88% stated that they applied the suggestions on the Mobile TIA application to select student activities and lectures. The suggestion for further research is to look at the learning outcomes and characters formed after one semester of implementing activities based on recommendations from the Mobile TIA application.

Keywords: Talent Management, Interest, Distance, Higher Education, Mobile Application.

1 INTRODUCTION

Law Number 20 of 2003 states as follows: "National education functions to develop abilities and shape the character and civilization of a dignified nation in order to educate the life of the nation, aiming to develop the potential of students to become human beings who believe and fear God Almighty, have noble morals, are healthy, knowledgeable, capable, creative, independent, and become democratic and responsible citizens." The mandate clearly states that education develops students' potential into abilities based on faith and piety, personality, noble morals, and independence. Thus, education has a strategic role in building student character.

Therefore, to achieve national education goals, students are required to participate in student guidance activities as an inseparable part of education.

Here are some references related to the need for student activity strategies. Puspita et al. (2020) created a game specifically designed using the Finite State Machine method to educate users about organizing student activities. Ginantra et al. (2018) created an application that can provide convenience in managing activities and room usage and make it easier for students to get information about student activities on campus. Suarmanayasa (2017) discussed the development of student activity strategies at the Faculty of Economics, Ganesha University of Education.

Distance education has unique features and characteristics that are different from conventional education. Universitas Terbuka, as a distance education pioneer, has accepted and provided services to various types of students. Among the most prominent features is the diversity of age and domicile of students, even though they enter the same semester and study program. This uniqueness is a challenge, so Universitas Terbuka can always inspire users and the public because of its ability to provide targeted services to students.

Universitas Terbuka continually needs to improve its services to students according to their characteristics. Therefore, an application must identify and allocate student characteristics based on their intelligence-type tendencies. This is necessary so that UT can create practical and efficient activities, and students can feel the benefits of improving their skills. In this study, the application was named TIA, an abbreviation of Talent & Interest Allocation based on Android.

2 METHODOLOGY

This research is a development research, namely the creation of a mobile application to analyze the talents and interests of distance education students. The application is named TIA (Talent and Interest Allocation) and is based on Android. The study population was new Padang Open University Undergraduate Program students, Odd Semester 2024/2025. The number of samples was 200 with probability sampling techniques. Primary data uses the results of the Android-based TIA analysis for each respondent when the application is applied. Secondary data consists of domicile data, education profile, and intelligence type.

2.1 System Requirements

Detailed description of system requirements, functional and non-functional.

3.2.1 Functional requirements

1) Student domicile data with details of province, city/district, and sub-district.
2) Faculty profile, including details of study programs, semesters, and types of services.
3) The questions measure six types of multiple intelligences: linguistic, logical, mathematical, musical, kinesthetic, interpersonal, and intrapersonal. The variables and indicators of the instrument refer to the types of intelligence of Gardner & Hatch (1989), which have been implemented in psychology and other fields (Chen, 2004; Davis, Christodoulou, Seider & Gardner, 2011).

3.2.2 Non-functional requirements

1) Hardware requirements

   Android-based mobile phone or smartphone with a minimum memory of 2 GB.

2) Software requirements
   - Android Studio/Eclipse IDE for Java
   - Minimum Android Version 2.3.3–2.3.7 Gingerbread (API level 10)
3) Human resource needs

2.2 System Design & Architecture

2.2.1 Design

The Android-based TIA application design uses the UUnifiedModeling Language (UML) modeling system with four diagrams: the Use Case Diagram, Activity Diagram, Sequence Diagram, and Class Diagram.

2.2.2 System Architecture

The architecture of the Android-based TIA system is a modification of the website-based system (Fatimah et al, 2023). Android-based TIA is designed based on two levels, namely managers and students (Figure 1). The manager level functions to create a list of questions and view the profiles of all students and the results of their intelligence types. Meanwhile, the

student level includes requests for account creation, answering test questions, and receiving grades in intelligence dominance recommendations for appropriate activities.

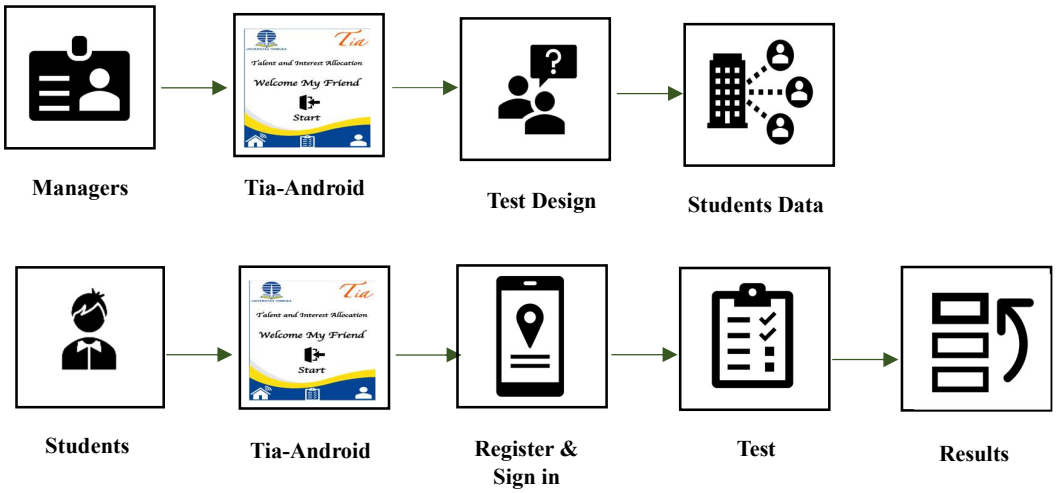


Figure 1. Android-Based TIA Architecture

2.3 Development Procedures and Data Analysis

2.3.1 Development Procedure

The application development procedure is a modification of the Borg & Gall model. The procedure starts with planning, product development, validation to experts, product revision, conducting application trials by taking actual data, then conducting the final revision of the product before being registered on the Play Store, and finally, mass production where TIA can be accessed on the Play Store (Figure 2).

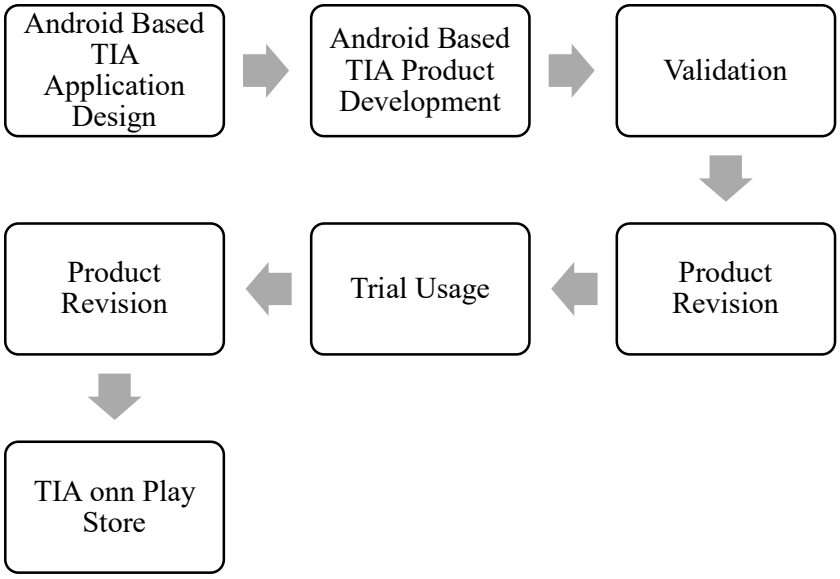


Figure 2. Android-Based TIA Development Procedure

2.3.2 Analisis Data

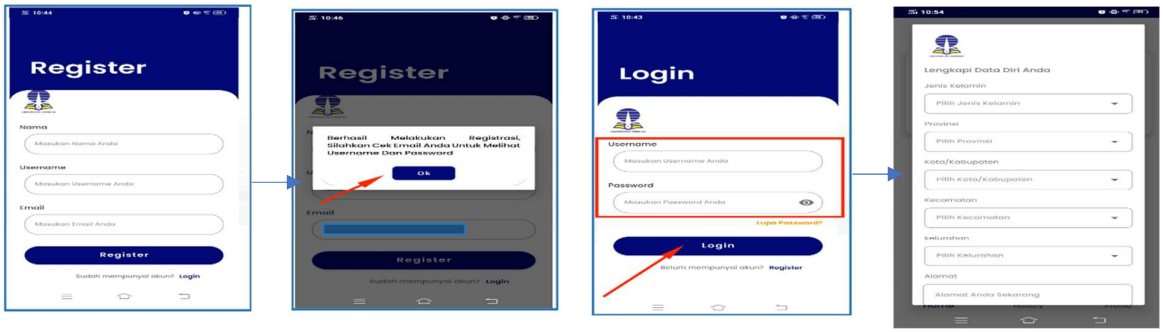
Analysis of the data from the field trials on UT Padang student data is denoted by $(U = \{u_i\})$ using an N-Soft Sets decision-making algorithm (Fatimah et al., 2018). The six types of intelligence are parameters and are denoted by $A = \{a, b, c, d, e, f\}$ namely linguistic (a), mathematical logic (b), kinesthetic (c), musical (d), interpersonal (e), dan intrapersonal (f). Each parameter consists of four measurement criteria (Fatimah, 2023). Students provide assessments in the form of rankings $R = \{0,1,2,3,4\}$ namely "never" (0), "very rarely" (1), "sometimes" (2), "often" (3), and "always" (4). So it is known $N = 5$. This example's threshold (T) is the value $r \geq 3$. The conclusion (k_A) is obtained if 75% of the parameters in the intelligence group meet the threshold, then the student (u_i) is categorized as having the type of intelligence according to the group.

3 FINDINGS AND DISCUSSION

The Android-based TIA application is an extension of the previously created website-based TIA application. The features in this application consist of menus that can still be added or developed further. Each menu has its process and data in the internal application.

3.1 Application Menu View

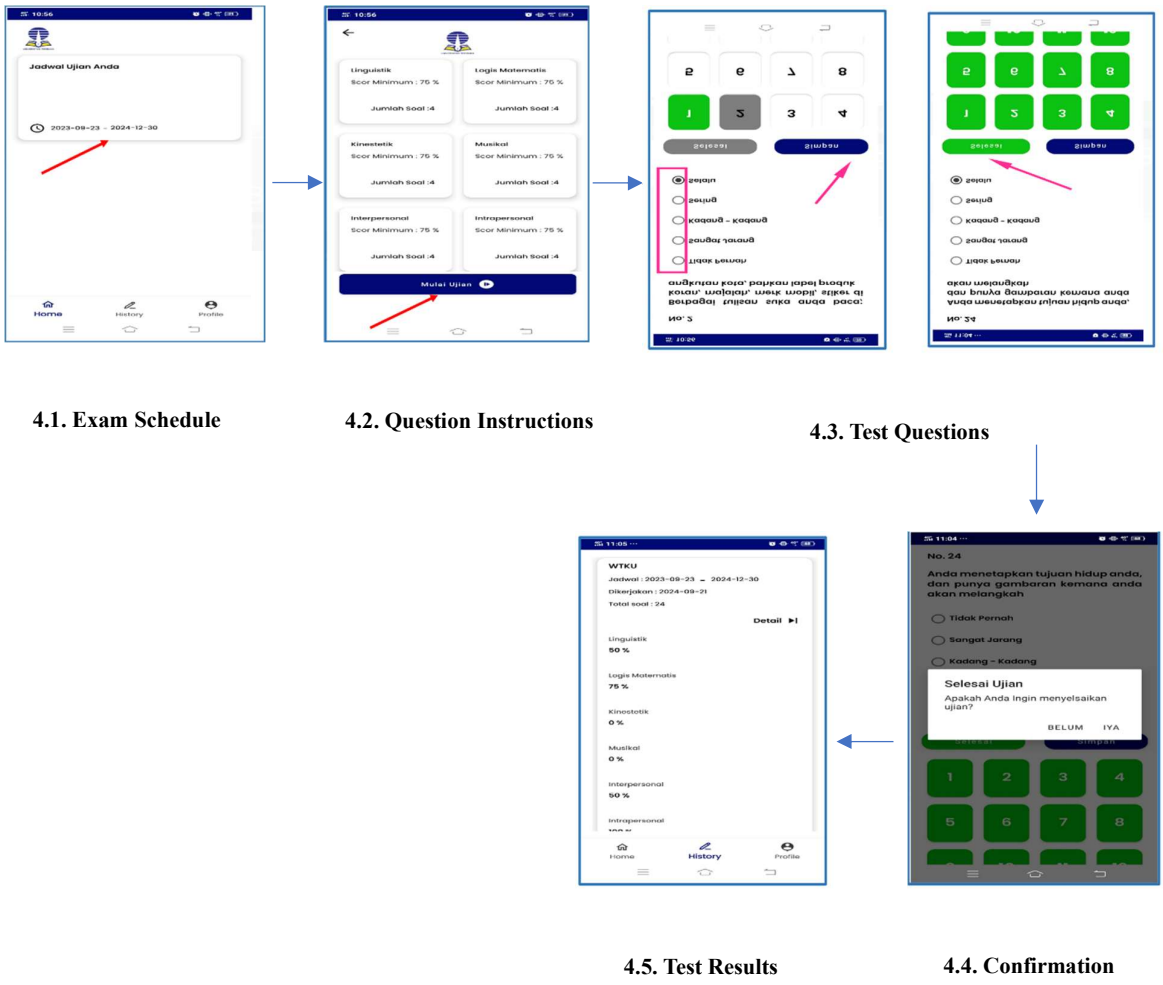
The main menu display of the Android-based TIA application displays the registration and login menu (Figure 3). In the registration menu, students submit an account request by filling in their name, username as Student Registration Number (NIM), and email address (Step 3.1). User and password notifications are sent to the email they registered, and then students log in (Step 3.2). Meanwhile, in the login menu, students fill in their profile, including gender, address, faculty, study program, semester, age generation, and type of service at UT (Step 3.3).



3.1. Register **3.2 Log in** **3.3 Fill in Data Profile**

Figure 3. TIA Android-Based Main Menu

The submenu display (Figure 4) includes the exam schedule, home, history, and profile (Step 4.1). After students select the exam schedule, information on question instructions appears (Step 4.2). In the exam submenu, students select answers according to their characteristics (Step 4.3). After confirming that the exam is complete (Step 4.4), the results will be obtained as scores for each type of intelligence recommendations for appropriate activities (Step 4.5).



Gambar 4. TIA Android-Based Application Sub Menu

3.2 Application Implementation Results

The application trial was conducted on 200 new students of Universitas Terbuka Padang. The respondent profile is presented in Table 1. Based on gender, the data obtained were 81% female and 19% male. Based on the generation profile, it is known that 21% of Generation Z (aged 13-22 years), 71% of Generation Y (aged 23-38 years), and Generation X (aged 39-54 years) only 8%. Meanwhile, based on the type of learning service, most students chose the Semester Package without Face-to-Face Tutorial, namely 83%, then 14% Non Semester Package, and only 4% took the Semester Package with Face-to-Face Tutorial.

Table 1. Respondent Profile

Profile	Gender		Generation			Types of Learning Services		
Type	Female	Male	Z	Y	X	Semester Package with Face-to-Face Tutorial	Semester Package without Face-to-Face Tutorial	Non-Semester Package
Sum	162	38	42	142	16	7	166	27

Based on the test results, 185 student data completed the test to completion. Based on the gender profile (Table 2), 55% of female respondents predominantly had intrapersonal intelligence, while 56% of males had more kinesthetic and intrapersonal intelligence.

Table 2. Intelligence Test Results Based on Gender Profile

Types of Intelligence	Number of Meets Criteria	
	Women (151 students)	Men (34 students)
Linguistic	52	15
Logical-Mathematical	73	15
Kinesthetic	70	**19**
Musical	51	10
Interpersonal	62	15
Intrapersonal	**83**	**19**
Dominant intelligence	Intrapersonal	Kinesthetic & Intrapersonal

Based on the age profile (Table 3), Generation Z and Generation Y have dominant intrapersonal intelligence of 50% and 51% of respondents, respectively. Meanwhile, 50% of Generation Y have Linguistic and Logical Mathematical intelligence.

Table 3. Generation Age Profile Intelligence Test Results

Types of Intelligence	Number of Meets Criteria		
	Generation Z (42 students)	Generation Y (142 students)	Generation X (16 students)
Linguistic	7	52	**8**
Logical-Mathematical	10	69	**8**
Kinesthetic	19	63	6
Musical	12	44	4
Interpersonal	14	54	7
Intrapersonal	**21**	**72**	7
Dominant intelligence	Intrapersonal	Intrapersonal	Linguistic, Logical-Mathematical

Based on the profile of the type of learning service (Table 4), intrapersonal is the dominant intelligence for the three groups of students for the Semester Package with Face-to-Face Tutorial, Semester Package without Face-to-Face Tutorial, and Non Semester Package with each percentage number respectively 86%, 52%, and 37%. Specifically, students in the Non-Semester Package category also have another dominant intelligence, namely kinesthetic (37% of respondents).

Table 4. Intelligence Test Results Profile Type of Learning Services

Types of Intelligence	Number of Meets Criteria		
	Semester Package with Face-to-Face Tutorial	Semester Package without Face-to-Face Tutorial	Non-Semester Package
Linguistic	2	57	8
Logical-Mathematical	3	77	7
Kinesthetic	2	76	**10**
Musical	2	53	5
Interpersonal	3	67	7
Intrapersonal	**6**	**86**	**10**

Dominant intelligence	Intrapersonal	Intrapersonal	Intrapersonal & Kinesthetic

Based on the results of the respondents' feedback, it was found that 95% of respondents said that the test results were under their daily character. Furthermore, 88% stated that they would apply the suggestions on the Mobile TIA application for selecting student activities and lectures.

This research recommendation is intended for institutions and individual students covering academic and non-academic activities. As higher education organizations, universities need to acquire skills to overcome today's competitive challenges (Pynes, (2008). The implementation of multiple intelligences is a collaboration between students and universities; the interconnectedness of mission, goals, processes, and outcomes in assessment; the need for more technology in the classroom (Kezar, 2001); and the relationship between affective and cognitive learning outcomes (Visser, Ashton & Vernon, 2006).

Recommendations related to academic activities can be adjusted to the type of learning service profile. However, in general, students are expected to be able to optimize their dominant intelligence to study courses, such as the research of Kusnadi Alrakhman (2022) on the relationship between knowledge, interests, and talents of a person and citizenship intelligence. For example, if the results of a student's test show that they are dominant in musical intelligence compared to logical-mathematical intelligence, then when studying mathematics courses, students can be accompanied by music or memorize formulas using easy-to-remember song tunes. For example, another student is known to have more dominant logical-mathematical intelligence than kinesthetic intelligence, so when studying physical education and sports courses, they can use a scientific data approach about the benefits of each theory and practice for health.

Recommendations for non-academic activities can be adjusted according to user profiles, namely gender and age generation. So that institutions or individual students can choose student activities that are right on target according to student potential. Not all activities are suitable for specific students, so students will choose one of the most in-demand and will be optimally successful when they know their potential. Some non-academic activities include

entrepreneurship development, proposal writing workshops, arts sports, leadership training, and social media.

4 CONCLUSION

Universitas Terbuka needs to improve quantity and quality continuously. Identification and classification of student intelligence are essential and will benefit UT and students directly. As an institution, UT provides a more targeted alternative according to the personality characteristics & and intelligence of each student group. Meanwhile, the benefits for students by knowing early on about the dominance of intelligence they have will have a positive impact on learning styles & and improving soft skills.

The Android-based TIA (Talent and Interest Allocation) application is an application that is easy to use, practical, and contains positive results & and recommendations for developing student skills. The TIA application can also simulate online exams for new students. For further research, researchers need to see the learning outcomes and character formed after implementing the Mobile TIA application.

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EXPLORING THE SUSTAINABILITY AND SCALABILITY OF MASSIVE OPEN ONLINE COURSES (MOOCS) IN DEVELOPING COUNTRIES: CHALLENGES AND OPPORTUNITIES

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Abstract

This study investigates the sustainability and scalability of Massive Open Online Courses (MOOCs) in developing countries, highlighting the challenges and opportunities that shape their adoption and effectiveness. Despite their potential to democratize education and bridge learning gaps, MOOCs face significant obstacles in these regions, including inadequate technological infrastructure, cultural barriers, and economic disparities. The research identifies that while MOOCs have been widely embraced in developed countries due to robust internet access and digital literacy, their impact in developing countries remains limited, with dropout rates as high as 95%. These challenges are exacerbated by a lack of localized content and culturally relevant pedagogical approaches, which contribute to low engagement and completion rates among learners.

Using a mixed-methods approach, the study combines quantitative data analysis from MOOC platforms and learner surveys with qualitative insights from interviews with educators, policymakers, and learners across selected countries in Africa, Asia, and Latin America. The results reveal that infrastructural deficiencies, such as unreliable internet access and insufficient digital devices, are the most immediate barriers to MOOC adoption. Cultural factors, including language barriers and traditional educational practices, also significantly hinder the success of MOOCs, as they are often designed with Western-centric pedagogies that may not resonate with local learners. Economic constraints further limit access to MOOCs, as the costs associated with internet access and digital devices are prohibitive for many in these regions.

Despite these challenges, the study identifies substantial opportunities for enhancing the effectiveness of MOOCs in developing countries. By localizing content, improving technological infrastructure, and aligning course offerings with local labor market needs, MOOCs can play a critical role in upskilling the workforce and fostering economic development. The study emphasizes the need for a holistic approach that integrates cultural sensitivity, infrastructure improvement, and economic support to make MOOCs a sustainable and scalable educational tool in developing regions. This research contributes to the broader understanding of how MOOCs can be adapted to meet the specific needs of learners in

developing countries, proposing strategic recommendations for their successful implementation.

Keywords: MOOC; Developing Countries; Educational Equity; Technological Infrastructure; Cultural Adaptation.

1 INTRODUCTION

Massive Open Online Courses (MOOCs) have revolutionized global education by providing unprecedented access to high-quality educational content from renowned institutions. These platforms have democratized learning, offering individuals from diverse socio-economic and geographical backgrounds the opportunity to engage with educational materials that were previously inaccessible. In developing countries, where educational infrastructure is often underdeveloped or insufficient, MOOCs present a significant opportunity to bridge educational gaps and promote equity (Waleed et al., 2019; Ortiz-Martínez et al., 2020). The potential of MOOCs to alleviate educational disparities and increase access to learning resources has been widely recognized, positioning them as a critical tool in fostering global educational equity.

In developed countries, the growth of MOOCs has been driven by the availability of advanced technological infrastructure, widespread internet access, and a well-established culture of lifelong learning. These factors have enabled the seamless integration of MOOCs into formal education systems, where they provide flexible and scalable learning opportunities that complement traditional educational models. The rapid adoption of digital technologies and the increasing recognition of the value of online learning have further contributed to the widespread use of MOOCs in these regions (Waleed et al., 2019). In contrast, the uptake of MOOCs in developing countries has been slower and marked by significant challenges, including inadequate technological infrastructure and limited digital literacy (Ma & Lee, 2018; Çağıltay et al., 2023).

One of the primary obstacles to MOOC adoption in developing countries is the lack of reliable internet access and digital devices, both of which are essential for supporting large-scale online education. Infrastructural deficiencies, such as inadequate bandwidth and unreliable connectivity, further complicate the implementation of MOOCs in these regions. Coupled with varying levels of digital literacy among learners, these challenges contribute to lower participation and completion rates in MOOCs, raising concerns about their inclusivity and accessibility in developing contexts (Ma & Lee, 2018). This "digital divide" continues to limit the reach of MOOCs, particularly among learners in rural and underserved areas.

Despite these infrastructural challenges, MOOCs hold considerable promise for improving educational access in developing countries. By providing flexible learning opportunities, MOOCs can cater to the diverse needs of learners, including working adults, professionals seeking to enhance their skills, and students in remote areas who have limited access to traditional educational resources (Rosendale, 2017; Toven-Lindsey et al., 2015). However, for MOOCs to fully realize their potential in these regions, it is crucial to address the unique infrastructural, cultural, and economic challenges that hinder their effectiveness.

The sustainability and scalability of MOOCs in developing countries are shaped by a complex interplay of infrastructural, cultural, and economic factors. Infrastructural barriers, such as insufficient internet bandwidth and a lack of digital devices, are among the most immediate challenges that limit the accessibility of MOOCs. The absence of adequate training for educators further exacerbates these challenges, preventing the full integration of MOOCs into local educational systems (Maphosa & Maphosa, 2023). Without substantial improvements in infrastructure, the core advantages of MOOCs—namely, flexibility and accessibility—remain out of reach for many learners in these regions.

Cultural factors also play a significant role in the adoption and success of MOOCs in developing countries. The cultural context, including language barriers and differing educational practices, influences how learners perceive and engage with online education. MOOCs, often designed with Western-centric pedagogical approaches, may not resonate with learners from diverse cultural backgrounds, leading to a disconnect between the course content and the local cultural context. This disconnect can result in lower engagement and completion rates, particularly among marginalized groups such as ethnic minorities and learners from rural areas (Deng et al., 2019). To address these issues, MOOCs must be designed with greater cultural sensitivity, incorporating content and pedagogical approaches that align with the specific cultural and educational needs of local learners.

Economic barriers further complicate the scalability of MOOCs in developing countries. Many potential learners face financial constraints that make it difficult to afford the necessary technology and internet access required for participating in MOOCs. Although many MOOCs are available at no cost, the hidden expenses associated with participation—such as the need for stable internet connections and suitable digital devices—can be prohibitive for marginalized populations. Moreover, the limited recognition of MOOC credentials by employers in

developing countries diminishes their perceived value, further discouraging learners from investing time and resources in these courses (Díaz & Sánchez, 2020).

To overcome these multifaceted challenges, the literature proposes several key strategies. One critical approach is the development of localized content that reflects the specific cultural and linguistic needs of learners in developing countries. Simply translating MOOCs designed for developed countries is insufficient; instead, these courses must be adapted to local realities to ensure relevance and accessibility for the target audience (Ma & Lee, 2018). This process requires collaboration between educational institutions in developed and developing countries, as well as a deep understanding of the local educational context.

In addition to content localization, improving technological infrastructure is essential for the success of MOOCs in these regions. Enhancing internet access, providing digital devices, and offering digital literacy training to both educators and learners are crucial steps toward integrating MOOCs into local education systems (Waleed et al., 2019). Educators, in particular, play a pivotal role in supporting student participation in MOOCs, making their training in digital literacy a critical component of this effort. By equipping educators with the skills and resources necessary to facilitate online learning, MOOCs can be more effectively integrated into educational systems in developing countries.

Economic challenges can be mitigated through the development of supportive policies and partnerships aimed at reducing the cost of accessing MOOCs and increasing the recognition of MOOC credentials. For example, subsidized internet services or partnerships with local businesses to offer MOOCs at reduced costs could make these courses more accessible to marginalized groups. Furthermore, integrating MOOC credentials into formal education and employment systems would enhance their perceived value, encouraging greater participation among learners (Díaz & Sánchez, 2020).

While existing research on MOOCs has predominantly focused on their implementation in developed countries, there remains a significant gap in understanding how MOOCs can be effectively adapted to meet the specific needs of learners in developing regions (Çağıltay et al., 2023). This study seeks to address this gap by exploring the sustainability and scalability of MOOCs in developing countries. By identifying and addressing the key infrastructural, cultural, and economic challenges that hinder the successful implementation of MOOCs in selected countries across Africa, Asia, and Latin America, this research aims to develop a

comprehensive framework to guide the sustainable and scalable deployment of MOOCs in these regions.

The novelty of this research lies in its comprehensive approach to understanding the specific challenges and opportunities associated with MOOCs in developing countries. While much of the existing research has focused on MOOCs in developed nations, this study fills a critical gap by addressing the unique contexts of developing regions. It emphasizes the importance of designing MOOCs that are culturally and linguistically tailored to the needs of learners in these areas (Ma & Lee, 2018). Additionally, this research aims to create a holistic framework that integrates infrastructural improvements, cultural considerations, and economic incentives to support the sustainable deployment of MOOCs in diverse developing contexts (Deng et al., 2019).

The scope of this study is defined by its geographical, contextual, and methodological boundaries. It will focus on selected developing countries in Africa, Asia, and Latin America, considering the diverse socio-economic conditions across these regions. The study will employ a mixed-methods approach, combining quantitative data from surveys and MOOC platform analytics with qualitative insights from interviews with key stakeholders. By analyzing MOOC initiatives from the past decade (2014-2024), this research will contribute to a broader understanding of MOOCs as a viable educational tool in developing countries, ultimately promoting greater educational access and equity on a global scale.

1.1 Current State of MOOCs in Developing Countries

Massive Open Online Courses (MOOCs) have become a transformative tool in global education, offering unprecedented access to learning by overcoming traditional barriers. However, their adoption and success in developing countries present a complex landscape with both opportunities and significant challenges. While MOOCs have been widely embraced in developed nations, their implementation in developing countries has faced numerous hurdles. This discrepancy is primarily due to unique challenges that are often overlooked in research, which tends to focus more on learners in developed contexts. Studies like those by Liyanagunawardena et al. (2013) highlight the urgent need for research that specifically addresses the barriers to MOOC participation in developing countries, such as infrastructural limitations, cultural differences, and economic challenges.

One of the most significant obstacles to MOOC adoption in developing regions is inadequate technological infrastructure. In many parts of Africa, Asia, and Latin America, internet access

is limited, connectivity is unreliable, and there is a shortage of necessary digital devices. These technological barriers prevent MOOCs from reaching their full potential in these areas, as they restrict access and diminish the quality of the learning experience. Without improvements in infrastructure, the goal of using MOOCs to promote educational equity remains out of reach.

Cultural factors also play a crucial role in the effectiveness of MOOCs in developing countries. The cultural context, including language barriers and differing educational practices, significantly influences how learners engage with online education. MOOCs, often designed with Western-centric pedagogical approaches, may not resonate with learners from diverse cultural backgrounds, leading to feelings of alienation and lower completion rates. Wahid et al. (2020) emphasize the importance of designing MOOCs that are culturally relevant and responsive to the needs of learners in developing countries. By incorporating content that reflects local contexts, MOOCs can enhance learner engagement and improve outcomes.

Economic challenges further complicate the sustainability and scalability of MOOCs in these regions. Financial constraints are a significant barrier for many potential learners, particularly where the cost of internet access and digital devices is high. Although MOOCs are often free, the hidden costs associated with participation can be prohibitive for marginalized populations. Moreover, the lack of recognition of MOOC credentials by employers in developing countries diminishes their value, discouraging participation.

The current state of MOOCs in developing countries presents both challenges and opportunities. Addressing these challenges through targeted research and innovative solutions is essential to unlocking the full potential of MOOCs as a sustainable and scalable educational tool. By focusing on the unique conditions of these regions, stakeholders can work towards creating a more inclusive and effective MOOC ecosystem that enhances educational equity and development on a global scale.

1.2 Challenges Facing MOOCs in Developing Countries

The literature on Massive Open Online Courses (MOOCs) in developing countries underscores a range of challenges that impede their successful implementation and scalability. These challenges are primarily rooted in infrastructural, cultural, and economic factors, which together hinder the effective utilization of MOOCs as a tool for enhancing educational access in these regions.

Inadequate technological infrastructure emerges as one of the most significant barriers. Dridi et al. (2020) highlight that many developing countries suffer from poor internet connectivity and insufficient technological resources, essential for supporting robust online learning environments. This issue is particularly pronounced in fragile settings, such as refugee camps, where the lack of reliable internet access severely limits the effectiveness of blended learning models. Similarly, Maphosa & Maphosa (2023) identify common challenges related to insufficient infrastructure and a lack of skilled personnel, which are critical for the successful delivery of MOOCs. Without the necessary infrastructure, the potential benefits of MOOCs remain largely inaccessible to many learners in developing regions.

Cultural attitudes towards education also play a crucial role in the adoption and success of MOOCs in these countries. Maphosa & Maphosa (2023) argue that many learners in developing regions may prioritize traditional face-to-face interactions over online learning, leading to resistance against MOOCs. Furthermore, the lack of digital literacy among potential learners exacerbates this issue. Pujar & Tadasad (2016) note that a significant portion of the population struggles with basic computer skills, limiting their ability to effectively engage with online courses. This suggests that integrating digital literacy training into MOOC offerings is essential for improving learner engagement and success in developing countries.

Economic disparities add another layer of complexity to the implementation of MOOCs. According to Çağıltay et al. (2023), despite the potential of MOOCs to bridge the digital divide, their adoption remains low in developing regions due to limited access to technology and a lack of resources to support online learning. The affordability of MOOCs and the hidden costs associated with technology and internet access present significant barriers for learners in low-income areas. Addressing these economic challenges is crucial to ensuring that MOOCs can be scaled and sustained in developing regions.

The challenges facing MOOCs in developing countries are multifaceted, encompassing infrastructural, cultural, and economic factors. A comprehensive approach is required to

address these issues, including improving internet connectivity, enhancing digital literacy, and considering the economic realities of potential learners. By tackling these challenges, MOOCs can become a sustainable and scalable solution for improving educational access and equity in developing regions. The literature emphasizes the need for targeted research and innovative strategies to overcome these barriers and fully realize the potential of MOOCs in these contexts.

1.3 Opportunities and Potential Solutions

The exploration of opportunities and potential solutions for Massive Open Online Courses (MOOCs) in developing countries reveals a promising landscape for enhancing educational access and equity. A comprehensive analysis of the literature identifies several key areas where MOOCs can be leveraged to address existing challenges and improve outcomes for learners. One of the most significant opportunities presented by MOOCs is their potential to democratize education by providing free or low-cost access to high-quality learning resources. Ma & Lee (2018) emphasize that MOOCs can reach a global audience, allowing learners from diverse backgrounds to access educational materials at their convenience. This accessibility is particularly crucial in developing countries, where traditional educational resources may be limited. By offering courses that cater to various interests and schedules, MOOCs can bridge the educational divide and empower learners who may otherwise lack access to formal education.

Another critical opportunity lies in the potential of MOOCs to upskill the labor force. Goglio & Bertolini (2021) argue that MOOCs serve as a practical extension of professional development and continuing education, enabling individuals to acquire new skills relevant to the job market. This is especially important in developing countries, where economic disparities often limit access to traditional training programs. By providing targeted skill development through MOOCs, learners can enhance their employability and contribute to economic growth. Additionally, Hossain et al. (2022) propose a model for designing MOOCs that specifically addresses graduate skill gaps. Their research highlights the importance of aligning course content with labor market needs, ensuring that learners acquire relevant skills that enhance their employability. By focusing on developing competencies that are in demand, MOOCs can play a pivotal role in preparing learners for the workforce and addressing skill shortages in various sectors.

The need for culturally relevant and inclusive course design is another area of opportunity. Liyanagunawardena & Williams (2016) note that the demographics of MOOC participants

often skew towards individuals from developed countries with higher levels of education. To address this imbalance, it is essential to create MOOCs that resonate with the cultural contexts of learners in developing countries. This includes incorporating local languages, cultural references, and relevant examples that enhance engagement and learning outcomes. Moreover, the accessibility of MOOCs can be further enhanced through targeted initiatives. Iniesto et al. (2019) argue for a holistic approach to creating accessible MOOCs, emphasizing the importance of addressing not only technical considerations but also the diverse needs of learners. By conducting accessibility audits and incorporating feedback from learners, MOOC providers can identify barriers and implement solutions that improve access for all participants, including those with disabilities.

The integration of technology into the learning experience also presents opportunities to enhance engagement and retention in MOOCs. Freitas et al. (2015) highlight the potential of innovative engagement strategies, such as interactive elements, gamification, and social learning opportunities, to create more dynamic and engaging learning environments that encourage participation and completion. In conclusion, the opportunities and potential solutions for MOOCs in developing countries are vast and varied. By focusing on enhancing access, upskilling the workforce, addressing skill gaps, promoting cultural adaptation, improving accessibility, and leveraging technology for engagement, stakeholders can unlock the full potential of MOOCs as transformative educational tools. Continued research and collaboration among educators, policymakers, and technology providers will be essential for realizing these opportunities and ensuring that MOOCs contribute meaningfully to educational equity and access in developing regions.

2 METHODOLOGY

2.1 Materials

This study utilized multiple data sources, including surveys and interviews, alongside data from MOOC platforms. The participants comprised educators, students, and policymakers from various developing countries. These stakeholders were selected to provide comprehensive insights into the sustainability and scalability of MOOC implementations in different educational and infrastructural contexts (Deng et al., 2019; Ma & Lee, 2018). The study focused on MOOC platforms widely used in the targeted regions, collecting both quantitative data from platform analytics and qualitative data from surveys and interviews (Díaz & Sánchez, 2020).

4.2 Sample Preparation

The selection of developing countries was based on specific criteria such as internet penetration rates, digital infrastructure, and economic indicators (Çağıltay et al., 2023). MOOC platforms were chosen according to their popularity in each country, considering those with higher engagement in the target regions (Waleed et al., 2019). The study applied stratified random sampling for the surveys to ensure representative coverage of key demographics (educators, students, policymakers) (Ortiz-Martínez et al., 2020). For the interviews, purposive sampling was employed to select participants with direct experience in the design, implementation, or policy-making aspects of MOOCs (Maphosa & Maphosa, 2023).

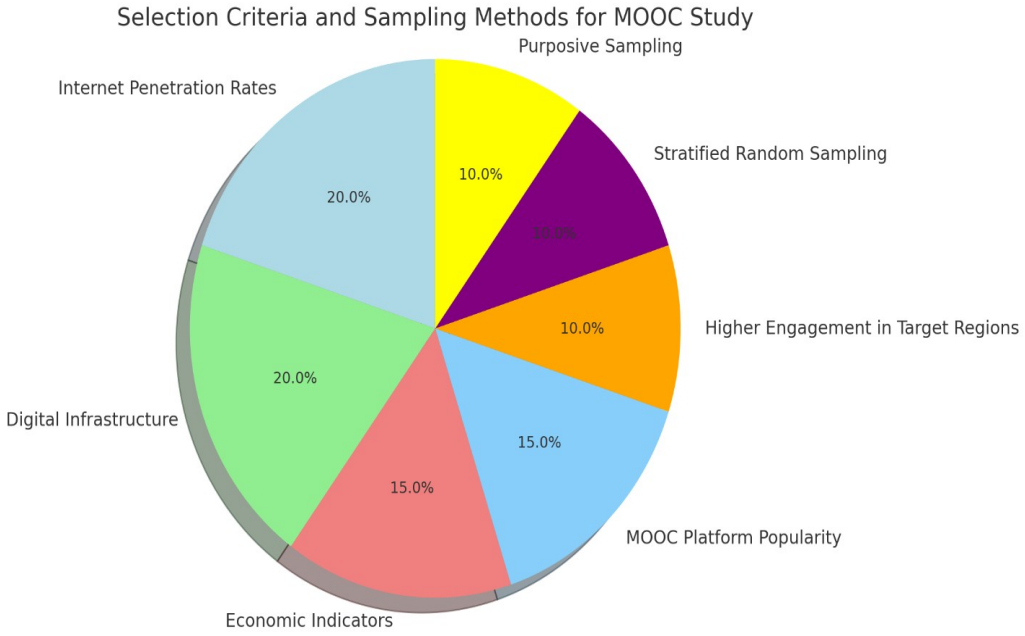

Figure 1. Selection Crieteria and Sampling Methods for MOOCs Study

3. Experimental Set-up

Data collection followed a mixed-methods approach. Quantitative data was gathered from MOOC platform analytics, focusing on user metrics such as engagement and completion rates (Rosendale, 2017). Surveys were distributed to learners and educators to gather data on MOOC usage, engagement, and perceptions of scalability (Toven-Lindsey et al., 2015). In parallel, qualitative data was collected through in-depth interviews with educators and policymakers, exploring the challenges and opportunities in implementing MOOCs in different socio-economic contexts (Deng et al., 2019). The analysis of the data used both quantitative techniques to assess trends and qualitative coding to identify key themes related to cultural,

infrastructural, and economic factors influencing MOOC sustainability (Díaz & Sánchez, 2020).

4. Parameters

Key parameters measured in this study included sustainability, scalability, user engagement, completion rates, and infrastructural readiness. Sustainability was assessed based on the long-term viability of MOOCs in the targeted countries (Ma & Lee, 2018), while scalability referred to the potential for broader implementation (Maphosa & Maphosa, 2023). Engagement and completion rates were quantified using MOOC platform data, while infrastructural readiness was evaluated through surveys focusing on internet access, availability of digital devices, and digital literacy levels among the participants (Ortiz-Martínez et al., 2020).

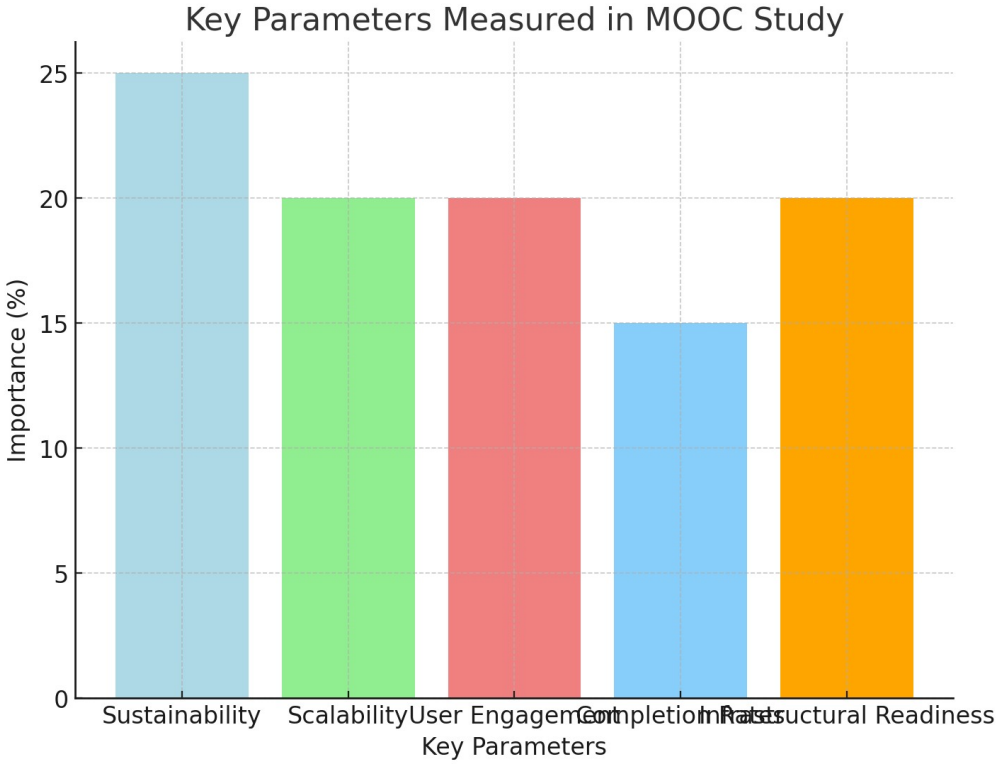

Figure 2. Key Parameters Measured in MOOCs

5. Statistical Analysis

The analysis of survey data involved the use of descriptive and inferential statistics to compare findings across different countries and platforms (Waleed et al., 2019). Techniques such as ANOVA and chi-square tests were applied to examine variations in engagement and completion rates between regions (Díaz & Sánchez, 2020). Interview transcripts were analyzed using thematic analysis to identify recurring themes and insights (Deng et al., 2019). The study also employed regression analysis to explore relationships between key variables, such as infrastructural readiness and MOOC completion rates, to draw meaningful comparisons across different settings (Çağıltay et al., 2023).

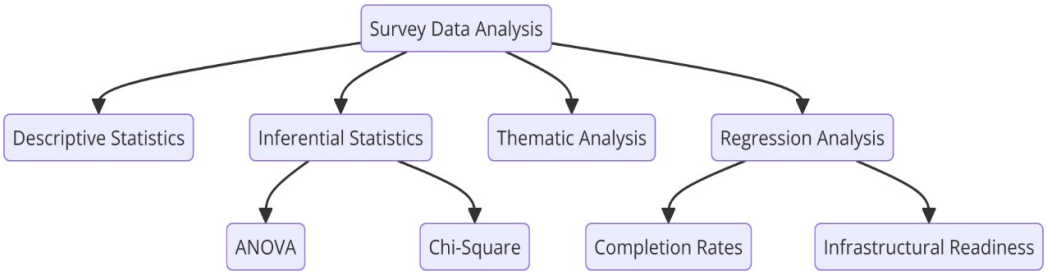

Figure 3. Statistical Analysis

3 FINDINGS AND DISCUSSION

3.1 Presentation of data on the current state of MOOCs in the selected regions

The exploration of the current state of Massive Open Online Courses (MOOCs) in developing countries unveils a complex interaction of challenges and opportunities. Despite the global popularity of MOOCs, their adoption in developing regions remains limited, with dropout rates as high as 95% reported by Aldowah et al. (2019). These high attrition rates highlight significant issues related to course design and learner engagement, which are particularly pronounced in environments where the course materials and instructional methods do not adequately meet the needs of diverse learner populations. Jordan (2015) further emphasizes that completion rates are heavily influenced by factors such as course length, assessment methods, and the cultural backgrounds of participants, suggesting that MOOCs often fail to effectively engage learners in these regions.

Key challenges identified include infrastructural limitations, cultural barriers, and economic disparities. Dridi et al. (2020) note that inadequate technological infrastructure, especially in fragile settings like refugee camps, severely limits the effectiveness of blended learning environments. This lack of reliable internet access and technological resources creates

significant barriers to participation, making it difficult for learners to fully engage with course content. Additionally, Liyanagunawardena and Williams (2016) point out that MOOC participants often come from developed countries, with many learners already possessing advanced degrees. This demographic trend raises concerns about the inclusivity of MOOCs and their ability to reach underserved populations in developing regions. Cultural attitudes also play a critical role, as Ma and Lee (2018) found that traditional views on education, which prioritize face-to-face interactions, can hinder the adoption of online learning in these regions. Economic challenges further exacerbate these issues, with the cost of internet access and technology being significant barriers for learners from economically disadvantaged backgrounds, as noted by Goglio and Bertolini (2021).

Despite these challenges, there are considerable opportunities for enhancing the effectiveness of MOOCs in developing countries. The literature suggests that making course content more culturally relevant and inclusive can improve engagement and completion rates. Iniesto et al. (2019) advocate for a holistic approach to accessibility, emphasizing the need to address both technical and user experience factors to create more inclusive learning environments. Additionally, leveraging technology to enhance engagement through gamification and interactive elements, as suggested by Freitas et al. (2015), can create a more dynamic learning experience. The potential of MOOCs to serve as a platform for upskilling the workforce presents a significant opportunity for economic development. By aligning course offerings with labor market needs, MOOCs can help bridge skill gaps and enhance employability in developing regions, as highlighted by Goglio and Bertolini (2021). This alignment is crucial for ensuring that MOOCs contribute meaningfully to the educational landscape and address the specific needs of learners in these contexts.

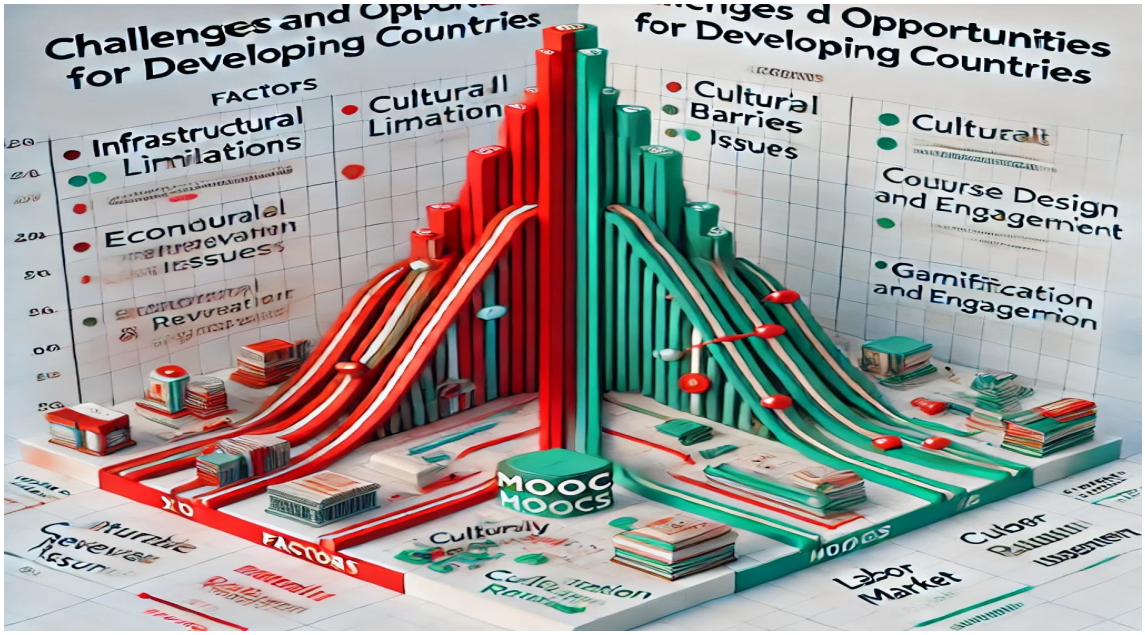

Figure 4: MOOCs in Developing Countries

The challenges and opportunities associated with the implementation of MOOCs (Massive Open Online Courses) in developing countries. The X-axis categorizes factors into two main groups: challenges and opportunities. The challenges include infrastructural limitations, cultural barriers, economic disparities, and issues related to course design and learner engagement. These factors are represented by a red line, indicating their significant impact, with scores as high as 95 for course design and engagement issues, followed by 90 for infrastructural limitations. These high scores demonstrate that these challenges are major obstacles to the success of MOOCs in these regions.

On the other hand, the opportunities, which include culturally relevant content, gamification, engagement strategies, and alignment with labor market needs, are depicted with a green line. These factors show a moderate to high potential for positive impact, with scores of 70, 75, and 80, respectively. While these opportunities do not reach the same level of impact as the challenges, they offer considerable potential for improving the effectiveness of MOOCs if the challenges are addressed.

The graph highlights a clear distinction between the high-impact challenges that must be overcome to enhance the success of MOOCs in developing countries and the opportunities that could significantly contribute to their effectiveness when properly leveraged.

3.2 Presentation Comparison of finding with existing research on MOOCS in developed and devoloping countries.

The exploration of MOOCs in both developed and developing nations presents a multifaceted educational landscape, marked by disparities in access, participation, and outcomes. While MOOCs hold the potential to democratize education and expand access to high-quality learning resources globally, significant inequities remain. Research reveals that MOOCs are predominantly used by learners in developed countries, while participation from developing regions remains notably lower (Brown et al., 2015; Gershon et al., 2021; Oudeweetering & Ağırdağ, 2018). This underrepresentation of learners from developing regions raises concerns regarding the inclusiveness and overall effectiveness of MOOCs in achieving true educational equity across different socio-economic contexts (Maphosa & Maphosa, 2023; Chaveesuk et al., 2022).

In developed countries, MOOCs have become integrated within traditional educational systems, complementing formal learning by offering flexible learning opportunities and additional resources. Factors such as robust technological infrastructure, higher digital literacy, and a more widespread acceptance of online learning contribute to higher completion rates and increased engagement in these regions (Sinclair & Kalvala, 2016; Wahid et al., 2020). MOOCs in these contexts often serve well-educated individuals seeking to advance their knowledge or professional skills, reinforcing existing educational advantages rather than addressing learning gaps (Gershon et al., 2021; Brown et al., 2015). Moreover, the majority of MOOC participants in developed countries tend to come from affluent backgrounds, a factor that perpetuates educational inequalities, as highlighted by Gershon et al. (2021) and Oudeweetering and Ağırdağ (2018

Conversely, in developing countries, the adoption and impact of MOOCs are hindered by various challenges, including poor technological infrastructure, limited internet access, and lower digital literacy levels (Wahid et al., 2020; Maphosa & Maphosa, 2023). These barriers severely limit both participation and completion rates. Studies show that completion rates in developing nations are significantly lower, with some as low as 4% to 5%, compared to their developed counterparts (Tripathi & Tandon, 2022; "Massive Open Online Courses as an Improvement in Education for Countries in Transition: Case of Bosnia and Herzegovina," 2023). The gap between developed and developing regions underscores the urgent need for MOOC models that are sensitive to the socio-economic realities of these contexts (Modise, 2022; Al-Adwan & Khdour, 2020).

Furthermore, the content and delivery of many MOOCs are often shaped by the cultural and educational norms of developed countries, which may not align with the learning needs of students in developing regions (Modise, 2022; Kasztelewicz et al., 2022). This lack of localization can alienate learners in developing countries, who may find the courses less relevant or applicable to their contexts (Modise, 2022; Maphosa & Maphosa, 2023). As a result, it is critical for MOOC providers to collaborate with local educators and stakeholders to create content that is culturally relevant and addresses the specific needs of learners in these regions (Karnam et al., 2020; Sigama & Kalema, 2022).

MOOCs have the potential to enhance educational access and foster equity, there remains a significant divide in their implementation and effectiveness between developed and developing countries. Overcoming these challenges, particularly those related to infrastructure and cultural relevance, is essential for MOOCs to truly serve as transformative tools for global education. Future research should focus on identifying effective strategies and models that address these disparities, ensuring that the benefits of MOOCs are accessible to learners across diverse socio-economic contexts (Chaveesuk et al., 2022; Tripathi & Tandon, 2022; Ma & Lee, 2023).

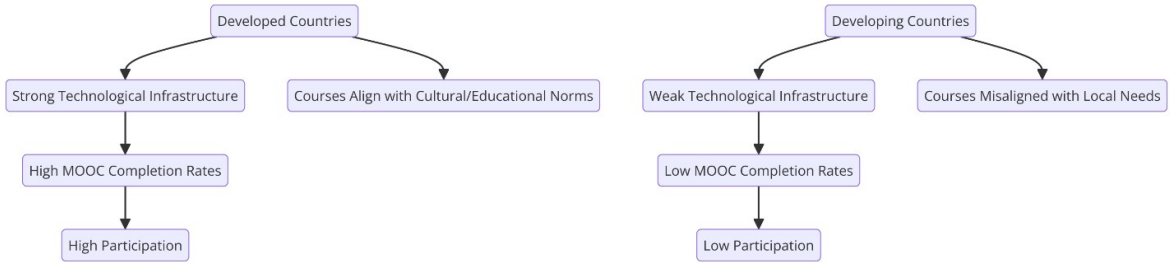

Figure 5. Comparison between developed and developing countries in MOOC participation.

3.3 Implication MOOCs

3.3.1 Implications of Findings for Policymakers, Educators, and Other Stakeholders

The findings from this study provide crucial insights for policymakers, educators, and stakeholders in the educational sector, particularly in developing countries. Policymakers are urged to prioritize the improvement of digital infrastructure, as reliable internet access and affordable digital devices are essential to increasing MOOC participation. Without significant investments in infrastructure, the potential benefits of MOOCs for expanding educational access and equity will remain unattainable for many. In addition, policymakers should collaborate with telecommunication companies to subsidize internet access, especially in rural

areas, where the digital divide is most pronounced (Dridi et al., 2020; Maphosa & Maphosa, 2023).

For educators, the research emphasizes the importance of cultural adaptation in MOOC content. Courses designed with a Western-centric perspective may not resonate with learners from different cultural backgrounds. Therefore, educators need to work with local experts to develop MOOCs that integrate culturally relevant examples, languages, and pedagogical methods. This cultural sensitivity will enhance learner engagement and completion rates in diverse contexts (Modise, 2022; Kasztelewicz et al., 2022).

Other stakeholders, including private sector companies and international organizations, can contribute by forming partnerships that reduce costs associated with online education. For instance, collaborations with technology providers to supply affordable digital devices or partnerships with educational institutions to offer localized content could further improve access and participation (Ma & Lee, 2018; Goglio & Bertolini, 2021).

3.3.2 SubPotential Impact on Educational Access and Equaity in Developing Countries

The implementation of MOOCs has the potential to significantly improve educational access and equity in developing countries, particularly if infrastructural, cultural, and economic barriers are addressed. MOOCs provide an opportunity to democratize education by offering flexible, low-cost access to high-quality learning resources, which can benefit marginalized populations, such as rural communities and underserved urban areas (Liyanagunawardena et al., 2013; Modise, 2022). However, the findings indicate that the current MOOC landscape in developing regions still favors affluent, digitally literate learners, thus perpetuating educational inequalities (Gershon et al., 2021; Oudeweetering & Ağırdağ, 2018).

By addressing the infrastructural gaps, such as improving internet access and digital literacy, MOOCs can help bridge these disparities, offering learners in developing regions a path to both personal and economic advancement. Moreover, localized and culturally relevant MOOCs can improve learner engagement, ensuring that diverse populations benefit equally from these educational opportunities (Díaz & Sánchez, 2020; Maphosa & Maphosa, 2023).

The fully leverage the transformative potential of MOOCs in promoting educational access and equity, it is essential that stakeholders adopt a holistic approach that includes infrastructural improvements, economic support, and cultural adaptation of course content (Çağıltay et al., 2023). These strategies will not only enhance the effectiveness of MOOCs but also contribute to sustainable educational development in these regions

4 CONCLUSION

This study has demonstrated that while Massive Open Online Courses (MOOCs) offer significant opportunities for enhancing educational access in developing countries, their sustainability and scalability face numerous challenges. The research identified key barriers such as inadequate technological infrastructure, cultural misalignment of course content, and economic constraints that limit MOOC participation and completion rates in these regions. Without addressing these obstacles, the full potential of MOOCs remains unrealized. However, the study also highlighted the substantial opportunity to localize content, improve infrastructure, and align course offerings with local labor market needs, thus enhancing the overall effectiveness of MOOCs in these contexts.

To support the growth and success of MOOCs in developing countries, it is critical for governments and institutions to implement targeted policies. These should include investments in improving digital infrastructure, such as expanding internet access and providing affordable digital devices, particularly in rural areas. Additionally, governments should offer subsidies or partnerships with private companies to reduce the costs of internet access and devices. Institutions should focus on developing culturally relevant and localized MOOC content to increase learner engagement and completion rates. Future research should explore the long-term impacts of these interventions and evaluate different models for integrating MOOCs into formal educational and employment sectors in developing regions. Such studies could further inform the development of tailored strategies to maximize the scalability and sustainability of MOOCs in these contexts

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DEVELOPING RECOMMENDER SYSTEM FOR LEARNING MANAGEMENT SYSTEM USING TRANSFORMER AS ATTENTION-BASED MODELS

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Abstract

In the era of information overload, recommender systems (RS) have become crucial tools in improving user experience across various domains, including Learning Management Systems (LMS). RS in LMS is particularly valuable for providing personalized learning recommendations that align with user individual preferences, abilities, and needs. This paper proposes to develop an RS for LMS using transformer models as attention-based systems. By leveraging the self-attention mechanism of transformers, the proposed system can accurately focus on the most relevant aspects of user interactions, resulting in more precise and relevant recommendations. Our experiments compare the transformer-based model with the Neural Collaborative Filtering (NCF) model, demonstrating the superiority of the transformer model in both HR@10 and NDCG@10 metrics. The transformer model achieves HR@10 of 70.59% and NDCG@10 of 50.34%, outperforming the NCF model by capturing more complex interactions between users and learning materials. The results highlight the potential of transformers to enhance personalized learning experiences in LMS, offering a more robust framework for understanding user behavior and delivering tailored learning content.

Keywords— recommender system, transformer, attention-based model

1 INTRODUCTION

In the era of information overload, recommender systems (RS) have become an essential tool in various domains, including Learning Management Systems (LMS). RS are widely used to help users find their desired items or services from a large collection of options. They can improve user satisfaction, loyalty, and retention, as well as generate revenue for the providers. However, designing effective RS is challenging, as they need to deal with complex and dynamic user preferences, item features, and system environments.

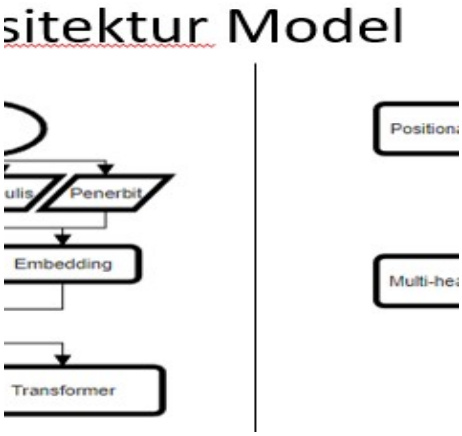
RS plays a crucial role in enhancing the user experience in the Learning Management System (LMS). According to [1], although LMS has facilitated access to various learning materials, the primary challenge is how to create a personalized and efficient learning experience for each user. They also state that many current LMS still function primarily as information repositories.

RS in LMS can provide recommendations for learning materials that align with individual interests, abilities, and needs by analyzing user learning patterns.

Technological advancements have enabled the application of attention-based transformer models as an RS. Transformers have become a trend in various fields of information technology due to their success in improving the performance of various applications, especially in generative language models like GPT (Generative Pre-trained Transformer). The success of these models in various fields has demonstrated their superiority in understanding context and generating more precise and personalized recommendations [2].

Transformers can analyze and understand user preferences more accurately with their excellent attention mechanism. This enables the system to provide more relevant recommendations. We hope that this work will not only contribute to the ongoing research in the field of transformer model and its application in RS but also inspire further innovation in the application of transformer in other fields.

Figure 1 Transformer structure



Related research about Transformers have become a focal point in various research areas related to recommender systems. Known as attention-based models, transformers have demonstrated their superiority in various applications, particularly in natural language processing and recommender systems. Research [3] introduced the transformer architecture, which underlies significant advancements in natural language processing and recommender systems. This study shows that the attention mechanism enables models to capture relationships between data more effectively and efficiently, forming the foundation for many modern transformer models used today.

One study demonstrates how BERT [4], a popular transformer model, can be used to improve the accuracy of recommender systems by understanding the context and sequence of user

preferences. This model can capture complex relationships between recommended items and user preferences, resulting in more relevant and accurate recommendations.

Another study introduces the SASRec model [5], which uses the self-attention mechanism to more effectively capture the dynamics of user preferences in the context of recommender systems. The success of this model in enhancing recommendation performance underscores the significant potential of using transformers in developing better recommender systems.

Both studies [4], [5] indicate that transformer models, with their strong attention capabilities, can significantly improve the quality and accuracy of recommender systems. Therefore, the application of transformers in recommender systems is expected to positively impact the enhancement LMS performance.

The **model architecture** used in this research consists of embedding, transformer encoder, and a fully connected (FC) layer at the end of the model. The main function of the transformer encoder is to process the input sequence to generate contextual representations of the data. The use of the encoder is highly beneficial for understanding relationships between features in the data sequence in detail, allowing the model to capture complex latent relationships between the features. The main function of the transformer decoder is to generate output sequences and is typically used for generating multiple output, so it is not used in this model and is replaced by an FC layer to produce the final output. The use of the FC layer allows the model to remain simple yet effective in capturing complex patterns from the sequence data, enabling it to generate relevant recommendation probabilities.

Embedding is a technique in machine learning and deep learning used to convert categorical data into lower-dimensional numeric vectors. Embeddings help avoid the pitfalls of numerical ordering of data and capture complex latent relationships between users and items [6]. Embeddings enable recommender systems to make more personalized and relevant predictions. The learned embedding vectors can capture each user's unique preferences, allowing the model to provide more suitable recommendations.

Transformer is a neural network architecture designed to handle sequential data efficiently and effectively. Transformers use an attention mechanism to process sequential data, allowing the model to simultaneously focus on different parts of the input sequence and providing better ability to capture contextual relationships between elements within that sequence [3]. Fig. 1 shows the main components in the transformer model, which include: positional encoding, multi-head attention, and feed-forward networks.

Positional encoding is a crucial component of the transformer model that allows the model to understand the order of a sequence of information. Transformers process input in parallel, which requires a positional encoding method to recognize the position of tokens in the sequence so that the order information is preserved [3].

This transformer model uses sinusoidal positional encoding [3] to provide positional information to each token in the input sequence of the transformer model. The sinusoidal function is designed in such a way that each dimension of a token's position is filled with values from sinusoidal and cosine functions that have different periods.

For each position p, with i and d representing the dimension index and model dimension, respectively, for even positional encoding $PE_{(p,2i)}$ and odd positional encoding $PE_{(p,2i+1)}$, the following applies:

$$PE_{(p,2i)} = \sin\left(\frac{p}{10000^{\frac{2i}{d}}}\right) \quad (1)$$

$$PE_{(p,2i+1)} = \cos\left(\frac{p}{10000^{\frac{2i}{d}}}\right) \quad (2)$$

This approach has the advantage that the relative differences between the positions of two tokens can be explicitly represented through the encoding values, which are highly useful for understanding the order of information. The use of sine and cosine functions allows the model to easily learn the relationships between positions within the sequence using linear operations like dot products [3]. Sinusoidal positional encoding ensures that the transformer model can effectively process sequential information even while working in parallel.

Multi-head attention is a key component of the transformer model architecture, allowing the model to focus on different pieces of input information in a more flexible and efficient manner. Multi-head attention enables the model to capture various aspects of the relationships between words in a sentence by using several attention heads [3] in parallel. Each attention head works independently to extract different information from the input, and the results are combined to provide richer and deeper representations.

Multi-head attention processes the input using a scaled dot-product attention mechanism [3]. For Query (Q), Key (K), and Value (V) vectors, which represent the data being processed, and d_k, which is the dimension of K, the following applies:

$$\text{Attention Weights} = \text{softmax}\left(\frac{Q.K^T}{\sqrt{d_k}}\right) \quad (3)$$

$$\text{Output} = \text{Attention Weights} \,.V \quad (4)$$

In Multi-Head Attention, this process is not performed only once but in parallel with several heads, each having a different set of Query, Key, and Value vectors. Each head produces a different output, and these outputs are then combined and projected back to the desired dimensions.

The Feed-Forward Networks layer in the transformer serves to process and transform the input representation after the attention mechanism. Each layer in the transformer has a feed-forward network (FFN) that is applied separately at each token position in the input [3].

In FFN, there is a Multi-layer Perceptron (MLP) consisting of two linear layers with a ReLU activation function between them. The output of the MLP is then added and normalized using layer normalization [7]. Feed-forward networks allow the model to capture complex relationships in the data and process information efficiently.

The Fully Connected (FC) layer in the model architecture plays an important role in completing the prediction process after the data is processed by the embedding and transformer encoder sections. The FC layer at the end of the model serves to convert the feature representations generated by the transformer encoder into prediction scores that indicate how relevant a target is to a user's preferences. This process is carried out by fully connecting every neuron in the previous layer to the neurons in the next layer, allowing the model to leverage all the learned information.

In the transformer architecture, the decoder is typically used to generate output sequences such as text. However, in the case of this book recommendation model, there is no need to generate an output sequence. Therefore, the decoder function is replaced by an FC layer, which is more appropriate for the task of generating specific recommendation scores. By removing the decoder and using an FC layer, the model can stay focused on its primary task of providing relevant recommendations without dealing with unnecessary additional complexity.

2 METHODOLOGY

In the experiment setup, the data used for the study comes from XuetangX[2], one of the largest Massive Open Online Course (MOOC) platforms in China. XuetangX[2] provides a rich dataset that includes user interaction data with various courses, making it an ideal resource for tasks like recommendations and learning behavior analysis. This dataset was also employed in previous works, such as the Hierarchical Reinforcement Learning [8] which focuses on optimizing course recommendations by modeling user behavior at multiple levels.

During training, we create 4 negative interactions for each positive interaction by replacing the actual target with 4 random targets from the sample. In the testing phase, we pair each positive interaction with 99 random negative interactions from the sample [9]. We compare the transformer model with the neural collaborative filtering model [6] for each user and target pair to determine the probability of recommending a book to the user.

We use Hit Rate (HR) and Normalized Discounted Cumulative Gain (NDCG) as evaluation metrics in our experiments. Hit Rate (HR) measures how often relevant items appear in the top-N recommendation list. We use this metric for its simplicity and effectiveness in providing a quick overview of recommendation quality [6]. Normalized Discounted Cumulative Gain (NDCG) evaluates the quality of the recommendation ranking by considering the relevance of items and their positions in the list. We use NDCG for its ability to capture the ranking quality more comprehensively compared to HR [10].

Figure 2. Experiment results

Model Performances (%)

Metode	***HR@10***	***NDCG@10***
NCF	61.55	37.18
Transformer	70.59	50.34

We implement the model using PyTorch and run the code on the Kaggle platform with an NVIDIA P100 GPU, which offers high performance and efficiency in training deep learning models. We use the AdamW optimizer with a learning rate of 0.0001 and a weight decay of 0.001 to control overfitting. The loss function used is Binary Cross Entropy with Logits, suitable for binary classification tasks with logit output.

3 FUNDINGS AND DISCUSSION

Fig. 2 illustrates the overall performance of the two models compared: the proposed transformer model and the Neural Collaborative Filtering (NCF) model [6]. Based on the results, the transformer model outperforms the NCF model in the metrics HR@10 and NDCG@10.

The transformer model achieves an HR@10 value of 70.59% compared to 61.55%. This improvement is due to the transformer's ability to capture complex and long-term relationships in sequential data. The self-attention mechanism in the transformer allows the model to focus on the most relevant information at each input position, enhancing recommendation accuracy. The transformer model shows a significant improvement with a score of 50.34% compared to 37.18% for the NCF on the NDCG@10 metric. This is because the transformer's encoder effectively processes the sequential data of users and targets, producing rich and meaningful representations. This allows the model to better understand user preferences and target characteristics compared to the NCF approach, which uses a Multi-Layer Perceptron (MLP). The NCF model, relying on MLP to combine user and target embeddings, is less capable of capturing the more complex interactions. As a result, the recommendation performance of the NCF model is lower compared to the transformer model.

The transformer encoder captures complex relationships in user and book data, producing representations rich in information about user preferences. This process allows the model to understand the context and interactions between various features in data. The encoders enables the model to better capture the interactions between user preferences and target characteristics to capture more complex interactions, thereby enhancing the accuracy and relevance of the final recommendations.

4 CONCLUTION

Overall, the proposed transformer model demonstrates superior performance compared to the NCF model across all evaluation metrics. The significant improvement in HR@10 and NDCG@10 indicates that the transformer model is more effective in recommending relevant courses to users. This advantage is primarily due to the transformer's ability to capture complex and long-term relationships in sequential data, as well as the effectiveness of the attention mechanism employed. The reference study [6] provides important context for understanding this comparison.

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