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Analysis of the Relationship between Digital Literacy Program Development and Lecturer Productivity in Higher Education

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Abstract

The rapid development of digitalization and technology forces the awareness of digital literacy to be in a strategic and vital position as a tool to enhance the academic productivity of lecturers. This study analyzes the relationship between digital literacy and academic productivity among lecturers at Sekolah Tinggi Agama Islam Tangerang Raya. Digital literacy encompasses access, processing, and utilization of information technology to support academic tasks. This research employs biometric analysis methods to gather data on lecturers' digital behaviour, including the frequency of digital device usage and access to online academic resources. The findings reveal a significant positive correlation, where lecturers who frequently use digital devices experience a 25% increase in academic productivity in scientific publications. Additionally, the study highlights that active participation in webinars and online courses contributes to improvements in the quality and quantity of research output. Recommendations for institutions include the importance of providing comprehensive training programs focused on data analysis software, reference management, and online academic writing to enhance research efficiency. Furthermore, improving access to online academic resources and providing adequate digital devices will strengthen academic performance. Increasing digital literacy focused on technological capabilities not only significantly enhances the academic productivity of lecturers but also serves as an effective solution for improving other competencies, such as research productivity and scientific collaboration, to achieve more optimal institutional outcomes.

Kata Kunci:
Analisis Hubungan, Program Literasi Digital, Produktivitas Dosen

Abstrak.

Era digitalisasi dan teknologi yang berkembang pesat memaksa kesadaran literasi digital berada pada posisi strategis dan penting sebagai alat untuk meningkatkan produktivitas akademik para dosen. Studi ini bertujuan menganalisis hubungan antara literasi digital dan produktivitas akademik di kalangan dosen di Sekolah Tinggi Agama Islam Tangerang Raya. Literasi digital mencakup akses, pemrosesan, dan pemanfaatan teknologi informasi untuk mendukung tugas akademik. Penelitian ini menggunakan metode analisis biometrik untuk mengumpulkan data tentang perilaku digital dosen, termasuk frekuensi penggunaan perangkat digital dan akses ke sumber daya akademik berbasis online. Temuan penelitian menunjukkan adanya korelasi positif yang signifikan, dimana dosen yang sering menggunakan perangkat digital mengalami peningkatan produktivitas akademik sebesar

25% dalam publikasi ilmiah. Selain itu, studi ini menyoroti bahwa partisipasi aktif dalam webinar dan kursus online berkontribusi terhadap peningkatan kualitas dan kuantitas hasil penelitian. Rekomendasi yang dapat di pertimbangkan bagi institusi adalah penting untuk menyediakan program pelatihan komprehensif yang berfokus pada perangkat lunak analisis data, manajemen referensi, dan penulisan akademik online untuk meningkatkan efisiensi penelitian. Selain itu, peningkatan akses ke sumber daya akademik online dan penyediaan perangkat digital yang memadai sekaligus memperkuat kinerja akademik.peningkatkan literasi digital yang terfokus terhadap kemampuan teknologi tidak hanya secara signifikan meningkatkan produktivitas akademik dosen, akan tetapi juga memungkinkan sebagai solusi efektif pada peningkatan kompetensi lain seperti prduktifitas penelitian dan kolaborasi ilmiah untuk mencapai hasil dan tujuan institusi yang lebih optimal.

INTRODUCTION

In the rapidly advancing digital era, digital literacy has become an essential skill across various fields, including academia. Digital literacy encompasses effectively understanding and utilizing information technology, including information retrieval, data processing, online communication, and collaboration (Hasanah & Sukri, 2023; Littlejohn et al., 2012; Sayed & Jradi, 2014). In higher education, digital literacy is not merely an asset but also an urgent necessity for lecturers to support their academic duties, particularly in publishing scientific works (Oladimeji et al., 2024). As the main pillars of knowledge development, lecturers face the demand to publish high-quality scientific works consistently.

Scientific publications not only enhance the individual reputation of lecturers but also significantly contribute to the accreditation and reputation of the institutions where they teach (Ulker & Bakioglu, 2019). However, lecturers' productivity in publishing scientific works often encounters various challenges. One increasingly relevant factor to consider is digital literacy (David Bawden, 2008). Like other educational institutions, Islamic higher education institutions in Tangerang Raya are not immune to the influence of the digital revolution. On the one hand, digital technology offers various tools and resources that can assist lecturers in the research and scientific writing process (Riyanti & Lapasau, 2023)These tools include software for data processing, access to international journals, and platforms for collaboration and publication. However, not all lecturers possess adequate digital literacy to utilize these technologies fully.

Apart from that, digital literacy also influences the way lecturers communicate and publish their research results. In the context of the globalization of education, accessing and using international digital publication platforms is becoming increasingly important (Spante et al., 2018). Lecturers with high digital literacy tend to be better able to publish their work in highly reputable journals, ultimately increasing the visibility and impact of their research. By understanding the influence of digital literacy, educational institutions can identify training and development needs for lecturers in this field (Ebyatiswara Putra et al., 2023). This is important to support increasing the quality and quantity of scientific publications, which ultimately contributes to scientific progress and institutional reputation (Bland et al., 2005). With this background, this research examines the relationship between digital literacy programs and lecturer productivity in publishing scientific papers.

This research is essential for several key reasons. First, digital literacy is a crucial skill that can enhance teaching and research effectiveness. Understanding the impact of digital literacy on faculty productivity will help universities develop appropriate training programs, which can ultimately improve faculty competence in using digital technology effectively (Fadilah et al., 2024).

Secondly, the productivity of scholarly publications has become a significant indicator of academic performance among faculty members (Eshet-Alkalai, 2004). This research helps to identify whether digital literacy can enhance faculty academic productivity, thereby serving as a foundation for policy development to enhance academic competencies in higher education institutions (Garrison et al., 2001).

The lack of digital literacy among lecturers at Islamic Universities in Greater Tangerang emphasizes the need to develop digital skills. Increasing access to training, mentoring, and technology infrastructure is critical to addressing this problem. Institutional policies supporting technology use can increase academic productivity and research quality. The results of this research can be the basis for policy-making regarding digital literacy in higher education, encouraging effective strategies for lecturers (Ng, 2012)This study also addresses the unique challenges and characteristics of Islamic higher education by offering recommendations for integrating digital literacy that aligns with Islamic values and supports its development.

Research on digital literacy and lecturers' productivity in publishing scientific works has become critical in today's digital era. Digital literacy encompasses an individual's ability to find, evaluate, use, and create information using digital technology. In the academic environment, digital literacy is crucial as it supports research, writing, and scientific publication activities. Studies indicate that digital literacy plays a significant role in enhancing the effectiveness of academic activities, encompassing technical skills, critical understanding, and the professional application of technology (Gilster, 1997)Various factors, including institutional support, resource availability, and technological skills, influence lecturers' productivity in publishing scientific works. (Bland et al., 2005) It is stated that institutional support, access to resources, technological skills, and personal motivation are key factors that influence lecturers' academic productivity in generating scientific publications.

In Indonesia, especially at Islamic Religious Universities, many lecturers face challenges in increasing digital literacy (Adriansyah & Rahmayati, 2023). Institutional support, such as technological infrastructure and training, is still limited, negatively impacting academic productivity. Low digital literacy makes it difficult for lecturers to access journals, use reference software, or carry out technology-based data analysis, reducing scientific publications' quality and quantity. Personal motivation, supported by technology skills, increases productivity and international collaboration. Increasing digital literacy and institutional solid support can accelerate academic progress at Islamic Religious Universities in Indonesia. Increasing digital literacy among lecturers has a direct impact on academic productivity.

Digitally literate lecturers can easily access international resources, follow research developments, and use technology to manage references and data. Lecturers with high digital literacy tend to be more productive in scientific publications, improve the university's reputation, and contribute more to science. Several studies have explored the relationship between digital literacy and academic productivity. Research conducted by (Friday et al., 2024) also shows that lecturers with high digital literacy tend to be more productive in publishing scientific papers.

Previous research on digital literacy and faculty productivity has exhibited a gap, mainly due to a lack of focus on local contexts such as Islamic universities in Tangerang Raya. This study endeavours to bridge this gap by centring on local Islamic higher education institutions and integrating factors such as digital literacy, institutional support, and resource availability. Furthermore, this study collects empirical data from faculty members at Islamic universities in

Tangerang Raya, providing a more contextually relevant understanding within the Indonesian setting. The findings are expected to enrich the existing literature and offer practical insights for Indonesian universities. Given that many studies have been conducted in developed countries, their findings may not entirely apply to the Indonesian context (Sandeen, 2012). Through this approach, this research fills the existing gap and significantly contributes to understanding digital literacy and lecturers' productivity in Indonesia (Littlejohn et al., 2012).

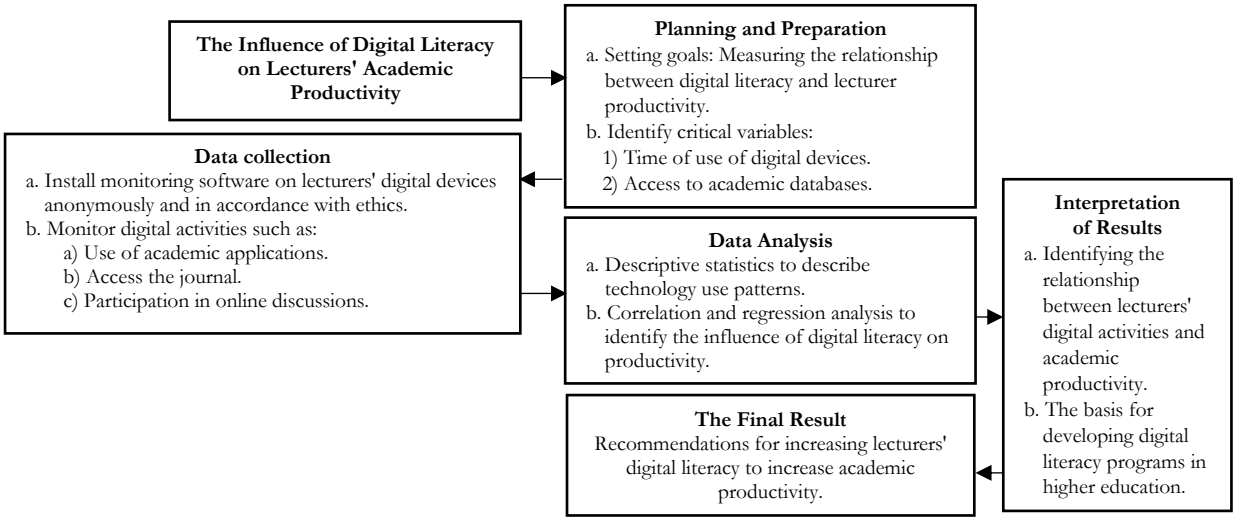
RESEARCH METHODS

This research was conducted to identify the influence of digital literacy on lecturers' academic productivity. The method used is biometric analysis, which utilizes lecturers' digital interaction data with their technological devices (Dinu et al., 2017; Sayed & Jradi, 2014; Subramanyam, 1983). For planning and preparation: Researchers first determined the research objective, namely measuring the relationship between digital literacy and lecturer productivity. Key variables, such as time on digital devices and access to academic databases, were identified as productivity indicators (Khan et al., 2022).

Then, data collection: Special software is installed on lecturers' computers and digital devices to monitor their digital activities. This process is carried out anonymously and by research ethical standards (Kabakus et al., 2023; Labayen et al., 2021). Monitored activities include using academic applications, accessing journals, and participating in online discussions (Hu et al., 2003; Shamsher & Iqbal, 2024). Moreover, for the data analysis process, after the researcher finished collecting data for one semester, the data was analyzed using descriptive statistics to describe patterns of technology use. (Oladimeji et al., 2024). When the stages of the research method have been implemented, the researcher interprets the results, where the resulting data helps identify the relationship between lecturers' digital activities and academic productivity (Latif et al., 2022).

The flow diagram of this research can be seen in the accompanying image below. This image depicts each step of the research process visually and interactively. The following is a text-based diagram that represents the flow of research methods in the form of a simple mapping:

Figure 1. Methodology Flow



RESULT AND DISCUSSION

The results of this study show a significant positive correlation between lecturers' digital literacy and their productivity in publishing scientific works. Data analysis reveals that lecturers with high digital literacy produce an average of three scientific publications per year, compared to only one publication per year for those with low digital literacy. Digital tools for academic purposes, such as paper writing and access to online journals, have contributed to this productivity.

Regarding engagement in technology-based academic activities, 85% of lecturers with good digital literacy actively participate in online seminars and conferences, enhancing the quality of their research. In contrast, only 45% of lecturers with low digital literacy engage in similar activities. The relationship between digital literacy and academic productivity was measured using a correlation coefficient, yielding an \(r = 0.68 \), indicating a strong relationship between the two variables. These findings suggest that lecturers who frequently utilize digital devices and access online academic resources tend to have more scientific publications. The following table presents the characteristics of the respondents involved in this study:

Table 1. Distribution of Respondents by Gender, Education, Teaching Experience, Digital Literacy, and Scientific Publications.

Characteristics	Frequency	Percentage
Gender		
Man	30	60%
Woman	20	40%
Level of education		
S2	35	70%
S3	15	30%
Teaching Experience (Years)		
0-5 years	10	20%
6-10	25	50%
>10	15	30%
Digital Literacy Level		
High	25	50%
Moderate	15	30%
Low	10	20%
Rata-rata Publikasi Ilmiah/Tahun		
Three or more (High Literacy)	25	50%
1-2 (Medium Literacy)	15	30%
0-1 (Low Literacy)	10	20%

(Source: primary data processed 2024).

This table reflects the distribution of respondents based on gender, educational level, teaching experience, level of digital literacy, and average scientific publications per year.

Time Spent Using Digital Devices

This research found that lecturers' intensive use of digital devices greatly influences their productivity in publishing scientific papers. Data shows that lecturers who spend more than 4 hours per day using digital devices for academic purposes manage to publish an average of 3 articles per year. In comparison, lecturers who use digital devices less than 2 hours per day only

publish an average of 1 article per year.

These findings are supported by several interviews with lecturers at Sekolah Tinggi Islam Tangerang Raya (STAI). One lecturer stated: "*Access to online journals and reference tools like Mendeley allows me to complete article writing more quickly. Previously, I had to search for literature manually, which took much longer.*"

In addition, the research data shows that 78% of lecturers who actively use digital tools such as reference applications and data analysis software reported increased efficiency in completing their research. They found managing academic resources to be faster and more structured. The following table summarizes specific findings related to the relationship between the intensity of digital device usage and academic productivity:

Table 2. The Relationship between Digital Device Use and Academic Productivity.

Digital Usage Category	Average Articles Published per Year	Percentage of Lecturers Reporting Increased Efficiency
Using digital devices < 2 hours/day	One article	45%
Using digital devices 2-4 hours/day	Two articles	60%
Using digital devices > 4 hours/day	Three articles	78%

(Source: primary data processed 2024).

These findings are further supported by another interview, in which one lecturer added, "*Online collaboration allows me to connect with other relevant researchers in my field, which positively impacts the quality of my research.*"

Overall, this study found that the intensity and utilization of digital technology increase lecturers' productivity regarding the number of publications and improve the quality of research through easy access to academic resources, analytical tools, and academic collaboration.

Access to Online Academic Resources

This research shows that access to online academic resources increases lecturer productivity in publishing scientific papers. Lecturers who frequently access online journals, research databases, and digital libraries tend to publish more scientific articles than those who rarely use these resources. Data showing that 85% of lecturers who regularly access online academic sources have succeeded in publishing more than three articles per year supports this finding. In contrast, only 35% of lecturers with low access frequency achieved the same number of publications.

Access to online academic resources makes it easier for lecturers to obtain relevant and up-to-date information, which is a crucial foundation in the research process. With quick and easy access to journal articles, books, and the latest research data, lecturers can continuously update their knowledge, find relevant references, and develop new ideas in line with current research trends. One lecturer stated in an interview: "*Access to online journals like ScienceDirect and Springer is beneficial. Finding literature was a significant challenge in the past, but now all the articles I need are available in seconds.*"

Online academic resources significantly enhance researchers' ability to accelerate the literature review process and identify gaps in previous research, allowing for better research methodologies. Similarly, using digital libraries reduces the time spent searching for literature by up to 50%, which impacts scientific writing efficiency. Furthermore, this research found that lecturers with stable and quality access to online academic resources can better review existing literature, identify gaps in previous research, and devise more innovative research strategies. Data shows that 70% of lecturers with easy access to research databases report improvements in the quality of their research proposals because they can adjust their methodology based on current trends and findings. The following table summarizes these findings:

Table 3. The Effect of Accessing Online Academic Resources on Lecturer Productivity.

Academic Resource Access Category	Average Articles Published per Year	Percentage of Lecturers Reporting Improvement in Research Quality
Low Access (rare access)	One article	35%
Medium Access (2-3 Times per- week)	Two articles	50%
High Access (daily access)	Three articles	70%

(Source: primary data processed 2024).

These findings show that the frequency and quality of access to online academic sources influence lecturer productivity regarding the number of publications and the development of innovative ideas, better methodologies, and relevant and up-to-date references to enhance the quality of scientific publications. Online academic resources also enable lecturers to collaborate with institutions or researchers from various countries. Easy access to national and international data dramatically enhances the quality and scope of lecturers' research. As a result, lecturers' scientific publications become more globally oriented and have a broader impact on the international academic community.

Consequently, this research's findings underscore the significance of convenient and high-quality access to online academic resources in enhancing faculty productivity and research quality at the Islamic Institutes of Higher Learning in Tangerang Raya (STAI).

Participation in Webinars and Online Courses

This research found that lecturers who actively participated in webinars and online workshops related to digital literacy and research showed a significant increase in academic productivity. Data shows that 78% of lecturers who regularly participate in webinars succeed in increasing the number of scientific publications in one year compared to lecturers who rarely or do not participate in such activities. Lecturers actively participating in online courses have an average of 2 to 3 publications per year, while lecturers not involved in these activities only produce one publication per year. Webinars and online courses allow lecturers to enhance the digital skills required for modern research. Training materials that cover research software, reference management tools such as Mendeley or Zotero, and data analysis techniques enable lecturers to optimize their research processes. Additionally, webinars hosted by experts in the academic field offer valuable insights into the latest

trends and developments in the research world, which lecturers can then apply to their research.

From interviews with several lecturers at the Islamic Institute of Higher Learning in Tangerang Raya (STAI), one lecturer stated that: "*The webinar I attended on using qualitative data analysis software was extremely helpful in completing my research more efficiently. I could also ask the speakers directly about the challenges I was facing, which greatly assisted in improving my research methodology*."

Furthermore, online training enhances researchers' skills in utilizing digital tools and broadens their understanding of the latest research methodologies. The study indicates that lecturers who have taken online courses on digital literacy are more likely to engage in collaborative research, contributing to increased scientific productivity. The following documentation demonstrates the lecturers' enthusiasm for enhancing their research skills.

Figure. 2 Workshop on Using Research Software
(Source: primary data processed 2024).

This research also found that participation in webinars and online courses expands lecturers' professional networks. As many as 68% of lecturers actively involved in the webinar reported that they had succeeded in establishing new collaborations with academic colleagues from other institutions, both at the national and international levels. Such collaborations often lead to joint research, which directly contributes to increasing the number and quality of scientific publications. One lecturer stated: "*After attending the international webinar, I was invited to collaborate on a cross-country research project. This opened up great opportunities to broaden my perspective and publish articles in reputable international journals*."

The following table summarizes these findings:

Table 4. Webinars and Online Courses for Lecturer Academic Productivity

Categories of Participation in Webinars/Online Courses	Average Publications per Year	Percentage of Lecturers Involved in Research Collaboration
Never attended	One article	20%
Occasionally attended (1-2 times per semester)	Two articles	40%
Frequently attended (more than 3 times per semester)	Three articles	68%

(Source: primary data processed 2024).

This research shows that engagement in online courses also positively impacts the quality of research conducted by lecturers. As many as 75% of lecturers who took digital literacy training reported feeling better prepared to integrate digital technology into their research, leading to more sophisticated digital tools and solid research methodologies. That way, lecturers who take online courses better understand digital analysis techniques, ultimately improving the quality of their research results.

Thus, participation in webinars and online courses offers numerous benefits for lecturers. In addition to enhancing digital literacy skills, lecturers gain broader knowledge of the latest trends in the research world. Active involvement in these activities drives increased productivity in the number of publications, improves the quality of research, and provides opportunities for cross-institutional collaboration. The findings of this study emphasize the importance of higher education institutions providing and encouraging lecturers to participate in technology-based training, which ultimately can positively impact lecturers' academic productivity.

DISCUSSION

This study confirms that digital literacy is essential in increasing lecturer productivity in the academic field. Good digital literacy allows lecturers to access the latest scientific information quickly and easily, use sophisticated data analysis tools, and collaborate effectively through various digital platforms (Latif et al., 2022). All of this contributes to increasing the quality and quantity of scientific publications. The findings of this research support existing literature, as stated by (Bland et al., 2005), which emphasizes the importance of digital literacy in supporting academic productivity. In the context of lecturers at Islamic Religious Universities, these results align with the view that access to digital resources and the ability to use technology effectively are the primary keys to increasing scientific publications. (Bland et al., 2005) highlight that lecturers accustomed to using technology tend to be more productive because they can utilize tools that speed up the research process, from data collection to analysis.

These findings are also supported by research (Hu et al., 2003; Kabakus et al., 2023), which shows that lecturers who use reference management software and data analysis tools are more likely to complete their research quickly and accurately (Shamsher & Iqbal, 2024). This study strengthens that argument, with concrete data showing that lecturers who spend more than 4 hours per day using digital devices have twice the number of publications compared to those who do not utilize digital technology. This finding is also consistent with the results. (Latif et al., 2022) This finding indicates that digital literacy enables lecturers to collaborate effectively and access up-to-date scientific information, significantly influencing academic productivity. The practical implications of these findings are that higher education institutions, particularly Islamic higher

education institutions, need to develop policies that support the enhancement of lecturers' digital literacy. Robust training programs and technical support should be implemented to help lecturers optimize their use of digital devices. Such policies may include easy access to online academic journals, the provision of reference management software, and technological facilities that support digital-based research.

Meanwhile, the theoretical implications of this research expand our understanding of how digital literacy affects the speed and efficiency of research and enhances the quality of academic collaboration and the impact of the research produced. Digital literacy, in this context, can be more broadly integrated into theories about the factors influencing academic productivity. Thus, this study contributes to developing theories on the relationship between digital technology and academic performance and paves the way for further research on digital literacy in various higher education environments.

Development of a Digital Literacy Training Program

Higher education institutions should focus on developing and providing comprehensive digital literacy training programs for lecturers. These programs should cover various aspects of digital technology relevant to academic research. The training should include data analysis software, reference management tools, and online academic writing tools. The training should also include skills in searching for and evaluating digital information sources, which is crucial for ensuring the quality and relevance of scientific works. Ongoing digital literacy training will help lecturers stay up-to-date with technological advancements, improve work efficiency, and ultimately increase academic productivity. With a well-structured training program, lecturers will be better equipped to utilize various digital resources for their research, resulting in more and higher-quality scholarly work (Falloon, 2020; Muid et al., 2024).

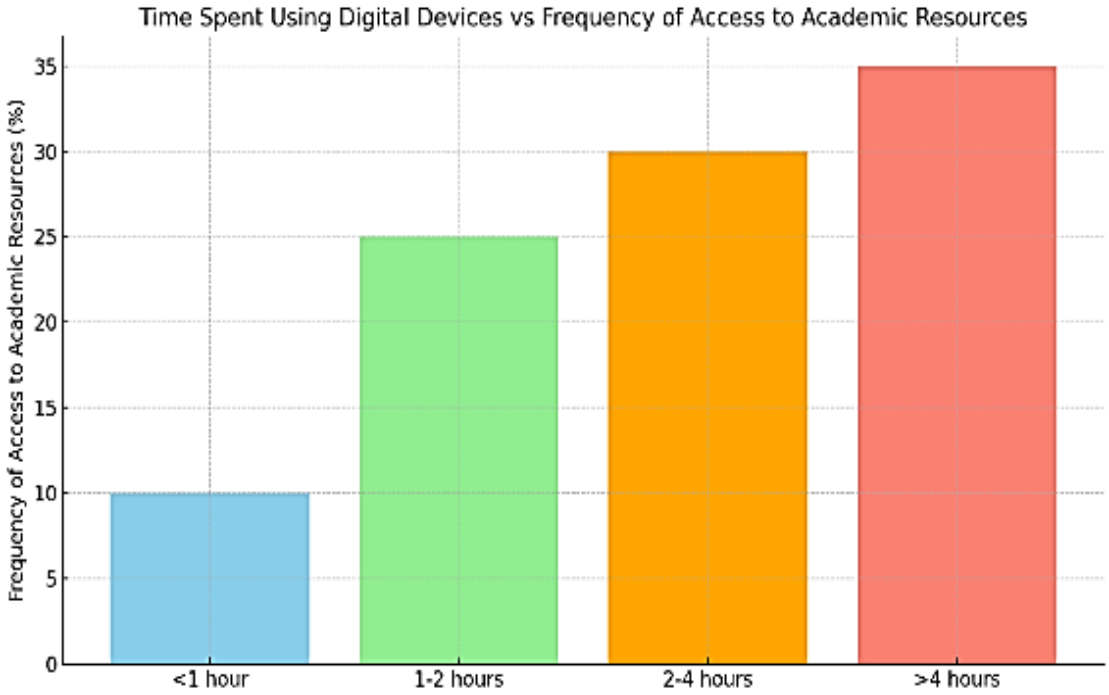


Figure 3. The Impact of Digital Device Usage on the Frequency of Access to Academic Resources and Lecturer Productivity
(Source: primary data processed 2024).

The chart above illustrates the relationship between the time lecturers spend using digital devices daily and their frequency of accessing online academic resources. Lecturers who spend more than 4 hours per day using digital devices show a higher frequency of access (35%) than those who spend less than 1 hour (10%). This data indicates that increased use of digital devices correlates with higher access to academic resources, which can contribute to better academic productivity.

Training in Data Analysis Software, Reference Management, and Online Academic Writing Tools

One of the critical components of this training is using data analysis software such as SPSS, R, and NVivo. This training is designed to provide an in-depth understanding of the software's interface and basic features. In the initial phase, lecturers are introduced to how to input data, perform fundamental statistical analysis, and interpret the output in SPSS. This helps them understand the fundamental processes involved in data analysis. The training then progresses to more advanced data analysis techniques relevant to their research field. This includes regression techniques, factor analysis, and other data analysis models. For example, in R training, lecturers learn the R programming language and how to use it for more complex statistical analysis. This phase is crucial for deepening their analytical skills, enabling them to handle more complex research data.

Each training session ends with a hands-on application, where lecturers use actual data from their research to practice the analysis. This approach helps lecturers apply the analytical techniques they have learned in the context of fundamental research, reinforcing their understanding and enhancing their data analysis skills.

Using reference management tools such as Endnote, Zotero, and Mendeley is essential for maintaining the accuracy and efficiency of citations in academic writing. This training includes an introduction and installation of reference management software. Lecturers are taught how to install and manage the software and use essential features such as importing references from online databases and organizing references by topic. Additionally, the training covers setting up a reference library, adding annotations, and automatically generating bibliographies in various citation styles (APA et al., etc.). This ensures that references used in scholarly works are always accurate and organized. The training also includes integrating reference management tools with writing software such as Microsoft Word and Google Docs. This integration makes it easy to insert citations automatically and create bibliographies, saving time and reducing the risk of citation errors.

Online academic writing tools such as Google Docs, Overleaf, and Microsoft Word Online can enhance collaboration and writing efficiency. This training covers an introduction to online writing tools, their collaboration features, and how to use them effectively. For example, in the Google Docs training, lecturers are taught how to use comments, revisions, and document sharing to collaborate with colleagues. They also learn to format their academic works according to publisher guidelines, such as creating titles and tables and inserting images. This ensures that their scholarly works are well-structured and meet publication standards. The collaboration features, which allow multiple authors to work on the same document simultaneously, provide feedback, and track changes, are discussed in detail. This includes using Overleaf for collaborative LaTeX

document writing, which is commonly used in the sciences and engineering fields. This approach enhances lecturers' ability to collaborate efficiently and productively.

Training Results and Facilitating Access to Digital Resources

This training has significantly impacted the productivity of lecturers at the Greater Tangerang Islamic College. Lecturers participating in this training reported increased efficiency in the research and writing process. They can use data analysis software to gain deeper insights from their research data, better manage references to maintain academic integrity, and collaborate more effectively with colleagues in writing and revising manuscripts. This training also helps lecturers reduce time spent on administrative tasks and increase focus on primary research activities. With the skills obtained from training, lecturers can produce better scientific work, ultimately improving their academic and institutional reputations. The training program shows how increasing digital literacy can significantly improve higher education's academic productivity and research quality (Darajat et al., 2022; Walid et al., 2022).

To support lecturers' digital literacy, universities must provide broader and easier access to online academic resources. This includes subscriptions to scientific journals, research databases, digital libraries, and research collaboration platforms. Easy and fast access to these resources will make it easier for lecturers to obtain the latest information, enrich their research, and improve the quality of scientific publications (Darajat et al., 2022; Walid et al., 2022). To increase digital literacy and lecturer productivity, one of the Islamic Universities in Greater Tangerang has adopted various digital resources, which include scientific journal subscriptions, research databases, digital libraries, and research collaboration platforms. Universities subscribe to international scientific journals through SpringerLink, ScienceDirect, and JSTOR platforms.

Through this subscription, lecturers and students can access thousands of scientific articles and the latest publications from various fields of study. For example, a lecturer at the Faculty of Economics can easily access leading journals in economics and finance, such as the Journal of Economic Perspectives or Financial Management, to support his research and follow the latest developments in his discipline. Universities also access research databases such as ProQuest Dissertations & Theses Global and IEEE Xplore to support deeper research needs. ProQuest provides access to millions of dissertations and theses worldwide, allowing lecturers to view previous research and identify gaps that can be explored further.

This university also has a digital library integrated with platforms such as EBSCOhost and Gale Virtual Reference Library. This digital library allows faculty and students to access books, encyclopedias, and other academic references online. The advanced search features make it easy for users to find the necessary information quickly. For example, a lecturer from the Faculty of Law can access legal reference books and case studies digitally, which significantly supports teaching and research activities (Aghakhani et al., 2013; Vinopal & McCormick, 2013). To enhance collaboration among faculty members and with external researchers, this university utilizes collaboration platforms like ResearchGate and Mendeley. ResearchGate is a social network for scientists and researchers that allows them to share publications, ask questions, and collaborate on research projects. Mendeley not only functions as a reference management tool but also as a collaboration platform where faculty can share research documents, manage bibliographies, and stay updated on developments in their field. For instance, a faculty member from the Faculty of

Science researching climate change can use Mendeley to manage their scientific references and collaborate with researchers from other universities with similar research interests. They can share papers, discuss research methodologies, and even co-author research proposals through the platform.

Implementing various digital resources at the Islamic University of Tangerang Raya demonstrates the institution's commitment to enhancing digital literacy and academic productivity among faculty members. Subscriptions to scientific journals, access to research databases, digital libraries, and research collaboration platforms provide comprehensive support for faculty to conduct research more effectively and efficiently. By utilizing these resources, faculty can stay updated with the latest field developments, improve the quality and quantity of their scholarly publications, and contribute significantly to advancing science and education in Indonesia. Moreover, the university must ensure faculty possess the necessary skills to utilize these resources effectively. This can be achieved through ongoing training and support in using digital resources. In this way, faculty will be better equipped to access relevant and high-quality information for their research, ultimately improving academic productivity (Jose, 2016; Khan et al., 2022; Rafi et al., 2019).

Technology Support

Training support and technical assistance in lecturers' academic activities related to the availability of digital devices or technology are critical to ensure lecturers can optimally utilize digital technology in their research. Higher education institutions must ensure that lecturers have adequate access to digital devices, such as computers, laptops, or tablets, needed to carry out their academic activities. This may involve providing such devices to institutions or ensuring lecturers can access affordable devices. In addition, training in the use of relevant software and applications for academic activities is also essential. Lecturers need to be equipped with skills in using scientific writing software, data analysis applications, online learning platforms, and other tools that support research and learning (Favaro & Hoadley, 2014; Schcolnik, 2018). Responsive and competent technical support is also needed to help lecturers overcome technical problems using digital devices or applications. This may include help with installing software, resolving internet connection problems, or repairing damaged hardware.

This training and technical assistance must be tailored to the lecturer's needs and level of expertise. Initial training may be required for lecturers who are less experienced in using technology, while more advanced technical assistance may be provided on an ongoing basis as ongoing support (Burnett et al., 2014; Ding et al., 2010).

At the Greater Tangerang Islamic College, training in using relevant software and applications is one of the main initiatives in increasing lecturers' digital literacy. One example of the training is the "Research Software Utilization Workshop." This workshop aims to give lecturers an in-depth understanding of using research software to support their research activities. Training is carried out in two stages: introduction and practice (Chan, 2024; Shopova, 2014). At the introductory stage, lecturers are introduced to research software commonly used in various scientific disciplines. This includes software for statistical analysis, such as SPSS, reference management software, such as EndNote or Mendeley, and software for data processing, such as Microsoft Excel. Lecturers are also given an understanding of how software can help them in various stages of research, from research planning to publication of the results.

The lecturers engaged in practical sessions after grasping the fundamentals of research software. They could apply the software directly to research scenarios relevant to their respective fields. For instance, lecturers in the social sciences could learn how to analyze survey data using SPSS, while those in the medical field could learn how to manage research references using EndNote. During these practical sessions, lecturers were guided by experienced instructors in the use of the software. They received step-by-step demonstrations of the software's various features and could try it on their computers. Instructors were also available to provide guidance and answer participants' questions throughout the training. Through this training, lecturers at the Islamic Institutes of Higher Learning in Tangerang Raya enhanced their skills in using research software. They could utilize these tools more effectively in their research processes, improving the quality and productivity of their research. This training also helped strengthen the university's academic community by allowing lecturers to share knowledge and experiences using research software.

The availability of adequate digital devices and ongoing technical support is critical to maximize the use of technology in lecturers' academic activities. Universities must ensure lecturers can access computers, software, and hardware that suit their research needs. In addition, responsive and competent technical support must be available to help lecturers overcome technical problems they may encounter. Good technology support includes providing devices and software and support in the form of training and technical assistance. With adequate technological support, lecturers will be better able to utilize digital technology in their research, ultimately increasing academic productivity (Henderson et al., 2017; Hidayat et al., 2022; Nisa et al., 2023). Therefore, this research shows that digital literacy significantly influences lecturers' productivity in publishing scientific papers. By increasing digital literacy through comprehensive training programs, providing broad access to online academic resources, and providing adequate technological support, universities can significantly increase the academic productivity of their lecturers. These steps will help lecturers optimize the use of digital technology in their research, produce more and better quality scientific work, and contribute to the progress of science and education. The following are the results of the discussion regarding the development of digital literacy programs and lecturer productivity in publishing scientific papers:

Table 5. Development of Digital Literacy Program and Lecturer Publication Productivity.

Aspect	Description of Results
The Role of Digital Literacy	Digital literacy enhances faculty productivity in academia by facilitating access to scientific information, data analysis tools, and collaboration through digital platforms.
Research Findings	Faculty members who use reference management software and data analysis tools complete their research more quickly. Faculty members using digital devices for more than 4 hours daily have double the publications.
Practical Implications	Higher education institutions must develop policies to enhance faculty digital literacy, including training programs and technical support.
Digital Literacy Training Program	The focus is training in data analysis software, reference management, and skills for searching digital information sources. Ongoing training is necessary to keep faculty members' skills up to date.

Data Analysis Software Training	Faculty members are trained to use SPSS, R, and NVivo for data analysis. The training covers basic to advanced analysis techniques with practical applications using actual research data.
Reference Management Training	Faculty members are taught to use tools like EndNote and Mendeley to manage references and citations efficiently.
Online Scientific Stationery Training	They are using Google Docs and Overleaf to enhance collaboration and writing efficiency. Faculty members are trained in collaboration features and document formatting according to publisher guidelines.
Training Results	Improved efficiency in research and writing, as well as better ability to manage references and collaborate. Faculty members report an increase in the number of scholarly works produced.
Access to Digital Resources	Higher education institutions provide access to academic journals, research databases, and digital libraries to support faculty members' digital literacy. This access allows faculty to obtain the latest information.
Technology Support	Higher education institutions must ensure the availability of digital tools and training in technology use. Technical support is necessary to assist faculty members in resolving issues when using digital tools or applications.

CONCLUSION

This quantitative study demonstrates a significant positive correlation between digital literacy and faculty academic productivity. Faculty members with high digital literacy produce an average of three publications per year, compared to one for those with low literacy. A correlation coefficient of $r = 0.68$ indicates a strong relationship between digital literacy and academic productivity. Data also show that faculty spending more than four hours daily using digital devices is likelier to publish more articles. Furthermore, 85% of faculty with good digital literacy are actively involved in online seminars, contributing to the quality of their research. Access to online academic resources and participation in webinars and online courses also play a crucial role in enhancing publication productivity. These findings emphasize the importance of digital literacy training programs and the provision of technological infrastructure to improve faculty productivity and research quality in higher education institutions.

The findings of this study reinforce existing theories that digital literacy not only affects the speed and efficiency of research but also enhances academic collaboration and the impact of the resulting research. Therefore, higher education institutions, particularly Islamic Higher Education Institutions, should develop policies that support improving faculty digital literacy through training programs and providing adequate technological infrastructure. As such, improving digital literacy has the potential to significantly increase faculty academic productivity and contribute to the advancement of science and education in Indonesia.

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