Jurnal Pijar MIPA
https://jurnalfkip.unram.ac.id/index.php/JPM

ISSN 1907-1744 (Print)
ISSN 2460-1500 (Online)

The Graduate's Portrait of Competence and Technology's Mastery in Biology Learning

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Received: January 2, 2024. Accepted: February 13, 2024. Published: March 19, 2024

Abstract: The quality of alumni is a general mark of the success of a study program, including the biology education study program at Universitas Terbuka. This survey research was conducted to determine the portrait of mastery of competence of Universitas Terbuka Biology Education study program graduates as biology teachers and their mastery of technology in learning. The graduates are junior high school teachers and high school teachers. The research sample was taken randomly until 94 graduates and 47 graduate users were obtained in various regions in Indonesia, such as Bogor, Central Jakarta, Pontianak, Serang, Cianjur, Pekanbaru, and Bandung. The instruments used are questionnaire instruments with Likert scales and interview guidelines conducted to graduate users and graduates. Furthermore, the data is analyzed descriptively to get a portrait of mastery of competence and technology in learning. The results of the data analysis showed that the portrait of mastery of competence was categorized as very good/high, which was indicated by a value of 98.94% (graduate self-reflection) and 97.87% (assessment by graduate users). In addition, from the analysis results, it is also known that the portrait of mastery of technology in graduate learning is categorized as very good/high, with a value of 91.49% (based on graduate self-reflection and assessment by graduate users). This high level of mastery of graduate competencies spurs the biology education study program to maintain the quality of biology learning so that the biology education study program continues to produce alumni who are of good quality.

Keywords: Competence; Graduates; Mastery; Technology.

Introduction

The realization of the vision and mission of the university program is reflected in how graduates participate in the world of community work after graduation or how they meet the competency standards of graduates of the original program (Permendikbud No.3 of 2020, Permendikbudristek No. 53 of 2023). The meaning of the word "graduate" refers to groups of people who have completed their studies both at the "school" level and at the "university" level [1]. Graduates are expected to play a role in the development of the University and uphold the good name and honour of the University in the community [2].

Graduates are assets from universities that have great potential to help the continuity of the home university/institution. Thus, it can be concluded that graduates are products of a university's study program which is expected to become valuable people for graduate users or the community. In line with this, Wathoni [3] said that graduates are the main product of an educational institution with the highest level, which is expected to expand networks, strengthen the image of institutions, and create job or internship opportunities.

Graduates of the Biology Education Study Program at the Universitas Terbuka are expected to participate in the development of the Universitas Terbuka to maintain the image and honour of the university. Maybe graduates from the Biology Education Study Program will become role models of success that attract the intrinsic interest of the community to get to know the Universitas Terbuka more closely.

Graduates who graduate in a certain period following the standard provisions of higher education are expected to have worked after graduation. Some are less than one year, some are in a span of 1 year, some are in a span of 2 years, and so on. The sooner graduates work after they graduate, the study program will gain good skills and performance. The sooner a graduate works after graduating from college, the better the skills and performance of graduates. The S1 Biology Education study program graduates at FKIP Universitas Terbuka have worked since they were students. Therefore, the requirements to become S1 Biology Education students are those with at least one year of teaching experience[4]. Thus, the search for S1 Biology Education graduates is not focused on how fast they work after graduation. However, it is focused on the skills and performance of graduates after they graduate for two years from the study program.

The skills and performance of graduates need to be reviewed periodically to obtain information and input for the study program, both from graduates themselves and graduate users. The skills and performance of graduates cover a broad scope, so in this study, the skills and performance of graduates studied include assessments by graduates and assessments by graduate users related to the profile of expertise in the field of science (main competencies) and mastery of the use of information technology in learning biology or science in the school where they work. This is essential information for improving study program services through the applicable curriculum and revisions for the future.

How to Cite:
Hutasoit, L. R., Kismiati, D. A., Setyawan, D. B., Wahyuningsih, T., & Nurdin, G. (2024). The Graduate's Portrait of Competence and Technology's Mastery In Biology Learning . *Jurnal Pijar Mipa*, *19*(2), 203–208. https://doi.org/10.29303/jpm.v19i2.6408

Research Methods

The method used in survey research, which aims to trace the mastery of competence and technology in biology learning, is a quantitative method obtained from questionnaires that graduates and graduate users have filled out. 94 graduates were sampled from this study, and 47 graduate users were recorded to assess graduate performance. This sampling is carried out randomly without any conditioning because the study aims to see a real portrait of the performance or ability of graduates in both aspects. The questionnaire was adapted with several modifications developed by Hutasoit [5]. This questionnaire uses a Likert scale with a range of 1 to 4. Range 1 indicates sufficient value, and range 4 means excellent value, as in Likert scale assessment criteria [6] [7]. Furthermore, after obtaining the data, a descriptive analysis was carried out, and the analysis data was included in the following assessment categories:

Table 1. The Assessment Criteria [8]

Final Score	Criteria
81-100%	Excellent
61-80%	Good
41-60%	Moderate
21-40%	Less
0-20%	Very Lack

Results and Discussion

Portrait of mastery of graduate competencies

A teacher needs mastery of competence in the fields of education and biology. Some indicators used in this instrument to find out how the portrait of competence possessed by a graduate of biology education are: providing opportunities for students to master science/biology learning materials according to their age and learning ability; carrying out learning activities according to the content of the curriculum and relate it to the context of students' daily lives; analyze student learning outcomes based on all forms of assessment to determine the level of student learning progress; play an active role in activities outside of learning organized by schools and communities; Compile materials, planning and implementing learning that contains appropriate information, and is up-to-date and has a learning journal, input notes from colleagues or the results of learning process assessments.

The portrait of mastery of graduate competencies is not only assessed based on self-reflection from graduates. The picture must be viewed from the other side, that is, from a graduate user. Graduate users are users of graduate services. The biology education study program graduates are superiors who hold positions in institutions where graduates work in a government, private, or non-government organization[9]. In this case, the graduate users are principals, vice principals, and others. Figures 1 and 2 are the result of an analysis of the profile of expertise in science according to graduates and graduate users.

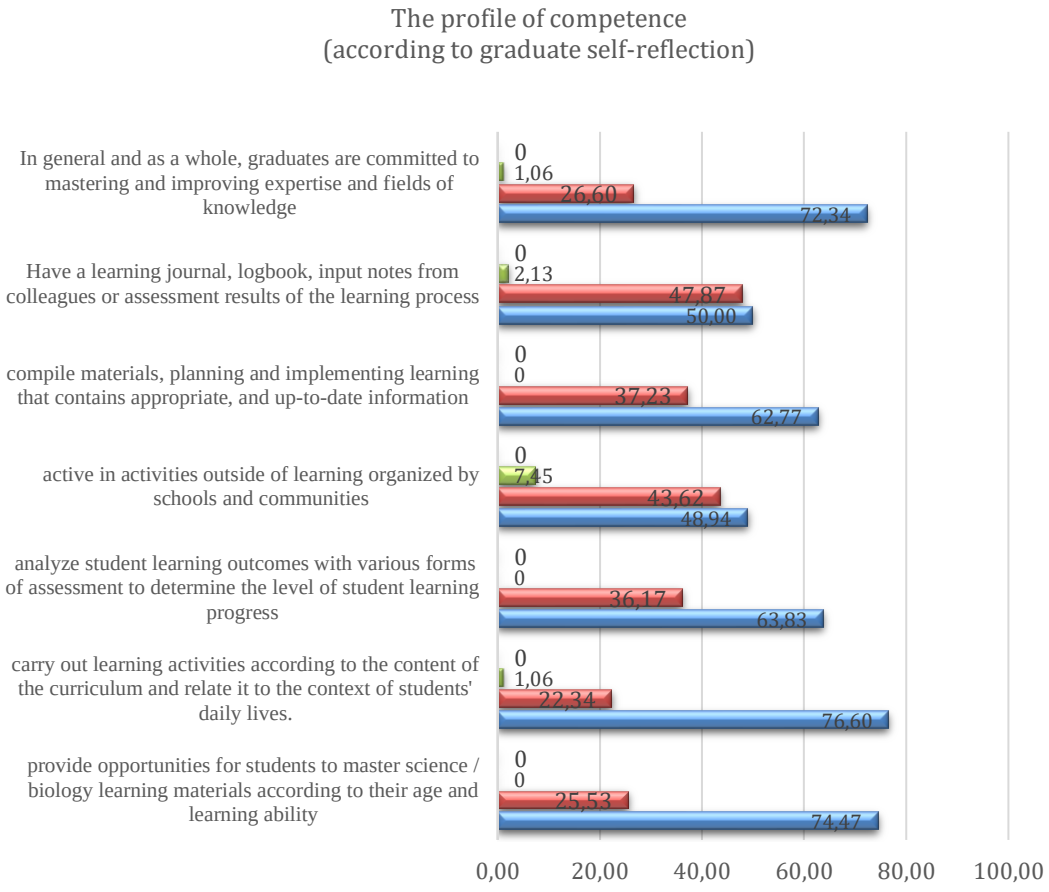

Figure 1. The profile of competence of graduates (Self-Reflection)

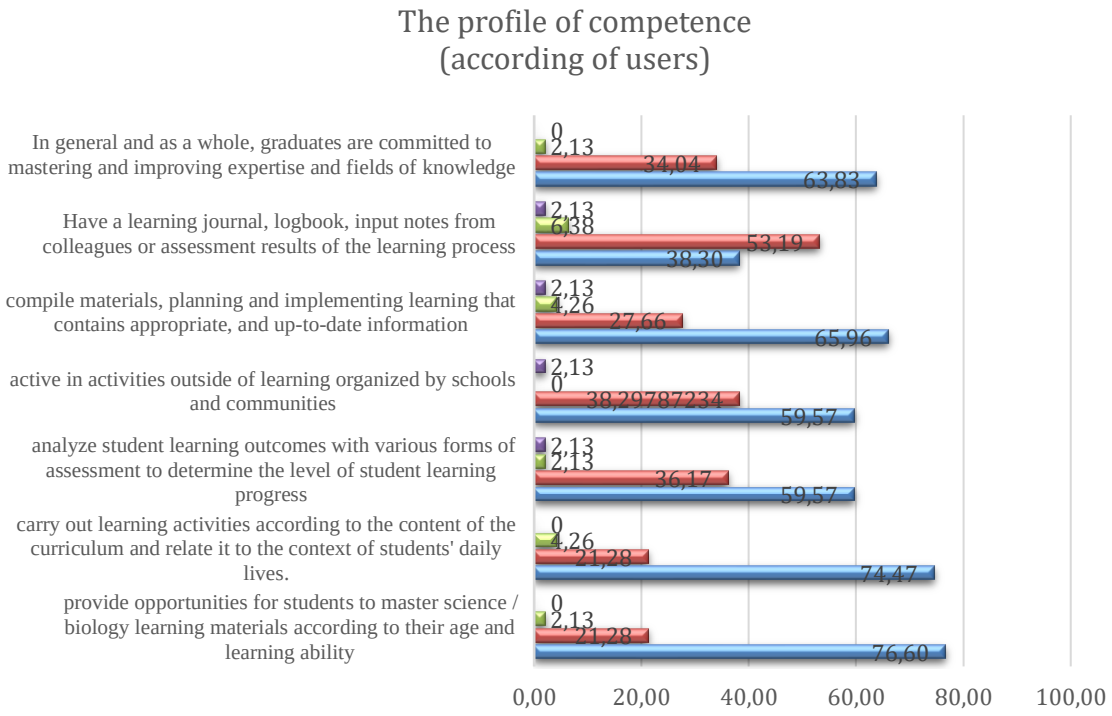

Figure 2. The profile of competence of graduates (According to Users)

From Figures 1 and 2, information was obtained that all graduates (100%) stated that they provided opportunities for students to master science/biology learning materials according to their age and learning ability. They analyze student learning outcomes with various assessment forms to determine the level of student learning progress (100%). They also compile materials, planning and implementing learning with appropriate, up-to-date information (100%). Then, the following assessment focused on a combination of strongly agree and agree statements, namely: as many as 98.94% of graduates have carried out learning activities according to curriculum content and relate them to the context of students' daily lives (76.60% strongly agree; 22.34% agree), 92.55% stated that they play an active role in activities outside learning organized by schools and communities (48.94% strongly agree; 43.62% agree). As many as 97.87% of graduates have learning journals, logbooks, colleague input notes, or learning process assessment results (50% strongly agree; 47.87% agree). Thus, it can be concluded that as many as 98.94% of graduates stated that they are committed to mastering and improving expertise and fields of knowledge (72.34% strongly agree; 26.60% agree).

The self-reflection of these graduates is also in line with the assessment by graduate users. 97.87% of graduate users consider that graduates have provided opportunities for students to master science/biology learning materials according to their age and learning ability. Graduates are also assessed by 95.74% of graduate users who have carried out learning activities according to curriculum content and relate them to the context of students' daily lives. Graduates have also analyzed student learning outcomes with various assessment forms to determine the level of student learning progress. 97.87% of graduate users rated graduates as having played an active role in activities outside of learning organized by schools and communities. 93.62% of graduate users also assess that graduates can compile materials, plan, and implement learning with appropriate and up-to-date information. In comparison, 91.49% of graduate users consider having learning journals, logbooks, colleague input notes, or learning process assessment results. Thus, in general, and overall, graduates, according to 97.87% of graduate users, have been able to commit to mastering and improving their expertise in fields of science.

Based on the results of data analysis, it is known that alumni have mastered the required competencies as a teacher as stated in Law of the Republic of Indonesia number 14 of 2005 article 8, which says that a teacher must have a set of knowledge, skills and behaviours that must be possessed, lived, and mastered by teachers and lecturers in carrying out professional duties.

Portrait of technological mastery of graduates in biology learning

The rapid development of information technology can potentially improve the quality of education. As a means of information technology with much information about everything, the internet is infinite and can be explored to develop education. Learning to use the internet is no longer limited by time and space. Thus, the use of information technology in education has an important meaning, especially in the equitable distribution of education and improving the quality of education in Indonesia. The development of science[10], especially in the field of Information and Communication Technology (ICT), which is all sophisticated (sophisticated) makes a variety of information from various corners of the world can be accessed quickly by anyone and from anywhere, interpersonal communication can be done quickly, cheaply anytime and anywhere[11]. Parkay & Stanford[12] state that using technology to improve learner learning needs more

than just knowledge about using the latest hardware and software.

Technology, information, and communication in learning are urgently needed in the 21st century. The rapid flow of information and the demands of the increasingly advanced era are at least unlikely for teachers to be the single most valid source of learning. Therefore, according to Miarso (Ismaniarti)[13], using ICT in schools should start from a strategic starting point, namely teachers. The strategic effort that needs to be made is for teachers to increase their confidence and participate in its development, namely the development of ICT for learning to improve the quality of student learning processes and outcomes.

In the digital era like today, the ability to use technology and information absolutely must be mastered by graduates who are teachers. Knowledge of technology in learning is part of the TPCK (Technological Pedagogical Content Knowledge) approach developed by Koehler[14]. Koehler, Mishra, Ackaoglu, & Rosenberg [15] explain the three primary knowledge studies in Technological Pedagogical Content Knowledge (TPACK): technological knowledge, content knowledge, and pedagogical knowledge, and the interaction between these dimensions.

Technological Knowledge is related to mastering the application of computer software and hardware, presentation equipment such as presentation documents, and other technologies within the scope of education. Technological Knowledge includes the ability to adapt and learn new technologies. According to Rosyid [16], mastery of Technological Knowledge needs to be mastered by teachers because of the continuous development and technological changes. To find out the portrait of mastery of technology, some things that are seen include getting Microsoft Office (such as ms. word, ms. excel, ms. powerpoint) to support learning, utilizing e-learning in the learning process anywhere, easy to find sources of information to add learning material through information technology; using internet-based learning outcome evaluation applications (e.g. quiziz, Kahoot, conker.ai, google form, etc.); utilize social media (e-mail, Facebook, TikTok, Instagram, Youtube etc.) to support learning; have a learning blog / homemade learning youtube; solve learning problems and their application according to the latest information technology. The analysis results related to this are shown in Figures 3 and 4 below.

Based on the results of the analysis, according to the statement chosen by graduates, as many as 98.94% of graduates master Microsoft Office (such as ms.word, ms.excel, ms.powerpoint) to support learning; 90.43% of graduates utilize e-learning in the learning process anywhere; 97.87% of graduates easily find information sources to add learning materials through information technology; 94.68% of graduates use internet-based learning outcome evaluation applications (examples: quiziz, kahoot, conker.ai, google form, etc.); 93.62% of graduates utilize social media e-mail to support learning; 82.98% of graduates utilize Facebook social media to support learning; 62.77% of graduates utilize TikTok social media to support learning; 71.28% of graduates use Instagram social media to support learning; 94.68% of graduates utilize YouTube social media to support learning; 87.23% of graduates use other social media to support learning; 64.89% of graduates have a learning blog account/channel / homemade learning YouTube; 90.43% of graduates can solve learning problems and their application according to the latest information technology. Thus, 91.49% of graduates, in general and overall, master and practice the use of information technology.

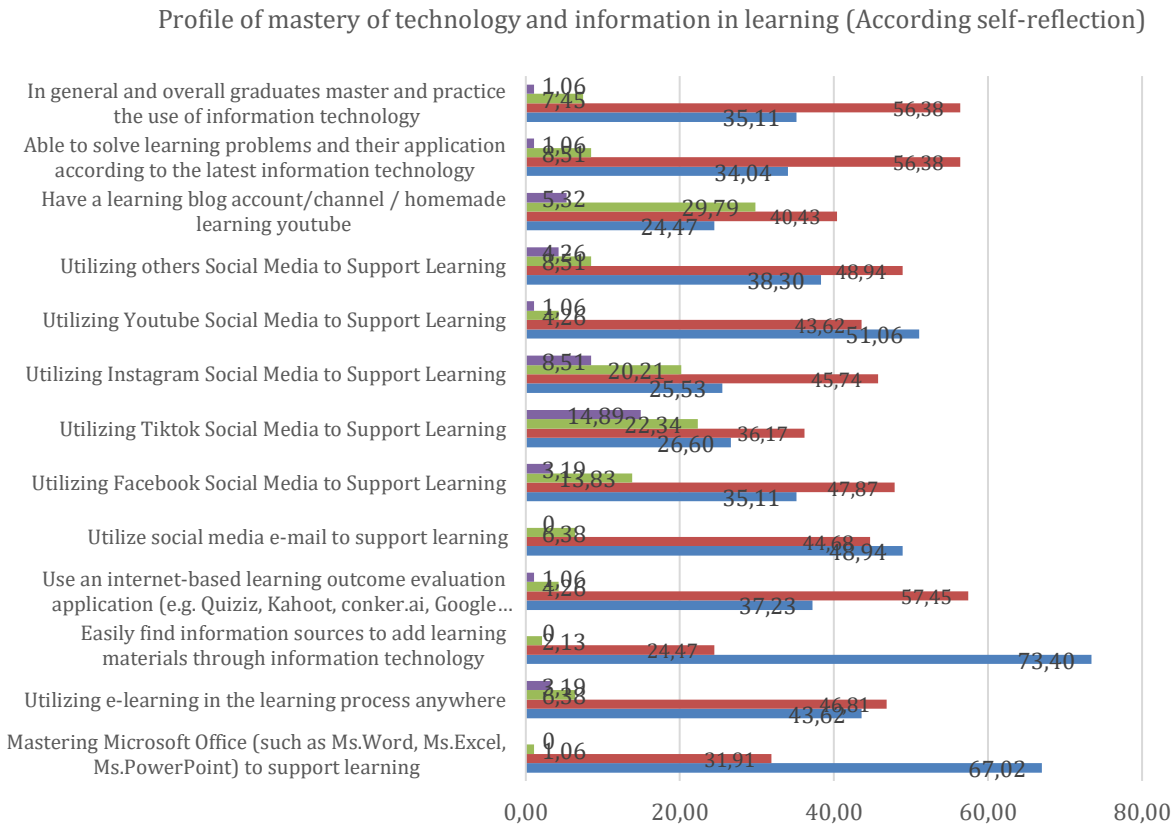

Figure 3. Profile of mastery of technology and information in learning (According to self-reflection)

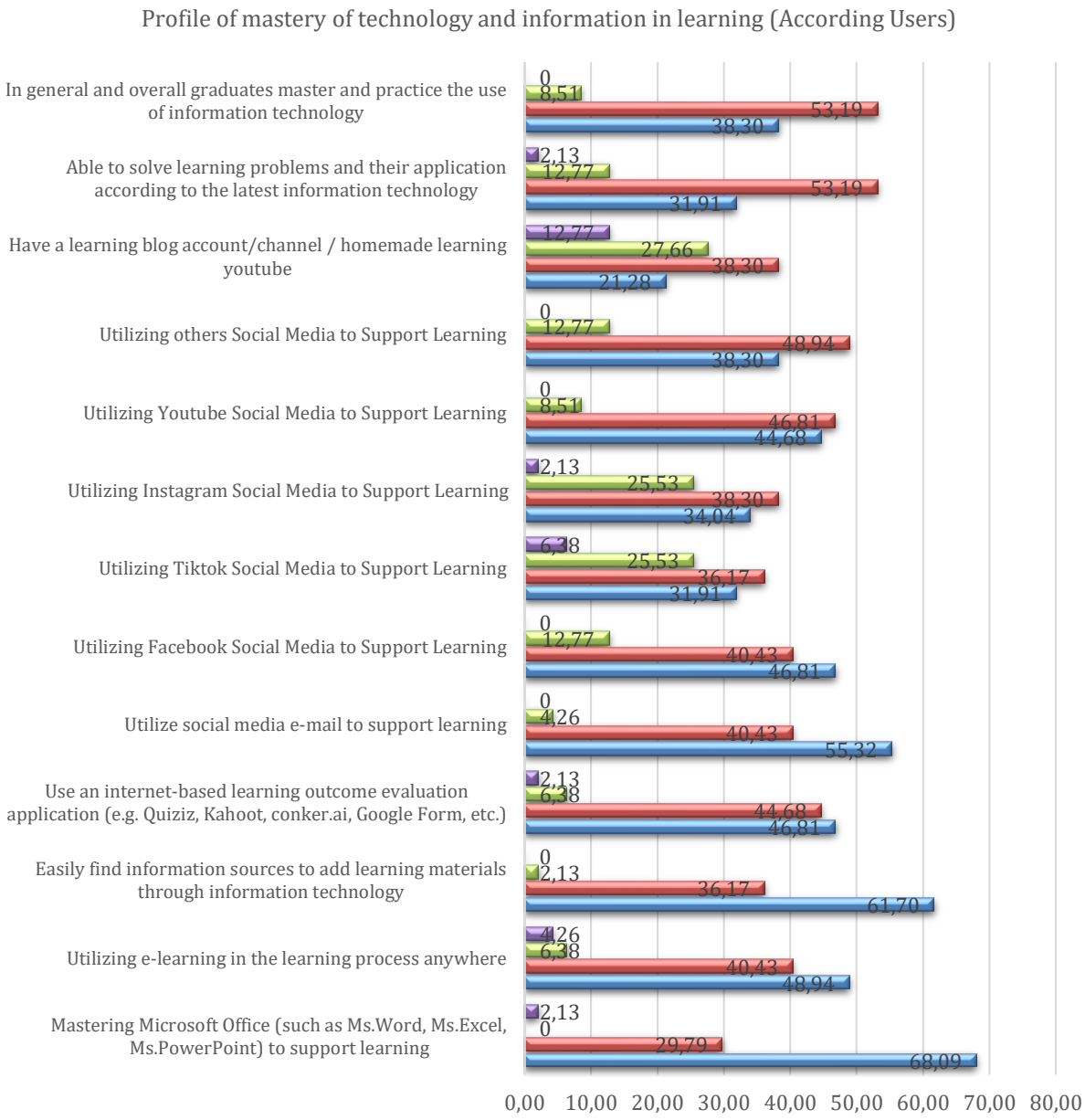

Figure 4. Profile of mastery of technology and information in learning (According to users)

Such is the case with the assessment obtained from graduate users. Graduate users rated that: as many as 97.87% of graduates mastered Microsoft Office (such as microsoft word, microsoft excel, microsoft powerpoint) to support learning; 89.36% of graduates utilize e-learning in the learning process anywhere; 97.87% of graduates easily find information sources to add learning materials through information technology; 91.49% of graduates use internet-based learning outcome evaluation applications (example: quiziz, kahoot, conker.ai, google form, etc.); 95.74% of graduates utilize social media e-mail to support learning; 87.23% of graduates utilize Facebook social media to support learning; 68.09% of graduates utilize TikTok social media to support learning; 72.34% of graduates use Instagram to support learning; 91.49% of graduates use YouTube social media to support learning; 87.23% of graduates utilize other social media to support learning; 59.57% of graduates have a learning blog account/channel / homemade learning YouTube; 85.11% of graduates can solve learning problems and their application according to the latest information technology. Thus, 91.49% of graduates, in general and overall, master and practice the use of information technology. Mastery of technology in learning at this time no longer relies on teachers and learning package books as the primary learning source. This is because many digital learning resources have been developed to be accessed using the internet [17], whenever and wherever students are. Therefore, teachers are now able to integrate technology into learning so that student's learning needs can be met optimally [18,19].

The data obtained explains that graduates have become teachers accommodating the Industrial Revolution 4.0. Teachers of the industrial era 4.0, which is synonymous with the advancement of the internet, must be used to

improve the quality of education. Smart culture using social media and the internet and how teachers read, disseminate, and write social media content must guarantee the teacher's duty as an educator who educates the nation and matures the nation's generation [20]. Currently, the government, in this case, the Ministry of Education and Culture and Technology, is preparing to mobilize teachers, where the Driving Teacher is a leadership education program for teachers to become learning leaders [21]. According to Isbani and Eko Indrajid [22], today's teachers must become millennials. Teachers can use online applications to interact with students and create a sense of comfort, pleasure, and fun in the learning process. Today's teachers must be able to address the needs of their students,

Conclusion

Based on the results of data analysis and discussion of the portrait of mastery of competence and mastery of technology in biology learning, it can be concluded that the picture of mastery of competence and mastery of technology in biology learning is categorized as very good/high, both based on graduate self-reflection and assessment from graduate users, with score scores for mastery of competencies of 98.94% (graduate self-reflection) and 97.87% (graduate user assessment). Such is the case with mastery of technology in learning, with a value of 91.49% (both from graduate self-reflection and assessment from graduate users).

Acknowledgements

The author would like to thank the graduates and graduate users, principals or vice principals in various regions in Indonesia who have been willing to visit so that data collection and interviews can run smoothly. Similarly, we would like to thank LPPM Universitas Terbuka for facilitating and funding this research.

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