



# Evaluating the Feasibility of Ubuntu-Based Software for Learning in the Computer Education Program at ULM

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**Abstract.** Windows is the most widely used operating system globally. It is known as proprietary software that requires relatively high hardware specifications. Ubuntu 22.04 LTS, as an open-source operating system, offers a legal, lightweight, and efficient alternative. This study aims to examine the feasibility of Ubuntu 22.04 LTS as a supporting operating system for learning activities in the Computer Education Study Program, Faculty of Teacher Training and Education, Lambung Mangkurat University. The research employed an experimental method with a one-shot case study design, focusing on two main indicators: software availability and compatibility. Data were collected through curriculum document analysis, questionnaires distributed to course lecturers, and direct software testing on Ubuntu. The findings indicate that, out of 50 required software applications, 32 were directly available and 18 had alternative equivalents. These results suggest that Ubuntu can adequately support the software needs of the Computer Education Study Program. Furthermore, this study produced a practical guideline document for using Ubuntu 22.04 LTS to support academic activities in the Computer Education Program.

**Keywords:** Ubuntu, educational software, software compatibility, experimental research, computer education

## 1 Introduction

An Operating System (OS) is the first layer of software installed on a computer's storage medium (hard disk) [1]. The operating system provides core services for application software. In general, an operating system is software stored on the computer's hard disk or memory that functions to manage both hardware and software (applications) within it. An operating system is essential for any computer device—it can be likened to the “soul” of a human being.

Windows is the most widely used operating system and holds the largest share of the global desktop market, including in Indonesia [2]. However, as a proprietary software product, Windows requires users to purchase a license for legal use. A single Windows 11 license costs approximately USD 139.00 or IDR 2,284,465.00 [3]. The licensing cost can be a financial consideration for institutions with multiple devices, such as educational institutions, or for individual students. Consequently, Windows is often used

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without an official license, which constitutes a copyright infringement and poses ethical and security risks [4].

It is important to note that Windows 11 has stricter hardware requirements than its predecessors, including the mandatory presence of TPM 2.0 (Trusted Platform Module) and Secure Boot [5]. While these features aim to enhance system security, they also render many older devices that previously ran Windows 10 smoothly no longer officially compatible with Windows 11 [6].

On the Other Hand, Ubuntu, on the other hand, is one of the Linux operating system distributions that is open-source and free of charge [7]. Ubuntu 22.04 LTS (Long Term Support) offers a modern interface, long-term stability, and continuously evolving software support, along with advantages in terms of security, transparent system updates, and an active user community [8]. Compared directly, Ubuntu provides cost-free usage and clearer legal status compared to Windows, which requires a commercial license.

In the context of higher education—particularly in technology-based study programs—the choice of an operating system is determined not only by its popularity but also by its educational value to students. As an open-source operating system, Ubuntu allows students to understand the system structure more openly and flexibly. Meanwhile, although Windows remains the most widely used operating system, it is proprietary in nature, thus limiting system-level exploration. In Indonesia, where the majority of the population has a low income [9], the use of free operating systems such as Ubuntu can be a strategic solution to reduce expenses.

In several educational institutions, Linux has already been adopted for learning purposes due to its open-source nature, flexibility, and cost efficiency [10]. At the elementary school level, Linux is used in various countries as part of digital education initiatives. In Indonesia, for example, the private elementary school Tanah Tinggi began migrating to Linux and FOSS applications in 2015 [11]. In Croatia, the use of Linux aims to reduce software licensing costs and minimize piracy rates, which reached 54% [12]. In Slovenia, a survey of 463 elementary schools revealed that three-quarters of teachers use open-source browsers, and nearly half use open-source office suites and Linux-based operating systems [13]. In Turkey, the government introduced open-source courses that provide students aged 11 and 12 with experience using GNU/Linux alongside the Windows operating system in IT classes [14]. South Africa also demonstrated a strong commitment to open-source adoption, where the Western Cape provincial government mandated the use of open-source software in primary schools as a response to the education crisis and financial limitations [15].

Linux is also widely used at the secondary school level. In India, the government promoted FOSS adoption through the IT@School project in Kerala, which migrated the education system to the GNU/Linux platform [16]. In Slovenia, a survey of 151 secondary schools showed active use of Linux in the teaching and learning process [17]. In Greece, support from the Greek Free/Open Source Software Society (GFOSS) encouraged 76.3% of 337 computer science teachers to use FOSS in their classrooms [18]. In Lithuania, about 40% of secondary schools—covering 51,125 schools and 92 gymnasiums—have implemented Linux with curricula based on open-source applications [19].

The use of Linux in higher education continues to grow due to its cost efficiency and software freedom. In Tanzania, higher education institutions have adopted FOSS because it is considered more secure, reliable, and transparent than commercial software [20]. The University of Magdeburg in Germany uses Linux for UNIX instruction due to funding limitations [21]. In Spain, the use of free software operating systems in universities increased from 8.9% in 2006 to 10% in 2007 [22]. The College of Applied Sciences in Oman implemented FOSS in its Information Technology program, aligning the software applications used with the curriculum [23]. Meanwhile, a survey of state universities in the United States found that 169 out of 7,152 computer laboratories across 559 universities used Linux operating systems [24]. In Indonesia, Telkom University in Bandung has successfully implemented Linux as part of its computer laboratory solutions [25].

## **2 Research Methods**

This study employed an experimental method using a one-shot case study design, aiming to determine whether the Ubuntu operating system is suitable for use as a learning facility in the Computer Education Study Program, Faculty of Teacher Training and Education (FKIP), Universitas Lambung Mangkurat (ULM). The experiment was conducted by installing software used in the curriculum, testing the main features of the software based on the context of related courses, documenting the process, and recording the availability and compatibility of the software. Figure 1 below presents the framework of this study.

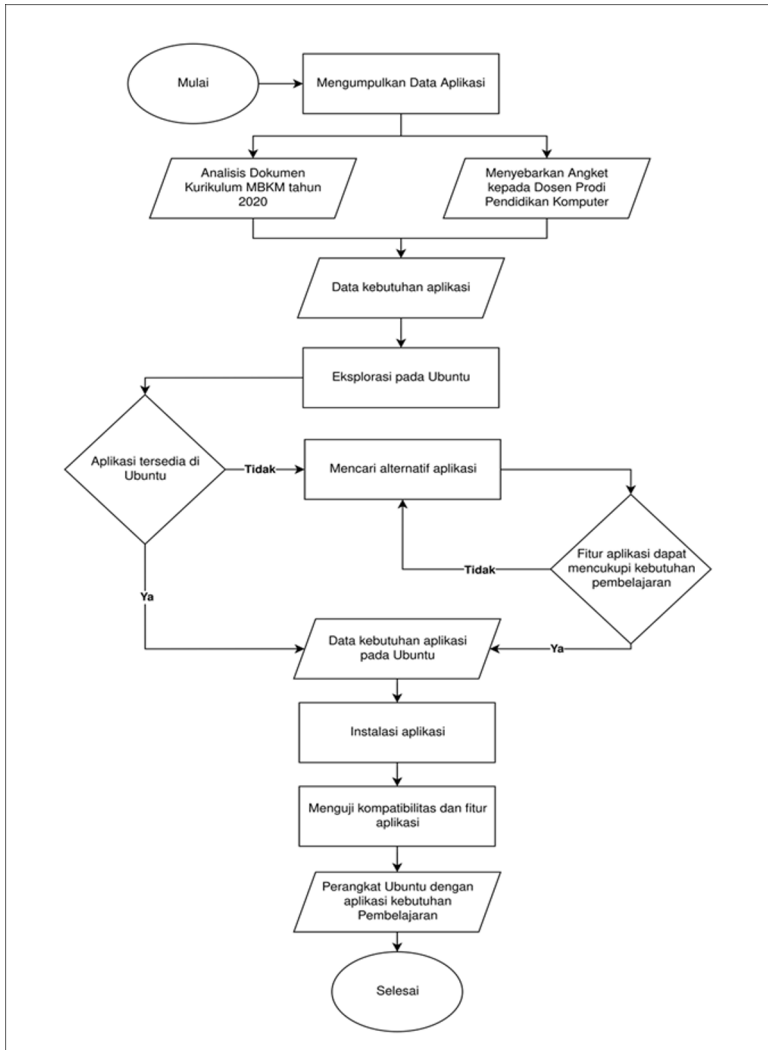


Fig. 1. Research Framework

## 2.1 Software Data Collection

The collection of software requirement data was carried out using two approaches:

**Curriculum Document Analysis** - The curriculum document analysis aimed to identify the available courses and their learning outcomes, allowing for the identification of relevant software—both explicitly and implicitly mentioned.

**Questionnaire Distribution to Lecturers** - The questionnaire was used to obtain up-to-date data on the software currently used by lecturers in their teaching activities.

The results of these two approaches were combined into a comprehensive list of required software, which served as the basis for the subsequent experimental stage.

## 2.2 Recapitulation of Application Requirement Data

The software requirement data obtained through curriculum document analysis and lecturer questionnaires were compiled into a single table. The recapitulation process involved identifying each software mentioned in either the documents or the questionnaires, followed by eliminating duplicates. This process resulted in a definitive list of software essential for supporting the learning process in the Computer Education Study Program.

## 2.3 Exploration on Ubuntu

The collected software data were then explored within the Ubuntu environment. The purpose of this exploration was to determine whether the applications were natively available on Ubuntu. If a specific application was not available, an alternative software with similar functionality was sought. Each software was further evaluated to determine whether its features sufficiently met the learning requirements; if not, it was marked as lacking an adequate solution within the Ubuntu environment.

The results of this exploration and the identification of alternative software were compiled into a final dataset of applications available on Ubuntu. This dataset was presented in the form of tables showing the distribution of software between Windows and their respective Ubuntu alternatives, as well as a list of applications to be installed on Ubuntu. The compiled software data were then used as the basis for validating Ubuntu's adequacy in facilitating learning activities and for conducting software testing experiments.

For unavailable applications, alternative software with similar functionality was identified and selected. The selection of alternative software was based on specific technical and functional criteria designed to ensure that the chosen alternatives adequately met the learning requirements of the corresponding courses. Table 1 below presents the criteria used for selecting alternative software.

## 2.4 Software Installation

The software was installed to test whether it could run properly and whether its main features functioned well within the Ubuntu environment. After the experimental testing, the process was documented using installation screenshots and logs, and the results were observed and recorded in a compatibility checklist table.

**Table 1.** Criteria for Selecting Alternative Software

No.	Criterion	Description
1	Runs on Ubuntu	The software must be compatible with and runnable on Ubuntu 22.04 LTS.
2	Interface Similarity	The software should have a user interface similar to the reference software.

No.	Criterion	Description
3	Features Supporting CLOs	The available features must support the achievement of the Course Learning Outcomes (CLOs) as required in the curriculum.
4	Resource Requirements	The hardware resource requirements needed to run the software.
5	Availability of Official Documentation	Official documentation on software usage must be publicly accessible.

## 2.5 Ubuntu System with Learning Applications

This stage represents the final outcome of the exploration and experimentation processes conducted earlier. After confirming that the required software was either directly available or had adequate alternatives, and that their features met the learning needs, all of the identified software were installed and tested within the Ubuntu environment.

The Ubuntu system equipped with various educational applications serves as a representation of an operating system ready to be used by both students and lecturers in teaching and learning activities. This readiness encompasses not only the availability of applications but also usability, system stability, and feature suitability in supporting the learning outcomes of each course in the Computer Education Study Program.

In other words, at this stage the researcher developed a complete and viable Ubuntu working environment for academic purposes, which also served as the basis for creating a practical user guide document. The results of this stage form the foundation for concluding whether Ubuntu can adequately meet the learning requirements and function as a viable alternative to the primary operating system used in the Computer Education Study Program.

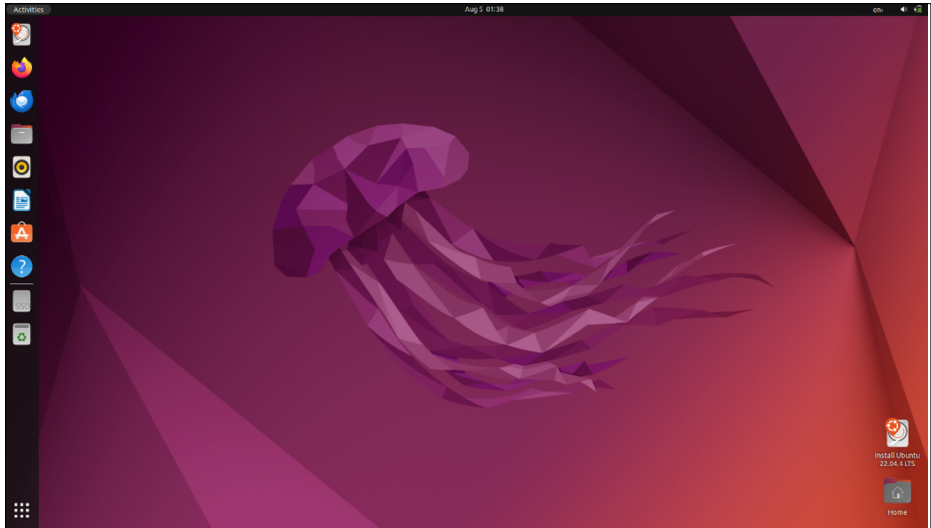
## 3 Results and Discussion

This section presents the results and discussion of the experiments conducted in the previous stages. The experimental findings serve as the basis for drawing conclusions regarding the feasibility of using the Linux Ubuntu operating system as a teaching and learning facility within the Computer Education Study Program, Faculty of Teacher Training and Education (FKIP), Universitas Lambung Mangkurat (ULM).

### 3.1 Installation of the Ubuntu Operating System

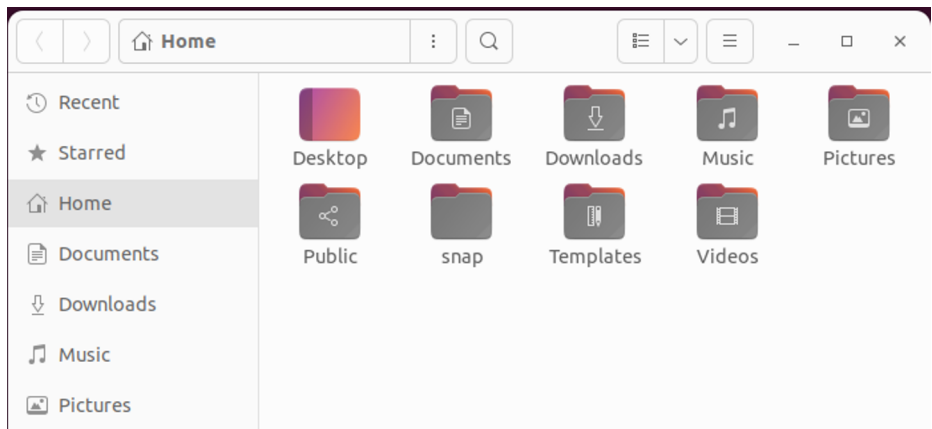
The installation of the Ubuntu operating system was completed successfully without significant issues. The installation steps included disk partitioning, network configuration, and installation of Ubuntu's default packages. After the installation process, the system was immediately operational and able to recognize essential hardware components without requiring additional driver installation. All basic Ubuntu features—such

as file management, connectivity, and system configuration—functioned properly. Figure 2 shows the Ubuntu 22.04 LTS operating system running on the researcher’s device.



**Fig. 2.** Ubuntu 22.04 LTS Desktop

By default, Ubuntu 22.04 LTS includes a free file manager called Nautilus. Nautilus is an application that allows users to visually manage files and folders, similar to Windows Explorer. With Nautilus, users can easily organize files and folders without needing to type commands in the terminal. Figure 3 presents the file management interface in Nautilus.



**Fig. 3.** Nautilus File Manager Interface

After installing Ubuntu 22.04, Wi-Fi connectivity worked immediately without any additional configuration or driver installation. The Wi-Fi was tested by connecting to an available access point, and the connection successfully provided internet access. Bluetooth functionality was enabled by default and accessible directly from the system settings menu. The connection test—pairing the laptop with a Bluetooth speaker—was successful and operated without issues. Audio output also functioned properly without requiring additional drivers. The internal speakers produced clear sound, and the system automatically detected external speakers when connected.

### 3.2 Software Data Collection Results

Software Mapping - This mapping includes the names of software identified through curriculum document analysis and questionnaires (generally Windows-based), as well as the corresponding software available on Ubuntu or alternative replacements when the original software is unavailable. Table 2 below presents the software mapping results.

**Table 2.** Software Mapping Between Windows and Ubuntu

No	Course	Software (Windows)	Software (Ubuntu)
1	Religion	Quran for Windows	Quran Companion / General Software
2	Pancasila	General Software	General Software
3	Civic Education	General Software	General Software
4	Indonesian Language	KBBI Online	KBBI Online / General Software
5	English Language	English Dictionary, Grammarly, General Software	English Dictionary, Grammarly, General Software
6	Introduction to Wetland Environment	General Software	General Software
7	Entrepreneurship	General Software	General Software
8	Introduction to Education	General Software	General Software
9	Student Development	General Software	General Software
10	Learning and Instruction	General Software	General Software
11	Teaching Profession	General Software	General Software
12	School Management and Administration	General Software	General Software
13	Basic Mathematics	General Software, GeoGebra, Mathematics	General Software, GeoGebra, WxMaxima

No	Course	Software (Windows)	Software (Ubuntu)
14	Basic Physics	PhET Interactive Simulation, SimPHY	PhET Interactive Simulation, SimPHY
15	Basic Programming 1	Python, IDLE, Pip Python, Visual Studio Code, Spyder	Python, IDLE, Pip Python, Visual Studio Code, Spyder
16	Introduction to Digital Systems	Logic.ly	Logic.ly
17	Discrete Mathematics	General Software	General Software
18	Calculus	GeoGebra, Mathematics, General Software	GeoGebra, WxMaxima, General Software
19	Introduction to Computer Organization	General Software	General Software
20	Data Structures	Python, IDLE, Pip Python, Visual Studio Code	Python, IDLE, Pip Python, Visual Studio Code
21	Web Programming 1	HTML, CSS, JavaScript, Git Bash	HTML, CSS, JavaScript, Git
22	Linear Algebra	General Software	General Software
23	Statistics and Probability	GeoGebra, SPSS, General Software	GeoGebra, Jamovi, General Software
24	Basic Programming 2	Java, NetBeans, Visual Studio Code	Java, NetBeans, Visual Studio Code
25	Operating Systems	Linux, Windows	Linux, Windows
26	Algorithm Design and Analysis	Python, Visual Studio Code	Python, Visual Studio Code
27	Digital Image Processing	GNU Octave, GIMP	GNU Octave, GIMP
28	Database	MySQL	MySQL
29	Mobile Application Programming	Android Studio	Android Studio
30	Web Programming 2	Apache2, PHP, MySQL, Composer, Visual Studio Code, Postman, Git Bash	Apache2, PHP, MySQL, Composer, Visual Studio Code, Postman, Git
31	Data Communication and Networking	Wireshark, Cisco Packet Tracer, Winbox	Wireshark, GNS3, Winbox
32	Logic for Computer Science	Visual Studio Code, General Software	Visual Studio Code, General Software
33	Open Source Development	Apache2, XAMPP, WordPress, Moodle, MySQL	Apache2, XAMPP, WordPress, Moodle, MySQL
34	Multimedia Processing Techniques	Python, Adobe Premiere, Audacity, Adobe Photoshop, CorelDraw	Python, Kdenlive, Audacity, GIMP, Inkscape

No	Course	Software (Windows)	Software (Ubuntu)
35	Interaction Systems	Figma	Figma
36	Software Engineering	Visual Studio Code, StarUML	Visual Studio Code, StarUML
37	Software Project	Visual Studio Code, Make	Visual Studio Code, Make
38	Educational Information Systems	General Software	General Software
39	Data Science	Python, Pip Python, NumPy, Pandas, JupyterLab	Python, Pip Python, NumPy, Pandas, JupyterLab
40	Computer-Assisted Instruction	iSpring, Google Classroom, Moodle	Open eLearning, Google Classroom, Moodle
41	Numerical Methods	GeoGebra, Python, General Software	GeoGebra, Python, General Software
42	Geographic Information Systems*	ArcGIS, Google Maps, Google Earth	QGIS, Google Maps, Google Earth
43	Computer Graphics*	OpenGL, Visual Studio Code	WebGL, Visual Studio Code
44	Intelligent Systems*	Python, Pip Python, Visual Studio Code, Google Colab	Python, Pip Python, Visual Studio Code, Google Colab
45	Cross-Program Elective 1	General Software	General Software
46	Cross-Program Elective 2	General Software	General Software
47	Cross-Program Elective 3	General Software	General Software
48	Machine Learning*	Python, Pip Python, Visual Studio Code, JupyterLab	Python, Pip Python, Visual Studio Code, JupyterLab
49	Simulation and Modeling*	Python, Pip Python	Python, Pip Python
50	Digital Photography*	Adobe Lightroom, Adobe Photoshop	Darktable, GIMP
51	Logic Programming*	SWI-Prolog	SWI-Prolog
52	Natural Language Processing*	Python, Pip Python, Visual Studio Code	Python, Pip Python, Visual Studio Code
53	Cryptography and Information Security*	Python, Pip Python, Visual Studio Code, General Software	Python, Pip Python, Visual Studio Code, General Software
54	Software Quality Assurance*	General Software	General Software
55	Project Management*	Leantime	Leantime
56	System Administration*	Nptool	Nptool

No	Course	Software (Windows)	Software (Ubuntu)
57	Learning Media and Technology	iSpring, GeoGebra	Open eLearning, GeoGebra
58	Internship (PKL)*	General Software	General Software
59	Curriculum Review for Vocational Schools (Instructional Design)	General Software	General Software
60	Teaching and Learning Strategies	General Software	General Software
61	Learning Evaluation	Anates, SPSS, General Software	PSPP, Jamovi, General Software
62	Computer Education Planning	General Software	General Software
63	Teaching Practice Program 1 (PLP 1)	General Software	General Software
64	Teaching Practice Program 2 (PLP 2)	General Software	General Software
65	Research Methodology	SPSS, General Software	Jamovi, General Software
66	Computers and Society	General Software	General Software
67	Thesis	General and Specialized Software	General and Specialized Software

### 3.3 Software Recapitulation

An evaluation was conducted on the software required to support learning activities in the Computer Education Program, FKIP at ULM. A total of 50 software applications were identified based on curriculum analysis and lecturer surveys. Table 3 below presents the results of the software requirement recapitulation that have been experimentally tested.

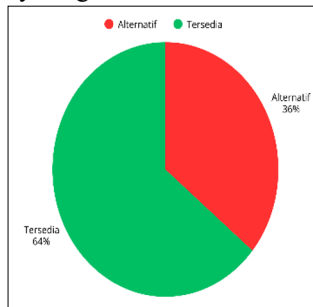
**Table 3.** Summary of Software Requirements

No.	Software	Remarks	No.	Software	Remarks
1	Python		26	Google Chrome	
2	IDLE		27	Quran Companion	Alternative
3	Pip Python		28	Git	
4	Visual Studio Code (VSCode)		29	PSPP	Alternative
5	GNU Octave		30	Postman	
6	SWI-Prolog		31	JupyterLab	
7	Wireshark		32	LibreOffice	Alternative

No.	Software	Remarks	No.	Software	Remarks
8	Android Studio		33	Mozilla Firefox	
9	Winbox		34	PDFSam Basic	Alternative
10	Kdenlive	Alternative	35	Totem	
11	Audacity	Alternative	36	Calibre	
12	Figma		37	PeaZip	Alternative
13	Geogebra		38	Zoom	
14	QGIS	Alternative	39	Free Download Manager	Alternative
15	Apache2		40	Darktable	Alternative
16	MySQL		41	SimPHY	
17	Java		42	Nautilus	
18	PHP		43	Jamovi	Alternative
19	Composer		44	WxMaxima	Alternative
20	WebGL	Alternative	45	XAMPP	
21	Zotero	Alternative	46	Wordpress	
22	Inkscape	Alternative	47	Moodle	
23	GIMP	Alternative	48	NetBeans	
24	Open eLearning	Alternative	49	Spyder	
25	GNS3	Alternative	50	StarUML	

**3.4 Software Installation Results**

Based on the experimental results, out of 50 software applications tested, 64% were available and could be installed on Ubuntu 22.04 LTS. Meanwhile, 36% were not available for Ubuntu but could be replaced with alternative software that provides similar functionality. Figure 4 below shows the availability chart of software requirements for the Computer Education Study Program on Ubuntu 22.04 LTS.



**Fig. 4.** Software Availability Chart

### 3.5 Software Validation Results

Software adequacy validation was carried out by comparing the software requirement data obtained from questionnaires and curriculum document analysis with the results of software installation and usage testing on Ubuntu 22.04 LTS. The findings indicate that Ubuntu 22.04 LTS sufficiently meets the software requirements for the Computer Education Study Program at FKIP ULM, either through native applications or their open-source alternatives.

### 3.6 Research Output

As part of the research outcomes, the author has developed a practical guide document for using the Ubuntu 22.04 LTS operating system, intended to support teaching and learning activities in the Computer Education Study Program at FKIP ULM. This guide was designed based on hands-on experimentation with the installation and operation of the software required by the Computer Education curriculum. The document provides comprehensive technical and procedural information arranged systematically, making it suitable for use by the academic community—especially new users of the Ubuntu 22.04 LTS operating system.

## 4 Conclusion and Suggestions

Based on the results of software requirement data collection through questionnaires and document analysis, as well as adequacy validation through direct experimentation on the Ubuntu 22.04 LTS operating system, it was found that out of 50 software applications required for learning activities, 32 were available natively and 18 were available as alternatives. These results demonstrate that Ubuntu 22.04 LTS is capable of fully meeting the software needs of the Computer Education Study Program at FKIP ULM.

Future research could expand this study by testing the performance and usability of Ubuntu 22.04 LTS across different hardware configurations and user groups, such as lecturers, students, and laboratory administrators. Additionally, it would be beneficial to explore the integration of Ubuntu with cloud-based learning platforms and educational management systems to enhance collaboration and accessibility. Continuous evaluation and documentation of software updates and compatibility are also recommended to ensure long-term sustainability. Finally, promoting open-source literacy among academic staff and students could strengthen the adoption and effective utilization of Ubuntu as a primary learning environment in higher education.

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