GEOSPATIAL IMPLEMENTATION FOR URBAN AND REGIONAL PLANNING PERSPECTIVES

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Abstract

This paper explores the geospatial technology implementation among students of the Department of Urban and Regional Planning at Universitas Terbuka, Indonesia. The study aims to assess the students' proficiency in geospatial technology, their interests in learning related topics, and the challenges they encounter while implementing geospatial technology in their studies. A total of 167 active students from various regions participated in the research through a questionnaire-based survey. The results revealed that five software tools, including ArcGIS, AutoCAD, Google Earth Engine, Microsoft Office, and QGIS, were commonly used by the students, each with varying levels of mastery. ArcGIS, a crucial tool for urban planning, was employed by 38% of the respondents, primarily at the visualization level. AutoCAD, known for its technical and architectural drawings, was preferred by 4% of the students, predominantly for data visualization. Google Earth Engine, a cloud-based geospatial data analysis platform, was chosen by 3% of the respondents, mainly for data inputting. Microsoft Office, while not explicitly designed for analysis, saw 38% of students using components like Excel and Access for data analysis. QGIS, with similar functions to ArcGIS, attracted 14% of the respondents. This study emphasizes the significance of geospatial technology integration in urban planning education and its role in shaping sustainable and efficient urban development. Furthermore, it highlights the challenges faced by students, particularly in a distance learning environment. By identifying the students' needs and skill levels, the research offers relevant recommendations to enhance geospatial technology education at Universitas Terbuka.

Keywords: DURP FST-UT, geographic information system, geospatial technology, urban and regional planning.

1 INTRODUCTION

The importance of geospatial technology in the field of urban and regional planning has been widely proven. However, in the context of the Open University, the implementation of geospatial technology by urban and regional planning students still faces challenges. As a distance education institution, the Open University has its own challenges in providing effective and in-depth learning about geospatial technology to its students.

Regional and urban planning education in the digital era requires the integration of geospatial technology to enrich the student learning experience. Geospatial technologies, such as ArcGIS, QGIS, Google Earth Engine, and City Engine, have proven to make significant contributions

to area analysis and mapping as well as sustainable planning. However, the implementation of geospatial technology in urban and regional planning learning has not yet been fully explored, especially in the open university environment. Therefore, this study aims to investigate the implementation of geospatial technology by urban and regional planning students at the Open University.

Most students at the Open University are workers who want to get a deeper learning of their work, this also affects the difference in ability to use geospatial technology.

Therefore, this study aims to identify the level of implementation of geospatial technology among urban and regional planning students and explore their needs related to learning geospatial technology. Through this collaboration, it is hoped that relevant solutions and recommendations can be found to improve geospatial technology learning at the Open University.

The main purpose of this study is to evaluate the level of mastery of geospatial technology by regional and urban planning students at the Open University, analyse students' learning interests related to geospatial technology and the topics they want to learn more, and identify the obstacles and challenges faced by students in implementing geospatial technology in regional and urban planning learning.

The use of geospatial technology in urban and regional planning education has been the focus of attention in recent years. As a powerful tool for spatial analysis and regional modelling, Geographic Information Systems (GIS) have opened up new opportunities in the learning and understanding of planning concepts. As mentioned by Azizi and Samsudin (2020), 'Integrating Geographic Information Systems (GIS) into urban planning education provides students with the necessary skills to tackle the complexities of spatial analysis and decision-making in the field of urban planning.In addition, Hamzah and Yusoff (2018) emphasize that 'the integration of GIS in urban planning education equips students with valuable spatial analysis, mapping, and visualization skills, enhancing their understanding of the built environment and the planning process.' Technology-based analysis in the field of urban and regional planning. Various tools and technologies have been used to help make more efficient and effective regional and urban planning decisions.

Geographic Information System (GIS) is one of the most commonly used technology-based analysis tools in urban and regional planning. GIS enables the collection, storage, analysis, and

visualization of data that has a spatial component. In urban and regional planning, GIS is used for land use mapping and analysis, urban modeling and simulation, infrastructure data management, and transportation network analysis. By using GIS, urban and regional planners can integrate spatial and non-spatial data to make better decisions in regional development, as well as in the lawmaking that governs them, said Batty M (1990) Information Systems for Planning in Developing Countries.

In addition, the use of geospatial technology in higher education prepares students to face challenges and demands related to urban development and future planning. Kowsar and Rajabifard (2018) note that geospatial technology has an important role in preparing regional and urban planning students for the smart city era. Students equipped with geospatial knowledge and skills can contribute to designing and managing sustainable and efficient cities.

Using Geographic Information Systems (GIS), 3D modelling, and other spatial analysis tools, planners can integrate geographic and non-geographic data to identify, analyse, and map important aspects of urban and regional planning. This technology allows planners to describe spatial relationships between different elements such as land, infrastructure, environment, and population, which in turn helps in better decision making and more effective planning drafting.

In addition, geospatial technologies also play an important role in the process of communication and participation in regional and urban planning. Through powerful visualization and interactive mapping, geospatial technology allows planners to present planning ideas and plans in a clearer and understandable way to a wide range of stakeholders. This facilitates better dialogue and public participation in the planning process, thereby increasing public awareness and understanding of the plans and policies being proposed. With broader participation and more open information, planners can gain valuable input and build strong community support for implemented planning plans.

2 METHODOLOGY

The methodology we used in this study is descriptive analysis and linear regression analysis, with the aim of gaining a deep understanding of the application of geospatial technology to urban and regional planning students at the Open University. This method is used to analyses the level of understanding and implementation of geospatial technology by students.

By using questionnaires as a data collection instrument distributed to 167 students for the registration period 2019.2 – 2023.1 active students of urban and regional planning at the Open University. Indicators are used to measure the level of ability and knowledge of students towards geospatial technology. Indicators to find out these two things include several aspects, namely: (1) Knowing what type of data and software can be used to process the data. (2) How often they use the software for data analysis, (3) The level or level of ability of students to the software they use, (4) Know the source of accurate and accountable data.

Data collection in this study used the questionnaire method with instrument validity testing methods in the form of Product Moment correlation analysis and instrument reliability testing methods using Cronbach Alpha analysis.

3 FINDINGS AND DISCUSSION

This study examines the implementation of spatial technology by Urban and Regional Planning of Universitas Terbuka students spread across 39 Regional Office of UT, namely Ambon 2 respondents, Aceh 1 respondent, Bandung 8 respondents, Banjarmasin 2 respondents, Batam 3 respondents, Bengkulu 2 respondents, Bogor 11 respondents, Denpasar 7 respondents, Gorontalo 3 respondents, Jakarta 2 respondents, Jambi 24 respondents, Jayapura 4 respondents, Jember 3 respondents, Kendari 2 respondents, Kupang 2 respondents, Lampung 3 respondents, Majene 2 respondents, Makassar 5 respondents, Malang 9 respondents, Manado 4 respondents, Mataram 3 respondents, Medan 7 respondents, Padang 7 respondents, Palangkaraya 1 respondent, Palembang 4 respondents, Palu 2 respondents, Pangkal pinang 3, Pekanbaru 5 respondents, Pontianak 1 respondent, Purwokerto 4 respondents, Riau 1 respondent, Samarinda 1 respondent, Semarang 1 respondent, Serang 1 respondent, Sorong 3 respondents, Surabaya 18 respondents, Surakarta 2 respondents, Tarakan 1 respondent, Ternate 2 respondents, Yogyakarta 3 respondents. With a total of 167 respondent students, 5 software used by students were obtained, namely, ArcGIS, AutoCAD, Google Earth Engine, Microsoft Office, QGIS with different levels of mastery, mastery levels were classified into 3 types: Level 1 (Inputting Data) or beginner, Level 2 (Data Management) or intermediate, and Level 3 (Data Visualization) Profession.

Table 1. List of respondent students spread across 39 Regional Office of UT.

	Regional Office of UT	Amount of Respondent
1.	Aceh	1
2.	Bandung	8
3.	Banjarmasin	2
4.	Batam	3
5.	Bengkulu	2
6.	Bogor	11
7.	Denpasar	7
8.	Gorontalo	3
9.	Jakarta	2
10.	Jambi	24
11.	Jayapura	4
12.	Jember	3
13.	Kendari	2
14.	Kupang	2
15.	Lampung	3
16.	Majene	2
17.	Makassar	5
18.	Malang	9
19.	Manado	4
20.	Mataram	3
21.	Medan	7
22.	Padang	7
23.	Palangkaraya	1
24.	Palembang	4
25.	Palu	2
26.	Pangkal Pinang	3
27.	Pekanbaru	5
28.	Pontianak	1
29.	Purwokerto	4

30.	Riau	1
31.	Samarinda	1
32.	Semarang	1
33.	Serang	1
34.	Sorong	3
35.	Surabaya	18
36.	Surakarta	2
37.	Tarakan	1
38.	Ternate	2
39.	Yogyakarta	3
Total		*167*

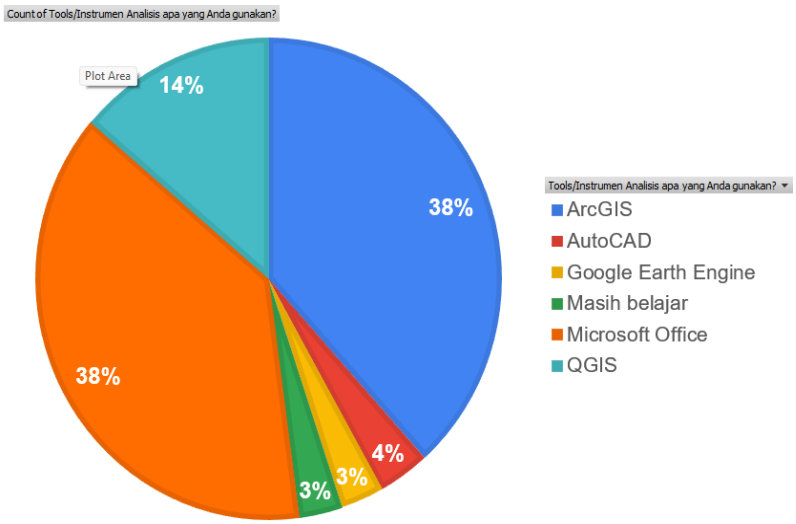


Figure 1. Results of analysis of respondents preferred software.

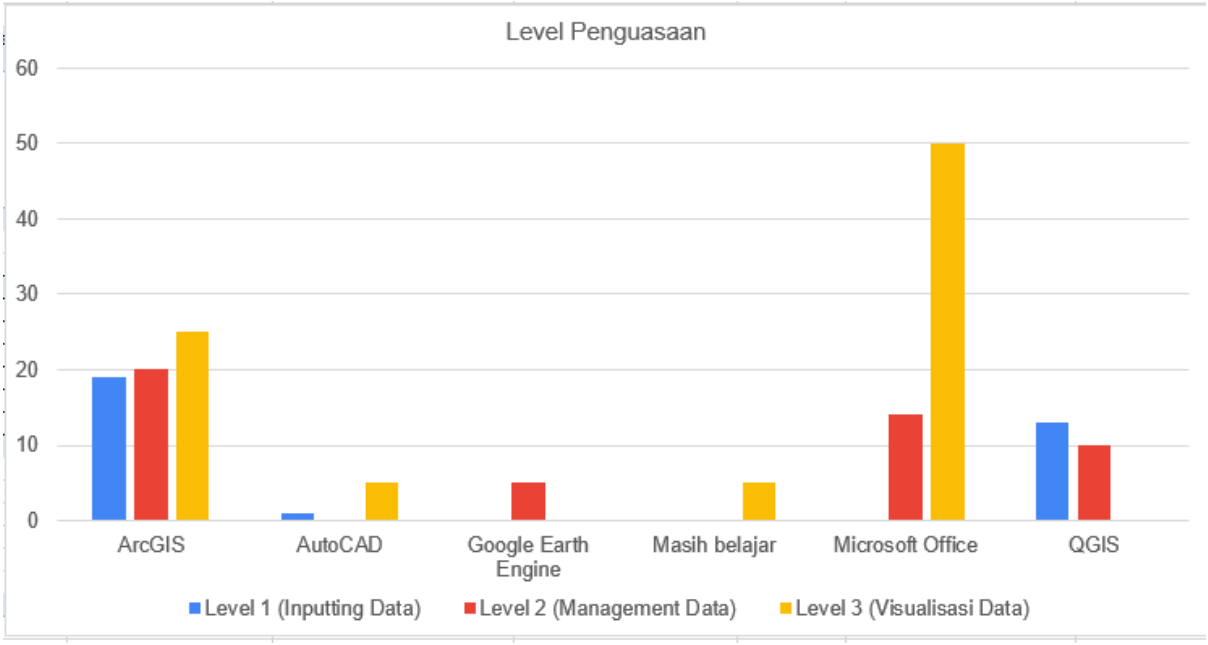


Figure 2. Results of analysis of respondent's choice of software and level of mastery.

ArcGIS, according to Dr. Karen Kemp from the University of Southern California, said ArcGIS plays an important role in regional and urban planning, by using this software, we can combine geographic data with other data, such as socio-economic which can provide a comprehensive understanding in the field of planning, therefore students consciously study and use ArcGIS as an analysis tool as many as 64 people (38%) with mastery level dominated by Level 3 which is already in the data visualization stage with 25 people (39%), and followed by Level 2 or data management with 20 people (31%), then Level 1 or beginners in the data Inputting stage with 19 people (30%).

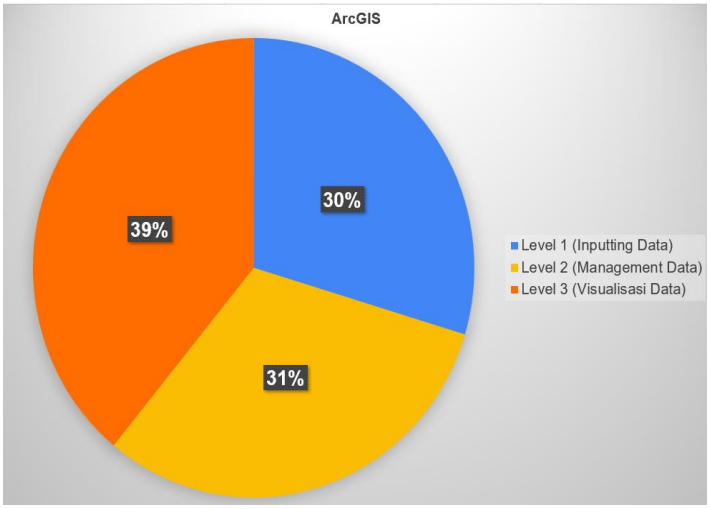


Figure 3. Respondents' level of mastery of ArcGIS.

In AutoCAD Software which is software intended to make engineering, architecture, and engineering drawings and can present precise 2D and 3D drawing output, it was chosen by 6 people or 4% of respondents from a total of 167 respondents, with a level of mastery of inputting data or level 1 as much as 1 person with a percentage of 17% and level 3 data visualization as many as 5 people or 83%.

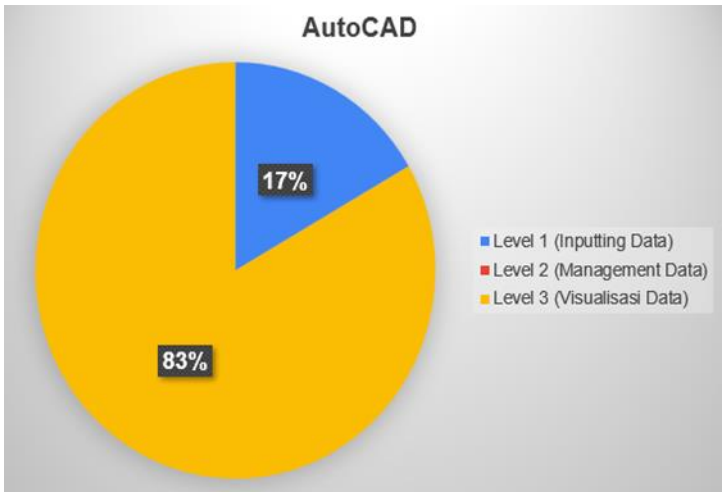
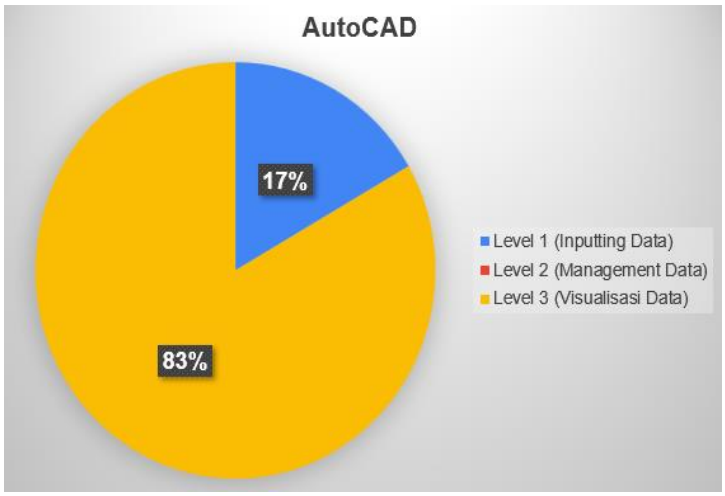


Figure 4. Respondent's level of mastery of AutoCAD.

Furthermore, Google Earth Engine or software that can be used to access and analyse geospatial data such as satellite imagery, with its excellent feature that is to perform high scalability analysis with a strong cloud computing infrastructure makes this device able to analyse geospatial data on a global scale quickly. This software was chosen by 5 respondent students (3%) who were all at level 2 or inputting data.

Microsoft Office is not specifically designed to be an analysis tool, but some of its components can be used to perform data analysis in a certain way, such as Microsoft Excel, Microsoft Access, and Microsoft Power BI, this software was chosen by 64 students with a percentage (38%) with a level of mastery of this software.



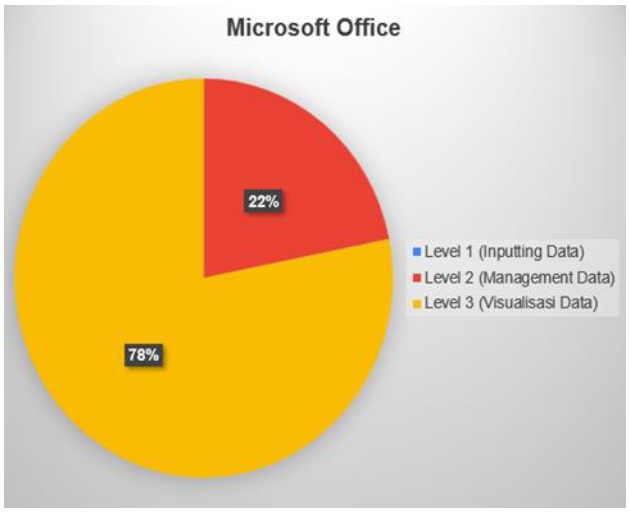


Figure 5. Respondent's level of mastery of Microsoft Office.

The Quantum GIS or QGIS has functions and advantages like ArcGIS, students who chose QGIS as an analytical tool 23 students with a presentation of 14%. With the mastery stage dominated by level 1 (Inputting Data) as many as 13 people (57%) and 10 people at level 2 (Management Data) (43%).

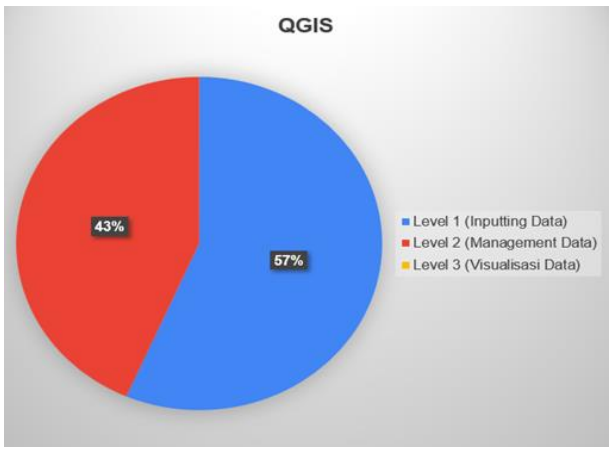


Figure 6. Respondent's level of mastery of QGIS.

In addition to the level of student mastery of the software they use, the frequency of students in using software also affects the implementation of geospatial technology such as how often students use geospatial technology instruments, the more often students use these instruments, the level of mastery also increases. Can be seen through Figure 6.

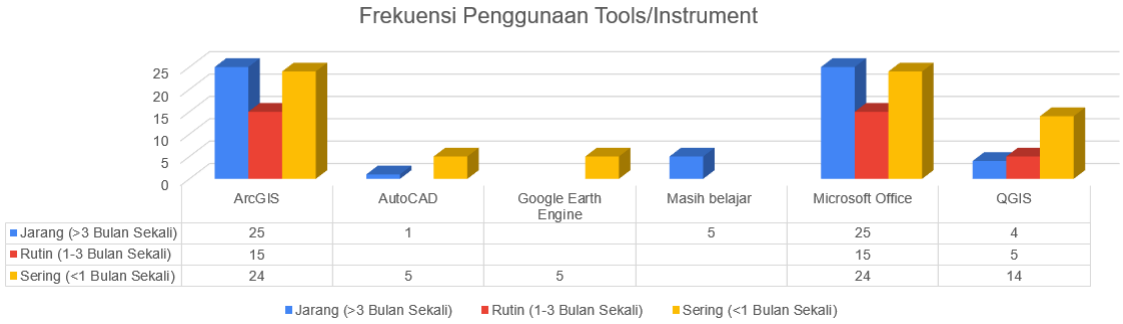


Figure 7. Frequency of use of tools/instruments.

The frequency of software use is not entirely due to learning activities, because it is necessary that the object of this research is UT students who have mostly worked, and from the data obtained the work of regional and urban planning students is relevant to the studies they take at the Open University, which can also be understood that the numbers that show students have known and can operate geospatial software have learned or have understood from work or have not received learning from the Open University, because respondents who do not work or are only students claim not to be familiar with geospatial data analysis software.

4 CONCLUSION

Based on the results of data analysis, it is known that the average level of understanding and implementation of geospatial technology by urban and regional planning students at the Open University is at level 3 (Data Visualization) because it is dominated by Microsoft Office, which in the category of geospatial technology visualization through Microsoft Office cannot be included, Microsoft office, in the context of geospatial technology can be used to process "raw" data or subsequent initial data for visualization of such data can use ArcGIS or QGIS. However, when referring to ArcGIS, AutoCAD, Google Earth Engine, and QGIS, the average level of urban and regional planning students is at level 2 (Data Management) and is still not good at visualizing data. There are 5 respondent students (3%) who are still in the "Still Learning" stage

for level 3 or data visualization in each geospatial software, which means independent learning interest in geospatial technology considering that students who are respondents of this study are at levels 1 to 4 with a registration period of 2019.2 to 2023.1. This study also has data where students provide input on what software related to geospatial technology, they want to learn more about and from the data it is known that urban and regional planning students at the open university conduct independent research on relevant technological tools used for urban and regional planning, such as Urban Footprint, and City Engine.

By knowing how powerful the software is, this research expects students and lecturers at the Open University to support knowledge and skills of geospatial technology information visualization in the use of geospatial information system technology, access to powerful software and technological devices is needed, as well as periodic training, workshops, or ESRI MOOC (Massive Online Open Courses) portals. It was decided that the Open University's urban and regional planning department is expected to provide students with access to ArcGIS software starting from the initial level because the program is paid, students can use ESRI's technology platform on platforms other than ArcGIS Desktop. This inevitably pressures students to use pirated software that violates the university's code of ethics.

Software can be shared by universities as educational support So, the easy access to ArcGIS licenses for students is expected to encourage students to be more skilled in the use of GIS technology using software from ESRI. As an alternative, researchers suggest that the Department of Urban and Regional Planning of the Open University introduce and use open software as well as in the use of GIS technology such as QGIS software, AutoCAD, Urban Footprint, City Engine, and similar GIS software that is open (opensource). It is very important for Open University majors to encourage students to participate in extracurricular activities or study groups that focus on remote sensing technology and geographic information systems as learning media and application models in education. Such activities can enhance the experience and skills of students, especially those studying urban and regional planning.

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