

# EMPOWERING INCLUSIVE EDUCATION: IDENTIFYING STRATEGIC CREATIVE HUB LOCATIONS SUPPORTING STUDENTS WITH DISABILITIES THROUGH DATA MINING AND HEATMAP VISUALIZATION

Intra Swadaya Hidayat<sup>1\*</sup>, D Tri Octafian<sup>2</sup>, Dani Pamungkas<sup>3</sup>, M.Ferdy<sup>4</sup>, Gilang Pratama<sup>5</sup>

Institut Teknologi dan Bisnis PalComTech<sup>1,2,3,4,5</sup>

[intra.swadaya@palcomtech.ac.id](mailto:intra.swadaya@palcomtech.ac.id)<sup>1\*</sup>, [octafian@palcomtech.ac.id](mailto:octafian@palcomtech.ac.id)<sup>2</sup>, [students@palcomtech.ac.id](mailto:students@palcomtech.ac.id)<sup>3</sup>,  
[students@palcomtech.ac.id](mailto:students@palcomtech.ac.id)<sup>4</sup>, [students@palcomtech.ac.id](mailto:students@palcomtech.ac.id)<sup>5</sup>

## Abstract

This research aims to identify optimal locations for the development of inclusive creative hubs for students with disabilities, particularly those with mental and intellectual disabilities, in Palembang City. The study utilizes a data-driven approach, combining data mining techniques and spatial visualization using heatmap. The data used in this study is sourced from the Basic Education Data ([dapo.kemdikbud.go.id](http://dapo.kemdikbud.go.id)) and verified by the Disability Services Unit of the Palembang City Education Office, which includes information on the number of students with disabilities and the accessibility of educational facilities in the region. Through data analysis, this study identifies districts in Palembang with high concentrations of students with disabilities and evaluates the need for inclusive facilities in these areas. By applying data mining techniques such as clustering and generating heatmaps, this research produces maps that highlight the optimal locations for the development of creative hubs that support the physical, intellectual, and social development of students with disabilities. The findings indicate that several districts, including Sukarami, Ilir Barat I, and Kalidoni, require greater attention in the development of inclusive facilities. The identified creative hubs can provide spaces for students with disabilities to interact, learn, and develop in a supportive environment. This research also emphasizes the importance of integrating spatial data into urban planning to create more inclusive spaces, ensuring that development policies prioritize the needs of students with disabilities. Ultimately, this study offers significant contributions to the planning of more inclusive public spaces and provides a solid foundation for decision-making in urban planning that is both inclusive and sustainable in Palembang City.

**Keywords:** *Data mining, Data Visualization, Data Analyst, Inclusive Education; Creative Hub; Heatmap Visualization; Spatial Analysis;*

## 1. INTRODUCTION

Inclusive education is a comprehensive approach that aims to provide equitable educational opportunities for all learners, regardless of their abilities, backgrounds, or needs. This approach is rooted in the belief that every child has the right to participate in a shared learning environment and that schools have a duty to accommodate diverse learners (Karim & Hue, 2022; Mathias, 2015). Core principles of inclusive education include equity and equality, as it promotes social integration and ensures that all students, including those with disabilities, have access to quality education (Ghergut, 2011; Maguvhe, 2023). It also emphasizes diversity and participation by encouraging the involvement of all students in learning activities (Ispas, 2020; Oranga et al., 2024). Furthermore, it calls for adaptation and support, requiring schools to adjust curricula, teaching methods, and assessment strategies to meet the diverse needs of students, while providing the necessary resources

to facilitate learning (Shabir et al., 2025; Triviño-Amigo et al., 2022). The benefits of inclusive education are evident in fostering social integration, as it cultivates empathy, respect, and understanding among students, which are essential skills for life beyond the classroom (Saporno, 2025). It also empowers students with disabilities by offering them opportunities to succeed in mainstream education (Shabir et al., 2025), and promotes community involvement through collaboration between schools, families, and communities, enriching the overall educational experience (Ispas, 2020).

However, despite the global adoption of inclusive education policies, there are several challenges in its implementation. Barriers such as inadequate teacher training, limited resources, and negative attitudes toward inclusion (Motitswe, 2025), as well as structural and systemic issues like the reliance on the medical model of disability, which focuses on deficits instead of strengths, hinder the development of inclusive practices (Hespe, 2023). Additionally, the gap between inclusive education policies and their practical application often leads to the exclusion of students with special needs from mainstream education (Merchant & Gaad, 2025; Srivastava, 2019). These challenges are particularly pronounced for students with disabilities, highlighting the need for more effective strategies to ensure their full participation and inclusion in the educational system.

Students with disabilities face numerous barriers to accessing and participating in education across various levels and contexts. These barriers can be categorized into economic and social, institutional and policy, physical and structural, educational and pedagogical, psychosocial, and resource-related challenges. Economic factors, such as poverty and social discrimination, significantly hinder educational opportunities, as seen in Cambodia, where families' economic struggles limit access to education for children with disabilities<sup>1</sup>. Furthermore, negative social attitudes and stigma exacerbate this challenge, further restricting educational access (Fournier et al., 2020; Mak & Nordtveit, 2011; Zhou, 2023). Institutional and policy barriers include poor governance, inadequate government support, and outdated policies, all of which prevent students with disabilities from benefiting from educational services (Nash et al., 2022). Moreover, the lack of necessary institutional resources, including trained disability professionals, limits the support available to these students (Valle-Flórez et al., 2021). Physical and structural barriers, such as inaccessible facilities and transportation, are prevalent, particularly in countries like Zimbabwe, where lack of accessible transportation is a major hindrance (Kett & Deluca, 2016). Similarly, students with visual disabilities face challenges in under-resourced schools in South Africa (Subrayen & Dhunpath, 2019). The digital equity gap is another pressing issue, as the lack of accessible online learning platforms and administrative support further disadvantages students with disabilities (Cain & Fanshawe, 2021; Figard & Carberry, 2022).

Educational and pedagogical barriers are also significant, including inappropriate teaching methods and a lack of curricular adjustments, which make learning environments less inclusive (Oliva, 2016; Sheldon & Erickson, 2020). Additionally, many teachers lack the necessary training to accommodate students with disabilities, which exacerbates the educational challenges faced by these students (Ntombela, 2020). Psychosocial barriers such as fear of discrimination and negative attitudes from peers and educators also prevent full participation in educational activities, further isolating students with disabilities (Abebe et al., 2023). Resource-related barriers, such as limited financial resources and insufficient access to assistive technologies, impede students' ability to benefit from educational

opportunities (Kameyama, 2021). To address these issues, recommendations include strengthening policies and governance, enhancing teacher training on inclusive practices, improving physical and digital accessibility, and expanding support services. By addressing these barriers through comprehensive strategies, educational institutions can create more inclusive learning environments. This highlights the need for strategic identification of locations that can support inclusive education, where data mining and heatmap visualization can play a vital role. These technologies can help pinpoint areas that require greater support and infrastructure for students with disabilities, enabling more targeted and effective interventions.

To determine strategic locations for creative hubs using data mining and heatmap visualization, several key insights emerge from the analysis of relevant techniques and tools. Data mining techniques, particularly clustering and pattern recognition, are crucial for identifying patterns and grouping similar data points, helping to understand spatial distributions and make informed decisions about the best locations for creative hubs (Ernawati et al., 2021; Kansakar & Gupta, 2024). In geospatial contexts, data mining techniques such as kernel density estimation and geocoding are often applied to analyze large datasets and extract meaningful patterns. These techniques enable the generation of heatmaps, which visually represent data density or intensity across various locations, thereby highlighting potential areas of interest (Compieta et al., 2007; Liu, 2022). Heatmap visualization, in turn, offers an enhanced method for representing data density, making it easier to pinpoint high-activity areas. Advanced heatmap methods, such as reverse rendering processes, can improve stability and detail, making them more effective for multi-scale digital maps (S. Wang et al., 2018). Furthermore, integrating heatmaps with other visualization tools, such as sunburst diagrams or 3D visualizations, provides a more comprehensive view of spatial relationships and hierarchical data, enriching the decision-making process (Chen et al., 2016). Real-time and interactive visualization tools, like the MR-Cube index structure, support seamless updates and allow for the exploration of location popularity, offering decision-makers a dynamic, up-to-date representation of data (Constantinou et al., 2019).

These tools have wide applications in strategic decision-making, such as urban planning and infrastructure development, where identifying high-activity areas is crucial for optimizing the placement of amenities and services (Kansakar & Gupta, 2024). Similarly, in retail and marketing strategies, GIS-based visualizations and heatmaps help select optimal locations, plan advertising campaigns, and target direct marketing activities (Erskine et al., 2019; Ozimec et al., 2012). In operational contexts, like emergency services or transportation, heatmaps help visualize data to optimize routes or allocate resources effectively (Agrawal et al., 2018). However, challenges such as ensuring data privacy and handling large datasets need to be addressed. Privacy protection mechanisms and efficient encryption algorithms are necessary to safeguard personal information, while advanced data mining and visualization tools must be used to process and display large, spatio-temporal datasets effectively (Compieta et al., 2007). A data-driven approach is adopted, utilizing data mining techniques and spatial visualization via heatmaps to guide informed decision-making.

Primary data were collected from the national Education Data Center ([dapo.kemdikbud.go.id](http://dapo.kemdikbud.go.id)) and verified by the Disability Services Unit of the Palembang City Education Office. The dataset includes the geographic distribution of students with disabilities and the current status of accessibility in educational infrastructure. Through clustering analysis and heatmap generation, the

study identifies high-concentration zones of students with disabilities, with limited inclusive facilities. These insights demonstrate how data mining and heatmap visualization can be effectively leveraged to determine the best strategic locations for creative hubs, ensuring that the selected sites foster creativity, collaboration, and innovation.

## **2. LITERATURE REVIEW**

### **2.1. Inclusive Education and Creative Hubs**

Inclusive education and creative hubs are interconnected concepts that emphasize the importance of diversity, collaboration, and creativity in educational settings. Integrating inclusive education practices into creative hubs can foster a more inclusive and innovative learning environment. The development of creative industries in higher education has led to an increase in international students and diverse cultural backgrounds, making inclusive teaching methods essential for accommodating this diversity and enhancing the educational experience for all students (Y. Wang, 2022). Furthermore, there is a significant relationship between pre-service teachers' attitudes toward inclusive education and their ability to teach creatively. Positive attitudes towards inclusion can enhance creative teaching practices, which are crucial in creative hubs (Soeharto et al., 2024). Creative hubs, such as those funded by the UK Arts and Humanities Research Council, facilitate knowledge exchange between creative businesses and academics, providing opportunities for collaboration and the continuous redefinition of creativity while also offering inclusive practices (Moreton, 2016).

Professional development programs for teachers in creative hubs can shift attitudes towards more positive and supportive approaches for students with disabilities, emphasizing life skills and community connectedness (Page et al., 2022). Inclusive leadership in educational institutions can significantly enhance teacher creativity and happiness, contributing to a culture that promotes both inclusivity and creativity, leading to better teaching and learning outcomes (Jiang et al., 2025). Building an inclusive community within creative hubs involves collaborative relationships between schools, students, families, and the broader community, supporting inclusive education while fostering creativity (Ispas, 2020). Additionally, co-designing technology in inclusive classrooms can address diverse sensory, motor, cognitive, or behavioral abilities, enhancing learning experiences for all students (Pires et al., 2022). Participation in aesthetic activities, such as theater, can also bridge the gap between social systems and local communities, highlighting the importance of non-formal art education in fostering inclusivity. In conclusion, integrating inclusive education practices into creative hubs creates a supportive and innovative learning environment. By fostering collaboration, enhancing teacher attitudes, and promoting inclusive leadership, creative hubs become spaces where diversity and creativity thrive, benefiting students and contributing to the broader goal of building an inclusive society.

### **2.2 Data Mining and Geospatial Analysis for Strategic Location Identification**

To identify strategic locations using data mining and geospatial analysis, it is essential to integrate geographic information into the data mining process. This approach, known as geospatial data mining, involves extracting patterns and insights from spatial data, which can significantly enhance decision-making in various fields. Geospatial data mining refers to the process of extracting knowledge, spatial relationships, or patterns from spatial databases, with applications in government, environmental studies, market research, and infrastructure planning (Kussul et al., 2024; Santos &

Amaral, 2005). Techniques like spatial lag models, which account for spatial dependencies in data, often outperform classical regression models in predictive accuracy (Zahiduzzaman et al., 2010). Clustering methods, such as KMeans clustering, categorize regions based on attributes like infrastructure quality, helping to identify developmental gaps and inform strategic planning (Kussul et al., 2024). Additionally, qualitative reasoning principles, combined with geographic identifiers, can infer new spatial relations, further enhancing the data mining process (Santos & Amaral, 2005). In strategic location identification, geospatial data mining has various applications, including AI-enhanced market research that helps SMEs assess market potential and optimize resource allocation by analyzing geographical patterns and trends (Mallela et al., 2024). In urban planning, analyzing spatial-temporal features of urban functional areas using trajectory data mining and POI semantic analysis can guide policy decisions and urban development (Zhang et al., 2018).

Similarly, in infrastructure development, geospatial data analysis categorizes villages based on infrastructure quality, highlighting areas needing improvement for better planning. However, challenges such as ensuring data quality, protecting privacy, and dealing with the complexity of spatial data need to be addressed (Idrees et al., 2018; Lu & Liu, 2012). Integrating geospatial data with socio-economic data provides a more comprehensive view, further enhancing strategic planning (Kussul et al., 2024). By leveraging these insights, organizations can make informed decisions about strategic locations, optimize resource allocation, and enhance overall effectiveness in various applications.

### **2.3 Heatmap Visualization**

Heatmap visualization is a powerful tool that can be effectively applied in educational settings to enhance understanding and analysis of data. In education, heatmaps can be used to track student progress, such as visualizing their input and learning trajectory in programming languages, helping students identify areas needing improvement (Wu, 2019). Additionally, heatmaps can visualize the use of external resources by students, providing teachers with insights into the range of additional information students access, which can guide them in offering better support (Čegan, 2017). Interactive data visualization platforms, like those using Power BI, can present teacher performance metrics effectively, enabling educational stakeholders to make informed decisions (Deshmukh et al., 2023). In computer science education, heatmaps can be integrated into algorithm visualization systems to enhance the learning of complex algorithms, providing interactive features and self-assessment exercises (Alharbi et al., 2010).

Furthermore, heatmaps can be part of learning analytics dashboards, which monitor students' temporal trajectories in real-time, allowing teachers to gain insights into the learning process and make data-driven decisions (López-Pernas et al., 2024). The benefits of heatmap visualization include enhanced data understanding, as they provide a rapid way to grasp data features and identify areas for further analysis (Zhgun & Prowse, 2022). Interactive heatmaps offer a more engaging way to visualize data, enabling users to reorder values, filter variables, and discretize continuous data for better analysis. Heatmaps also offer a comprehensive display of complex datasets, making them easier to understand without the need for dimensionality reduction (De et al., 2021). However, challenges such as ensuring accuracy in data interpretation exist, as heatmaps can sometimes lead to inaccuracies when comparing numeric values. Introducing 3D heatmaps can improve accuracy, but may introduce additional challenges (Kraus et al., 2020). Static heatmaps may also limit user

understanding, and adding interactive features can significantly enhance the visualization, providing distinct views and better insights. In the context of identifying strategic locations for creative hubs, heatmap visualization can be a valuable tool by visually representing areas with high concentrations of students, resources, or activity, helping to make informed decisions about the best locations for these hubs, fostering collaboration and creativity.

### 3. RESEARCH METHODOLOGY

This study adopts a quantitative research approach to identify strategic locations for creative hubs that support students with disabilities, utilizing data mining techniques and heatmap visualization. The methodology focuses on analyzing large datasets to extract meaningful patterns and visualize spatial distributions that aid in decision-making for inclusive education.

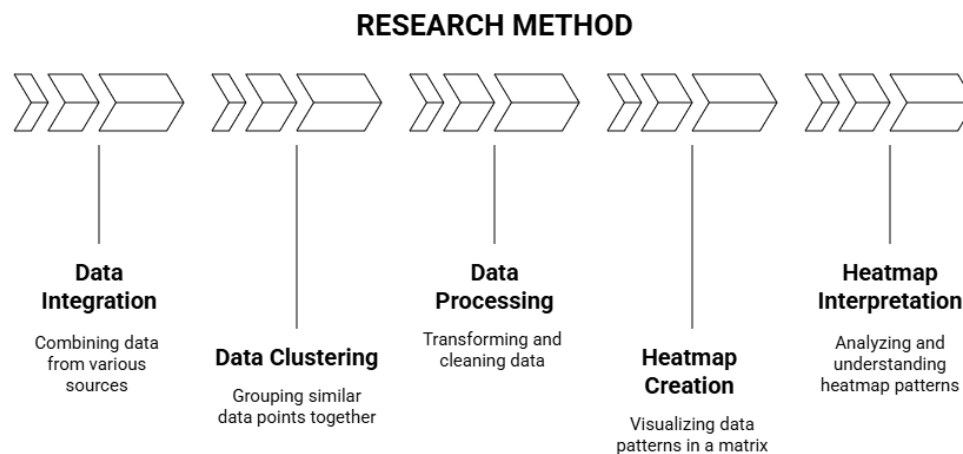


Figure 1. Research Method

#### 3.1. Data Mining Techniques

In this research, the data mining techniques used involve two main steps:

##### 1. Table Merging:

- Datasets from various sources, such as the Basic Education Data ([dapo.kemdikbud.go.id](http://dapo.kemdikbud.go.id)), inclusion verification, and ULD data, are merged based on relevant key fields such as educational unit codes, geographic location, and types of disabilities.
- The merging process ensures that data from different sources are integrated and consistent, making it ready for further analysis.

##### 2. Data Clustering:

- The data is then grouped based on key fields, including:
  - Types of disabilities (mental or intellectual).
  - Districts or geographic regions.
  - The level of facility needs (number of children with special needs in each location).
- This clustering helps in understanding the data distribution and facilitates further analysis, such as the creation of heatmaps for visualizing areas with high needs.

### 3.2. Heatmap Creation and Interpretation Process

#### 1. Data Processing:

- The data resulting from the merging and clustering steps is organized into a format suitable for visualization.
- Fields such as the number of students with disabilities per district and educational unit locations become the primary variables for heatmap creation.

#### 2. Heatmap Creation:

- Heatmaps are generated using google looker studio.
- The heatmap represents data intensity based on the number of children with special needs in each area, with higher concentrations represented by darker colors.

#### 3. Heatmap Interpretation:

- The color patterns on the heatmap indicate areas with higher facility needs (darker colors), signaling regions that require more attention for inclusive educational facilities.
- The data generated is used to recommend priority locations for the development of **creative hubs** that can support inclusive education for students with disabilities.

This methodology enables the use of quantitative data to visually identify areas that need the most intervention and infrastructure development for inclusive education.

## 4. RESULTS AND DISCUSSIONS

### 4.1. Results

The data analysis conducted in this study led to the identification of several key areas in Palembang that require the development of inclusive creative hubs for students with disabilities, particularly those with intellectual and mental disabilities. By employing data mining techniques such as clustering and kernel density estimation, we were able to pinpoint regions with high concentrations of students with disabilities and assess the current state of accessibility to educational facilities.

1. Data Integration and Clustering: The merging of data from various sources, including Dapo Kemdikbud, inclusion verification data, and Unit Layanan Disabilitas (ULD), provided a comprehensive view of the geographical distribution of students with disabilities. Clustering based on disability type, geographic region, and facility need revealed that districts like Sukrami, Ilir Barat I, and Kalidoni have a higher concentration of students requiring specialized educational resources.

SATUAN PENDIDIKAN		PDBK ▾	JENIS DISABILITAS
1.	PKBM HOMESCHOOLING HSPG	47	11
2.	SMP NEGERI 13 PALEMBANG	37	6
3.	SD NEGERI 204 PALEMBANG	32	4
4.	PKBM ESSA EDUTAMA	27	4
5.	SD XAVERIUS 1 PALEMBANG	15	1
6.	SD NEGERI 247 PALEMBANG	14	2
7.	SMP NEGERI 37 PALEMBANG	12	3
8.	SMP NEGERI 05 PALEMBANG	11	3
9.	TK XAVERIUS 9 PALEMBANG	10	4
10.	SD NEGERI 163 PALEMBANG	9	3
11.	SD NEGERI 030 PALEMBANG	9	2
12.	SD NEGERI 134 PALEMBANG	8	2
13.	SD NEGERI 103 PALEMBANG	8	5

Kecamat...		PDBK ▾	JENIS DISABILITAS
1.	Sukarami	154	15
2.	Ilir Barat I	132	15
3.	Kalidoni	132	15
4.	Sako	107	15
5.	Alang-Alan...	92	15
6.	Kertapati	80	15
7.	Seberang ...	72	15
8.	Plaju	71	15
9.	Kemuning	71	15
10.	Jakabaring	69	15
11.	Gandus	69	15
12.	Ilir Timur III	68	15
13.	Ilir Timur II	67	15

Figure 2. Number of students based on educational units and districts

- Heatmap Visualization: The heatmap created through Looker Studio visualized the concentration of students with disabilities across Palembang, highlighting areas with the highest need for accessible facilities. Darker areas on the heatmap represented regions with a higher density of students with disabilities, which directly correlated with the need for creative hubs. These hubs are essential for providing inclusive spaces for students to interact, learn, and develop their intellectual, social, and physical skills.



Figure 3. Heatmap Visualization

3. Strategic Location Identification: The visual representation of the heatmap provided clear insights into areas such as Sukarami, Ilir Barat I, and Kalidoni, which were identified as priority zones for the establishment of creative hubs. These districts not only had a higher number of students with disabilities but also presented challenges in terms of accessibility to existing facilities. The heatmap confirmed these areas as strategic locations for implementing creative hubs that can support inclusive education and foster a sense of community.

#### 4.2. Discussion

The findings from this study underline the significance of data-driven decision-making in urban planning and the development of inclusive educational infrastructure. The heatmap visualization proved to be an effective tool in illustrating the geographic distribution of students with disabilities, offering decision-makers an intuitive and accessible means of identifying priority areas for intervention.

1. Effectiveness of Heatmap Visualization: The use of heatmap visualization enabled a clear understanding of where the greatest need for inclusive educational facilities exists. This approach also allowed for the prioritization of areas requiring the most attention, based on the concentration of students with disabilities and their access to educational resources. The areas identified in this study, such as Sukarami and Ilir Barat I, have specific needs related to accessibility, and this method provided a straightforward way to pinpoint these gaps.

2. **Challenges in Accessibility:** Although the heatmap revealed areas with a high density of students with disabilities, it also highlighted the significant challenge of physical accessibility. Many of these districts, including Sukarami and Ilir Barat I, have inadequate infrastructure to support students with disabilities, such as limited transportation options and lack of disability-friendly buildings. Therefore, the development of creative hubs in these regions is crucial for improving social integration and providing spaces for students to engage in learning activities that cater to their specific needs.
3. **Policy Implications:** The findings emphasize the importance of integrating inclusive policies into urban planning and development. By identifying these key areas for creative hub development, the study provides a foundation for policymakers to focus resources and efforts on locations where they are most needed. Furthermore, the research supports the notion that the spatial distribution of disabilities should play a significant role in future infrastructure planning to ensure that public spaces and educational facilities are accessible to everyone, regardless of their abilities.
4. **Future Considerations:** While the study successfully identified high-priority locations, there is a need for further data integration to account for additional variables that may affect accessibility, such as socio-economic factors and public transportation availability. Future research could also explore the social impacts of creative hubs on students with disabilities, evaluating how these spaces contribute to their development and integration into broader social and educational contexts.

## 5. CONCLUSION

This study successfully demonstrates the potential of using data mining techniques and heatmap visualization to identify strategic locations for the development of inclusive creative hubs for students with disabilities in Palembang. By integrating data from multiple sources, such as Dapo Kemdikbud, inclusion verification data, and Unit Layanan Disabilitas (ULD), we were able to map out areas with a high concentration of students with disabilities and assess the level of accessibility of existing facilities.

The heatmap visualization provided a clear and intuitive way to identify high-priority locations, such as Sukarami, Ilir Barat I, and Kalidoni, which were shown to have significant needs for inclusive facilities. These locations, marked by their higher densities of students with disabilities and limited access to educational infrastructure, were identified as optimal areas for the establishment of creative hubs.

The research highlights the importance of integrating inclusive planning in urban development, with a focus on addressing accessibility gaps. By prioritizing locations based on data-driven insights, policymakers can make more informed decisions to ensure that students with disabilities have equal opportunities to engage in creative and educational activities.

In conclusion, the study provides a strong foundation for the development of more inclusive and accessible public spaces in Palembang, offering a clear framework for future planning of educational

infrastructure. The methodology presented can also be applied to other cities, contributing to the broader goal of fostering inclusive education worldwide.

## **LIMITATION AND STUDY FORWARD**

This study faces several limitations that could influence the generalizability and accuracy of its findings. Firstly, the dataset used is limited to specific educational units in Palembang, focusing primarily on students with mental and intellectual disabilities, which may not represent the broader population of students with disabilities across other regions. Additionally, the accuracy of the spatial data used to create the heatmaps might be affected by incomplete or outdated geographic data, particularly regarding the exact coordinates of educational units and the accessibility of infrastructure. Another limitation is the lack of socio-economic data, which could provide more insights into the barriers students face in accessing education and inclusive facilities. The study is also confined to Palembang, meaning the results may not be fully applicable to other regions, especially rural areas with different educational dynamics. Lastly, while heatmaps offer a visual representation of the data, their interpretation can be subjective, and they may not fully capture the complexities of local conditions, such as cultural or social factors.

For future research, there are several directions to explore. Expanding the data collection to include a wider range of disability types, socio-economic factors, and longitudinal data would provide a more comprehensive view of the needs of students with disabilities. Additionally, incorporating real-time data and interactive mapping tools would allow for dynamic updates to the heatmaps, ensuring that the analysis remains current. Future studies should also integrate social and economic data, as this would provide a more holistic understanding of the factors affecting students with disabilities and allow for more targeted interventions. Expanding the geographic scope to include other cities or rural areas could help determine whether the findings are consistent across different regions, and a comparative analysis could highlight specific challenges in rural versus urban settings. Finally, closer collaboration with local stakeholders, including schools, disability services, and policymakers, would ensure that the locations identified for creative hubs align with the actual needs of the community, making the solutions both practical and sustainable.

## **ACKNOWLEDGEMENT**

We would like to express our sincere gratitude to all those who have supported and contributed to the successful completion of this research. First and foremost, we thank the Dapo Kemdikbud for providing the essential data on educational units and students with disabilities, which was fundamental to the analysis in this study. We also extend our gratitude to the Unit Layanan Disabilitas of the Palembang City Education Office for their invaluable assistance in verifying the data and providing insights into the accessibility challenges faced by students with disabilities.

We would also like to acknowledge the support from the research team at Institut Teknologi dan Bisnis PalComTech for their guidance and expertise throughout the study. Their dedication and constructive feedback were instrumental in refining the methodology and analysis.

## REFERENCES

- Abebe, S. M., Shitu, K., Liulseged, T., Abera, M., Fentie, M., Mekonnen, F., Batorowicz, B., Xu, X., Efed, N. A., & Aldersey, H. M. (2023). Understanding Barriers and Facilitators to Inclusive Education for Grade 7-9 Students with Disabilities in Ethiopia and Ghana: A Qualitative study. *Disability, CBR and Inclusive Development*, 34(1), 6–26. <https://doi.org/10.20372/dcidj.671>
- Agrawal, S., Sonbhadra, S. K., & Agarwal, S. (2018). Favour prediction of Taxi services using real-time visualization. *2018 International Conference on Advances in Computing, Communications and Informatics, ICACCI 2018*, 2276–2282. <https://doi.org/10.1109/ICACCI.2018.8554632>
- Alharbi, A., Henskens, F., & Hannaford, M. (2010). Integrated standard environment for the teaching and learning of operating systems algorithms using visualizations. *Proceedings - 5th International Multi-Conference on Computing in the Global Information Technology, ICCGI 2010*, 205–208. <https://doi.org/10.1109/ICCGI.2010.12>
- Cain, M., & Fanshawe, M. (2021). Expectations for success: Auditing opportunities for students with print disabilities to fully engage in online learning environments in higher education. *Australasian Journal of Educational Technology*, 37(3), 137–151. <https://doi.org/10.14742/ajet.6449>
- Čegan, L. (2017). Visualization of external resource usage via new type of heat map. *Advanced Science Letters*, 23(5), 3893–3896. <https://doi.org/10.1166/asl.2017.8319>
- Chen, Y., Lin, X., Zhao, Y., Sun, Y., & Zhang, X. (2016). SunMap: an associated hierarchical data visualization method based on heatmap and sunburst. *Jisuanji Fuzhu Sheji Yu Tuxingxue Xuebao/Journal of Computer-Aided Design and Computer Graphics*, 28(7), 1075–1083. <https://www.scopus.com/inward/record.uri?eid=2-s2.0-84977279396&partnerID=40&md5=6894c8af749d7563ed22a684e7e04907>
- Compieta, P., Di Martino, S., Bertolotto, M., Ferrucci, F., & Kechadi, T. (2007). Exploratory spatio-temporal data mining and visualization. *Journal of Visual Languages and Computing*, 18(3), 255–279. <https://doi.org/10.1016/j.jvlc.2007.02.006>
- Constantinou, G., Anastasiou, C., Stripelis, D., & Shahabi, C. (2019). MR-Cubes: On-The-fly computation of location popularity from check-in data streams. *Proceedings - IEEE International Conference on Mobile Data Management, 2019-June*, 27–36. <https://doi.org/10.1109/MDM.2019.00-77>
- De, M., Dutta, S., Ray, S., & Dey, S. R. (2021). Visual Clustering Analysis of some traditional Mango (*Mangifera indica* L.) varieties of Murshidabad District, West Bengal using Clust Vis web tool. *International Journal of Advancement in Life Sciences Research*, 4(3), 32–43. <https://doi.org/10.31632/ijalsr.2021.v04i03.005>
- Deshmukh, V., Prithviraj, J., Rautkar, A., Agrawal, R., Dhule, C., & Chavhan, N. (2023). Interactive Data Visualization Platform to Present Effective Teacher Performance with Power BI. *2023 International Conference on Advances in Computation, Communication and Information Technology, ICAICCIT 2023*, 1335–1339. <https://doi.org/10.1109/ICAICCIT60255.2023.10466179>
- Ernawati, E., Baharin, S. S. K., & Kasmin, F. (2021). A review of data mining methods in RFM-based customer segmentation. *Journal of Physics: Conference Series*, 1869(1). <https://doi.org/10.1088/1742-6596/1869/1/012085>
- Erskine, M. A., Khojah, M., & McDaniel, A. E. (2019). Location selection using heat maps: Relative advantage, task-technology fit, and decision-making performance. *Computers in Human Behavior*, 101, 151–162. <https://doi.org/10.1016/j.chb.2019.07.014>

- Ferdinand, A. (2014). *Metode Penelitian Manajemen Edisi 5*. Badan Penerbit Universitas Diponegoro.
- Figard, R., & Carberry, A. (2022). Virtual Learning Accessibility Barriers Experienced by Engineering Students with Disabilities in the Wake of the COVID-19 Pandemic. *Proceedings - Frontiers in Education Conference, FIE, 2022-October*.  
<https://doi.org/10.1109/FIE56618.2022.9962642>
- Fournier, A.-L., Hubert, B., & Careau, L. (2020). Obstacles et facilitateurs perçus par les étudiants en situation de handicap à l'université et l'appréciation des services. *Canadian Journal of Education, 43*(2), 465–497. <https://www.scopus.com/inward/record.uri?eid=2-s2.0-85091723634&partnerID=40&md5=50783af687c06873e78923085317d4a3>
- Ghergut, A. (2011). Education of children with special needs in Romania; Attitudes and experiences. *Procedia - Social and Behavioral Sciences, 12*, 595–599.  
<https://doi.org/10.1016/j.sbspro.2011.02.073>
- Ghozali, I. (2014). *Structural Equation Modeling, Metode Alternatif dengan Partial Least Square (PLS) (Edisi 4)*. Badan Penerbit Universitas Diponegoro.
- Hespel, N. (2023). Inclusive education, a critical perspective. *Information Psychiatrique, 99*(7), 439–444. <https://doi.org/10.1684/ipe.2023.2615>
- Idrees, A. M., Khaled, M. L. A., & Talkhan, A. H. A. (2018). Spatial data mining, spatial data warehousing, and spatial OLAP. In *Emerging Trends in Open Source Geographic Information Systems* (pp. 97–132). <https://doi.org/10.4018/978-1-5225-5039-6.ch005>
- Imas, C., Bohari, A., & Rahyadi, I. (2022). *PERCEIVED QUALITY, EFFECT, AND PURCHASE INTENTION: A REVIEW FROM ACADEMIC DATABASE. 7*(10).  
<https://doi.org/10.36418/syntax-literature.v7i10.12941>
- Ispas, C. (2020). Decision-making training of teachers for inclusive school. In *Studies in Systems, Decision and Control* (Vol. 247, pp. 79–89). [https://doi.org/10.1007/978-3-030-30659-5\\_4](https://doi.org/10.1007/978-3-030-30659-5_4)
- Jiang, M., Zhang, J., & Arshad, M. Z. (2025). Cultivating a creative ecosystem: the role of inclusive leadership in educational success. *Acta Psychologica, 257*.  
<https://doi.org/10.1016/j.actpsy.2025.105076>
- Kameyama, Y. (2021). Who are out-of-school children? Children with disabilities in Mongolia. *Compare, 51*(5), 670–689. <https://doi.org/10.1080/03057925.2019.1664894>
- Kansakar, A. R., & Gupta, R. (2024). Geospatial Data Analysis for Restaurant Business Strategies and Urban Planning. *2024 IEEE Region 10 Symposium, TENSYPMP 2024*.  
<https://doi.org/10.1109/TENSYPMP61132.2024.10752245>
- Karim, S., & Hue, M.-T. (2022). Global Perspectives and the Challenge of Inclusive Education. In *Supporting Diverse Students in Asian Inclusive Classrooms: From Policies and Theories to Practice* (pp. 1–22). <https://doi.org/10.4324/9781032021775-2>
- Kett, M., & Deluca, M. (2016). Transport and access to inclusive education in Mashonaland West Province, Zimbabwe. *Social Inclusion, 4*(3), 61–71. <https://doi.org/10.17645/si.v4i3.502>
- Kraus, M., Angerbauer, K., Buchmüller, J., Schweitzer, D., Keim, D. A., Sedlmair, M., & Fuchs, J. (2020). Assessing 2D and 3D Heatmaps for Comparative Analysis: An Empirical Study. *Conference on Human Factors in Computing Systems - Proceedings*.  
<https://doi.org/10.1145/3313831.3376675>
- Kussul, N., Potuzhnyi, B., & Svirsh, V. (2024). Clustering Techniques for Modeling Village Infrastructure Development. *CEUR Workshop Proceedings, 3668*, 98–119.

- <https://www.scopus.com/inward/record.uri?eid=2-s2.0-85191653094&partnerID=40&md5=343592330777a08687a7dea2b13ad0d7>
- Liu, J. (2022). Privacy issues involved in data mining and countermeasures. *MEMAT 2022 - 2nd International Conference on Mechanical Engineering, Intelligent Manufacturing and Automation Technology*, 1283–1287. <https://www.scopus.com/inward/record.uri?eid=2-s2.0-85137034672&partnerID=40&md5=e5aa52c2c900d47881284ce58dc30575>
- López-Pernas, S., Gordillo, A., Barra, E., & Saqr, M. (2024). Tracking Students' Progress in Educational Escape Rooms Through a Sequence Analysis Inspired Dashboard. *Lecture Notes in Computer Science (Including Subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics)*, 15160 LNCS, 119–124. [https://doi.org/10.1007/978-3-031-72312-4\\_15](https://doi.org/10.1007/978-3-031-72312-4_15)
- Lu, Y., & Liu, Y. (2012). Pervasive location acquisition technologies: Opportunities and challenges for geospatial studies. *Computers, Environment and Urban Systems*, 36(2), 105–108. <https://doi.org/10.1016/j.compenvurbsys.2012.02.002>
- Maguvhe, M. O. (2023). African building blocks for inclusive education programme, curriculum design, development and delivery. In *Using African Epistemologies in Shaping Inclusive Education Knowledge* (pp. 163–183). [https://doi.org/10.1007/978-3-031-31115-4\\_10](https://doi.org/10.1007/978-3-031-31115-4_10)
- Mak, M., & Nordtveit, B. H. (2011). “Reasonable accommodations” or education for all? the case of children living with disabilities in Cambodia. *Journal of Disability Policy Studies*, 22(1), 55–64. <https://doi.org/10.1177/1044207310396508>
- Mallela, G., Sahu, R., & Dash, M. K. (2024). AI-Enhanced Geospatial Analysis for Global Small and Medium Enterprises Market. *8th International Conference on I-SMAC (IoT in Social, Mobile, Analytics and Cloud), I-SMAC 2024 - Proceedings*, 1660–1665. <https://doi.org/10.1109/I-SMAC61858.2024.10714641>
- Mathias, B. A. (2015). Inclusive education for the disabled: A study of blind students in Nnamdi Azikiwe University, Awka, Nigeria. In *Disability Studies: Educating for Inclusion* (pp. 105–116). <https://www.scopus.com/inward/record.uri?eid=2-s2.0-84943149642&partnerID=40&md5=ef98a36ea3049db45e2c4a7f38c74aa2>
- Merchant, Z., & Gaad, E. (2025). Analysing the State of Inclusive Education in China: Challenges and Perspectives. *Lecture Notes in Civil Engineering*, 587, 55–66. [https://doi.org/10.1007/978-3-031-84371-6\\_5](https://doi.org/10.1007/978-3-031-84371-6_5)
- Moreton, S. (2016). Rethinking ‘knowledge exchange’: new approaches to collaborative work in the arts and humanities. *International Journal of Cultural Policy*, 22(1), 100–115. <https://doi.org/10.1080/10286632.2015.1101081>
- Motitswe, J. M. C. (2025). Teachers' perceptions on including learners with barriers to learning in South African inclusive education system. *African Journal of Disability*, 14(14), 1–10. <https://doi.org/10.4102/ajod.v14i0.1543>
- Nash, R., Conner, B., Fellows, K., Clemmensen, B., Gullickson, R., & Goldrup, S. (2022). Barriers in medical education: a scoping review of common themes for medical students with disabilities. *Discover Education*, 1(1). <https://doi.org/10.1007/s44217-022-00003-0>
- Ntombela, S. (2020). Teaching and learning support for students with disabilities: Issues and perspectives in open distance e-learning. *Turkish Online Journal of Distance Education*, 21(3), 18–26. <https://doi.org/10.17718/TOJDE.761919>
- Oliva, D. V. (2016). Barriers and resources to learning and participation of inclusive students. *Psicologia USP*, 27(3), 492–502. <https://doi.org/10.1590/0103-656420140099>

- Oranga, J., Njurai, E., Gisore, B., & Areba, G. N. (2024). Inclusive education: Transcending exclusionary practices in education. In *Exploring Educational Equity at the Intersection of Policy and Practice* (pp. 101–119). <https://doi.org/10.4018/979-8-3693-1614-6.ch006>
- Ozimec, A.-M., Natter, M., & Reutterer, T. (2012). Visual decision making styles and geographical information systems. In *Quantitative Marketing and Marketing Management: Marketing Models and Methods in Theory and Practice* (Vol. 9783834937223, pp. 191–207). [https://doi.org/10.1007/978-3-8349-3722-3\\_9](https://doi.org/10.1007/978-3-8349-3722-3_9)
- Page, A., Mavropoulou, S., & Harrington, I. (2022). Culturally Responsive Inclusive Education: The Value of the Local Context. *International Journal of Disability, Development and Education*, 69(4), 1313–1326. <https://doi.org/10.1080/1034912X.2020.1757627>
- Pires, A. C., Neto, I., Brulé, E., Malinverni, L., Metatla, O., & Hourcade, J. P. (2022). Co-Designing with Mixed-Ability Groups of Children to Promote Inclusive Education. *Proceedings of Interaction Design and Children, IDC 2022*, 715–718. <https://doi.org/10.1145/3501712.3536389>
- Rafieian, O., & Yoganarasimhan, H. (2023). AI and personalization. *Artificial Intelligence in Marketing*, 1(1), 77–102.
- Santos, M. Y., & Amaral, L. A. (2005). Geo-spatial data mining in the analysis of a demographic database. *Soft Computing*, 9(5), 374–384. <https://doi.org/10.1007/s00500-004-0417-0>
- Saporno, R. N. (2025). Students' biases and accommodation in inclusive education: Understanding barriers and promoting equity in the classroom. *Environment and Social Psychology*, 10(3). <https://doi.org/10.59429/esp.v10i3.3196>
- Sari, D. K., Suziana, S., & Games, D. (2020). An evaluation of social media advertising for Muslim millennial parents. *Journal of Islamic Marketing*, 12(9), 1835–1853.
- Septiarini, E., & Ezra Karamang. (2023). Pengaruh Instagram Konten Marketing terhadap Purchase Intention Membership Fitness Center yang Dimediasi Brand Engagement. *Journal of Trends Economics and Accounting Research*, 4(2), 338–345. <https://doi.org/10.47065/jtear.v4i2.1007>
- Shabir, I., Parveen, A., Jabeen, S., & Jan, U. (2025). Empowerment of students with disabilities in education. In *Enablers, Barriers, and Challenges for Inclusive Curriculum* (pp. 45–76). <https://doi.org/10.4018/979-8-3373-1000-8.ch003>
- Sheldon, E., & Erickson, K. (2020). Emergent literacy instruction for students with significant disabilities in the regular classroom. *Assistive Technology Outcomes and Benefits*, 14(1), 135–160. <https://www.scopus.com/inward/record.uri?eid=2-s2.0-85089592679&partnerID=40&md5=9a7aa19fe5e4e5e8f59ef0864652d494>
- Soeharto, S., Subasi Singh, S., & Afriyanti, F. (2024). Associations between attitudes toward inclusive education and teaching for creativity for Indonesian pre-service teachers. *Thinking Skills and Creativity*, 51. <https://doi.org/10.1016/j.tsc.2024.101469>
- Srivastava, M. (2019). Mapping changes in legislation and implementation for special needs education in India. In *International Perspectives on Education and Society* (pp. 271–286). <https://doi.org/10.1108/S1479-367920190000037020>
- Subrayen, R., & Dhunpath, R. (2019). A snapshot of the chalkboard writing experiences of bachelor of education students with visual disabilities in South Africa. *African Journal of Disability*, 8. <https://doi.org/10.4102/ajod.v8i0.523>
- Triviño-Amigo, N., Barrios-Fernandez, S., Mañanas-Iglesias, C., Carlos-Vivas, J., Mendoza-Muñoz, M., Adsuar, J. C., Acevedo-Duque, Á., & Rojo-Ramos, J. (2022). Spanish Teachers' Perceptions of Their Preparation for Inclusive Education: The Relationship between Age and Years of

- Teaching Experience. *International Journal of Environmental Research and Public Health*, 19(9). <https://doi.org/10.3390/ijerph19095750>
- Valle-Flórez, R.-E., de Caso Fuertes, A. M., Baelo, R., & García-Martín, S. (2021). Faculty of education professors' perception about the inclusion of university students with disabilities. *International Journal of Environmental Research and Public Health*, 18(21). <https://doi.org/10.3390/ijerph182111667>
- Viki Ahmad Badri, & Miftahul Huda. (2024). Pengaruh Artificial Intelligence Marketing dan Content Marketing Terhadap Minat Beli dan Keputusan Pembelian. *Economic Reviews Journal*, 3(4). <https://doi.org/10.56709/mrj.v3i4.497>
- Wang, S., Xu, Z., Zhang, J., & Du, M. (2018). A Reverse Rendering Method of Heatmap. *Journal of Geo-Information Science*, 20(4), 515–522. <https://doi.org/10.12082/dqxxkx.2018.170379>
- Wang, Y. (2022). Inclusive Teaching Strategy in Creative Industry Education. In *Creative Business Education: Exploring the Contours of Pedagogical Praxis* (pp. 107–119). [https://doi.org/10.1007/978-3-031-10928-7\\_7](https://doi.org/10.1007/978-3-031-10928-7_7)
- Wu, L. (2019). Spot the learning: Heatmaps for learning Java. *Proceedings of the 24th Western Canadian Conference on Computing Education, WCCCE 2019*. <https://doi.org/10.1145/3314994.3325076>
- Zahiduzzaman, A. K. M., Quasem, M. N., Khan, M., & Rahman, R. M. (2010). Spatial data mining on literacy rates and educational establishments in Bangladesh. *Proceedings of 2010 13th International Conference on Computer and Information Technology, ICCIT 2010*, 394–399. <https://doi.org/10.1109/ICCITECHN.2010.5723890>
- Zhang, H., Wang, R., Chen, B., Hou, Y., & Qu, D. (2018). Dynamic Identification of Urban Functional Areas and Visual Analysis of Time-varying Patterns Based on Trajectory Data and POIs. *Jisuanji Fuzhu Sheji Yu Tuxingxue Xuebao/Journal of Computer-Aided Design and Computer Graphics*, 30(9), 1728–1740. <https://doi.org/10.3724/SP.J.1089.2018.16357>
- Zhgun, T. V, & Prowse, D. C. (2022). Visualization of data in the analysis and assessment of quality of socio-economic systems. *AIP Conference Proceedings*, 2383. <https://doi.org/10.1063/5.0075932>
- Zhou, Z. (2023). Disabilities in Higher Education: Beyond “Accommodation.” *Journal of Disability Studies in Education*, 3(2), 191–216. <https://doi.org/10.1163/25888803-bja10021>