

MAPPING PUBLICATION TRENDS OF PROBLEM-BASED LEARNING IN VISUAL COMMUNICATION DESIGN 2020–2025: A GOOGLE SCHOLAR BIBLIOMETRIC ANALYSIS

Yati Bt. Samsuddin¹

¹Universitas Negeri Makassar, Jl. A. P. Pettarani, Makassar, Sulawesi Selatan, Indonesia

Email: yati.bt.samsuddin@unm.ac.id

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Abstract. This study aims to map research trends on Problem-Based Learning (PBL) in Visual Communication Design (VCD) during 2020–2025 through a Google Scholar-based bibliometric analysis. Bibliographic data were collected using Publish or Perish (PoP) with the query "problem based learning" AND ("visual communication design" OR "visual communication design"), and subsequently analyzed with VOSviewer to generate co-occurrence network, density, and temporal overlay visualizations. The final dataset consists of 200 documents, accumulating 927 citations, with an h-index of 15 and a g-index of 26. Visualization results indicate that dominant nodes are closely associated with applied learning contexts—particularly terms related to VCD and vocational/SMK settings—alongside terms related to learning evaluation and supporting instructional tools, such as outcome assessment (eg, posttest/test) and student activity enhancement. The density map confirms the concentration of terms around these dominant nodes, while the overlay map reveals temporal variation of terms within the visualized year range. Overall, the findings suggest that PBL research at the intersection of VCD captured by this corpus is more strongly oriented toward implementation and pedagogical outcomes than toward deeper conceptual elaboration specific to design reasoning. This study contributes a bibliometric evidence-based map of trends and thematic structure to support state-of-the-art reviews and sharpen future research agendas in PBL–VCD.

Keywords: Problem-Based Learning, Visual Communication Design, Visual Communication Design, Bibliometric Analysis, Google Scholar

Abstract. Penelitian ini bertujuan memetakan tren riset Problem-Based Learning (PBL) pada bidang Visual Communication Design/Desain Komunikasi Visual periode 2020–2025 melalui analisis bibliometrik berbasis data pada Google Scholar. Data bibliografis dikumpulkan menggunakan Publish or Perish (PoP) dengan kueri "problem based learning" AND ("visual communication design" OR "desain komunikasi visual"), kemudian dianalisis menggunakan VOSviewer untuk membangun visualisasi jejaring ko-okurensi, kepadatan istilah, dan overlay temporal. Dataset akhir mencakup 200 dokumen dengan 927 sitasi, h-index 15, dan g-index 26. Hasil visualisasi menunjukkan simpul dominan terkait konteks pembelajaran terapan, terutama istilah yang beririsan dengan DKV dan konteks vokasional/SMK, serta istilah yang terkait evaluasi pembelajaran dan perangkat pendukung seperti pengukuran hasil (misalnya posttest/uji) dan penguatan aktivitas belajar. Peta kepadatan menegaskan konsentrasi istilah pada simpul-simpul dominan tersebut, sedangkan peta overlay memperlihatkan variasi temporal istilah pada rentang tahun yang divisualkan. Secara keseluruhan, temuan mengindikasikan bahwa riset PBL pada irisan DKV dalam korpus yang terjaring lebih kuat berorientasi implementatif-pedagogis dibanding pendalaman konseptual spesifik terkait penalaran desain. Penelitian ini berkontribusi menyediakan peta tren dan struktur tema untuk mendukung penyusunan state of the art dan penajaman agenda riset PBL–DKV berbasis bukti bibliometrik.

Keywords: Problem-Based Learning, Desain Komunikasi Visual, Visual Communication Design, Bibliometrik, Google Scholar

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INTRODUCTION

The Problem-Based Learning (PBL) approach is positioned as a relevant pedagogical strategy for vocational and professional education because it positions authentic problems as learning triggers, encouraging reasoning, collaboration, and evidence-based decision-making. Classical studies have defined PBL as a learning architecture that shifts the focus from knowledge transmission to knowledge construction through structured problem-solving (Yew & Goh, 2016). In the field of Visual Communication Design (DKV), the project-based nature of the practice, iteration, design briefs, and user needs evaluation make PBL conceptually aligned: students not only learn tools, but also formulate design problems, test alternative solutions, and account for their visual decisions. Implementation evidence also shows that PBL can improve learning outcomes in design software (Corel Draw), which requires the integration of technical skills and visual problem-solving (Suarbawa, 2019), and supports meaningful learning and higher-order thinking (Ardianti et al., 2021). However, although the relevance of PBL for DKV is often acknowledged, the research landscape at the intersection of “PBL” and “visual communication design” has not been systematically mapped.

The need for mapping is increasingly pressing as educational and design research evolves rapidly and publications spread across disciplines. A bibliometric approach is crucial for understanding broad patterns without losing the depth of further interpretation, particularly through the visualization of keyword co-occurrence networks, co-citations, and co-authorships (Van Eck & Waltman, 2014). This visualization simplifies data complexity, but also risks losing information and therefore needs to be combined with expert judgment (Van Eck & Waltman, 2014). Therefore, rigorously designed bibliometric research—from query, period, inclusion criteria, to data cleaning—is crucial for the quality of trend maps. The use of VOSviewer is considered helpful for knowledge mapping, but still requires methodological discipline in dataset selection and analysis parameters (Patty et al., 2024). Thus, PBL bibliometric mapping in Visual Communication Design (DKV) is not simply about creating maps, but also about methodological work to produce valid and useful trend images.

Several bibliometric studies on PBL have mapped the research direction and focus of educational themes in general. These studies have shown that bibliometrics can capture the structure and evolution of PBL knowledge through cluster mapping and keywords (Handoyo et al., 2024; Dwikoranto et al., 2024). Google Scholar-based bibliometrics have also been applied to specific topics and can be used as a data source if data retrieval and filtering procedures are explicitly stated (Zakiyyah et al., 2022). However, the shift from “general PBL” to “PBL in specific fields” is not automatic, due to differences in terminology and publication

communities. Therefore, matching the queries “problem-based learning” AND “visual communication design” in the 2020–2025 period is important to distinguish research that truly falls within the PBL–DKV intersection from research that only touches on one or the other, while also capturing post-pandemic dynamics in learning practices.

Substantively, the mapping of PBL trends in Visual Communication Design (DKV) is rooted in the cognitive, procedural, reflective, and communicative character of DKV competencies. PBL positions design tools as tools for solving visual problems, not as ends in themselves; implementation findings demonstrate a link between PBL and improved learning outcomes in practice-oriented DKV contexts (Suarbawa, 2019). In the vocational domain, PBL also impacts learning outcomes when combined with problem-solving media or scenarios (Herawati et al., 2023), and has the potential to improve learning outcomes in vocational high schools (Adawiyah & Susarno, n.d.). However, these implementation findings have not yet been tied to a knowledge map that shows the structure of scientific conversations over time. Research gaps arise due to the general nature of PBL mapping (Dwikoranto et al., 2024; Handoyo et al., 2024), the distribution of literature across outlets, the differences in terminology between PBL and DKV (Yew & Goh, 2016; Van Eck & Waltman, 2014), and the potential for new themes in the 2020–2025 period. Bibliometric mapping is needed to fill this gap.

Based on this background, this study aims to map PBL research trends in the field of Visual Communication Design (DKV) through a bibliometric analysis of Google Scholar for the 2020–2025 period, selected as a focused five-year window to represent contemporary research dynamics, minimize dilution by older publication patterns, and provide a more accurate picture of current trends. Using the queries “problem-based learning” AND “visual communication design.” The mapping is aimed at identifying the development of publications per year, dominant themes or keywords, formed research clusters, and indications of research focus directions. Conceptually, a bibliometric network visualization framework is used to read the structure of the field and relationships between concepts (Van Eck & Waltman, 2014), while technically the research utilizes the practice of using VOSviewer which emphasizes the importance of data and parameter selection (Patty et al., 2024), as well as lessons learned from previous PBL bibliometric studies (Dwikoranto et al., 2024; Handoyo et al., 2024). The formulation of this research problem is: “What are the trends, theme clusters, and the evolution of PBL research focus in the field of Visual Communication Design based on the bibliometric analysis of Google Scholar for the 2020–2025 period?” With the principle of careful visualization and transparency of search procedures, especially when using Google Scholar

(Zakiyyah et al., 2022), the mapping results are expected to depict areas that are widely researched while also showing empty spaces for a strategic research agenda for developing problem-based DKV learning.

METHOD

This research method uses a descriptive-bibliometric design to map annual publication trends and the structure of Problem-Based Learning (PBL) research themes in the field of Visual Communication Design for the period 2020–2025. Bibliographic data sources were obtained from Google Scholar (GS) through the Publish or Perish (PoP) tool, because PoP facilitates the extraction of publication metadata from GS in a structured manner and can be exported for further analysis. The search procedure was carried out by setting the year range 2020 to 2025 in the PoP (year range field), then entering a query in the keywords column as follows: "problem based learning" AND ("visual communication design" OR "visual communication design"); other settings were made consistent for replication, namely the GS search mode, title/abstract/text search (according to the available PoP options), and the maximum result limit (e.g., 200–500 results) were stated explicitly in the report so that readers know the scope of the dataset. Inclusion criteria included: (1) publications were in the 2020–2025 period, (2) contained terms that matched the query in the GS indexed metadata/text, and (3) had minimal analyzable information (title, year, author, source/venue, and citation if available); while exclusion criteria included duplicate entries, documents without a valid year, and entries that were clearly irrelevant after a quick check of the title and abstract/metadata snippets in the PoP. The initial dataset obtained was then exported from the PoP in RIS format (for VOSviewer compatibility) and/or CSV (for annual trend recap), and data cleaning was performed: removal of duplications (based on title–author–year matches), standardization of terminology (e.g., variations of “problem-based learning”, “problem based learning”, “PBL”), and unification of equivalent terms “visual communication design” and “visual communication design” using a thesaurus (text file) to prevent co-occurrence from being split into terms that are actually the same. Bibliometric analysis was performed using VOSviewer by loading the RIS/CSV file, then selecting keyword-based co-occurrence analysis (or terms from the title and abstract if keyword metadata is incomplete), using a predetermined counting method (e.g., full counting) to ensure replication of the results, and determining a minimum occurrence threshold (e.g., minimum occurrence = 2 or 3) according to the dataset size and reported as a parameter. VOSviewer was used to generate three main outputs: (1) network visualization to view theme clusters and intertopic proximity, (2) overlay visualization with the average publication year

attribute to read the evolution of the focus (newer/older terms), and (3) density visualization to identify the most dominant terms; all maps were saved in image format and item-cluster tables for reporting. For the annual trend focus, the number of publications per year was calculated from the CSV file (year column), presented as a frequency table and trend graph, so that the increase/decrease pattern during 2020–2025 could be seen. The reliability of the procedure is maintained by documenting the search date, PoP parameters, initial number of results, number after cleaning, and VOSviewer parameters (analysis type, analysis unit, counting method, minimum occurrence, and thesaurus use), so that other researchers can replicate these steps consistently at different times and in different contexts.

RESULTS

Publication and Citation Statistics

Bibliographic data search results using Publish or Perish (PoP) with the Google Scholar database in the publication year range 2020–2025 produced 200 documents used as the analysis dataset. In the citation year range 2020–2026 (6 years), the dataset collected 927 citations. The average citation value per year was recorded at 154.50, while the average citation per document was 4.64. The citation impact indicator showed an h-index of 15 and a g-index of 26, with additional metrics hI_norm 10, hI_annual 1.67, and hA-index 8. In terms of author collaboration, PoP displayed 2.29 authors/paper which indicates the average number of authors per document in this dataset. The distribution of documents based on citation thresholds shows that 77 documents have ≥ 1 citation, 40 documents have ≥ 2 citations, 14 documents have ≥ 5 citations, 6 documents have ≥ 10 citations, and 0 documents have reached ≥ 20 citations. This summary metric represents the size and citation footprint of the dataset collected from Google Scholar according to the specified keywords and year range.

Table 1. Summary of citation metrics of the PoP–google scholar dataset, 2020–2025

Indicator	Mark
Year of publication	2020–2025
Year of citation	2020–2026 (6 years)
Number of documents (papers)	200
Total citations	927
Citations per year (cites/year)	154.50
Citations per document (cites/paper)	4.64
Authors per document (authors/paper)	2.29
h-index	15
g-index	26
hI_norm	10
hI_annual	1.67
hA-index	8

Documents with ≥ 1 citation	77
Documents with ≥ 2 citations	40
Documents with ≥ 5 citations	14
Documents with ≥ 10 citations	6
Documents with ≥ 20 citations	0

Term Co-occurrence Network Map

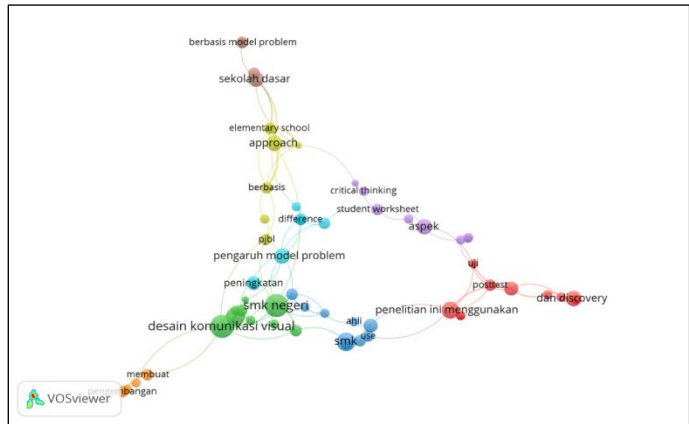


Figure 1. Co-occurrence network map

The results of bibliometric mapping using VOSviewer display a term co-occurrence network (network visualization) that illustrates the interconnectedness between terms in the dataset. In the network map, node size indicates the relative level of occurrence, while connecting lines indicate co-occurrence relationships between terms. Visually, several nodes appear dominant due to their label size and relatively central position. The node “visual communication design” appears to be one of the large nodes that is an important point in the network, and in the adjacent area, the nodes “state vocational school” and “vocational high school” are also visible, which are related to several other terms. Around this area, the map displays terms that are still in the same network, such as “improvement,” “influence of problem models,” and the term “pjbl.” This connection is visible from the relationship lines that connect these nodes in a relatively dense area.

At the top of the map, the "elementary school" node appears prominently and is connected to the terms "elementary school," "approach," and "problem-based model." These four terms form a connected area that can be read as a collection of interrelated nodes. Furthermore, the term "based" appears in the middle area and acts as a node that is still connected to other nodes around it. In the center of the map, the term "difference" appears near the connecting path between the top and bottom-center nodes.

On the right side of the network map, a series of nodes clearly form a relationship path, encompassing the terms "student worksheet," "critical thinking," and "aspect." Also on the same path are nodes related to the evaluation process, such as "test" and "posttest," as well as the "and discovery" node located on the far right. In the center-right area, the "this study uses" node is visible, still connected to the node path on the right. Visually, the network map displays several color groups (clusters) that indicate grouping of nodes based on their close co-occurrence, so that dominant and supporting nodes can be identified based on their position and connectivity.

Table 2. Terms that appear dominant/prominent on the network map

Area on the map	Terms that appear prominent
DKV–SMK (bottom left–center)	visual communication design; state vocational school; vocational school; improvement; influence of problem models; pjbl; expert; use
SD–approach (top)	elementary school; elementary school; approach; problem-based model; based
Cognitive–instrument–assessment pathway (center–right)	<i>critical thinking</i> ; student worksheet; aspects; test; posttest; and discovery; this study uses
Development (bottom left)	create; develop
Conjunction (middle)	<i>Difference</i>

Density Map

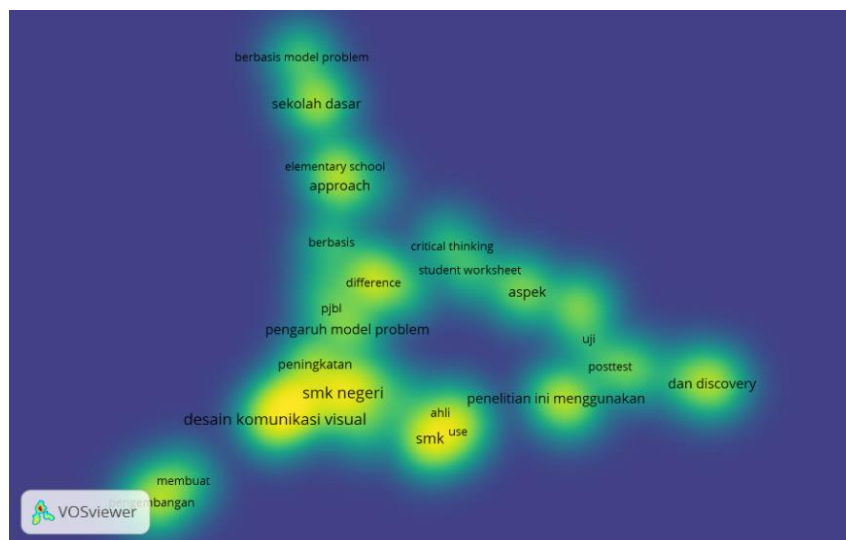


Figure 2. Density visualization

The density visualization from VOSviewer shows areas with higher intensity of occurrence and association through brightness levels (hotspots). In the density map, hotspots appear strongly around the term "visual communication design" in the bottom-left/center, as well as the area adjacent to the term "state vocational school." In the bottom-center area, hotspots are

also visible at the "smk" node along with closely located terms such as "use" and "expert," which appear in the bright zone. In the right-center area, hotspots appear at the term "this study uses," while on the right side, hotspots are visible at the "and discovery" node, which is located near evaluative nodes such as "posttest" and "test." At the top of the map, the areas of "elementary school" and "approach" also appear as prominent areas of density, followed by the term "elementary school" which is on the same path. This density map provides a visual representation of the areas of terms that appear most "dense" in the dataset's term co-occurrence network.

Table 3. Hotspots on the density map

Hotspots on the density map	The term labels that appear in the area
Bottom-left/center	visual communication design; state vocational school; improvement; influence of problem models
Bottom-middle	vocational school; use; expert
Right-center	This research uses
Right	and discovery; posttest; test
On	elementary school; approach; elementary school; problem-based model

Temporal Overlay Map

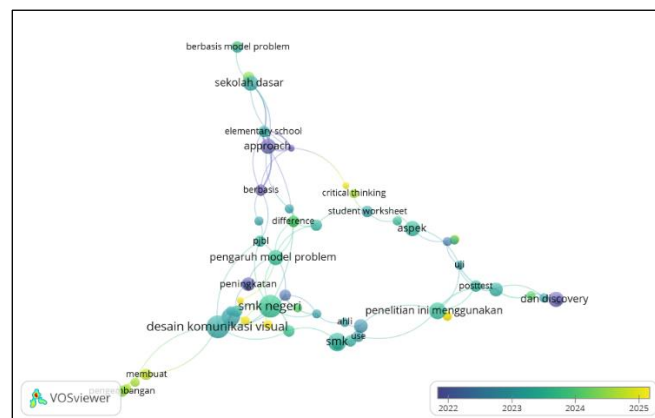


Figure 3. Temporal overlay

The overlay map displays the year gradation of nodes on a scale of 2022–2025 as seen in the color legend. In the overlay map, nodes within the same network are colored according to their year position on the scale. Visibly, dominant nodes such as “visual communication design” and “state vocational high school” remain large in the overlay, each carrying a color corresponding to the 2022–2025 legend. In the right lane, the nodes “and discovery,” “posttest,” and “test” are also clearly visible with color variations that follow the overlay legend. In the center-right area, the node “this study uses” appears as a node connected to the

right lane and is colored according to the year range in the overlay. In the lane containing the terms “aspect,” “student worksheet,” and “critical thinking,” these nodes also display colors that indicate their temporal position on the overlay scale. At the top, the terms “elementary school,” “approach,” and “elementary school” remain visible, indicating the presence of these terms in the same overlay map. Thus, the overlay available in this output presents temporal information in the range 2022–2025 as per the VOSviewer view.

DISCUSSION

Bibliometric findings indicate that the 2020–2025 publication corpus identified through Google Scholar constitutes an active but highly implemental research landscape. The 200 documents with 927 citations and an h-index of 15 indicate consistent attention to PBL themes within the Visual Communication Design (DKV) segment, although it has not yet formed a highly consolidated scholarly community. The scattered citations—not concentrated in a few dominant works—illustrate the cross-disciplinary character, variety of outlets, and differences in terminology and approaches. This aligns with the nature of PBL as a cross-contextual pedagogical approach (Yew & Goh, 2016). Thus, the PBL–DKV corpus appears more like a spectrum of research practices adjacent to the PBL framework, rather than a single, tightly knit community, and bibliometrics serve to map larger patterns before conducting in-depth content analysis.

The co-occurrence map shows the dominance of nodes related to the educational context and learning evaluation—such as “visual communication design,” “vocational high school/state vocational high school,” “test,” and “posttest”—rather than abstract conceptual design nodes. This indicates that PBL–DKV research still focuses on classroom research, emphasizing the measurement of learning outcomes, engagement, and pretest–posttest or inter-group comparisons. This pattern is consistent with implementation studies, such as PBL to improve psychomotor learning outcomes in Corel Draw (Suarbawa, 2019) and differences in learning outcomes in design brief materials (Adawiyah & Susarno, n.d.). Thus, the emergence of evaluative terms is not an algorithmic coincidence, but a methodological trace of the dominant research type; while the inclusion of cross-level terms such as “elementary school” emphasizes the importance of query refinement and data cleaning in Google Scholar-based bibliometrics (Zakiyyah et al., 2022; Patty et al., 2024).

This implementation orientation makes sense considering the nature of PBL, which emphasizes authentic problems, small group discussions, independent learning, and strengthening reasoning (Yew & Goh, 2016). In Visual Communication Design (DKV),

problems are manifested as briefs, communication needs, and challenges in developing visual messages; therefore, the indicators selected by researchers tend to be learning performance, activeness, and task/project quality. Implementation evidence supports this (Suarbawa, 2019; Herawati et al., 2023). Therefore, the co-occurrence map reflects not only "themes" but also dominant measurement practices. The shift toward issues of design cognition or the rationality of visual decisions has not yet emerged as a major node, so the mapping results serve as a diagnosis of dense and loose areas for exploration.

The emergence of generic terms such as "this study uses" confirms the importance of term cleaning. These terms are not substantive themes, but rather artifacts of text extraction that have not been fully filtered. Because the analysis utilizes VOSviewer, term normalization, synonym unification, and stopword elimination are crucial to maintaining the validity of the map (Van Eck & Waltman, 2014; Zakiyyah et al., 2022; Patty et al., 2024). Distinguishing between conceptual terms (e.g., "visual communication design," "critical thinking") and procedural/narrative terms is necessary to avoid biased interpretation; this also represents an important methodological lesson from the study.

The cluster structure demonstrates the interconnectedness of "critical thinking," "student worksheet," and evaluative terms. This interconnectedness demonstrates the need for scaffolding in PBL: although it demands independent investigation, the process remains guided through student worksheets (LKPD), modules, or teaching tools. Implementation studies confirm the role of these tools in organizing group work, media, and PBL syntax (Adawiyah & Susarno, n.d.; Herawati et al., 2023; Ardianti et al., 2021). Thus, the network of terms intersecting with worksheets/instruments reflects the actual practice of PBL–DKV implementation.

The temporal overlay shows that the prominent terms in the final phase still revolved around learning instruments and evaluation, and had not shifted strongly to design theory terminology (such as semiotics or visual rhetoric). This indicates that the dominant discourse remained applied-pedagogical, in line with broad-scale PBL bibliometric findings (Handoyo et al., 2024) and the evolving character of PBL according to context (Sarıkaya & Deniz-Celiker, 2024). Because the focus of the 2020–2025 period is a recent snapshot, the conclusions are not intended to be comprehensive claims about the history of PBL.

The dominance of the vocational high school context has important academic implications. Vocational high schools emphasize work competencies, so problem-solving-based PBL aligns with DKV learning. Client briefs, target audiences, and media constraints become authentic issues; therefore, performance evaluation becomes natural. Studies by Suarbawa (2019),

Adawiyah & Susarno (nd), and Herawati et al., (2023) demonstrate this consistency. Our bibliometrics resonate with these implementation findings, confirming that PBL–DKV is widely applied in vocational contexts.

In fact, this consistency reveals a research gap. Research still focuses primarily on quantitative outcomes; future opportunities include expanding indicators to encompass specific design dimensions: communication problem formulation, audience research, exploration of visual alternatives, conceptual-visual consistency, and justification of design decisions. PBL provides a mechanism for this (Yew & Goh, 2016; Ardianti et al., 2021). Therefore, the research agenda can be directed from posttest scores to the quality of reasoning and design products.

Methodologically, this study demonstrates the value of Google Scholar-based bibliometrics: broad coverage, but demanding data quality control. Transparency of procedures (Publish or Perish, VOSviewer) and careful map interpretation are essential (Van Eck & Waltman, 2014; Zakiyyah et al., 2022; Patty et al., 2024). The emerging narrative terms provide clear evidence that data cleaning determines the validity of the mapping.

Limitations of the study include: heterogeneous Google Scholar data sources; sensitivity of co-occurrence to term cleaning; maps reflect proximity, not causality; the 2020–2025 period captures only the most recent phase; and limitations due to the lack of a full content analysis of all documents. Mentioning limitations is necessary to prevent the results from being read beyond methodological capacity.

Overall, this study maps the trends and structure of PBL–DKV research themes for 2020–2025, with dominant vocational/vocational high school (SMK) characteristics and learning evaluation. Its contribution is not only a map, but also a basis for further research agendas towards measuring the quality of design reasoning, briefs, audience investigations, and visual argumentation—in line with PBL mechanisms (Yew & Goh, 2016). The novelty lies in the specification of the object (PBL–DKV intersection), the period, and the mapping of the theme structure that is ready to be used to design further research that is sharper and more conceptual.

CONCLUSION

This study concludes that bibliometric mapping based on Google Scholar (through Publish or Perish) and network analysis using VOSviewer can measurably depict the research landscape of Problem-Based Learning (PBL) in the Visual Communication Design segment for the 2020–2025 period. The analyzed dataset includes 200 documents with a total of 927 citations, and shows a medium impact level through an h-index of 15 and a g-index of 26,

indicating the presence of a number of fairly influential reference works in this corpus. From the co-occurrence network map, this study found that the structure of the apparent research themes tends to be dominated by the context of applied education, especially those related to vocational/vocational high schools, as well as terminology related to learning evaluation and supporting tools (e.g., terms related to tests, posttests, worksheets, and thinking skills). The density map shows the center of term density at the most frequently appearing nodes, while the overlay map displays temporal variations at nodes within the visualized year range, thus providing an overview of the dynamics of research focus in the current period. Overall, these findings indicate that PBL research in the DKV domain in the collected corpus is more strongly focused on implementative-pedagogical orientation (learning development, learning activities, and outcome measurement) compared to conceptual deepening specific to design cognition or visual communication argumentation. The main contribution of this research is to provide a trend map and theme structure that can be used as a basis for compiling the state of the art, sharpening the position of further research, and determining areas that are already dense and areas that are still loose in PBL–DKV research.

RECOMMENDATION

Future research is directed at strengthening data quality and deepening the substantive focus. First, subsequent research is recommended to conduct more rigorous term cleaning through the development of a thesaurus and specific stopwords to prevent narrative/methodological terms from dominating the map, thus ensuring that the resulting clusters better represent conceptual themes. Second, it is recommended to add a directed content analysis stage to key articles in each cluster to validate the cluster's meaning and explain the character of the findings more substantially, without relying solely on term co-occurrence. Third, further research needs to expand the "outcome" indicators in the context of Visual Communication Design (DKV), for example, examining the quality of design reasoning, the quality of brief formulation, the quality of visual alternative exploration, and the strength of visual communication decision justification, so that PBL is not only portrayed through learning evaluation scores. Fourth, further studies can test more precise query variations and incorporate terms common in Visual Communication Design (e.g., design brief, studio, visual communication) to make the corpus more specific to the Visual Communication Design (DKV) domain and reduce the inclusion of irrelevant cross-level documents. Fifth, future research is recommended to compare the mapping results from Google Scholar with other databases (if necessary) to test the consistency of the theme structure and strengthen the

generalizability of the findings. With this direction, future PBL–DKV research is expected to not only develop in the quantity of publications, but also increase in conceptual depth, the accuracy of the theme mapping, and direct contribution to the development of problem-based visual communication design learning.

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