Global Trends in School Immersion Programs: A 50-Year Bibliometric Analysis and Transferable Insights for Malaysia

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ABSTRACT

This study examines the development of global school immersion program research over the past five decades by identifying publication trends, influential contributors, thematic evolution, and emerging research directions while deriving lessons for Malaysia's multicultural educational context. A bibliometric analysis was conducted using 1,491 journal articles indexed in the Scopus database between 1976 and 2026. Performance analysis and science-mapping techniques were applied using Harzing's Publish or Perish and VOSviewer to analyse publication patterns, citation performance, collaboration networks, and keyword co-occurrence relationships. The results reveal substantial growth in school immersion program research, particularly after 2015, indicating increasing global interest in immersion-based education. Research output is dominated by the United States and Canada, while bilingual education, language immersion, and intercultural learning remain the core themes. Keyword analysis shows a gradual expansion towards medical education, experiential learning, virtual reality, e-learning, and professional competency development. The findings suggest that immersion scholarship has evolved from a language-focused domain into a broader interdisciplinary field encompassing educational, behavioural, technological, and professional learning contexts. The study extends the conceptualisation of school immersion from language-focused learning towards a broader interdisciplinary conceptual framework integrating intercultural, behavioural, experiential, technological, and competency development dimensions. The findings provide insights for policymakers and educational institutions, particularly in Malaysia, to strengthen immersion-related planning, teacher preparation, intercultural learning, and technology-enhanced educational initiatives. This study offers one of the earliest comprehensive bibliometric analyses of school immersion program research, providing a structured understanding of its intellectual development, research gaps, and future directions.

Keywords: Bibliometric; Education; Evolution; Immersion Program; Malaysia; School

INTRODUCTION

Immersion programs are educational approaches in which students learn academic subjects through a second language while following the standard curriculum (Asson et al., 2025; Kuska et al., 2010). Unlike conventional language instruction, immersion education uses the target language as the primary medium of instruction across subjects such as mathematics and science (Hill, 2023). Common models include early immersion and dual-language immersion, which aim to promote bilingualism, biliteracy, and intercultural competence (Steele et al., 2024). Previous studies have shown that immersion education contributes positively to cognitive development, language proficiency, academic achievement, and intercultural awareness (Asson et al., 2025; Steele et al., 2024). However, challenges remain, including inadequate teacher preparation, limited specialised training, and unequal access to immersion opportunities across educational settings (Chen & Gorke, 2024).

Recent literature shows that school immersion programs have expanded beyond language acquisition to include cultural, academic, and experiential learning dimensions. Cultural immersion initiatives are increasingly used to strengthen intercultural competence, cultural sensitivity, and professional readiness across various disciplines (Onosu, 2021). Language immersion programs, particularly dual language

immersion (DLI), have also demonstrated positive effects on academic achievement, bilingualism, and intercultural awareness among students (Lu et al., 2023; Morales et al., 2025). Studies on Mandarin immersion programs further indicate strong academic progress without major disparities across racial or linguistic backgrounds (Lu et al., 2023). Despite these benefits, previous research continues to highlight challenges related to inequitable implementation, limited educational resources, and tensions between policy goals and classroom realities (Nic, 2024). Overall, the literature suggests that immersion programs offer important academic and sociocultural benefits, although their effectiveness depends on adequate preparation, active participation, and structured reflection processes (Pandor et al., 2026).

Malaysia has gradually expanded its involvement in school immersion-related educational initiatives in response to increasing globalisation, multilingual communication demands, and intercultural learning needs. Although formal school immersion programs in Malaysia remain less established compared to countries such as Canada and Australia, several initiatives demonstrate growing interest in bilingual and culturally immersive education. The Dual-Language Programme (DLP), introduced in 2016, represents one of the closest immersion-oriented approaches within the Malaysian education system, where Science and Mathematics subjects are taught in English to strengthen language proficiency and subject mastery (Suliman et al., 2020). Earlier initiatives such as the Teaching of Science and Mathematics in English (TeSME) also reflected efforts to promote bilingual learning environments, although challenges related to teacher readiness, bilingual support, and educational resources affected implementation effectiveness (Lee, 2014). In addition, student exchange programs, international study visits, and intercultural educational collaborations have increasingly been introduced to improve intercultural competence, adaptability, and global awareness among students (Meyer et al., 2024).

Despite these developments, several issues continue to affect the progress of school immersion programs in Malaysia. Existing initiatives often face challenges related to shortages of trained bilingual teachers, uneven access to learning resources, and limited integration between language learning and cultural immersion components (Lu, 2020). Furthermore, most existing studies remain focused on language proficiency and academic achievement, while comparatively limited attention has been directed toward behavioural change, intercultural adaptability, digital immersion learning, and long-term competency development. At the global level, the literature on school immersion programs also remains fragmented across different educational contexts, immersion models, and disciplinary perspectives (Kurulgan, 2024). Emerging themes such as digital immersion learning, multicultural integration, and behavioural development remain insufficiently synthesised, while no dedicated bibliometric study on school immersion programs has been identified within the Scopus database. Consequently, the intellectual structure, thematic evolution, influential contributors, and collaborative research networks within this field remain unclear. Therefore, a bibliometric analysis is necessary to systematically map the development of school immersion program scholarship, identify major research trends and emerging themes, and generate important lessons that may support the future strengthening of immersion-related educational initiatives within Malaysia's multicultural educational context.

The objective of this study is to examine the development of school immersion program research through bibliometric analysis by identifying publication trends, major themes, influential contributors, and collaboration patterns. The study also explores the thematic evolution of immersion scholarship, identifies emerging research gaps, and provides lessons that may support the strengthening of school immersion programs within Malaysia's multicultural educational context.

Theoretically, this study contributes by providing a structured understanding of the intellectual development, thematic evolution, and interdisciplinary nature of school immersion program research. Practically, the findings offer useful insights for policymakers and educational institutions, particularly in Malaysia, to strengthen immersion-related planning, curriculum development, teacher preparation, and technology-integrated learning approaches.

The originality of this study lies in providing one of the earliest comprehensive bibliometric analyses of school immersion program research indexed in Scopus. The study systematically maps publication trends,

thematic evolution, influential contributors, and research networks, offering a clearer understanding of the global development and future directions of immersion program scholarship.

METHODOLOGY

Bibliometric analysis has become increasingly important for systematically examining publication trends, citation patterns, collaboration networks, and thematic development within a research field over time (Donthu et al., 2021). It also improves transparency and consistency through structured analytical procedures and clearly defined data sources (Lim & Kumar, 2024). Accordingly, this study applies a four-stage bibliometric analysis procedure adapted from previous research (Donthu et al., 2021) (Figure 1).

Defining the research objectives

Using bibliographic data retrieved from the Scopus database and analysed through Harzing's Publish or Perish and VOSviewer, this study presents a bibliometric review of global school immersion program research. The analysis examines publication trends, influential contributors, leading countries and institutions, citation patterns, and thematic development within the field. Based on these objectives, the study addresses the following research questions:

RQ1. How has global research on school immersion programs evolved, and what do existing publication patterns reveal about the development of the field?

RQ2. Which authors, institutions, countries, and journals contribute most prominently to school immersion program research?

RQ3. Which publications exert the greatest influence on school immersion program scholarship based on citation impact?

RQ4. What major themes, conceptual relationships, and research trends can be identified through keyword co-occurrence analysis in school immersion program studies?

Selection of bibliometric analysis methods

This study adopts two complementary bibliometric methods to examine global school immersion program scholarship. Performance analysis evaluates publication productivity and citation impact to identify influential contributors and research trends (Donthu et al., 2021). Science mapping is further applied through document analysis, citation analysis, co-authorship analysis, bibliographic coupling, and co-word analysis to examine collaboration networks, thematic relationships, and the intellectual development of the field (Baker et al., 2021; Donthu et al., 2021). Collectively, these methods provide a systematic understanding of the structure, evolution, and future directions of school immersion program research.

Data collection

The data for this study were retrieved from the Scopus database, which is widely recognised as one of the largest repositories of peer-reviewed academic publications and citation records. Due to its extensive multidisciplinary coverage, Scopus is frequently employed in bibliometric studies to examine publication trends, citation performance, and patterns of scholarly influence across different research domains (Salleh et al., 2023). In addition, its structured indexing system and compatibility with established bibliometric software enhance the reliability and comprehensiveness of systematic literature analyses (Mat & Lian, 2025).

The data retrieval process was conducted on 26 February 2026 using the Scopus advanced search interface. A carefully designed search query, TITLE-ABS-KEY ((immerse OR immersion*) AND (school*)), was applied to identify publications specifically related to school immersion programs. This search strategy ensured that only studies explicitly referring to immersion-related school programs within the title, abstract, or keywords were included in the dataset. The use of a focused and topic-specific search string is consistent

with recommended bibliometric procedures for improving dataset precision and minimising the inclusion of unrelated publications (Donthu et al., 2021; Öztürk et al., 2024).

The initial search generated a total of 3,263 publications. Several screening procedures were subsequently conducted to improve dataset relevance, consistency, and quality. The screening criteria restricted the publication period to 1976–2026, included only journal articles, and excluded non-English publications to ensure linguistic consistency and comparability across the dataset. Following the screening process, a final dataset of 1,491 articles was retained for bibliometric analysis.

To reduce potential selection bias and enhance the reliability of the screening process, the initial screening and data extraction procedures were conducted independently by the first author. This process involved reviewing publication titles, abstracts, document types, publication years, and keyword relevance to ensure consistency with the scope of school immersion program research. Subsequently, the second author independently reviewed and verified the screened dataset, including the inclusion and exclusion decisions, search procedures, and publication relevance. Any inconsistencies identified during the verification process were discussed and resolved collaboratively to ensure greater accuracy, transparency, and methodological rigour in the final dataset selection.

Conducting the bibliometric analysis and interpreting of results

The preliminary analysis of publication output and citation performance was conducted using the Analyze Results function in Scopus to obtain descriptive information on document types, publication sources, authors, and institutional affiliations within school immersion program research. The bibliographic data were then downloaded in RIS and CSV formats and analysed using Harzing's Publish or Perish (Version 8) and VOSviewer (Version 1.6.20). Publish or Perish was used to generate citation-based metrics, while VOSviewer was employed to construct visual networks based on keyword co-occurrence and thematic relationships (Nandiyanto & Husaeni, 2022). These tools enabled both statistical and visual examination of the intellectual structure, thematic evolution, and research development of school immersion program scholarship.

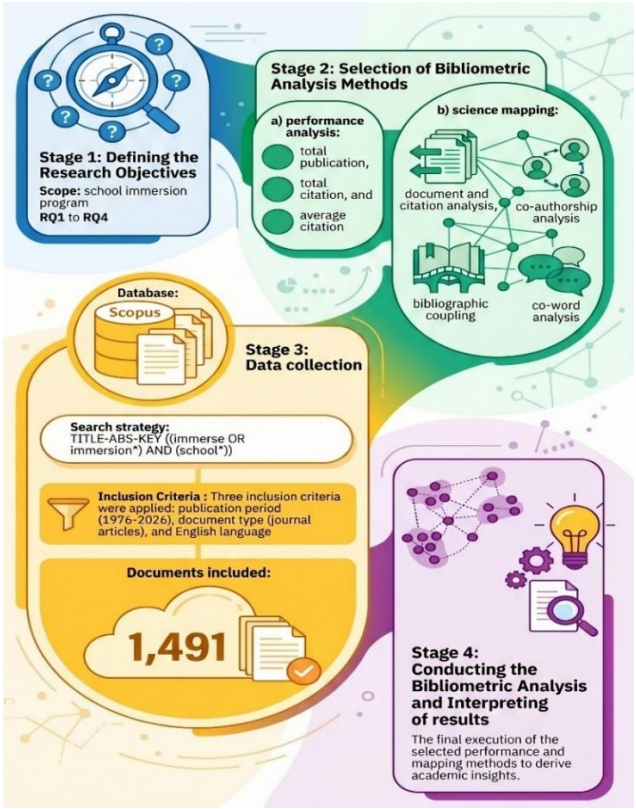

Figure 1. Procedures for Conducting Bibliometric Analysis

Source: Donthu et al. (2021)

RESULTS

The bibliometric findings provide important insight into the evolution of school immersion programs as a research field. The observed publication trends, citation patterns, and thematic clusters demonstrate not only increasing scholarly attention, but also the progressive establishment of school immersion research as an interdisciplinary area linked to education, language acquisition, cultural integration, and policy development.

Global Trends and Research Patterns in School Immersion Studies (1976–2026)

School immersion program research demonstrated substantial growth between 1976 and 2026, reflecting increasing global interest in immersion-based education. During the early period from 1976 to the late 1980s, publication output remained limited and inconsistent, indicating that immersion education was still at an emerging stage within academic scholarship. From the 1990s to the mid-2000s, research activity became more stable, reflecting growing scholarly attention toward bilingual education, second-language acquisition, and multicultural learning approaches.

A stronger upward trend became evident after 2005, particularly from 2010 onwards, as annual publication output increased significantly. Research productivity accelerated further after 2015, with several peak years recorded, including 2020, 2022, 2024, and 2025. The lower number of publications in 2026 is likely due to incomplete indexing during data extraction rather than reduced research activity. Overall, the findings demonstrate a sustained long-term expansion of school immersion program research over the past five decades, highlighting its increasing importance within global educational discourse.

The publication pattern also reflects the intellectual evolution of the field. Earlier studies primarily focused on language acquisition, bilingual classroom instruction, and adaptation within immersion learning environments. As the field expanded during the 2000s, research increasingly incorporated broader issues related to multicultural education, globalisation, and inclusive educational practices. More recent studies demonstrate greater thematic diversification, including cognitive development, cultural competence, dual-language immersion, educational equity, identity formation, and policy implementation. This progression suggests that school immersion research has evolved into a broader interdisciplinary field connected to education, linguistics, psychology, and sociocultural policy studies, although stronger theoretical consolidation remains necessary to further strengthen the field's conceptual foundation (Figure 2).

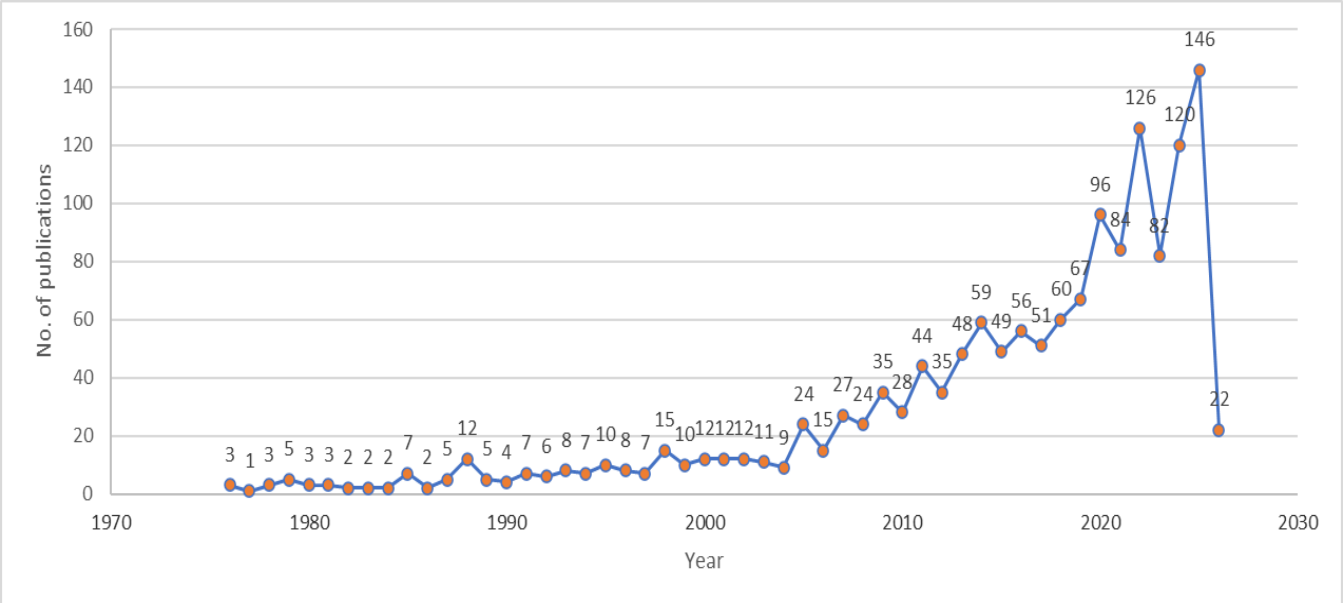

Figure 2. Trend of publications on school immersion program from 1976 to 2026

Source: Scopus Database

The bibliometric distribution of publications on school immersion programs demonstrates a strong concentration of research activity within a limited number of countries. The United States emerged as the dominant contributor with 641 publications, far exceeding all other countries in the dataset. Canada ranked second with 161 publications, followed by Australia (98), the United Kingdom (82), and Spain (75). These figures indicate that research on school immersion programs has been primarily driven by developed Western countries, particularly those with established educational research systems and strong interests in multicultural, bilingual, and experiential learning initiatives. China and Ireland also recorded notable contributions with 44 publications each, reflecting growing scholarly attention toward immersion-based educational approaches in different regional contexts.

Beyond the leading contributors, publication output declined considerably. Several countries such as Germany (34), New Zealand (31), Taiwan (31), and Hong Kong (30) demonstrated moderate research engagement, while South Korea, Brazil, the Netherlands, and South Africa each produced between 18 and 21 publications. The distribution suggests that although participation in this research area is geographically widespread, research intensity remains uneven across regions.

In the lower publication range, many countries contributed only a small number of studies. Nations including Malaysia, Portugal, Sweden, and Denmark recorded fewer than 10 publications, while more than 20 countries produced only one or two studies each. This pattern reflects a dispersed but limited global participation in the field, where a small group of countries accounts for most of the scholarly output while many others remain at an emerging stage of research development on school immersion programs (Figure 3).

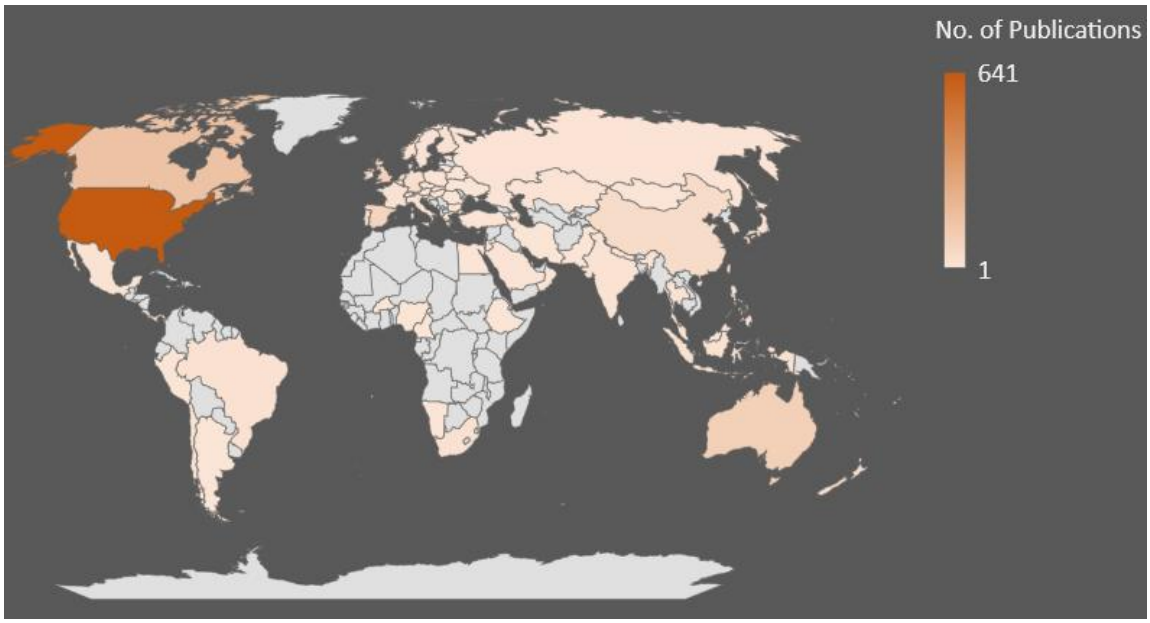

Figure 3. Trends in school immersion program publications by country

Source: Scopus Database

The distribution of subject areas demonstrates that research on school immersion programs is heavily centred within the educational and social science domains. Social Sciences represents the largest disciplinary category with 1,491 publications (59.88%), indicating that immersion programs are predominantly examined through perspectives related to education systems, pedagogy, cultural integration, language learning, and student development. The second-largest contribution comes from Arts and Humanities with 545 publications (21.89%), highlighting the close connection between immersion education and linguistic, cultural, and intercultural studies. Collectively, these two subject areas account for more than four-fifths of the total publications, suggesting that the intellectual foundation of school immersion program research is strongly rooted in educational and humanistic inquiry.

Smaller yet notable contributions from Business, Management and Accounting (1.24%), Engineering (1.04%), and Mathematics (1.04%) suggest that immersion-based approaches are increasingly being adapted beyond traditional educational settings into technical and professional disciplines. Overall, the subject area pattern highlights the interdisciplinary nature of school immersion program research, although its primary concentration remains closely associated with educational, social, and cultural dimensions (Table 1).

Table 1. Top 10 school immersion program publications by subject area

Subject area	Total	%
Social Sciences	1491	59.88%
Arts and Humanities	545	21.89%
Psychology	150	6.02%
Computer Science	87	3.49%
Medicine	57	2.29%
Health Professions	47	1.89%
Business, Management and Accounting	31	1.24%
Nursing	30	1.20%
Engineering	26	1.04%
Mathematics	26	1.04%

Source: Scopus Database

The funding pattern for school immersion program research reflects a relatively diverse sponsorship structure involving government agencies, public research councils, educational institutions, and international funding initiatives. The Social Sciences and Humanities Research Council of Canada recorded the highest contribution with 29 funded publications, followed by the National Science Foundation (20 publications) and the National Institutes of Health (12 publications). Other notable contributors included the Ministry of Science and Technology of Taiwan and the U.S. Department of Education, with 11 funded publications each. These findings indicate that the field is strongly supported by public-sector and education-oriented funding bodies focusing on educational innovation, language development, and student learning outcomes.

Several organisations demonstrated moderate but consistent involvement, including the European Commission, Institute of Education Sciences, Spencer Foundation, and Horizon 2020. Beyond the leading sponsors, the funding landscape becomes increasingly fragmented, with many organisations contributing only a small number of funded studies. Overall, the pattern suggests that school immersion program research is supported through broad but dispersed and largely project-based funding arrangements rather than long-term specialised funding streams (Figure 4).

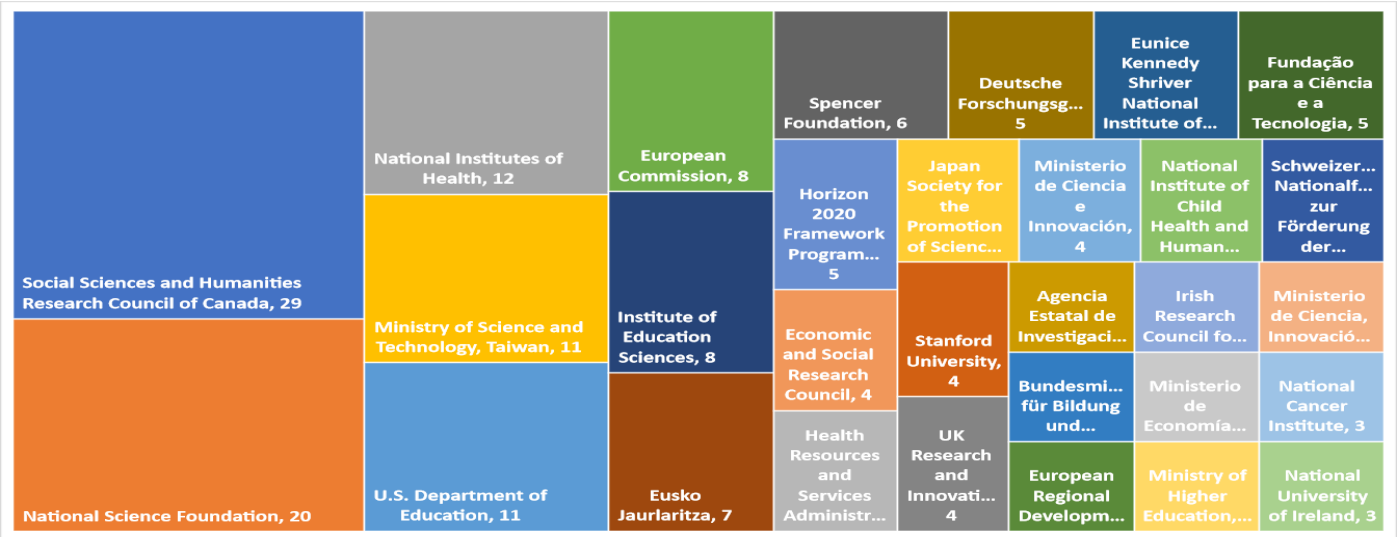

Figure 4. Major funding sponsors supporting school immersion program research

Source: Scopus Database

Leading Contributors to School Immersion Program Research: Authors, Institutions, and Publication Sources

The productivity distribution among the top authors in school immersion program research demonstrates a relatively balanced pattern without a single overwhelmingly dominant scholar. Chen, X., Genesee, F., and Nic Aindriú each recorded the highest contribution with 9 publications, indicating their consistent involvement and influence within the field. A second tier of contributors includes Dorner, L. and Ó Duibhir, P., both with 7 publications, reflecting sustained scholarly engagement in immersion-related educational studies.

Several other authors, including Lyster, R. and Padilla, A.M., produced 6 publications each, while Dagenais, F., Day, E., and Feinauer contributed 5 publications respectively. The relatively small gap between the most productive and lower-ranked authors suggests that research activity is distributed across multiple recurring scholars rather than concentrated around a single dominant figure. Overall, the publication pattern indicates a collaborative and moderately dispersed authorship structure in school immersion program research, where several researchers contribute steadily to the development of the field (Figure 5).

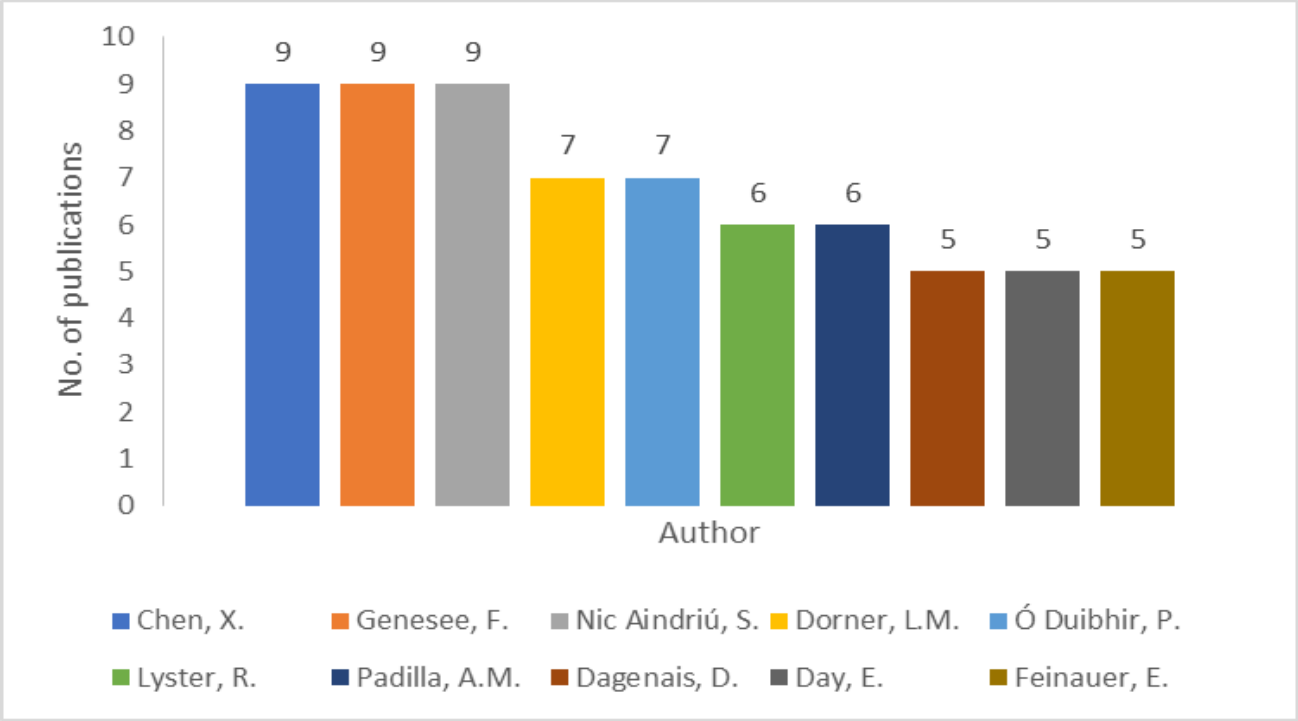

Figure 5. Top 10 Leading Authors in School Immersion Program Research

Source: Scopus Database

The institutional publication pattern in school immersion program research shows that several universities maintain strong and consistent research productivity without a single institution overwhelmingly dominating the field. The University of Toronto recorded the highest output with 37 publications, followed by Université McGill (23 publications) and Dublin City University (22 publications), highlighting the strong contribution of Canadian and Irish institutions to immersion education research.

Other active contributors include the University of Minnesota Twin Cities (19 publications), Arizona State University and The University of Utah (18 publications each), and the University of California, Los Angeles (17 publications). Additional institutions such as The University of Arizona, The University of Sydney, and York University also demonstrated notable research engagement. Overall, the relatively small differences in publication counts suggest a moderately distributed and internationally connected research structure driven by universities across North America, Europe, and Oceania (Figure 6).

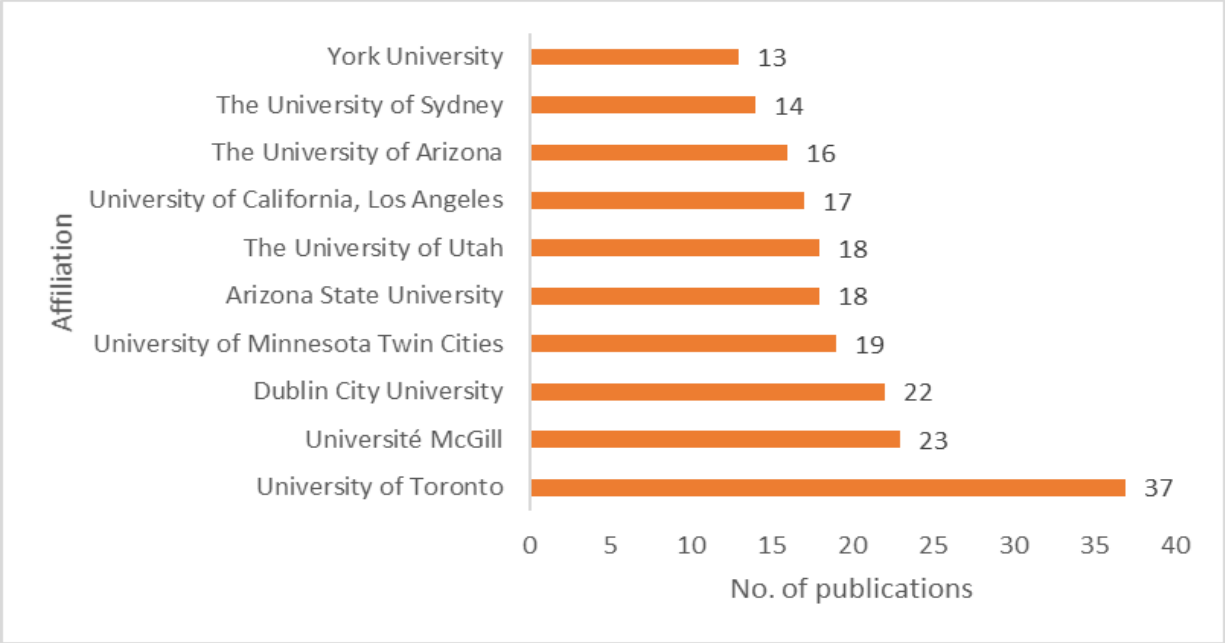

Figure 6. Top Institutional Affiliations in School Immersion Program Publications

Source: Scopus Database

The source title distribution demonstrates that school immersion program research is highly concentrated within a small group of specialised journals focusing on bilingualism, multilingualism, and language education (Table 2). The International Journal of Bilingual Education and Bilingualism recorded the highest number of publications with 69 documents (22.33%), establishing it as the primary outlet in the field. This was followed by the Bilingual Research Journal with 44 publications (14.24%) and the Journal of Multilingual and Multicultural Development with 43 publications (13.92%). The strong dominance of these journals indicates that immersion program scholarship is closely linked to bilingual and multicultural educational discourse.

At the lower end of the top 10 list, Applied Psycholinguistics contributed 16 publications (5.18%), while both Canadian Modern Language Review and the Journal of Immersion and Content Based Language Education recorded 18 publications each (5.83%). Although these figures are smaller compared to the leading journals, they still demonstrate consistent scholarly engagement within specialised areas related to language acquisition, psycholinguistics, and immersion pedagogy.

Overall, the publication counts among the top sources range from 16 to 69 documents, with an average of approximately 31 publications per journal. The substantial gap between the leading journal and the remaining outlets suggests that a limited number of highly specialised journals serve as the central platforms for disseminating school immersion program research. At the same time, the presence of multiple recurring journals with moderate publication counts reflects a stable and interconnected publication network within the field.

Table 2. Top 10 school immersion program publications by source title

Source title	**Publisher**	**No. of documents**	**%**
International Journal of Bilingual Education and Bilingualism	Routledge	69	22.33%
Bilingual Research Journal	Routledge	44	14.24%
Journal of Multilingual and Multicultural Development	Routledge	43	13.92%
Foreign Language Annals	Wiley	38	12.30%
BMC Medical Education	BioMed Central Ltd.	22	7.12%

Language Culture and Curriculum	Taylor & Francis	22	7.12%
Academic Medicine	Lippincott Williams and Wilkins	19	6.15%
Canadian Modern Language Review	University of Toronto Press	18	5.83%
Journal of Immersion and Content Based Language Education	John Benjamins Publishing Company	18	5.83%
Applied Psycholinguistics	Cambridge University Press	16	5.18%

Source: Scopus Database

Highly cited publications in school immersion program study

The citation profile of the top 10 publications demonstrates that the intellectual foundations of school immersion program research are strongly rooted in bilingual education, cultural diversity, language development, and student learning experiences. The most influential publication is Sleeter (2001), which has accumulated 1,285 citations and an average of 51.4 citations per year, highlighting its enduring contribution to discussions on teacher preparation and culturally responsive education. This is followed by Gutiérrez et al. (1999) with 1,014 citations and 37.56 citations per year, reflecting the significant influence of concepts related to hybridity, diversity, and multilingual learning environments. Barab et al. (2005) ranks third with 732 citations and 34.86 citations per year, indicating the growing relevance of immersive and technology-enhanced learning approaches within educational research.

Several highly cited studies focus specifically on language immersion outcomes. The works of MacIntyre et al. (2001, 2002), Oller et al. (2007), and Lyster and Mori (2006) have received substantial scholarly attention for their contributions to willingness to communicate, bilingual literacy development, second-language motivation, and classroom interaction in immersion settings. These studies collectively reinforce the importance of linguistic, psychological, and pedagogical factors in shaping immersion learning outcomes.

More recent publications, including Valdez et al. (2016) and Flores and García (2017), recorded relatively high annual citation rates despite their younger age. Their influence reflects increasing scholarly concern with issues of equity, access, social justice, and the changing sociopolitical dimensions of dual-language and bilingual education. Overall, the citation pattern suggests that the most influential school immersion program studies have evolved from a primary focus on language acquisition and bilingual development toward broader concerns related to cultural diversity, educational equity, learner engagement, and innovative learning environments (Table 3).

Table 3: Top 10 Most Highly Cited Publications in School Immersion Program Research

Author	**Year**	**Title**	**Age**	**No. of citations**	**Citations/ year**
Sleeter	2001	Preparing teachers for culturally diverse schools: Research and the overwhelming presence of whiteness	25	1285	51.4
Gutierrez et al.	1999	Rethinking diversity: Hybridity and hybrid language practices in the third space	27	1014	37.56
Barab et al.	2005	Making learning fun: Quest Atlantis, a game without guns	21	732	34.86
MacIntyre et al.	2001	Willingness to communicate, social support, and language-learning orientations of immersion students	25	399	15.96
Christensen et al.	2007	Ethics, CSR, and sustainability education in the Financial Times top 50 global business schools: Baseline data and future research directions	19	375	19.74
Oller et al.	2007	Profile effects in early bilingual language and literacy	19	339	17.84

Lyster & Mori	2006	Interactional feedback and instructional counterbalance	20	321	16.05
MacIntyre et al.	2002	Sex and age effects on willingness to communicate, anxiety, perceived competence, and L2 motivation among junior high school French immersion students	24	303	12.63
Valdez et al.	2016	The Gentrification of Dual Language Education	10	273	27.3
Flores & Garcea	2017	A Critical Review of Bilingual Education in the United States: From Basements and Pride to Boutiques and Profit	9	269	29.89

Source: Scopus Database

Keyword co-occurrence analysis

Figures 7, 8, and 9 present VOSviewer visualisations illustrating the thematic structure of school immersion program research through keyword co-occurrence analysis. These visualisations identify the most interconnected concepts and demonstrate the relationships between keywords within the broader research landscape (Ozek et al., 2023). From the 1,491 publications analysed, a total of 4,700 keywords were initially extracted. After applying a minimum occurrence threshold of eight, 158 keywords satisfied the selection criteria and were grouped into five thematic clusters. The threshold was intentionally set at a higher level to retain only frequently occurring and conceptually meaningful keywords while excluding less significant terms with limited analytical relevance. The identified clusters and their related keywords are presented in Table 4.

Table 4. Number and list of keywords across five clusters

Cluster	**No. of keywords**	**Main Keywords**
1 (red)	87	Academic achievement, assessment, augmented reality, bilingual, California, Canada, collaboration, computer aided instruction, creativity, cultural immersion, diversity, dual immersion, e-learning, education policy, elementary school, English, English immersion, ethnography, evaluation, experiential learning, French, gamification, identity, immersion, inclusion, indigenous education, irish, language, leadership, literacy, minority language, motivation, multilingualism, pedagogy, primary education, primary school, professional development, reading comprehension, school choice, second language learning, student engagement, teacher preparation, technology, two-way immersion, virtual reality, vocabulary
2 (green)	29	Clinical competence, curriculum, education, empathy, human, information processing, medical student, methodology, procedures, program development, program evaluation, united states
3 (blue)	22	Adult, article, cross-sectional study, female, male, nursing education, perception, questionnaire, simulation, skill, young adult
4 (yellow)	11	Australia, career choice, decision making, general practice, longitudinal study, New Zealand, workforce
5 (purple)	9	Adolescent, child, interview, qualitative research, school, training, university
Total	158	

Source: Scopus Database

Keyword co-occurrence analysis was conducted using VOSviewer network visualisation to identify the major research themes in school immersion program studies. In this visualisation, node size represents the frequency of keyword occurrence, while the connecting lines indicate the strength of relationships between terms. Different colours represent thematic clusters that reflect related research areas within the field

(Hassan & Duarte, 2024). Figure 7 illustrates four interconnected thematic clusters that shape the intellectual structure of school immersion program research.

The red cluster forms the largest thematic domain and is strongly associated with bilingual and language immersion education. Frequently occurring keywords such as immersion, bilingual education, bilingualism, teacher education, dual language immersion, and language development indicate that much of the literature focuses on multilingual learning, language acquisition, and instructional practices. The inclusion of terms such as motivation, identity, and virtual reality suggests increasing attention toward sociocultural and technology-enhanced learning dimensions. The green cluster is centred on medical and professional education. Keywords including medical education, curriculum, clinical competence, medical student, and clinical education demonstrate the growing application of immersion-based learning in healthcare training and competency development. Meanwhile, the blue cluster reflects empirical and participant-oriented research themes. Common terms such as human, article, female, male, adult, and psychology indicate a strong focus on behavioural, cognitive, and evidence-based educational studies. The yellow cluster, although smaller, highlights applied professional contexts through keywords such as decision making, professional practice, and rural health care.

Overall, the network structure demonstrates that school immersion program research is both interdisciplinary and strongly interconnected. The literature is primarily anchored in bilingual and language immersion education, which remains the central foundation of the field. At the same time, the emergence of medical education, psychology, and professional training clusters indicates that immersion-based approaches are increasingly being adapted beyond traditional language-learning contexts. The integration of behavioural, technological, and competency-related themes further suggests that school immersion research has evolved from a narrow focus on language acquisition toward broader educational, cognitive, and experiential learning applications.

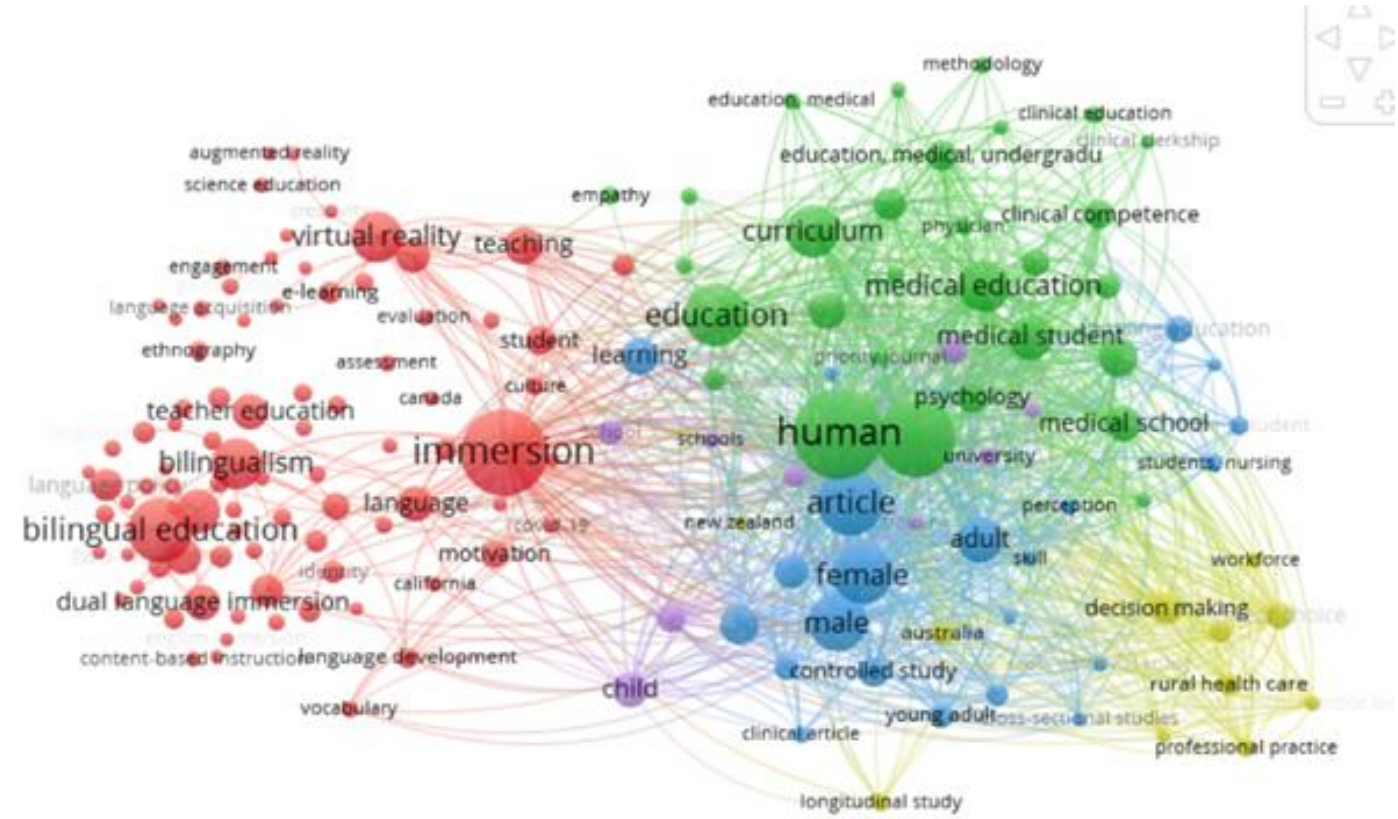

Figure 7. Keyword Co-occurrence Analysis of School Immersion Program Literature

Source: Scopus Database

In the overlay visualisation, colours indicate the average publication year of keywords within the dataset. Darker colours (blue and purple) represent earlier research themes, whereas lighter colours (green to yellow)

indicate more recent topics that reflect emerging directions in school immersion program research. This visualisation therefore illustrates how the thematic focus of the field has evolved over time (Figure 8). The earlier stage of the literature is represented by darker-toned keywords associated with the foundational aspects of bilingual and immersion education. Terms such as bilingual education, bilingualism, teacher education, language development, and dual language immersion suggest that initial studies concentrated primarily on language acquisition, instructional approaches, and multilingual learning environments. These themes established the core educational foundation of immersion research. Keywords displayed in green shades represent a transitional phase in which the field expanded into broader educational and developmental contexts. Frequently connected terms such as education, curriculum, medical education, medical student, psychology, and learning indicate growing scholarly attention toward experiential learning, competency development, and behavioural dimensions of immersion-based education. This stage reflects the diversification of immersion research beyond traditional language-learning settings.

The most recent developments, highlighted in lighter green and yellow tones, are linked to technology-oriented and practice-based themes. Keywords such as virtual reality, e-learning, decision making, professional practice, and workforce indicate increasing interest in digital learning environments, professional training, and applied educational contexts. The appearance of these terms suggests that contemporary research is moving toward more innovative, interdisciplinary, and practice-driven applications of immersion learning. Overall, the overlay map shows a clear transition in school immersion program research over the past 50 years, moving from a strong emphasis on bilingual and language immersion foundations toward broader educational, psychological, technological, and professional applications. This evolution reflects the increasing interdisciplinary nature of the field and the growing integration of digital innovation and practice-oriented learning contexts.

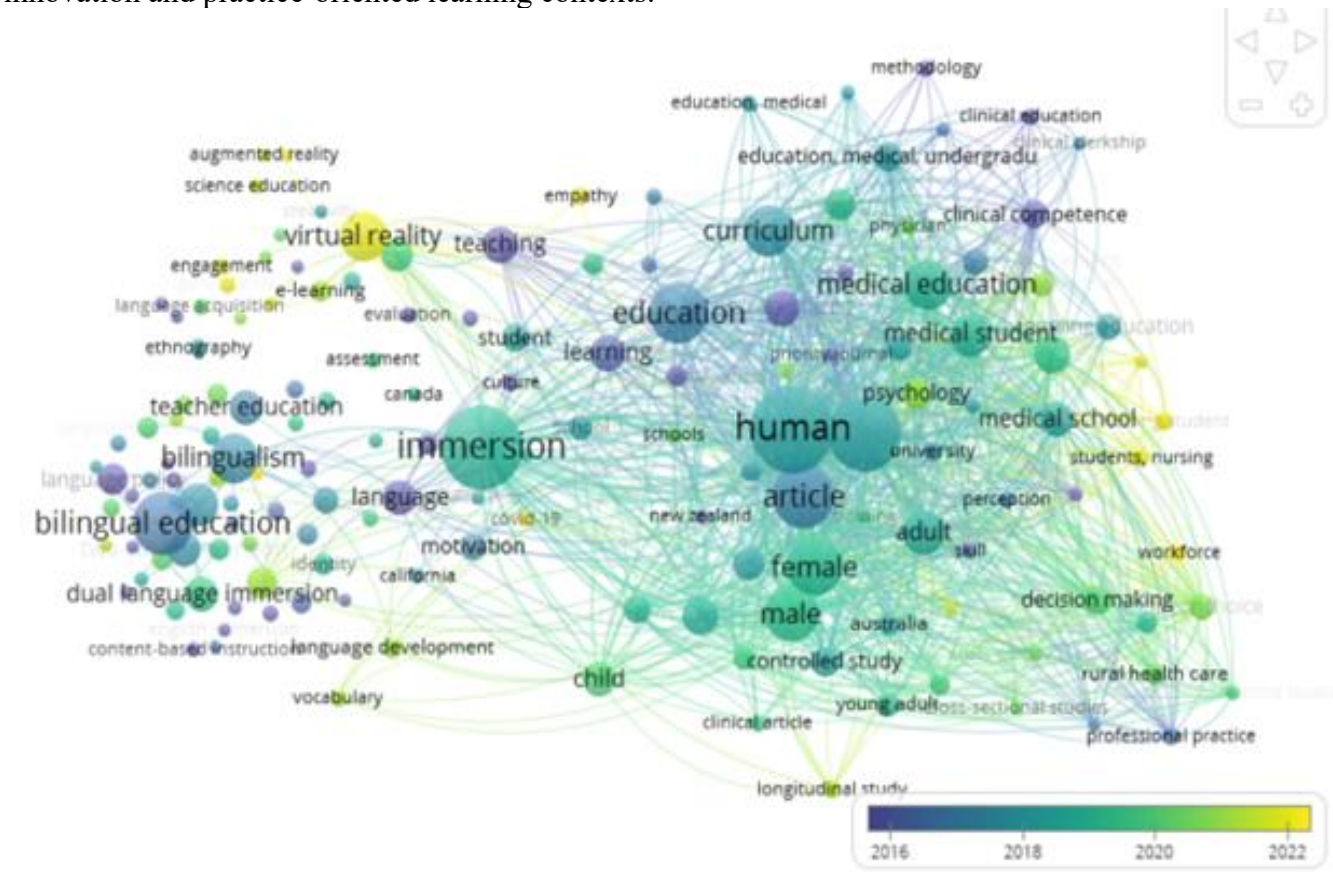

Figure 8. Temporal Development of School Immersion Program Research Based on Keyword Overlay Analysis

Source: Scopus Database

In the density visualisation, colour intensity represents the frequency and concentration of keywords within the dataset. Bright yellow areas indicate the most frequently occurring and highly connected terms, while

green and blue regions represent less prominent keywords with lower levels of occurrence (Digdowiseiso, 2025). Figure 9 shows the strongest concentration around the keyword's immersion, human, article, education, and bilingual education, indicating that these concepts form the central foundation of school immersion program research. The high-density presence of these terms reflects the dominant focus on immersion-based learning, bilingual instruction, and human-centred educational studies.

Moderately dense areas are clustered around themes such as medical education, curriculum, medical student, teacher education, bilingualism, learning, and language. This pattern suggests sustained scholarly attention toward curriculum development, language acquisition, professional education, and instructional practices within immersion settings. The prominence of both educational and medical-related terms further highlights the interdisciplinary expansion of immersion research into healthcare and competency-based learning environments. At the outer and lower-density regions are keywords such as virtual reality, e-learning, decision making, professional practice, and rural health care. These terms represent newer or more specialised research directions that remain less developed compared to the dominant bilingual and educational themes. Their presence nevertheless indicates increasing scholarly interest in technology-supported learning, applied professional training, and experiential educational approaches.

Overall, the density map reinforces the strong dominance of bilingual and immersion education as the intellectual core of the field, while also demonstrating the gradual diversification of research into technological, medical, and practice-oriented learning contexts (Figure 9).

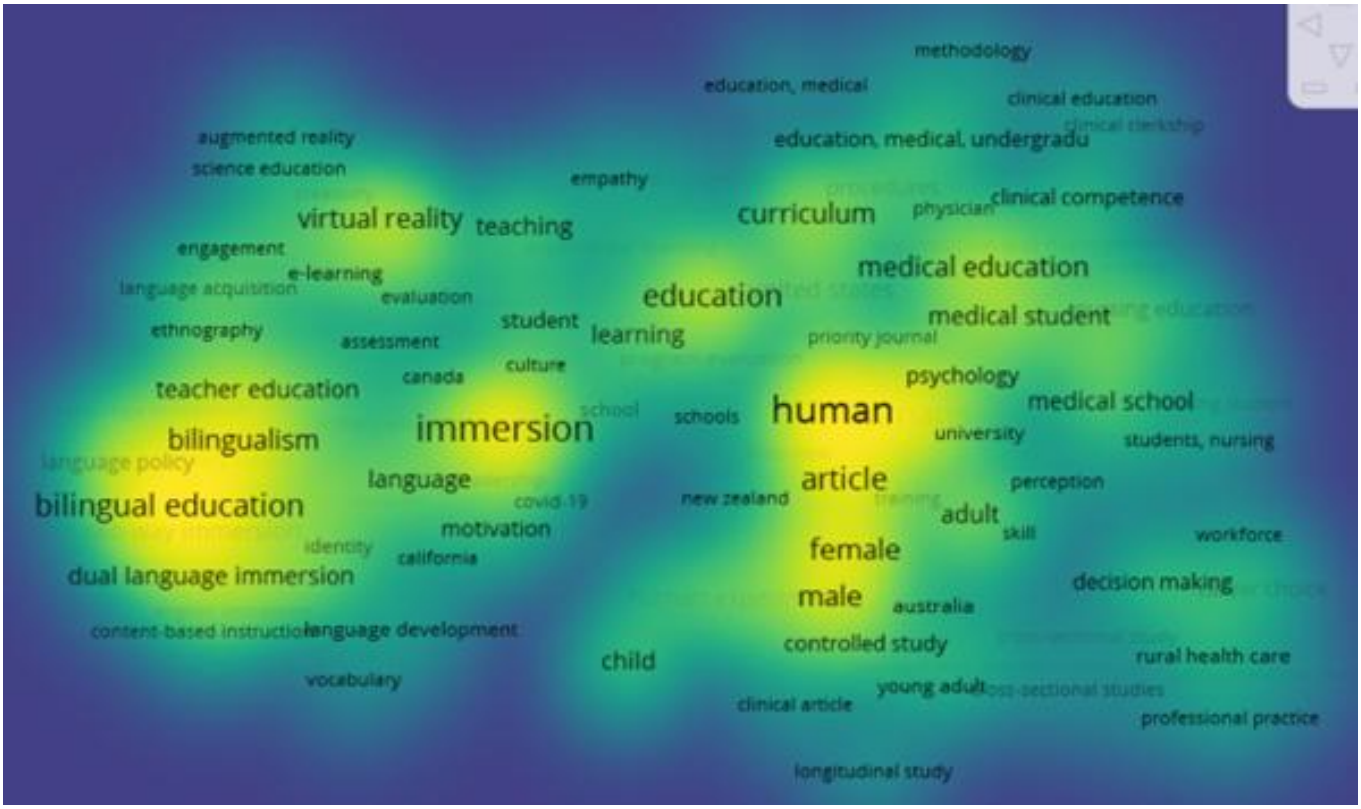

Figure 9. Keyword Density Analysis of School Immersion Program Research

Source: Scopus Database

DISCUSSION

The growing scholarly attention toward school immersion programs reflects broader global transformations in education, communication, and workforce expectations. Increasing globalisation, migration, and multicultural interaction have intensified the importance of multilingual competence and intercultural understanding within education systems. As societies become more linguistically and culturally diverse, immersion-based learning approaches are increasingly viewed as effective mechanisms for improving

language proficiency, cultural adaptability, and inclusive educational engagement (Wang et al., 2025). This development may explain the substantial expansion of school immersion research in recent years and its increasing interdisciplinary relevance. For Malaysia, these findings are particularly important given the country's multicultural and multilingual social structure. Malaysia consists of diverse ethnic and linguistic communities, making immersion-based educational approaches potentially valuable for strengthening intercultural understanding, communication skills, and national integration (Renganathan, 2023). Future Malaysian school immersion initiatives could therefore focus not only on language proficiency, but also on experiential learning, collaborative interaction, and intercultural engagement to improve overall program effectiveness and student adaptability within diverse educational environments.

The strong concentration of research activity within developed Western countries may be influenced by several structural factors. Countries such as the United States, Canada, Australia, and the United Kingdom possess longer histories of bilingual education policy implementation, stronger educational research infrastructure, and greater institutional funding capacity (Sanchez-Perez & Manzano-Agugliaro, 2021). Multilingual educational models in these countries are often associated with immigration policies, multicultural integration, and national identity development (Perez-Izaguirre et al., 2024). Consequently, immersion programs have received sustained academic and policy attention as mechanisms for educational inclusion and social cohesion. Malaysia may draw several important lessons from these experiences. Given its multilingual educational environment and cultural diversity, Malaysia has the potential to strengthen school immersion initiatives through more structured bilingual and intercultural learning frameworks. Greater collaboration with neighbouring countries such as Singapore may also provide valuable insights, particularly because both countries share multilingual educational characteristics and multicultural societal contexts (Patras et al., 2022). Cross-country collaboration could support curriculum development, teacher training, policy benchmarking, and the sharing of best practices related to immersion-based education in Southeast Asia.

The interdisciplinary expansion of school immersion program research further suggests that immersion learning is no longer confined to traditional second-language instruction. Instead, immersion approaches are increasingly applied within healthcare, professional education, behavioural studies, and technology-supported learning environments. This shift may be driven by growing recognition that immersive educational experiences can strengthen communication skills, collaborative learning, professional competence, and real-world problem-solving abilities. The integration of immersion concepts into medical and workforce-oriented training indicates that immersion education is evolving into a broader competency-development strategy rather than functioning solely as a language-learning mechanism (Abhishek et al., 2026).

The emergence of technology-related themes such as virtual reality and e-learning also reflects changing educational practices in the digital era. Advances in educational technology have created new opportunities for immersive and interactive learning experiences that extend beyond physical classrooms. The expansion of online and hybrid learning environments, particularly following the COVID-19 pandemic, has likely accelerated interest in digitally mediated immersion approaches (Power et al., 2024). These developments suggest that future immersion education models may increasingly combine physical, virtual, and hybrid learning environments to enhance engagement and experiential learning outcomes (Kee et al., 2024). In Malaysia, this direction is consistent with the Ministry of Education's Digital Education Policy, which provides a national policy framework for strengthening digital education. Accordingly, virtual reality, AI-supported learning, and digital immersion could be incorporated into school immersion activities to provide simulated intercultural environments, personalised learning experiences, and opportunities for students to develop digital and adaptive competencies. For Malaysia, the integration of technology into school immersion programs is becoming increasingly important considering global economic uncertainty, geopolitical tensions, and the evolving demands of the future workforce (Rahimi & Oh, 2024). Ongoing geopolitical conflicts and global energy-related disruptions continue to reshape labour market expectations and accelerate digital transformation across industries. As a result, school immersion programs should not focus exclusively on cultural exposure and language acquisition, but also incorporate digital competencies, artificial intelligence (AI) literacy, problem-solving skills, and adaptive learning capabilities. The growing

influence of AI technologies within education and employment sectors further suggests that future immersion programs must prepare students for technologically driven environments and emerging workforce realities (Wang & Huang, 2025).

The findings suggest that school immersion program research has evolved beyond a narrow focus on bilingual and language acquisition theories toward a broader interdisciplinary educational framework. The growing integration of psychology, professional education, digital learning, and experiential learning themes indicates that immersion programs should be understood not only as language-learning mechanisms, but also as platforms for behavioural, cognitive, and competency development. The emergence of technology-related themes such as virtual reality and e-learning further highlights the need for future theoretical models to incorporate digital pedagogy, AI-supported learning, and hybrid immersion approaches (Korobkova, 2025). In addition, the findings reveal that behavioural transformation and long-term competency development remain relatively underexplored areas, suggesting important opportunities for future research.

The findings suggest that Malaysian school immersion programs could potentially extend beyond traditional language-learning objectives by incorporating intercultural engagement, behavioural development, digital readiness, and experiential learning elements. Given Malaysia's multicultural and multilingual environment, such approaches may contribute to social integration, communication skills, and adaptive learning competencies. Implementation could be considered progressively, beginning with pilot programmes in selected schools, followed by evaluation and potential wider adoption in subsequent implementation cycles. In this regard, the Ministry of Education could provide broad policy direction and curriculum guidance, while schools could coordinate programme delivery and student participation, supported by teachers with appropriate professional development. Schools should adopt more student-centred and interdisciplinary approaches that integrate collaborative learning, problem-solving activities, digital technologies, and real-world immersion experiences. Teacher training should also be strengthened, particularly in intercultural communication, experiential pedagogy, and technology-supported learning to ensure more effective program delivery. Monitoring systems should move beyond measuring language proficiency and academic performance alone. Policymakers should also evaluate behavioural change, intercultural adaptability, communication skills, emotional development, and digital competency outcomes. Longitudinal assessment frameworks may help determine whether immersion programs contribute to sustained behavioural transformation and long-term human capital development. Overall, the findings suggest that Malaysian school immersion programs should be repositioned as broader educational transformation initiatives that integrate multicultural learning, behavioural development, digital competency, and experiential education.

Several limitations should be acknowledged. First, the analysis relied solely on bibliometric methods, which limited the ability to examine the contextual and empirical dimensions of school immersion programmes. Second, the dataset was limited to Scopus-indexed publications, which may have excluded relevant studies from other databases or regional sources and may have introduced language bias by under representing relevant studies published in languages less represented within the database. Future research could address these limitations by expanding the bibliometric dataset to include databases such as Web of Science and regional indexing platforms, while also incorporating empirical approaches such as qualitative interviews, surveys, or comparative case studies to provide deeper contextual insights into the implementation and outcomes of school immersion programmes.

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