

Gagne's Instructional Design in Vocational Training: Insights from A Bibliometric Analysis

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ABSTRACT

Gagne's instructional design framework has formed a cornerstone in educational research, with the systematic movement of learners from theoretical understanding to practical skill application. Through its Nine Events of Instruction, the framework provides a structured pathway that meets demands for diversity in educational contexts, especially in vocational training where competency-based learning and real-world application are paramount. The paper provides a bibliometric review of Gagne-related research into publication trends, geographic contributions, and thematic clusters. The findings show remarkable peaks in scholarly activity during the years 2023 and 2024, reflecting an increasing relevance of Gagne's principles when it comes to tackling the complexities of hybrid and digital learning environments. Geographical disparities in the contribution of research works point to the dominance of high-income nations, headed by the USA, while developing contributors like Malaysia and Turkey show growth in influence toward the positive movement of global inclusiveness. Structured learning, skill development, and interdisciplinary innovation are major themes emerging through keyword co-occurrence mapping, while peripheral clusters represent developing areas such as virtual reality and artificial intelligence in instructional design. These findings point out the flexibility of Gagne and his potential to renew vocational education by embedding state-of-the-art technologies and collaboration of different disciplines. This study concludes by calling for a fair distribution of resources and the exploration of underrepresented themes to keep Gagne's framework relevant to the changing needs of modern education. This research synthesizes bibliometric insights that indicate the Gagne instructional design model has remained very relevant in preparing learners for success in a rapidly changing global landscape.

Keywords: Instructional design, Bibliometric analysis, Vocational education, Gagne's framework

INTRODUCTION

Bibliometric analysis offers a systematic approach to exploring the academic impact and thematic evolution of scholarly works. In this dataset, notable authors and their contributions form the foundation for understanding the dynamic interplay of theoretical advancements and practical applications. For example, Syahrial et al., (2024) delve into the application of Gagne's theory in optimizing educational strategies, shedding light on the pivotal role of structured teaching methodologies in improving learning outcomes. It underscores the enduring influence of foundational educational theories in contemporary academic discourse. Similarly, McNeill, (2024) explores the transformative potential of micro-investments in online learning environments, emphasizing the nuanced strategies that maximize educational reach and effectiveness. The collaborative efforts of Turmel et al., (2024) highlight the intersection of political equality and democratic frameworks, contributing to a broader understanding of societal structures. Meanwhile, Wright, (2024) and Thraves, (2024) bring unique perspectives to their respective fields, further diversifying the intellectual scope of this dataset.

Such insights underscore the interconnected nature of scholarly pursuits and highlight how individual

contributions coalesce into a collective body of knowledge. This examination not only evaluates the quantitative aspects of research output such as citation counts and publication venues but also delves into the qualitative narratives that define academic trajectories. It seeks to show an integrated perception of the scholarship landscape by situating individual authors and their works into a broad bibliometric context and, in such a way, informing future research and interdisciplinary synergies.

LITERATURE REVIEW

The study of pedagogical approaches within vocational education consistently emphasizes the critical interplay between theoretical models and practical implementation. The abstracts reviewed represent continuing efforts to identify productive instructional frameworks, particularly when theories of learning are themselves derived from soundly principled educational contexts, such as Gagne's Nine Events of Instruction. This model retains a formal view of instructional design, focusing on steps in sequence: attention gained, objective presentation, stimulus recall, content presentation, guidance, performance elicited, feedback given, and performance assessed and retention enhanced. These principles have been applied in vocational education to optimize learning outcomes by addressing both cognitive and procedural dimensions of skill acquisition (Sangsawang, 2020). A recurring theme in the reviewed works is the emphasis on microlearning as a scalable and impactful approach for vocational learners. This method aligns well with the dynamic needs of adult learners and working professionals, offering modular and contextually relevant content that integrates seamlessly into professional workflows (Krismadinata et al., 2020). The practical implications of this strategy include heightened learner engagement and improved retention rates, showcasing the adaptability of microlearning for diverse vocational contexts. Another significant dimension involves the integration of equity-focused methodologies in vocational training.

This reflects a growing recognition of the socio-economic barriers that often impede access to quality education and employment opportunities. Strategies highlighted include institutional reforms and inclusive learning programs, such as those tailored for diverse socio-economic backgrounds (Darwin, 2007). Such efforts align with broader global objectives to bridge skill gaps and foster inclusive economic growth. Innovative methodologies, such as leveraging gamification and digital tools, are increasingly being implemented to enhance engagement in vocational settings. These approaches address the evolving preferences of modern learners, who often favor interactive and technology-mediated instruction over traditional didactic methods. Examples include frameworks for multimedia-based performance assessment (De Klerk et al., 2018) and motivational augmented reality applications in training (Bacca et al., 2019). These technological integrations contribute to the bibliometric trend of advancing digital pedagogy in vocational education research. Gifted education within vocational contexts also emerges as a nuanced topic, emphasizing tailored pathways for high-achieving learners. Such frameworks advocate for differentiated learning environments where exceptional talent can be nurtured without compromising the inclusivity of vocational training systems (Suyanto & Sofyan, 2017). This aligns with bibliometric findings that identify talent differentiation as a growing area of interest in vocational education studies.

The analysis also sheds light on policy frameworks that underpin vocational education reforms. The role of governments and educational institutions is crucial in fostering environments where theoretical advancements translate into meaningful practice. Collaborative efforts between academia, industry, and policymakers are pivotal in aligning vocational training with labor market demands, ensuring learners are equipped with relevant and future-ready skills (Wang, 2024). Bibliometric insights highlight the importance of interdisciplinary collaboration in achieving these goals. The reviewed literature underscores the multidimensional nature of vocational education, where pedagogical innovations, equity-driven policies, and adaptive methodologies converge to create robust learning ecosystems (Sri et al., 2024). According to Xing & Diao, (2024) integrating technology and evidence-based practices continues redefining the boundaries of vocational training, aligning it more closely with the needs of modern economies and diverse learner populations. Future research, as supported by bibliometric trends, should continue to explore these intersections, ensuring that vocational education remains a dynamic and impactful domain.

RESEARCH QUESTIONS

RQ1: What factors influence the rise and fall of scholarly publication trends over time in a specific academic

field?

RQ2: How do patterns of author contributions influence leadership, collaboration, and diversity in a research field?

RQ3: How do geographic differences and collaborations shape research productivity and equity?

RQ 4: How do thematic clusters and connections in co-occurrence networks influence knowledge development in a research field?

RQ5: How do co-citation networks reveal core ideas, interdisciplinary links, and new research opportunities in a field?

RQ6: How do bibliographic coupling patterns reveal the roles of leading nations, emerging contributors, and regional collaborations in global research?

METHODOLOGY

Combining, organizing, and analyzing bibliographic data from scientific publications is known as bibliometrics. (A. Verbeek et al., 2002; Assyakur & Rosa, 2022; Saad et al., 2024). Alongside standard descriptive details, such as publishing journals, publication year, and primary author categorization. Wu & Wu, (2017) also incorporate sophisticated methodologies such as document co-citation analysis. An attractive literature review implies a methodical process that involves pinpointing relevant keywords, conducting literature searches, and performing detailed analysis to create a thorough bibliography and produce reliable outcomes (Jusoh & Ishak, 2024). In light of this, the research tried to target the most premium publications because they provide better insights into the theoretical aspects that shape up the trends of evolution of the research area. The data collected for the study was extracted from the SCOPUS database due to reliability reasons (Alves et al., 2021; Di Stefano et al., 2010). Moreover, to ensure the inclusion of high-quality publications, only articles published in meticulously peer-reviewed academic journals were chosen, deliberately omitting books and lecture notes..(Appio et al., 2014). Notably, Elsevier's Scopus, known for its extensive coverage, facilitated the collection of publications spanning from 2011 to December 2024 for subsequent analysis.

Data Search Strategy

The search terms for article retrieval were identified through a screening sequence in the investigation. Study was initiated by querying the Scopus database with online TITLE-ABS-KEY(("Gagné" OR "Gagné's instructional model" OR "Gagné's nine events of instruction" OR "Gagné's principles of learning" OR "R.M. Gagné" OR "Robert Gagné" OR "Robert M. Gagné" OR "Robert Mills Gagné" OR "Gagné's instructional framework")) This resulted in the compilation of 984 articles. The results were then reduced to 214 articles when the query was honed to concentrate on particular study genres, such as conference papers, book chapters, and articles. Only research articles written in English and in the final stages of publication within the last 15 years were included in this further filter. Ultimately, a total number of 214 articles was identified for 15 years, from 2011 to 2024. The study covered every publication on the Gagne framework and education found in the Scopus database as of December 2024. These 15 years were chosen to provide reliable data from the Scopus database on research trends about education and the Gagne framework.

Table 1: The search string.

Scopus	TITLE-ABS-KEY (("Gagné" OR "Gagné's instructional model" OR "Gagné's nine events of instruction" OR "Gagné's principles of learning" OR "R.M. Gagné" OR "Robert Gagné" OR "Robert M. Gagné" OR "Robert Mills Gagné" OR "Gagné's instructional framework"))
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Table 2: The selection criterion is searching

Source: Moher et al., (2009)

Criterion	Inclusion	Exclusion
Language	English	Non-English
Time line	2011 – 2024	< 2011
Literature type	Journal (Article), Book, Book Chapter and Conference Paper	Review, Note, Short Survey, Erratum

Data Analysis

Nees Jan van Eck and Ludo Waltman from Leiden University in the Netherlands created the user-friendly bibliometric software named as VOSviewer (N.J. Van Eck & L. Waltman, 2010, 2017). This widely recognized tool for analyzing and visualizing scientific literature excels at producing intuitive network visualizations, density maps, and clustering representations. Its versatility allows researchers to investigate co-authorship, co-citation, and keyword co-occurrence networks, providing a comprehensive view of research landscapes. With a user-friendly interface and regular updates, it facilitates efficient and dynamic analysis of extensive datasets. Because of its advanced capabilities for computing metrics, customizing visualizations, and integrating data from diverse bibliometric sources, VOSviewer proves invaluable for scholars tackling complex research challenges.

VOSviewer is a highly regarded tool for transforming intricate bibliometric data into intuitive visual representations, including maps and charts. Renowned for its ability to create density maps, analyze keyword co-occurrence patterns, and cluster-related items, the software excels in network visualization. Its user-friendly design appeals to both novice and seasoned researchers, facilitating an in-depth exploration of research landscapes. Regular updates ensure that VOSviewer remains at the forefront of bibliometric analysis, offering robust metrics and customizable visualization features. Its flexibility in determining a number of bibliometric data types, such as co-authorship trends and citation metrics, positions it as a crucial resource for scholars seeking an extensive knowledge of their academic disciplines.

Data from the Scopus database spanning the years 2011 to December 2024, included publication details such as year, title, authors, journal, citations, and keywords. These plain-text datasets were analyzed using VOSviewer (version 1.6.19), leveraging its advanced clustering and visualization tools to derive meaningful insights. Unlike traditional Multidimensional Scaling (MDS) methods, VOSviewer maps items in low-dimensional spaces, ensuring their spatial relationships accurately represent their similarity and level of connection (N.J. Van Eck & L. Waltman, 2010). While sharing some conceptual similarities with MDS (Appio et al., 2014), this customized method significantly improves the precision of visualized relationships, establishing VOSviewer as an indispensable tool for bibliometric analysis. Unlike traditional approaches, VOSviewer emphasizes the normalization of co-occurrence frequencies using metrics such as association strength (AS_{ij}), derived from a unique calculation formula (N.J. Van Eck & L. Waltman, 2007) as shown below:

$$AS_{ij} = \frac{1}{4} \frac{C_{ij}}{\sqrt{W_i W_j}}$$

This is proportional to the ratio of the actual occurrences of i and j to the anticipated occurrences of i and j , believing that the co-occurrences of i and j are statistically independent. Consequently, VOSviewer uses this index to minimize the weighted sum of the squared distances between all item pairings before arranging the items in the form of a map. Aparicio et al., (2016) state that the LinLog/modularity normalization was used. By leveraging VOSviewer to visualize the dataset, patterns rooted in mathematical relationships were identified.

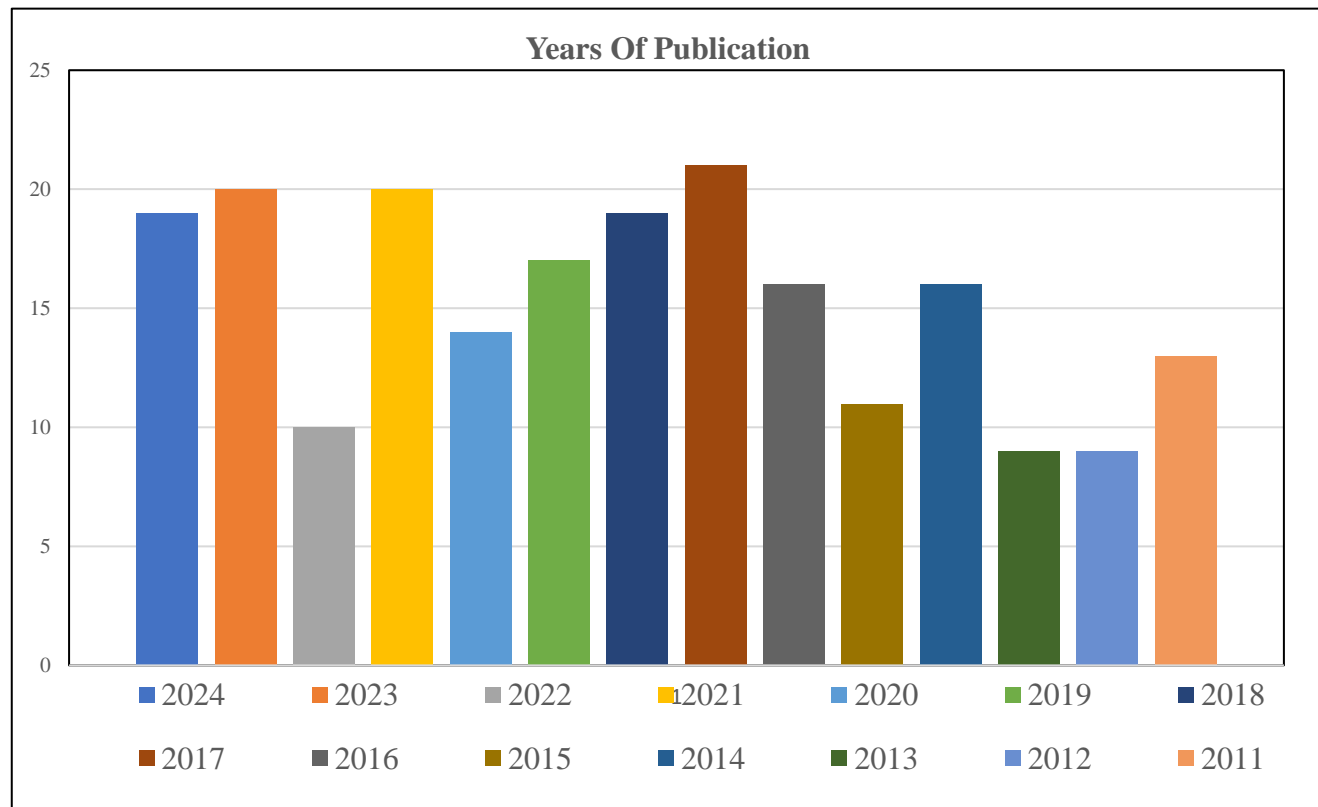
This approach enabled the implementation of analyses such as co-citation studies, keyword co-occurrence mapping, and citation evaluations.

RESULT AND FINDING

Based on the research question, or RQ 1, RQ 2, RQ 3, RQ 4, RQ 5, and RQ 6 the study's findings and associated comments are provided as follows:

What are the research trends in Gagne's studies according to the year of publication?

Figure 1: Document publication by years.



Understanding the trajectory of scholarly outputs is essential for comprehending the development and maturity of a research field over time. This analysis of publication trends from 2011 to 2024 provides a detailed perspective on the dynamics of scholarly productivity, contextualizing the findings within broader research cycles, external influences, and methodological advancements. The timeline reveals a cyclical pattern of peaks and troughs, reflecting the interplay between periods of exploration and consolidation. Peaks, such as those observed in 2023 and 2024 with 20 and 21 publications respectively, indicate phases of rapid growth likely driven by increased funding, technological advancements, or the establishment of collaborative networks. These periods often correspond to transformative phases marked by breakthroughs or the prioritization of specific research agendas. Conversely, troughs in productivity, such as those in 2013 and 2022, may reflect challenges like funding reductions, global disruptions, or shifts in research priorities. Despite these fluctuations, the field demonstrates resilience, as evidenced by its recovery and sustained upward trajectory, underscoring the adaptive nature of academic scholarship in navigating evolving challenges.

Descriptive statistics further enrich this understanding, offering quantitative insights into the field's productivity trends. The average annual publication count of 15.3, with a standard deviation of 4.3, reflects moderate year-to-year variability, while the interquartile range of 11.5 to 19 publications highlights a stable baseline of output. Outliers in the data signal significant transformative or challenging phases, with peaks in years like 2017 and 2023 corresponding to the introduction of innovative methodologies, landmark publications, or external factors influencing scholarly focus. The sharp rise in 2024 suggests enhanced accessibility to publication platforms and the culmination of long-term research initiatives, signaling a promising growth trajectory. On the other hand, periods of reduced productivity, such as those in 2013 and 2022, highlight the impact of funding constraints,

systemic disruptions, or moments of scholarly reflection. These cyclical patterns emphasize the importance of sustained support for academic research to navigate uncertainties and maintain momentum. By situating these findings within a broader qualitative and contextual framework, this analysis provides a comprehensive understanding of the forces shaping scholarly productivity. It illuminates historical trends and informs strategies for future research and policy-making, ensuring the field remains dynamic, adaptable, and well-equipped to address the complexities of an ever-evolving academic landscape(Deli et al., 2024).

Who writes the most cited articles?

Figure 2: Trends of document by author

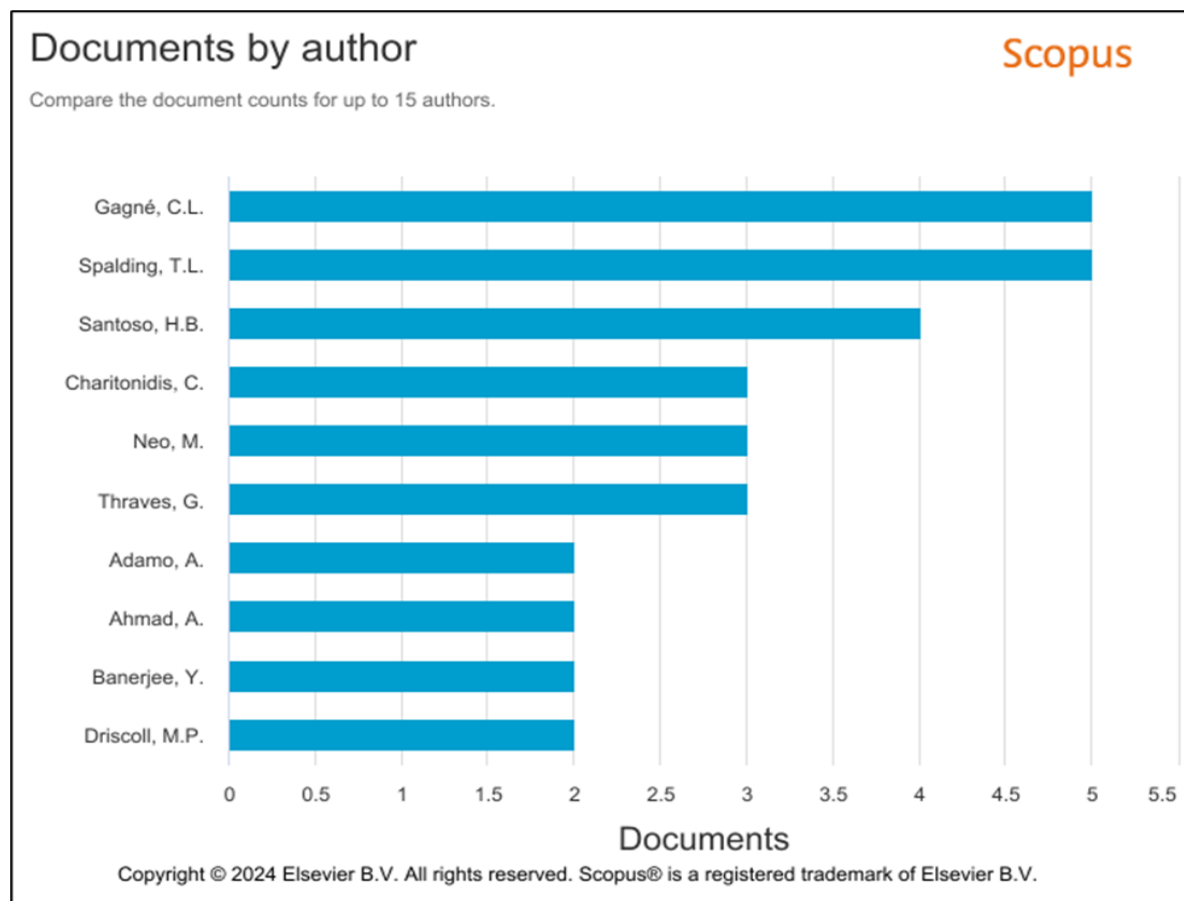


Table 3: Trends of document by author and percentage

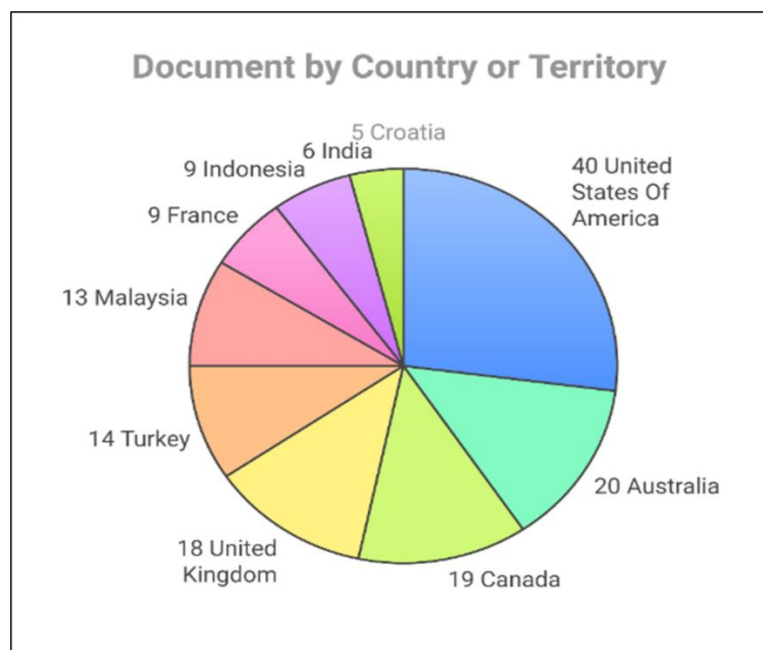
Author Name	Number of Document	Percentages (%)
Neo, M.	4	2.3
Santoso, H.B.	4	2.3
Thraves, G.	3	1.7
Ahmad, A.	2	1.14
Banerjee, Y.	2	1.14
Charitonidis, C.	2	1.14
Cotič, M.	2	1.14
Driscoll, M.P.	2	1.14
Jeffery, M.	2	1.14
Jurčec, L.	2	1.14

The analysis of author contributions provides an essential lens for understanding the dynamics of knowledge creation within a research domain. While some authors act as pivotal figures driving sustained inquiry, others may contribute intermittently, enriching the field with unique perspectives. These patterns of engagement not only highlight the collaborative nature of academic research but also provide insight into the structural diversity and resilience of the scholarly community. Against this backdrop, this analysis aims to critically examine authorial contributions to publications, uncovering trends that shape the research landscape. The bibliometric analysis highlights a stratified pattern of author contributions within the research field, ranging from high-output core contributors to a broad base of single-document participants. Key contributors, including Gagné, C.L. and Spalding, T.L., each with five publications, significantly influence the intellectual direction of the discipline by their consistent and influential contributions. These thought leaders likely influence research priorities and foster collaborations, anchoring the field's progression. Intermediate contributors, including authors with three to four publications, form a critical cohort that demonstrates consistent engagement.

Positioned to transition into leadership roles, their work reflects the potential for future growth and increased influence within the academic community. In contrast, the majority of contributors have authored only a single publication, a trend that underscores the inclusivity of the field, enabling diverse perspectives to enrich the scholarly discourse. However, this inclusivity raises concerns regarding the continuity and depth of engagement, given the relatively low maximum output of five publications and the decentralized nature of the field. To strengthen the field's scholarly output and foster sustained growth, targeted strategies are essential. Encouraging collaborations between core contributors and less frequent authors could bridge gaps in knowledge dissemination and productivity, while supporting intermediate contributors with resources and mentorship could enhance their leadership capacity and sustained scholarly engagement. Additionally, incentivizing continued participation from single-document authors would diversify the field's insights and foster innovation. The balance between leadership and inclusivity offers a foundation for a vibrant and dynamic research community. However, strategic interventions aimed at fostering collaboration, nurturing emerging scholars, and promoting sustained participation will be critical to expanding the field's scope and depth. Such efforts will ensure that the field remains robust, cohesive, and well-positioned to address evolving academic and societal challenges (Wu et al., 2022).

What are the types of documents categorized by country or territory of research?

Figure 3: Trends of document by country or territory



The pie chart reveals the type of document by country or territory where research on *gagne* has been most concentrated. Here's a breakdown of the main findings:

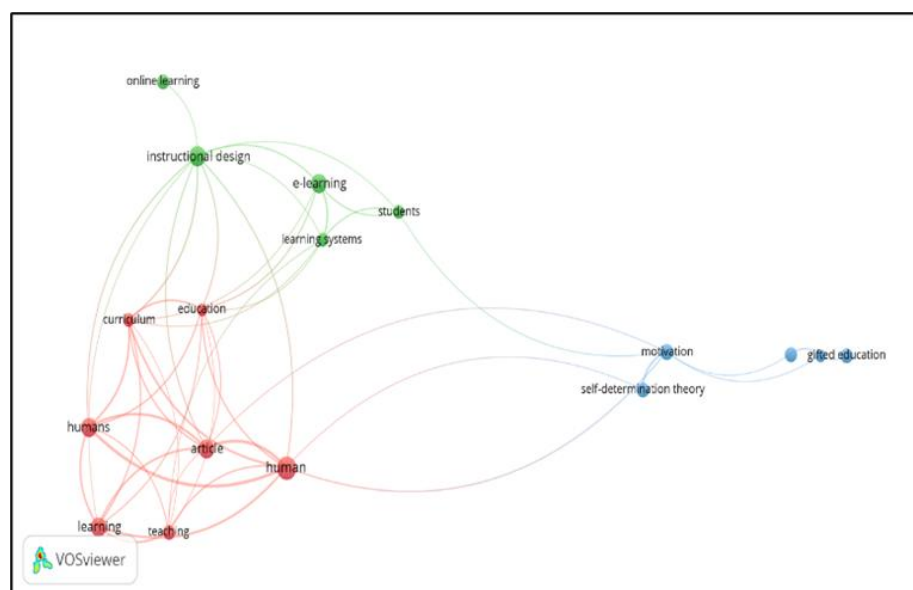
- The global distribution of scholarly contributions provides a window into the dynamics of research

production and dissemination. Academic output is shaped by a multitude of factors, including access to resources, institutional capacities, collaboration networks, and historical legacies of academic development. While high-income nations often dominate in terms of volume, the increasing participation of emerging economies reflects a growing democratization of knowledge production. In this context, the analysis of document contributions by country/territory seeks to uncover patterns and disparities that define the current landscape of research and highlight areas for potential growth and collaboration.

- ii) The geographic analysis of document contributions reveals a nuanced dynamic of concentration and inclusivity within the research field. High-income nations, such as the United States (40 documents), Australia (20 documents), Canada (19 documents), and the United Kingdom (18 documents), dominate scholarly output, leveraging their robust academic infrastructure, extensive funding mechanisms, and well-established traditions of international collaboration. These nations act as global hubs for innovation, setting research agendas and disseminating knowledge across disciplines. Emerging contributors, including Turkey and Malaysia (14 documents each), demonstrate the significant impact of targeted investments in education, research infrastructure, and international partnerships. These nations highlight a promising trajectory toward greater prominence in the global research network. Meanwhile, countries with smaller outputs, such as Indonesia, India, and Croatia, provide valuable diversity to the field, despite systemic barriers such as limited funding, infrastructural constraints, and restricted access to high-impact journals. This disparity underscores the importance of fostering inclusivity and reducing barriers to participation to harness the full potential of diverse academic contributions.
- iii) To cultivate a balanced and inclusive research ecosystem, coordinated strategic efforts are essential. High-output nations must collaborate with emerging contributors to promote knowledge transfer, capacity building, and innovation through initiatives such as joint projects, international conferences, and researcher exchange programs. Targeted investments in underrepresented regions, particularly those with smaller outputs, can strengthen their research ecosystems by improving infrastructural capacity, providing equitable access to publishing platforms, and fostering local expertise. Additionally, sustained monitoring of geographic contributions can help identify trends, successes, and areas requiring intervention, ensuring a data-driven approach to inclusivity and adaptability in global research. Bridging gaps between established and emerging contributors and empowering underrepresented regions will enrich the research landscape, fostering a dynamic and equitable academic community that maximizes the collective potential of all participants. This strategic approach will not only address existing disparities but also stimulate innovation and collaboration, ensuring the sustainability and relevance of global research efforts.

What is the map of co-occurrence keywords about Gagne's?

Figure 4: Network visualization map of co-occurrence keywords



In bibliometric research, co-occurrence keyword analysis provides a systematic method for revealing the conceptual framework and intellectual development of an academic discipline. This method provides valuable

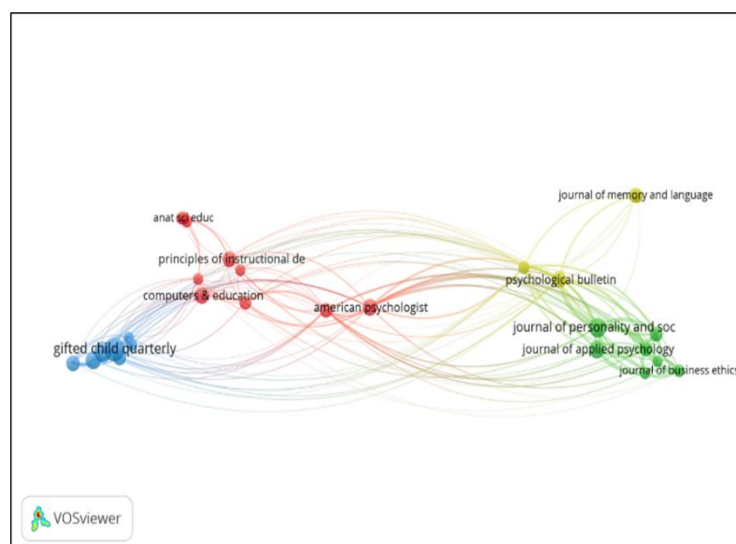
insights into core themes, interdisciplinary integration, and emerging areas of interest by analyzing the relationships and frequencies of keyword connections. This narrative examines the theme clusters identified from the co-occurrence network, providing an extensive overview of the study landscape. The yellow cluster serves as the foundation of the research field, encompassing essential themes such as "article," "curriculum," "education," "human," "humans," "learning," and "teaching." These closely interlinked keywords signify a focus on structured pedagogical frameworks and their application in instructional design. For example, the prominence of "curriculum" and "learning" underscores the systematic organization of knowledge delivery, while "teaching" highlights the implementation of these frameworks in practice. This cluster represents the intellectual backbone of the field, forming a cohesive base for further exploration and scholarly inquiry. The green cluster represents a bridge between traditional pedagogical approaches and contemporary technological advancements, incorporating keywords such as "e-learning," "instructional design," "learning systems," and "online learning." This cluster reflects the growing integration of digital tools and hybrid methodologies in education.

The centrality of "instructional design" within this cluster underscores its role as a nexus for connecting various subfields, enabling the adaptation of traditional strategies to innovative, technology-driven models. The prevalence of terms like "e-learning" and "online learning" illustrates the field's responsiveness to changing educational paradigms, emphasizing the need for flexible, adaptive instructional practices. The blue cluster highlights specialized and emerging topics, including "gifted," "motivation," "self-determination theory," "talent development," and "students." These keywords signify an increasing focus on personalized education and the psychological dimensions of learning. For instance, "motivation" and "self-determination theory" emphasize the importance of fostering learner autonomy and engagement, while "talent development" and "gifted education" address the tailored needs of specific learner groups. Although these topics are less central to the network, they represent important opportunities for future research, particularly in contexts requiring targeted or individualized educational interventions. Weaker connections in the network, such as those between "learning systems" and "students" or "self-determination theory" and "motivation," indicate nascent research areas or emerging interdisciplinary linkages. Strengthening these relationships could enhance the overall cohesiveness of the research domain, promoting a more integrative and comprehensive understanding of its dynamics.

The co-occurrence keyword analysis provides a detailed overview of the thematic structure and intellectual landscape of the field. The yellow cluster underscores foundational principles, the green cluster facilitates connections between traditional and innovative approaches, and the blue cluster explores specialized and nascent areas of study. Sustained development of these clusters, along with strategic efforts to enhance interdisciplinary connections and investigate underexplored topics, will ensure the continued evolution and relevance of the field. This approach supports both theoretical advancement and practical innovation, addressing the complexities and demands of contemporary educational contexts.

What are the popular sources related to the study?

Figure 5: Network visualization map of sources' co-citation

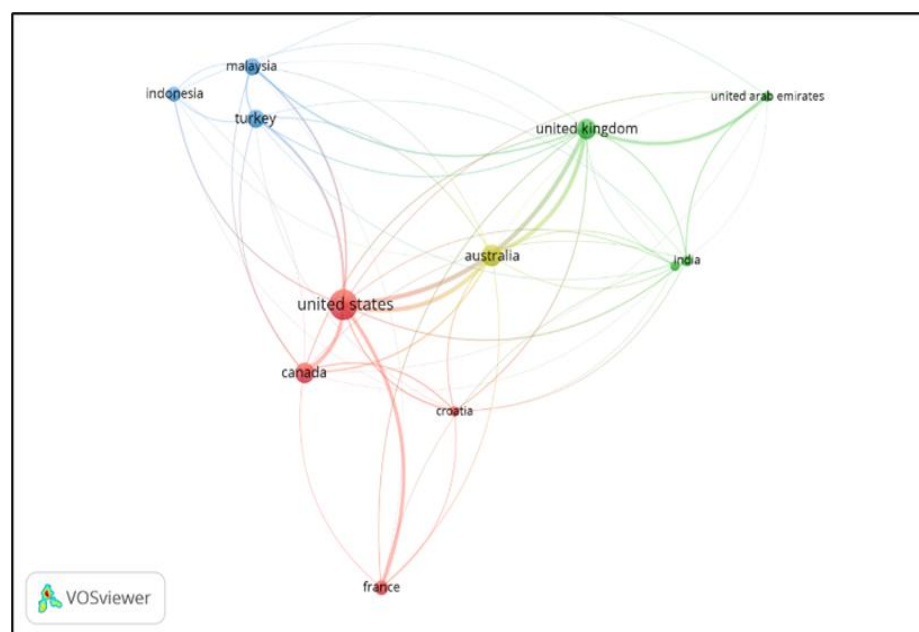


The co-citation network provides a vivid representation of the intellectual structure within the research field, showcasing clusters of frequently co-cited sources that shape the theoretical and methodological foundations of the domain. By analyzing the relationships among cited works, the network reveals distinct thematic groupings, highlighting foundational texts, interdisciplinary bridges, and emerging areas of inquiry. The visualization underscores the prominence of specific journals and texts as foundational pillars of the field. Core sources such as "Psychological Bulletin", "American Psychologist", and "Principles of Instructional Design" form a dense cluster, emphasizing their central role in shaping theoretical frameworks and advancing methodological practices. These works often serve as reference points for multiple studies, reinforcing their status as intellectual anchors within the domain. Their strong interconnectedness reflects their influence across a wide range of educational and psychological research themes. Interdisciplinary integration is evident through the connections between traditionally distinct fields. For example, sources like "Computers & Education" and "Journal of Business Ethics" highlight the growing convergence of instructional design, digital technology, and ethical considerations. These links suggest an evolving focus on addressing real-world challenges through the integration of diverse methodologies and perspectives. This bridging of disciplines signifies the adaptability and relevance of the field to contemporary educational and societal contexts. Emerging themes are represented by peripheral clusters such as "Gifted Child Quarterly", which point to specialized areas of inquiry, including talent development and the education of gifted learners. While less central to the network, these works highlight critical niches within the broader field, suggesting opportunities for deeper exploration and future research. The overall structure of the network reflects a dynamic interplay between foundational texts, interdisciplinary bridges, and emerging themes. The dense interconnections among core sources emphasize the established intellectual backbone of the field, while the more diffuse links to peripheral clusters indicate areas of untapped potential.

This co-citation analysis underscores the complexity and richness of the research landscape, providing a roadmap for future inquiries that build on established foundations while exploring new frontiers. By fostering interdisciplinary connections and engaging with specialized areas, the research community can continue to advance the field's theoretical and practical contributions. In conclusion, this co-citation analysis demonstrates that the field is built on a robust intellectual foundation with dynamic interdisciplinary connections and promising avenues for future exploration. By strategically nurturing core themes while encouraging the development of emerging areas, scholars can ensure the continued growth and relevance of the field. Such efforts will deepen theoretical understanding and equip the research community to address complex and evolving challenges in a rapidly changing academic landscape.

What is the collaboration between bibliographic coupling countries

Figure 6: Network visualization map of bibliographic coupling of countries



The bibliographic coupling analysis provides an intricate view of the global intellectual network shaping the

research field, highlighting patterns of shared references that signify collaboration, influence, and thematic convergence. This analysis not only identifies leading contributors but also uncovers the evolving role of emerging players, offering insights into the dynamics of scholarly exchange across regions. Prominent contributors such as the United States, United Kingdom, and Australia stand out as intellectual hubs within the field. The United States demonstrates unparalleled influence, characterized by the highest bibliographic coupling strength, reflecting its substantial research output, extensive collaborations, and a strong academic infrastructure. The United Kingdom and Australia follow closely, contributing significantly to the global discourse with their focus on high-quality, impactful research. The dense coupling between these countries indicates their shared reliance on foundational literature, which underpins their research and reflects a coherent intellectual trajectory within the field. This interconnectedness also underscores their role in advancing theoretical frameworks and methodological innovations that drive the field forward. Emerging contributors, such as Malaysia, Turkey, and Indonesia, represent an exciting trend of diversification in the research landscape. These countries are increasingly integrating into the global network, as evidenced by their growing bibliographic coupling with established leaders. Their rising engagement suggests an active contribution to expanding the field, often by contextualizing foundational research to address region-specific challenges and opportunities. For example, Malaysia and Turkey's bibliographic ties with high-output nations indicate their openness to adopting established methodologies while innovating within their local contexts.

This trend highlights the critical role of emerging regions in enriching the diversity of the field by introducing new perspectives and addressing underexplored areas. Further, countries such as India, United Arab Emirates, and Spain demonstrate the gradual establishment of new research nodes. Their coupling patterns indicate a strategic alignment with foundational works, enabling these nations to leverage established knowledge bases while making distinct contributions. India, for instance, shows a growing focus on building intellectual linkages that balance global standards with regional research priorities. Similarly, the United Arab Emirates' contributions underscore the significance of aligning national investments in research infrastructure with global intellectual currents, as reflected in its strong coupling with established players. The interplay between established leaders and emerging contributors underscores the dynamic evolution of the field. The strong coupling among leading contributors demonstrates their reliance on shared intellectual foundations and their leadership in driving the global research agenda. Meanwhile, the growing integration of emerging regions highlights the expanding inclusivity of the field, as these nations contribute new insights and context-specific innovations.

This dynamic not only broadens the geographical representation of research but also enhances the richness of intellectual exchange, fostering a more comprehensive and multidimensional understanding of the field. In conclusion, the bibliographic coupling analysis reveals a vibrant and evolving research network. Established contributors like the United States, United Kingdom, and Australia anchor the field with their strong intellectual foundations and high-quality research outputs. Emerging nations such as Malaysia, Turkey, and Indonesia inject diversity and innovation, while countries like India and the United Arab Emirates illustrate the potential of strategic alignment with global research standards. By fostering international collaborations and supporting the participation of underrepresented regions, the research community can ensure the continued growth, inclusivity, and innovation of the field. These efforts will not only sustain the field's intellectual vitality but also promote a more equitable and globally representative research ecosystem.

DISCUSSION

Gagne's instructional design framework, with its structured sequence of instructional events, has consistently served as a cornerstone in advancing teaching methodologies, particularly within vocational education. The framework's emphasis on transitioning learners from knowledge acquisition to practical application aligns with the competency-based demands of vocational training, where skill mastery and real-world applicability are paramount. Its ability to scaffold learning experiences allows vocational educators to systematically guide learners toward achieving industry-relevant competencies. Recent bibliometric analyses underscore the framework's adaptability, highlighting cyclical trends in scholarly output with notable peaks in 2023 and 2024, reflecting its renewed relevance in hybrid and digital learning contexts. Additionally, keyword co-occurrence mapping identifies central themes such as structured learning, skill development, and interdisciplinary

innovation, with peripheral areas like virtual reality and artificial intelligence suggesting opportunities for integration. Despite these advances, systemic challenges persist, as reflected in periods of reduced activity and geographic disparities in research contributions. Emerging contributors such as Malaysia and Turkey, however, signal a growing inclusivity that underscores the importance of fostering regional contributions and sustained scholarly engagement.

CONCLUSION

In conclusion, Gagne's instructional design framework remains an indispensable tool for modernizing vocational education, offering a structured, adaptable approach that bridges traditional pedagogical methods with the evolving needs of a technology-driven workforce. By integrating emerging technologies such as virtual reality and simulations, vocational programs can create immersive and effective learning environments, equipping learners with the competencies required for success in a globalized economy. To maximize its impact, future research must prioritize equitable resource distribution, interdisciplinary collaboration, and the exploration of underrepresented areas. These strategic efforts will ensure the framework's continued relevance, enabling vocational education to meet the demands of an ever-changing professional landscape and to prepare learners for meaningful contributions in the global workforce.

REFERENCES

1. Verbeek, K. Debackere, M. Luwel, & E. Zimmermann. (2002). Measuring progress and evolution in science and technology - I: The multiple uses of bibliometric indicators. *International Journal of Management Reviews*, 4(2), 179–211.
2. Alves, J. L., Borges, I. B., & De Nadae, J. (2021). Sustainability in complex projects of civil construction: Bibliometric and bibliographic review. *Gestao e Producao*, 28(4). <https://doi.org/10.1590/1806-9649-2020v28e5389>
3. Aparicio, M., Bacao, F., & Oliveira, T. (2016). An e-Learning Theoretical Framework. In *Educational Technology & Society* (Vol. 19, Issue 1).
4. Appio, F. P., Cesaroni, F., & Di Minin, A. (2014). Visualizing the structure and bridges of the intellectual property management and strategy literature: a document co-citation analysis. *Scientometrics*, 101(1), 623– 661. <https://doi.org/10.1007/s11192-014-1329-0>
5. Assyakur, D. S., & Rosa, E. M. (2022). Spiritual Leadership in Healthcare: A Bibliometric Analysis. *Jurnal Aisyah : Jurnal Ilmu Kesehatan*, 7(2). <https://doi.org/10.30604/jika.v7i2.914>
6. Bacca, J., Baldiris, S., & Fabregat, R. (2019). Framework for designing motivational augmented reality applications in vocational education and training. In *Australasian Journal of Educational Technology* (Issue 3). <http://piranya.udg.edu/quimica/files/TableOfFrameworksComparison.pdf>
7. Buscombe, C. (2013). Using Gagne's theory to teach procedural skills. *Clinical Teacher*, 10(5), 302–307. <https://doi.org/10.1111/tct.12051>
8. Darwin, S. (2007). The changing contexts of vocational education: implications for institutional vocational learning. *International Journal of Training Research*, 5(1), 55–71. <https://doi.org/10.5172/ijtr.5.1.55>
9. Deli, M. M., Rauf, U. A. A., Asha'ari, M. J., Jamil, A. H., Purwati, A. A., Abdullah, S. I. N. W., Ismail, F., & Harun, S. N. (2024). A Bibliometric Article Regarding Twin Technology In Technology Management For The Year 2019-2023: Industry In Malaysia. *Journal of Applied Engineering and Technological Science*, 5(2), 925–940. <https://doi.org/10.37385/jaets.v5i2.3244>
10. De Klerk, S., Veldkamp, B. P., & Eggen, T. J. H. M. (2018). A framework for designing and developing multimedia-based performance assessment in vocational education. *Educational Technology Research and Development*, 66(1), 147–171. <https://doi.org/10.1007/s11423-017-9559-5>
11. Di Stefano, G., Peteraf, M., & Veronay, G. (2010). Dynamic capabilities deconstructed: A bibliographic investigation into the origins, development, and future directions of the research domain. *Industrial and Corporate Change*, 19(4), 1187–1204. <https://doi.org/10.1093/icc/dtq027>
12. Hassan, S., & Baloch, H. (2020). Online Small Group Clinical Be(side) Teaching (BeST) Using

- Authentic Scenario with Hypothetico-Deductive Approach and Gagne Instructional Model. *Education in Medicine Journal*, 12(3), 55–64. <https://doi.org/10.21315/eimj2020.12.3.7>
13. Jusoh, M. Y. F., & Ishak, N. A. (2024). A Bibliometric Study On Energy Literacy And Education: Mapping Trends, Focus Areas, And Research Gaps. *Journal of Contemporary Social Science and Education Studies*, 4(2). <https://doi.org/10.5281/zenodo.13370480>
14. Krismadinata, Verawardina, U., Jalinus, N., Rizal, F., Sukardi, Sudira, P., Ramadhani, D., Lubis, A. L., Friadi, J., Arifin, A. S. R., & Novaliendry, D. (2020). Blended learning as instructional model in vocational education: Literature review. *Universal Journal of Educational Research*, 8(11B), 5801–5815. <https://doi.org/10.13189/ujer.2020.082214>
15. Kocaöz, O. E., & Yalçın, G. (2022). The effectiveness of Gagne’s model in concept teaching for a student with intellectual disability. *Journal of Pedagogical Research*. <https://doi.org/10.33902/jpr.202216895>
16. McNeill, L. (2024). Micro Investment, Big Reward: Leveraging Microlearning for Engagement and Student Success. In *Handbook of Research in Online Learning* (pp.339–362). The Netherlands: Brill.
17. Moher, D., Liberati, A., Tetzlaff, J., & Altman, D. G. (2009). Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. *BMJ*, 339(jul21 1) b2535–b2535. <https://doi.org/10.1136/bmj.b2535>
18. Mofrad, S., Zarifasanaiey, N., Bazrafkan, L., & Shahraki, H. R. (2021). The effect of multi- stage mobile training based on Gagne’s instructional design on learning, retention, and satisfaction of health volunteers. *Journal of Education and Health Promotion*, 10(1). https://doi.org/10.4103/jehp.jehp_1094_20
19. Ng, J. Y. (2014). Combining Peyton’s four-step approach and Gagne’s instructional model in teaching slit-lamp examination. *Perspectives on Medical Education*, 3(6), 480–485. <https://doi.org/10.1007/s40037-014-0136-x>
- N.J Van Eck, & L.Waltman. (2007). Bibliometric Mapping of the Computational Intelligence Field. <http://hdl.handle.net/1765/10073>
20. N.J.Van Eck, & L.Waltman. (2010). Software survey: VOSviewer, a computer program for bibliometric mapping. *Scientometrics*, 84(2), 523– 538. <https://doi.org/10.1007/s11192-009- 0146-3>
21. N.J.Van Eck, & L.Waltman. (2017). Citation-based clustering of publications using CitNetExplorer and VOSviewer. *Scientometrics*, 111(2), 1053–1070. <https://doi.org/10.1007/s11192-017-2300-7>
22. Patricia L. Smith, & Tillman J. Ragan. (1996). Impact of R.M. Gagné’s Work on Instructional Theory. *Proceedings of Selected Research and Development Presentations*.
23. Saad, S., Lani, M. N., Wan Abdullah, W. Z., Daniel, M. D.-D., Azra, M.N., Nik Ubaidillah, N. H., Jusoh, M. Y. F., Yarlina, V. P., & Imathiu, S. (2024). Navigating Global Research Trends on Seafoods-Related Foodborne Diseases: A Decadal Bibliometric Analysis. *Journal of Advanced Research in Applied Sciences and Engineering Technology*, 275–296. <https://doi.org/10.37934/araset.59.1.275296>
24. Sangsawang, T. (2020). An instructional design for online learning in vocational education according to a self-regulated learning framework for problem solving during the covid-19 crisis. *Indonesian Journal of Science and Technology*, 5(2), 283–198. <https://doi.org/10.17509/ijost.v5i2.24702>
25. Sri, R., Pujiastuti, E., Ardiyanto, J., Mukti, A., Susanto, E., Asri, A., & Widiyati, S. (2024). Interdisciplinary Collaboration Management at Vocational Education. *International Conference on Science, Education and Technology*, 10, 185–190. <http://proceeding.unnes.ac.id/ISSET>
26. Suyanto, W., & Sofyan, H. (2017). Vocational Education Development Framework in 21 st Century. <http://datapokok.ditpsmk.net/>
27. Syahril, Asrial, Sabil, H., Azzahra, M. Z., & Nawahdani, A. M. (2024). Optimizing Learning Through Gagne’s Theory: Teaching Video Analysis.For Prospective Teachers. *Jurnal Ilmiah Ilmu Terapan Universitas Jambi*, 8(2), 509–523. <https://doi.org/10.22437/jiituj.v8i2.37239>
28. Turmel, P., Robichaud, D., & Mossu, S. E. (2024). Qui paie gagne. Égalité démocratique, inégalités économiques et financement électoral au Canada. *Canadian Journal of Political Science*, 57(2), 254–277. <https://doi.org/10.1017/S0008423924000180>
29. Wang, X. (2024). Effective skills supply and grand vocational education: Interdisciplinary thinking on

-
- China's vocational education. *Vocation, Technology & Education*, 1.
<https://doi.org/10.54844/vte.2024.0521>
30. Wright, V. (2024). Introduction: the change in france. In V. Wright (Ed.), *Continuity and Change in France* (2nd ed., pp. 1–81). Routledge.
 31. Wu, S., Chen, W., Chen, W., & Zheng, W. (2022). Effects of Cultural Intelligence and Imposter Syndrome on School Belonging through Academic Resilience among University Students with Vocational Backgrounds. *International Journal of Environmental Research and Public Health*, 19(13).
<https://doi.org/10.3390/ijerph19137944>
 32. Wu, Y. C. J., & Wu, T. (2017). A decade of entrepreneurship education in the Asia Pacific for future directions in theory and practice. In *Management Decision* (Vol. 55, Issue 7, pp. 1333–1350). Emerald Group Publishing Ltd. <https://doi.org/10.1108/MD-05-2017-0518>
 33. Xing, L., & Diao, Y. (2024, June 20). Research on Digital Training in Higher Vocational Colleges under the Perspective of Human and Technology Integration. <https://doi.org/10.4108/eai.29-3-2024.2347749>