

ENHANCE STUDENT'S GROWTH MINDSET: EXPLORING THE INTERVENTION ALL AROUND THE WORLD USING BIBLIOMETRIC ANALYSIS

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Abstract : Growth mindset therapy research has grown considerably in the past decade. Intervention effectiveness is assessed, not global design, delivery, and implementation changes. This study used bibliometrics to map 2010–2025 growth mindset intervention structural change. From Publish or Perish, Google Scholar included 100 most-cited intervention studies. Topic trends, intervention typologies, and bibliometric mapping patterns emerged from VOSviewer co-occurrence and co-authorship studies. Quick, digital, scalable, and low-cost interventions replaced classroom ones. Growth mindset is now a cross-domain intervention to improve academic, mental, resilience, and career outcomes. Most influential research are from Western countries, mostly the US, indicating limited cross-cultural validation. Short and online interventions dominated the five intervention typologies because to their scalability and usefulness. This study provides a growth mindset intervention research approach and finds a significant scalability-impact trade-off. Systematic reviews, meta-analyses, and cross-cultural empirical investigations should examine intervention faithfulness, contextual variables, and cultural adaptability in addition to efficacy.

Keywords : Growth Mindset Intervention; Bibliometric Analysis; Scalability, Digital Intervention.

Abstrak : Penelitian terapi pola pikir pertumbuhan telah berkembang pesat dalam dekade terakhir. Efektivitas intervensi dinilai, bukan perubahan desain, penyampaian, dan implementasi secara global. Studi ini menggunakan bibliometrik untuk memetakan perubahan struktural intervensi pola pikir pertumbuhan tahun 2010–2025. Dari Publish or Perish, Google Scholar menyertakan 100 studi intervensi yang paling banyak dikutip. Tren topik, tipologi intervensi, dan pola pemetaan bibliometrik muncul dari studi ko-okurensi dan ko-kepenulisan VOSviewer. Intervensi yang cepat, digital, terukur, dan berbiaya rendah menggantikan intervensi di kelas. Pola pikir pertumbuhan kini menjadi intervensi lintas domain untuk meningkatkan hasil akademik, mental, ketahanan, dan karier. Penelitian yang paling berpengaruh berasal dari negara-negara Barat, sebagian besar AS, yang menunjukkan validasi lintas budaya yang terbatas. Intervensi singkat dan daring mendominasi lima tipologi intervensi karena skalabilitas dan kegunaannya. Studi ini memberikan pendekatan penelitian intervensi pola pikir pertumbuhan dan menemukan adanya pertukaran signifikan antara skalabilitas dan dampak. Tinjauan sistematis, meta-analisis, dan investigasi empiris lintas budaya harus meneliti kesetiaan intervensi, variabel kontekstual, dan kemampuan adaptasi budaya selain efektivitasnya.

Kata Kunci : Intervensi Growth Mindset; Analisis Bibliometrik; Skalabilitas; Intervensi Digital

INTRODUCTION

Over the past two decades, growth mindset has become one of the most influential psychological constructs in educational research. Originating from Dweck's implicit theories of intelligence, growth mindset proposes that intellectual abilities can be developed through effort, effective learning strategies, and appropriate support rather than being fixed traits (C. Dweck, 2017; C. S. Dweck & Yeager, 2019). This perspective has substantially reshaped contemporary educational psychology by positioning learners' beliefs about intelligence as an important determinant of motivation, persistence, resilience, and academic success (C. S. Dweck, 2015; Kapasi & Pei, 2022; Tao et al., 2022; Wolcott et al., 2021). The increasing educational importance of growth mindset is particularly relevant in countries such as Indonesia, where the 2018 Programme for International Student Assessment (PISA) reported that only approximately 29% of students demonstrated a growth mindset orientation (Risna, 2022). Consequently, considerable scholarly attention has shifted from understanding the construct itself toward designing interventions capable of fostering growth mindset across diverse educational settings.

Growth mindset interventions have subsequently become one of the most widely investigated psychological interventions in education. Numerous empirical studies demonstrate that these interventions improve motivation (Aditomo, 2015; Rhew et al., 2018), resilience (Yeager & Dweck, 2012), grit and persistence (Brez et al., 2020; Yalçın & Yilmaz, 2023), academic achievement (Burnette et al., 2017; Muthukrishnan et al., 2024; Paunesku et al., 2015), and broader educational outcomes (Brougham & Kashubeck-West, 2017; Sun et al., 2021). More recently, growth mindset interventions have expanded beyond academic settings to address mental health, anxiety, well-being, career development, and entrepreneurial self-efficacy (Burnette et al., 2020; Lipsey et al., 2023). This expansion suggests that growth mindset is increasingly functioning not merely as an educational outcome but as a broader psychological mechanism capable of facilitating adaptive development across multiple domains (Park et al., 2020).

The rapid expansion of intervention studies has generated a substantial body of evidence regarding effectiveness. Consequently, systematic reviews and meta-analyses have largely concentrated on determining whether growth mindset interventions produce significant effects, identifying moderators of intervention success, and estimating effect sizes across different populations (Burnette et al., 2022; Calo et al., 2024; Tipton et al., 2023). These studies have been instrumental in establishing the empirical efficacy of growth mindset interventions. However, by focusing primarily on intervention outcomes, they

provide limited insight into how intervention science itself has changed over time. Questions concerning how intervention designs have evolved, why delivery models have shifted, and how implementation strategies have transformed remain largely unanswered.

A similar limitation characterizes existing bibliometric studies. Recent bibliometric investigations have successfully mapped publication trends, keyword co-occurrences, collaboration networks, and research productivity within specific domains of growth mindset research, including mathematics education (Xu et al., 2022), educational practices during the COVID-19 pandemic (Sugiarti et al., 2024), online interventions (Lestari et al., 2025), and organizational or human resource development (Han & Stieha, 2020). Collectively, these studies provide valuable descriptive information regarding who publishes, where research is conducted, and which topics receive increasing scholarly attention. Nevertheless, their analytical focus remains largely structural, emphasizing publication patterns rather than explaining the developmental trajectory of intervention research itself.

As a result, an important conceptual gap remains. Existing systematic reviews explain whether growth mindset interventions work, whereas existing bibliometric studies describe where, when, and by whom the literature has developed. Neither line of research adequately explains how growth mindset intervention science has evolved. More specifically, little is known about the long-term transformation of intervention characteristics, including shifts in intervention design, delivery modalities, implementation strategies, scalability, and research orientation. Consequently, the field currently lacks an integrative perspective capable of explaining the developmental trajectory through which growth mindset interventions have progressed from intensive classroom-based programmes to scalable, digitally delivered, and cross-domain intervention models.

To address this gap, the present study employs bibliometric analysis of the 100 most-cited growth mindset intervention studies published between 2010 and 2025. Rather than evaluating intervention effectiveness or merely describing publication trends, this study investigates the evolutionary trajectory of growth mindset intervention science. Through co-occurrence, temporal overlay, and collaboration analyses, the study examines how intervention designs, implementation strategies, delivery models, and research priorities have transformed during the past fifteen years. By shifting attention from intervention outcomes to the evolution of intervention science itself, this study offers a broader understanding of how the field has matured beyond questions of effectiveness toward issues of scalability, contextual adaptation, and implementation.

Accordingly, this study makes three principal contributions. First, it moves beyond conventional bibliometric mapping by explaining the structural evolution of growth mindset intervention research rather than merely describing publication characteristics. Second, it proposes the Evolutionary Trajectory of Growth Mindset Intervention Science, a conceptual framework demonstrating how the field has transitioned from effectiveness-oriented interventions to implementation-oriented and scalability-driven intervention science. Third, the study establishes an empirical foundation for future research by identifying the next developmental frontier of growth mindset interventions, namely the integration of scalability, contextual adaptation, and implementation fidelity across diverse cultural and educational settings.

METHOD

The design used in this study is a bibliometric study. Bibliometrics is important because it enables objective and systematic analysis across all disciplines to map the fragmented scientific knowledge, it provides structured analysis for large volumes of data, helping to identify key trends, themes, and influential actors in research (Aria & Cuccurullo, 2017). Bibliometric techniques can also pinpoint current research areas and provide a roadmap for future studies (Xu et al., 2022). For bibliometric analysis, several major *databases* (including Scopus, Web of Science, Dimensions, PubMed, and Google Scholar) provide downloadable data (Zaitouni et al., 2024). This study utilizes Google Scholars as the primary database due to its broad coverage across disciplines and inclusion of diverse publication sources. Google Scholar was selected because growth mindset intervention studies are frequently published across multidisciplinary sources, including educational, psychological, health, and conference literature, which are often incompletely indexed by Scopus and Web of Science. Consequently, Google Scholar provides a broader representation of the intellectual landscape of growth mindset intervention research and is particularly useful for identifying influential studies across disciplinary boundaries.

Carefully conducted bibliometric studies can provide a solid foundation for advancing a field in meaningful ways. This gives academics the opportunity and power to: (1) gain a comprehensive understanding picture from a single source); (2) identify knowledge gaps that still exist; (3) acquire new ideas for further research; (4) position the contribution they will make appropriately in the field (Donthu, Kumar, Mukherjee, et al., 2021). Data collection is done through a publish or perish application with a search query: TITLE-ABS-KEY ("growth mindset" AND "intervention"). The screening process used strict inclusion criteria (only English-language journal articles with experimental/intervention themes for the period 2010–2025), resulting in the 100 most-cited articles as the final data.

The metadata is then exported in .csv format and analyzed using VOSviewer version 1.6.20. The bibliometric technique used is Co-occurrence analysis with the 'Full Counting' method, and the minimum threshold for keyword occurrence is set to 5 times. Analysis of collaboration between countries was also carried out using Co-authorship analysis to map the geographical distribution of research.

The data collection technique used in this study is documentation. The data in this study are secondary, in the form of articles published in scientific journals. Researchers search, collect, and analyse relevant information from these sources. Publish or Perish is a software program that can be used to retrieve and analyse academic citations (Harzing, 2020). This software is widely used to calculate citation metrics, such as the H-index and G-index (Raman et al., 2021). The search process employed the keyword of "Growth Mindset Intervention" to ensure relevance to the specific focus of this study. The initial search yielded approximately 1.000 articles. However, to ensure data quality, relevance, and manageability of the bibliometric analysis, a data cleaning a filtering process was conducted. This process involved selecting the top 100 most relevant articles, based on: (1) citation counts, and (2) relevance ranking provided by Google Scholar as retrieved via Publish or Perish.

This restriction was applied to ensure high quality data by prioritizing influential and widely recognized studies, reduce noise and irrelevant records commonly found in large scale Google Scholar datasets, and maintain analytical focus on studies that are most closely aligned with the specific topic of growth mindset interventions. Thus, the final dataset consists of 100 highly relevant and high impact articles, representing the core body of literature in this research area. The validity and reliability of this study are ensured through methodological accuracy and transparency, particularly in the documentation or research procedures, selection criteria, and citation metrics are presented in the results of the Citation matrix in Table 1.

Table 1: Citation Metric

Indicator	Information
Publication Years	2010-2025
Citation Years	15 (2010-2025)
Papers	100
Citations	3342
Cites/year	222.80
Cites/paper	33.42
Cites/author	1234.54
Papers/author	49.59
Authors/paper	2.97
h-indeks	23

The citation metric data in Table 1 demonstrate a very strong and effective research profile. The dataset consists of 100 articles published over 15 years (2010-2025) with a total of 3,342 citations and an average of 33.42 citations per article. The selection of the 2010-2025 period is based on the significant growth of empirical studies focusing on the development and implementation of growth mindset interventions during this time. This indicates that the selected timeframe is the most relevant for capturing the evolution of intervention practices.

The findings also highlight a strong trend of collaboration, as evidenced by an average of 2.97 authors per article. This collaboration not only improves the quality of scientific work but also expands its reach and influence. This collaboration is also supported by the fact that each author contributed an average of 49.59 articles, demonstrating deep and productive engagement. Further evidence of the study's quality was an h-index of 23, indicating that 23 articles had been cited at least 23 times. This figure confirms that the scientific contribution of research on growth mindset interventions has sustained recognition and impact, beyond just momentary productivity. Overall, the data show that this research is productive, collaborative, and highly influential in the scientific world. This data is complemented by a flowchart in figure 1.

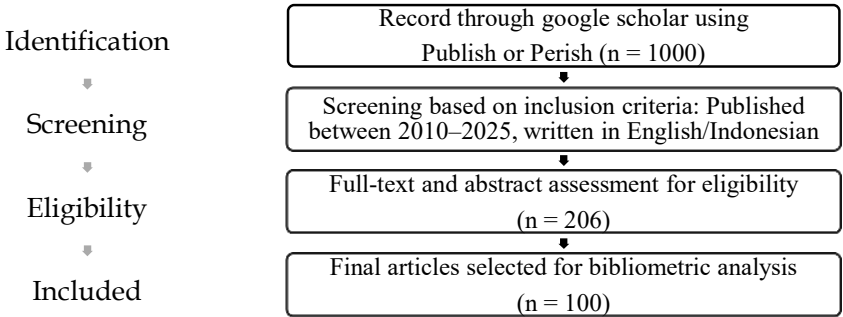


Figure 1: Bibliometric Overview of Research on Growth Mindset Interventions

The data analysis of this study focuses on two methods: descriptive analysis and qualitative narrative analysis. Descriptive analysis is used to map the research landscape, identify trends, and analyse collaborations. This analysis involves simple statistical calculations, such as the frequency of publications per year, the distribution of topics, methodologies, and patterns of collaboration between authors, institutions, and countries. Furthermore, a narrative synthesis is conducted to identify knowledge gaps and promising research areas. The process begins by identifying the main themes of the literature. Then, a coherent narrative is constructed to summarise and explain the findings of each theme,

forming a big picture of the growth mindset research "landscape". The integration of quantitative mapping and qualitative interpretation allows this study not only to describe patterns but also to provide deeper insights into emerging trends, research gaps, and future research directions.

RESULT AND DISCUSSION

1. Results

a) From Classroom-Based Programs to Scalable Digital Interventions

The network visualization reveals a significant transformation in the design orientation of growth mindset interventions. Rather than remaining concentrated on traditional classroom-based programs, the field increasingly incorporates concepts associated with scalability, including online delivery, brief interventions, single-session formats, and low-cost implementation models. This pattern suggests a shift in research priorities from intensive intervention delivery toward broader dissemination and implementation efficiency.

The mapping of the research landscape was conducted through the creation of network visualisations. This visualisation presents a map of the relationships between the various terms and keywords that appear most frequently in the literature on "growth mindset interventions." Each cluster, represented by a different colour, shows a group of closely related concepts, providing a clear picture of the research focus. Network visualisation is presented in Figure 2. Importantly, this mapping does not merely describe the field, but reveals the underlying intellectual structure that shapes how growth mindset interventions are conceptualized, implemented, and evaluated globally.

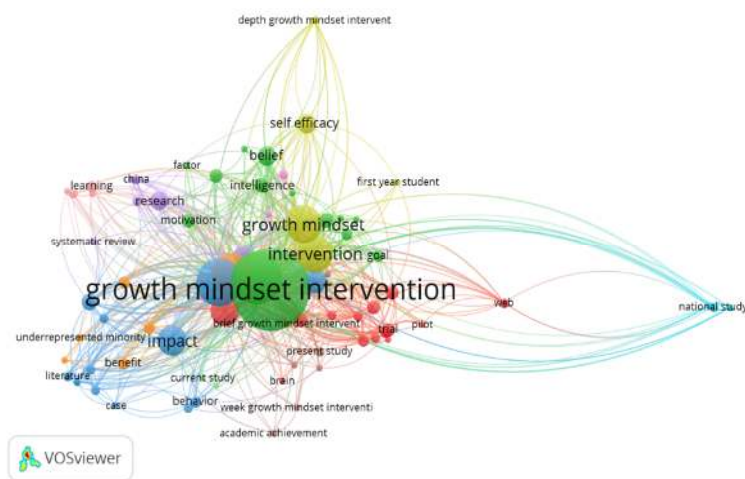


Figure 2: Conceptual Evolution of Growth Mindset Intervention Research

The growth mindset intervention network visualisation shows several main clusters, which are represented by different colours. Each Cluster represents a group of concepts that are closely interconnected. The paradigm shift in growth-mindset interventions is also illustrated in Figure 2. The initial research on the growth mindset focused on the central circle in the form of theoretical foundations (belief, intelligence, motivation, self-efficacy, learning), methodology (trial, pilot, literature, systematic review), practical impact (impact, benefit), as well as the population and context of "first-year student" and "adolescent". Growth mindset research is evolving, where findings in the form of a curved line to the right that is quite far away indicate the use of web-based interventions and lead to national studies, leading to a shift in research focus. Web-based interventions are an interesting finding to be criticized, because the use of technology is not a new media trend, but a pragmatic response by global researchers to solve the scalability crisis that has been inherent in psychological interventions. This will have the opportunity to increase the effectiveness and efficiency of the implementation of technology-assisted interventions to be tested on a wide scale (nationally).

Importantly, this transition should not be interpreted merely as a technological trend. Instead, the emergence of web-based, online, and national-scale intervention studies reflects an attempt to address the long-standing scalability challenge in educational and psychological interventions. Researchers increasingly seek intervention formats capable of reaching larger populations while maintaining acceptable levels of effectiveness.

The next analysis, presented in Figure 3, shows research trends over time. Using *overlay* visualisation, the different colours on each keyword represent the average time period of the publication, ranging from dark blue for the early years (2014) to bright yellow for the current years (2024). This analysis provides a clear picture of how the research focus of "growth mindset interventions" has shifted and evolved over the past decade. This phase represents the theoretical consolidation stage, where scholars focused on establishing conceptual clarity and building a foundational evidence base.

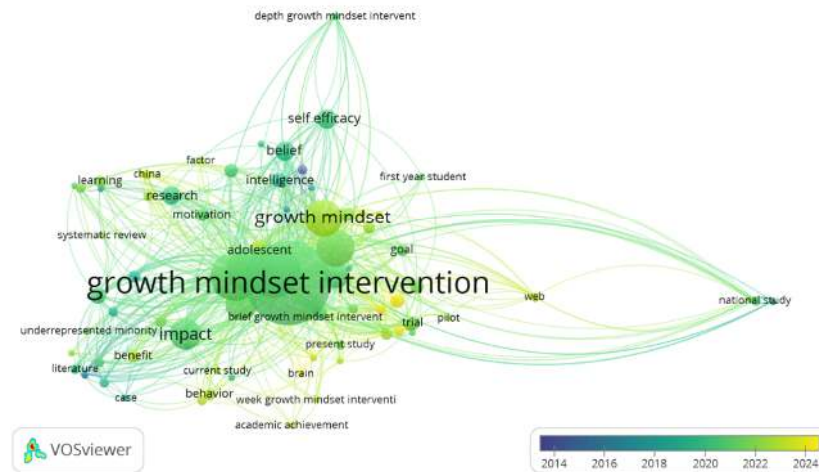


Figure 3: Temporal Evolution of Research Themes Growth Mindset Intervention

In the Early Period (around 2014-2018), research focused more on fundamental and conceptual topics. Keywords such as "systematic review", "research", and "learning" dominate, indicating that current studies aim to review the existing literature and build a theoretical basis related to the concept of growth mindset. Recent Period (approaching 2024), Over time, the focus of research shifted to a more practical and experimental realm. This indicates a transition from conceptual studies to the implementation and testing of interventions in the field. This transition reflects a movement toward intervention maturity, where the emphasis shifts from understanding the concept to optimizing its real-world application and effectiveness. The increasing presence of large scale and national level studies indicates that growth mindset interventions are moving toward policy relevant and system level implementation.

Despite the shift in focus, the core relationship between "growth mindset intervention", "impact", and "academic achievement" remained the focus throughout the period. This suggests that the primary goal of the study, which is to test the impact of interventions on academic performance, remains consistent. Overall, this visualisation reflects the transition from basic research to applied research. This field of study has evolved from the stage of conceptualisation and literature review to the stage of implementation, testing, and evaluation of real impact in the field. This trajectory is a hallmark of a field transitioning from theoretical novelty to applied scientific maturity.

b) Growth Mindset as a Cross-Domain Intervention Mechanism

An analysis of the main trends in research that has been published focuses on articles with the highest citations. Analysis of the ten most-cited publications reveals that growth mindset interventions are no longer confined to academic achievement outcomes. Instead, the intervention has been applied across multiple domains including mental health, entrepreneurship, career development, self-efficacy, resilience, and mathematics anxiety. Table 2 presents a list of the ten articles with the most citations, providing an overview of the topics, methodologies, and context of interventions that have a significant impact and influence on the growth mindset research literature.

Table 2: Top Ten Citation Articles

No	Citation	Authors	Title	Journal
1	435	(Schleider & Weisz, 2017)	A single-session growth mindset intervention for adolescent anxiety and depression: 9-month outcomes of a randomized trial	Journal of Child Psychology and Psychiatry
2	398	(Yeager et al., 2022)	Teacher Mindsets Help Explain Where a Growth-Mindset Intervention Does and Doesn't Work	Psychological sciences
3	364	(Burnette et al., 2020)	A Growth Mindset Intervention: Enhancing Students' Entrepreneurial Self-Efficacy and Career Development	Entrepreneurship Theory and Practice
4	273	(Samuel & Warner, 2021)	I Can Math!": Reducing Math Anxiety and Increasing Math Self-Efficacy Using a Mindfulness and Growth Mindset-Based Intervention in First-Year Students	Community College Journal of Research and Practice
5	236	(Burnette et al., 2017)	An online growth mindset intervention in a sample of rural adolescent girls	The british Journal of Educational Psychology
6	155	(Fink et al., 2018)	Improving general chemistry performance through a growth mindset intervention: selective	Chemistry Education

			effects on underrepresented minorities	Research and Practice
7	140	(DeBacker et al., 2018)	Effects of a one-shot growth mindset intervention on beliefs about intelligence and achievement goals	Educational Psychology An International Journal of Experimental Educational Psychology
8	131	(Manchi Chao et al., 2017)	Do rewards reinforce the growth mindset? Joint effects of the growth mindset and incentive schemes in a field intervention.	Journal of Experimental Psychology: General
9	106	(Brougham & Kashubeck-West, 2017)	Impact of a Growth Mindset Intervention on Academic Performance of Students at Two Urban High Schools	Professional School Counseling
10	68	(Brez et al., 2020)	Failure to Replicate: Testing a Growth Mindset Intervention for College Student Success	Basic and Applied Social Psychology

The most cited documents primarily focus on *growth mindset* interventions applied across a wide range of subjects and contexts. Of the top 10 publications, the majority (8 out of 10) were published between 2017 and 2022, indicating that this topic has remained relevant and has been extensively researched in recent years. This period represents a critical phase in the consolidation of growth mindset intervention research. Most of the publications (9 out of 10) were produced by researchers from the United States, revealing a significant geographical imbalance in the production of knowledge. This concentration highlights the epistemic centralization of growth mindset research within Western contexts and suggests a critical gap in cross-cultural validation. It also raises questions regarding the generalizability of findings to non-Western educational systems. Because growth mindset theory originated within Western psychological traditions that emphasize personal agency and self-development, its effectiveness may vary across collectivistic cultures where social obligation, interdependence, and relational achievement are more salient. One publication from outside the United States originated in Hong Kong, indicating that

research on growth mindset has begun to extend beyond Western contexts, although such representation remains limited.

The two most prominent publications recorded citation counts exceeding 300. One publication received 435 citations and examined a single-session *growth mindset* intervention designed to address adolescent anxiety. The success of single-session interventions demonstrates the field's strong orientation toward efficiency and scalability. Another publication, published more recently in 2022, had accumulated 398 citations, demonstrating a very high level of impact and relevance within a relatively short period. Its emphasis on teacher mindset underscores the importance of contextual and relational factors in determining intervention effectiveness. These findings indicate that growth mindset interventions are not only concerned with individual psychological change but also increasingly recognize the influence of the surrounding educational environment.

Other highly cited publications demonstrate the diversity of applications of *growth mindset* interventions. The interventions have been associated with entrepreneurial development, anxiety reduction in mathematics, online learning, chemistry education, and academic achievement more generally. This diversity of applications indicates that growth mindset has evolved from a domain-specific construct into a cross-domain psychological intervention framework. The expansion also signals a conceptual shift in which growth mindset is no longer viewed merely as an outcome to be developed, but increasingly as a mechanism through which multiple educational, psychological, and developmental outcomes can be achieved.

Initially, growth mindset theory primarily focused on academic learning and achievement in school settings. Based on the top ten publications, however, interventions have undergone significant expansion into social development, career development, and mental health. The implementation of growth mindset requires support from the surrounding environmental ecosystem, including teachers, parents, peers, institutional settings, and broader cultural contexts. Age, educational environment, social conditions, and cultural background also appear to be important factors influencing the effectiveness of growth mindset interventions. These findings provide a basis for expanding research on growth mindset interventions across different educational settings and cultural backgrounds. Overall, the findings suggest a functional evolution of growth mindset theory. Earlier research positioned growth mindset primarily as an educational construct associated with learning and achievement, whereas more recent influential research increasingly positions it as a

psychological mechanism through which broader developmental outcomes can be facilitated.

c) Emerging Typologies of Growth Mindset Interventions

The diversity of applications found in these publications is also visually reflected in the data mapping. A deeper analysis, conducted by filtering the keyword "intervention" in VOSviewer, reveals five clusters and 10 *growth mindset* intervention items, as presented in Table 3.

Table 3: Clustering of Growth Mindset Interventions

Cluster (items)	Intervention	Explanation
1 (3 items)	Brief growth mindset intervention, single session growth mindset	Review interventions that do not take a long time, can be in just one session or of very short duration. This could be because short interventions are easier to implement on a large scale.
2 (2 item)	Online growth mindset intervention	Interventions delivered through digital platforms
4 (2 item)	Depth growth mindset intervention	More intense interventions, perhaps of longer duration or involving more components.
6 (1 item)	Low-cost growth mindset intervention	Cost-effective interventions, which are essential for implementation in schools or institutions with limited budgets.
8 (2 item)	"Shot growth mindset intervention", "Week growth mindset intervention"	Interventions of very specific and short duration, such as in one week.

The clustering analysis identifies five dominant intervention typologies. Although differing in duration, complexity, and delivery mode, these intervention models collectively reveal a common emphasis on implementation practicality. Brief, single session, online, and low-cost interventions occupy a central position within the network, indicating that scalability has become a defining characteristic of contemporary growth mindset research. Nevertheless, the coexistence of deeper intervention models suggests that the field has not reached consensus regarding the optimal balance between intervention efficiency and intervention intensity. Overall, this analysis reveals that *growth mindset* intervention research varies significantly in terms of duration, media, and complexity. There is a strong focus on short, easy-to-implement interventions, both in-person (Cluster 1) and online (Cluster 2). On the

other hand, there is also an interest in more in-depth interventions (Cluster 4). The focus on low costs (Cluster 6) also shows practicality in its implementation.

The dominance of short, single-session, and low-cost interventions reflects a strong global demand for scalable and easily deployable solutions. This trend aligns with broader movements in educational and psychological interventions that prioritize efficiency, accessibility, and cost-effectiveness. However, the coexistence of deep interventions suggests an unresolved tension between scalability and depth of impact. This indicates that while short interventions are practical, they may not always be sufficient for producing sustained or transformative change. The increasing use of online interventions highlights the digital transformation of the field, particularly in response to the need for wider reach and flexibility. Overall, the clustering results reveal a critical paradigm shift that growth mindset interventions are increasingly designed not only for effectiveness, but also for scalability, adaptability, and contextual relevance. This is crucial so that interventions can be easily implemented in busy environments, such as schools or companies, without disrupting busy schedules.

2. Discussion

The present study moves beyond the conventional purpose of bibliometric analysis as a tool for describing publication trends, keyword networks, or collaboration patterns. Instead, the bibliometric evidence reveals a more fundamental transformation occurring within growth mindset intervention research itself. Viewed collectively, the temporal evolution of research themes, the conceptual network structure, the diversification of highly cited intervention studies, and the emergence of new intervention typologies indicate that the field has undergone a profound shift in its underlying scientific logic (Gazmuri, 2025).

This interpretation differs from previous bibliometric studies, which have primarily focused on mapping thematic clusters, publication productivity, or collaborative networks, and from systematic reviews that have concentrated almost exclusively on evaluating intervention effectiveness and effect sizes. Although these studies provide valuable descriptive evidence, they do not explain how the intervention science itself has evolved (Aria & Cuccurullo, 2017; Donthu, Kumar, Pattnaik, et al., 2021; Gazmuri, 2025). The present findings suggest that the observed changes are not isolated developments but interconnected manifestations of a broader scientific transition. Consequently, the contribution of this study lies not merely in documenting the

evolution of growth mindset interventions, but in explaining the changing scientific logic that has shaped this evolution over the past fifteen years.

Building upon these observations, we argue that the field has entered a new scientific era characterized by four interrelated evolutionary shifts (Skivington, 2021). The first concerns the evolution of delivery logic, in which interventions increasingly prioritize scalability and implementation efficiency. The second involves the evolution of functional logic, whereby growth mindset has expanded from an educational outcome into a cross-domain psychological mechanism capable of supporting diverse developmental objectives. The third reflects the evolution of implementation logic, where the pursuit of scalability simultaneously creates new challenges related to intervention fidelity, contextual adaptation, and sustainability. Finally, these transformations collectively give rise to an evolution in scientific logic, as researchers move beyond asking whether growth mindset interventions are effective toward investigating how they can remain effective across different educational, cultural, and psychological contexts. Together, these four evolutionary shifts provide the conceptual foundation for understanding how growth mindset intervention science has matured beyond effectiveness-oriented research toward a more comprehensive implementation science.

The bibliometric evidence indicates that one of the earliest and most visible transformations in growth mindset intervention research concerns the logic through which interventions are delivered. Rather than representing a simple methodological refinement, the temporal mapping, network visualization, and intervention typology analyses collectively demonstrate that the field has progressively shifted from intensive classroom-based programmes toward increasingly flexible delivery systems. This evolution reflects a fundamental reorientation in intervention design, whereby accessibility, scalability, and implementation feasibility have become central considerations alongside intervention effectiveness. Because intervention effectiveness became increasingly established, researchers no longer treated delivery as a procedural issue but as a scientific problem concerning dissemination and implementation.

The bibliometric findings suggest that this delivery model has gradually been replaced by a substantially different implementation logic. Network visualization demonstrates the increasing prominence of keywords such as online intervention, single-session intervention, brief intervention, low-cost intervention, and national study, while temporal mapping shows that these themes have become increasingly dominant in recent years (Janssen & van Atteveldt, 2025). This transformation appears to be driven by practical challenges inherent in conventional intervention delivery. Intensive classroom programmes require substantial instructional time, trained facilitators, financial

resources, and institutional commitment, thereby limiting their feasibility for large-scale implementation. As growth mindset research matured and empirical evidence supporting intervention effectiveness accumulated, the central challenge gradually shifted from demonstrating whether interventions work toward determining how they could be delivered efficiently without substantially compromising their psychological impact. Consequently, intervention science increasingly embraced delivery systems that were shorter, more flexible, digitally supported, and economically sustainable (Burnette et al., 2017; DeBacker et al., 2018; Schleider & Weisz, 2017). This transition illustrates the field's movement from efficacy-oriented delivery toward implementation-oriented delivery.

The findings suggest that the evolution of delivery logic represents the first major scientific transformation identified in this bibliometric analysis. The field has progressively shifted from asking how growth mindset should be taught within classrooms toward asking how growth mindset interventions can be delivered efficiently across increasingly diverse educational and psychological contexts. More importantly, this transformation created the necessary conditions for the subsequent expansion of growth mindset beyond formal education. Once interventions became sufficiently flexible, scalable, and transferable across delivery settings, growth mindset could increasingly be applied to broader developmental domains such as mental health, career development, resilience, and entrepreneurship. Thus, the evolution of delivery logic ultimately enabled the evolution of functional logic that characterizes the next stage in the development of growth mindset intervention science.

The bibliometric findings indicate that the second major transformation in growth mindset intervention research concerns the functional logic of the intervention itself. Whereas the previous evolution focused on how interventions are delivered, the present findings reveal a parallel shift in what growth mindset interventions are expected to accomplish (Dweck & Yeager, 2019; Yeager et al., 2016). Early intervention studies largely conceptualized growth mindset as an educational construct whose primary objective was to enhance students' learning motivation, persistence, and academic performance. Consequently, intervention success was predominantly evaluated through school-related outcomes such as grades, classroom engagement, and academic achievement (Brougham & Kashubeck-West, 2017; Dweck & Yeager, 2019). Within this perspective, growth mindset represented the desired endpoint of educational intervention, a belief system that learners should acquire to improve their performance within formal educational settings. The functional scope of the intervention therefore remained relatively narrow and strongly aligned with educational psychology.

The bibliometric evidence demonstrates that this educational orientation has progressively broadened. Analysis of the most influential publications reveals that growth mindset interventions are now routinely implemented to address substantially different developmental objectives, including anxiety reduction, mental health promotion, entrepreneurial self-efficacy, career development, resilience, mathematics anxiety, and social adaptation. Notably, several of the most highly cited studies no longer evaluate academic achievement as their primary outcome. Instead, they investigate whether growth mindset can facilitate psychological adjustment, emotional well-being, vocational development, or adaptive functioning in diverse populations (Burnette et al., 2020; Lipsey et al., 2023; Schleider & Weisz, 2017; Tao et al., 2022). This diversification suggests that researchers increasingly regarded growth mindset not as a domain-specific educational outcome but as a generalizable mechanism capable of supporting adaptive functioning across distinct developmental contexts.

This evolving functional logic also explains the growing integration of growth mindset with other psychological resources such as resilience, grit, persistence, self-efficacy, and adaptive coping. Rather than functioning as an isolated cognitive belief, growth mindset increasingly operates within a broader constellation of motivational and behavioural processes that collectively support long-term development (Andrian & Ilfiandra, 2020; Elliot et al., 2017; Park et al., 2020; Yeager & Dweck, 2012). Consequently, intervention success is no longer judged solely by whether participants report stronger growth mindset beliefs, but by whether these cognitive changes generate meaningful improvements in behavioural, emotional, and developmental outcomes. This interpretation is consistent with the expanding evidence that growth mindset interventions produce benefits extending well beyond educational performance alone.

The expansion of growth mindset interventions across increasingly diverse educational, psychological, and community settings has fundamentally altered the central implementation question confronting the field. Earlier intervention research was primarily concerned with demonstrating whether growth mindset interventions could produce measurable improvements in academic outcomes. As intervention models became shorter, more scalable, and applicable across multiple developmental domains, however, the primary scientific challenge shifted from establishing intervention efficacy toward understanding how intervention effectiveness can be preserved under increasingly heterogeneous implementation conditions (Damschroder et al., 2022). The evolution identified in the present bibliometric analysis therefore reflects a transition from intervention design logic toward implementation logic, in which successful

interventions depend not only on what is delivered but also on how intervention mechanisms interact with their surrounding contexts.

This transition is evident in the changing emphasis of the contemporary literature. The most influential intervention studies no longer evaluate intervention content in isolation but increasingly examine the conditions under which identical interventions generate substantially different outcomes. Teacher mindset, institutional support, implementation quality, learner characteristics, and contextual reinforcement have emerged as critical determinants of intervention effectiveness (Burnette et al., 2022; Yeager et al., 2022). Viewed from this perspective, intervention fidelity also requires reconsideration. Traditionally, fidelity has largely been interpreted as adherence to standardized intervention procedures and delivery protocols. However, the bibliometric findings suggest that fidelity should instead be conceptualized as preserving the psychological mechanisms through which growth mindset interventions generate adaptive change. Whether interventions are delivered through classrooms, digital platforms, or brief single-session formats, their effectiveness ultimately depends on whether participants successfully reinterpret effort, challenge, and failure as opportunities for development rather than indicators of fixed ability (Bandura, 2004; Buchanan, 2024; Schleider & Weisz, 2017). Accordingly, maintaining implementation fidelity involves preserving these underlying cognitive and motivational processes rather than merely replicating intervention activities.

The cumulative evidence presented throughout this bibliometric analysis suggests that the most important transformation within growth mindset intervention research extends beyond changes in intervention formats, target populations, or implementation strategies. Rather, the findings indicate that the underlying scientific logic of intervention research itself has progressively evolved. This interpretation is consistent with recent developments in implementation science, which increasingly conceptualize scientific frameworks as dynamic systems requiring continuous refinement in response to accumulating empirical evidence rather than static explanatory models (Damschroder et al., 2022). Over the past fifteen years, researchers have not merely developed new intervention models, they have fundamentally redefined what interventions are expected to accomplish, how intervention success should be evaluated, and which scientific questions deserve priority. Consequently, the evolution of growth mindset intervention research should be understood as the evolution of intervention science rather than simply the evolution of intervention technology (Reardon et al., 2025).

The progression across these four stages was neither chronological coincidence nor thematic diversification. Rather, each stage emerged because the dominant scientific

question of the previous stage had been progressively resolved, thereby generating a new set of theoretical and implementation challenges. Once intervention effectiveness had been repeatedly demonstrated, scientific attention shifted toward explaining the mechanisms responsible for those effects. As these mechanisms became increasingly established, the principal challenge became disseminating them efficiently across broader populations. Large-scale dissemination subsequently exposed contextual variability, giving rise to the current emphasis on implementation quality, contextual adaptation, and long-term sustainability.

The first stage of this evolution was primarily characterized by an effectiveness-oriented scientific logic (Skivington, 2021). Early studies sought to establish whether growth mindset interventions could successfully modify individuals' beliefs regarding the malleability of intelligence and improve academic outcomes. Intervention success was therefore evaluated mainly through measurable changes in academic achievement, persistence, and motivational beliefs, while theoretical attention focused on validating the core assumptions of growth mindset theory (Dweck & Yeager, 2019). Within this paradigm, interventions were conceptualized as educational programmes whose principal objective was demonstrating causal efficacy under relatively controlled educational settings.

As empirical evidence accumulated, however, the scientific emphasis gradually shifted toward understanding why interventions work rather than simply confirming that they do. This transition gave rise to a second stage that may be described as mechanism-oriented intervention science. This transition mirrors a broader movement in psychological intervention research from outcome-oriented models toward mechanism-based explanations of behavioural change (Hayes et al., 2020). Instead of treating growth mindset as the ultimate intervention outcome, contemporary studies increasingly conceptualized it as a psychological mechanism capable of activating adaptive cognitive, motivational, and behavioural processes across multiple developmental domains. This conceptual transition explains the rapid expansion of intervention applications into resilience, anxiety reduction, entrepreneurial self-efficacy, career development, and mental health promotion (Burnette et al., 2020; Lipsey et al., 2023; Schleider & Weisz, 2017; Tao et al., 2022). Growth mindset therefore evolved from being an educational construct into a transferable psychological mechanism capable of supporting adaptive functioning across diverse contexts.

The third stage emerged as intervention research increasingly addressed questions of dissemination and public accessibility. Once intervention mechanisms had been established, researchers shifted their attention toward maximizing implementation

efficiency through brief, single-session, online, and low-cost intervention models (Burnette et al., 2017; DeBacker et al., 2018; Schleider & Weisz, 2017). This phase represents implementation-oriented intervention science, in which intervention success is no longer defined solely by efficacy but also by scalability, accessibility, and feasibility within real-world educational systems. Similar developments have been observed across implementation science, where scientific attention has progressively shifted from establishing intervention efficacy toward understanding implementation mechanisms, contextual determinants, and long-term sustainability (Burnette et al., 2023; Damschroder et al., 2022). The bibliometric evidence clearly demonstrates that intervention research has become progressively oriented toward implementation challenges rather than intervention development alone.

The findings of the present study further suggest that the field is now entering a fourth stage in its scientific development. As intervention dissemination expands across increasingly diverse educational, psychological, organisational, and cultural settings, implementation challenges can no longer be adequately addressed through standardized intervention models. Instead, intervention effectiveness increasingly depends upon the interaction between intervention mechanisms and implementation environments. Contextual variables including teacher mindset, institutional climate, implementation quality, learner characteristics, and cultural values are no longer peripheral moderators but central determinants of intervention success (Brez et al., 2020; Burnette et al., 2022; Damschroder et al., 2022; Schroeder et al., 2022; Yeager et al., 2022). Accordingly, intervention science is progressively evolving toward a context-sensitive scientific logic, in which preserving psychological mechanisms requires meaningful contextual adaptation rather than procedural standardization alone. Contemporary implementation frameworks further argue that contextual adaptation should be viewed as an essential mechanism for preserving intervention effectiveness rather than as a deviation from standardized intervention protocols (Damschroder et al., 2022; Schroeder et al., 2022).

Importantly, these four stages should not be interpreted as replacing one another. Instead, they represent cumulative layers of scientific development that progressively expand the scope of intervention science (Damschroder et al., 2022; Reardon et al., 2025). Demonstrating intervention effectiveness remains essential, understanding intervention mechanisms remains theoretically indispensable, and scalable implementation remains practically necessary. Nevertheless, contemporary intervention research increasingly recognizes that these achievements alone are insufficient without careful consideration of contextual responsiveness. Scientific progress therefore reflects the integration rather than the substitution of earlier intervention paradigms.

The present study proposes the Evolutionary Framework of Growth Mindset Intervention Science. Unlike previous implementation frameworks that primarily focus on optimizing intervention delivery, such as the Framework for the Implementation of Mindset Interventions (Burnette et al., 2023), the present Evolutionary Framework explains how the scientific priorities governing growth mindset intervention research have progressively evolved from effectiveness-oriented inquiry to mechanism-oriented explanation, implementation-oriented optimization, and ultimately context-sensitive intervention science.. The framework conceptualizes the development of the field as a sequential yet cumulative progression consisting of four interconnected scientific stages: 1) effectiveness-oriented intervention science, which established empirical evidence for intervention efficacy; 2) mechanism-oriented intervention science, which explained the psychological processes underlying behavioural change; 3) implementation-oriented intervention science, which emphasized scalability, accessibility, and dissemination; and 4) context-sensitive intervention science, which prioritizes contextual adaptation, implementation fidelity, and long-term sustainability.

Accordingly, the principal theoretical contribution of this study is not merely documenting how growth mindset interventions have changed, but explaining how the science of growth mindset intervention itself has evolved. This Evolutionary Framework of Growth Mindset Intervention Science provides a conceptual roadmap for future research by positioning intervention effectiveness, psychological mechanisms, implementation quality, and contextual adaptation as complementary stages within a single, evolving scientific paradigm.

The principal theoretical contribution of this study lies in moving beyond descriptive bibliometric mapping toward explaining the evolutionary dynamics of growth mindset intervention science. Previous bibliometric studies have primarily documented publication trends, thematic clusters, collaboration networks, and keyword co-occurrence (Sugiarti et al., 2024; Xu et al., 2022), while systematic reviews and meta-analyses have synthesized evidence regarding intervention effectiveness, effect sizes, and moderating variables (Burnette et al., 2022; Tipton et al., 2023). Although these studies substantially advance empirical knowledge, they largely treat changes in intervention design, delivery, implementation, and application as independent developments. Consequently, the literature has lacked an integrative theoretical perspective capable of explaining how intervention science itself evolves.

The first contribution of the framework is therefore conceptual. Existing growth mindset theories have primarily focused on explaining why individuals develop adaptive beliefs about intelligence and how these beliefs influence learning and

behaviour (Dweck & Yeager, 2019; Novita et al. 2026). *Second*, the proposed framework integrates previously fragmented findings into a coherent developmental process. Earlier studies documented the emergence of brief interventions, digital delivery, online implementation, and low-cost intervention models (Burnette et al., 2017; DeBacker et al., 2018; Schleider & Weisz, 2017), while others highlighted the expansion of growth mindset interventions into entrepreneurship, mental health, resilience, and career development (Burnette et al., 2020; Lipsey et al., 2023; Tao et al., 2022). Rather than interpreting these developments independently, the present framework explains their interdependence. The evolution of delivery logic enabled broader functional applications; expanding functional applications generated greater implementation complexity; and these implementation challenges subsequently reshaped the scientific agenda toward context-sensitive intervention research. Thus, the framework contributes not merely by identifying research trends but by explaining the mechanism through which one stage of scientific development creates the conditions for the next.

Third, this study contributes to the broader literature on implementation science. Contemporary implementation theories increasingly emphasize that intervention effectiveness depends upon interactions between intervention mechanisms and contextual conditions rather than intervention content alone (Fixsen et al., 2005; Nielsen & Andersen, 2026; Nilsen & Bernhardsson, 2019). The findings of the present study complement this perspective by demonstrating that growth mindset intervention research has progressively adopted similar assumptions. Earlier intervention studies prioritized efficacy under controlled educational settings, whereas contemporary research increasingly prioritizes implementation fidelity, contextual adaptation, scalability, and sustainability (Aulia et al. 2024; Burnette et al., 2022; Yeager et al., 2022). Consequently, the proposed framework positions growth mindset intervention research within the broader evolution of implementation science, where the central scientific question is no longer whether interventions work, but how intervention mechanisms remain effective across diverse implementation environments.

Finally, the proposed framework contributes methodologically to bibliometric research itself. Bibliometric studies have traditionally been employed to describe the intellectual structure of scientific fields through publication patterns, citation networks, and thematic mapping (Aria & Cuccurullo, 2017; Donthu, Kumar, Mukherjee, et al., 2021; Donthu, Kumar, Pattnaik, et al., 2021). The present study demonstrates that bibliometric evidence can also serve as a basis for theory generation. By integrating temporal mapping, conceptual networks, citation structures, and intervention typologies into a single explanatory model, this study illustrates how bibliometric analysis can move

beyond descriptive visualization toward conceptual synthesis. In this sense, bibliometric analysis is positioned not only as a mapping technique but also as a methodological approach for explaining the evolution of scientific knowledge.

This study has several limitations. *First*, as a bibliometric study it focused on mapping the literature rather than evaluating the effectiveness or equality of individual interventions. Therefore, the findings cannot determine which intervention models are most effective. *Second*, the use of a single keyword “Growth Mindset Intervention” may have excluded relevant studies that use alternative terminology. *Third*, reliance on Google Scholar as the primary data source may introduce bias due to its broad indexing system and limited filtering capabilities. Additionally, the selection of the top 100 most relevant articles based on citation and relevance ranking may introduce citation bias, favouring highly cited and often older publications. Future studies should triangulate multiple bibliographic databases, including Google Scholar, Scopus, and Web of Science, to improve data robustness, reducing indexing bias, and provide a more comprehensive representation of global growth mindset intervention research. Furthermore, citation-based selection strategies may underrepresent recently published but potentially influential studies that have not yet accumulated substantial citation counts. Despite these limitations, the study provides a robust overview of the structural and thematic evolution of growth mindset intervention research.

CONCLUSION

This study set out to move beyond the conventional objectives of bibliometric analysis by explaining not merely how growth mindset intervention research has expanded, but how the scientific logic governing the field has evolved. Rather than treating publication growth, thematic diversification, and intervention innovation as independent developments, the bibliometric evidence demonstrates that these patterns collectively represent the maturation of growth mindset intervention science over the past fifteen years. Accordingly, the principal contribution of this study is not simply the identification of research trends, but the explanation of the evolutionary trajectory through which intervention science itself has developed.

The findings reveal four interconnected dimensions of scientific evolution. First, intervention delivery logic evolved from intensive classroom-based programmes toward scalable, digitally supported, and implementation-efficient delivery systems. Second, functional logic expanded from improving academic achievement to supporting broader psychological, educational, and developmental outcomes, positioning growth mindset as a cross-domain psychological mechanism rather than solely an educational construct. Third,

implementation logic shifted scientific attention from intervention efficacy toward scalability, implementation quality, contextual adaptation, and sustainability. Finally, these cumulative developments reflect a broader evolution in scientific logic, whereby the central research agenda has progressively moved from demonstrating whether interventions work to understanding how psychological mechanisms can remain effective across diverse implementation contexts.

Building upon these findings, this study proposes the Evolutionary Framework of Growth Mindset Intervention Science, which conceptualizes the development of the field as a cumulative progression through four complementary scientific stages: effectiveness-oriented intervention science, mechanism-oriented intervention science, implementation-oriented intervention science, and context-sensitive intervention science. Unlike previous bibliometric studies that primarily describe publication patterns or systematic reviews that evaluate intervention effectiveness, the proposed framework explains how changing scientific priorities have shaped the long-term development of growth mindset intervention research. In doing so, the framework positions intervention science itself as the primary unit of theoretical explanation.

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