

Review Article

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Evaluation of the Impact of Educational Programs at Secondary School: Systematic and Bibliometric Review of Literature

Najlae El Khammari , Rachid Hasnaoui 

Abstract

Background/purpose. In this systematic and bibliometric review, we aim to document the approaches and methodologies used to evaluate the impact of educational programs in high schools. Focusing on the main components, such as teacher training, student support, and technology integration, the study explores the different evaluation methodologies, including experimental, quasi-experimental, and mixed approaches.

Materials/Methods. This study is part of a systematic and bibliometric review process, aimed at providing an in-depth analysis of the evaluation methods and models used to measure the impact of educational programs in high schools. This methodology was chosen for its ability to identify, evaluate and synthesize the results of recent empirical research, thus ensuring a comprehensive view of evaluative approaches in education. Based on the recommendations of the PRISMA guidelines, we have followed a rigorous process to identify, select and analyse relevant studies.

Results. The results show that the annual production of research in this field shows that it has increased steadily from 2018 to 2024, The most relevant contributions have focused on the study of artificial intelligence, human resource.

Conclusion. The increasing use of educational technologies and e-learning systems provides a unique opportunity to enrich evaluation methodologies and the Impact assessment of high school education programmes is a key area for improving the quality and effectiveness of educational interventions.

1. Introduction

Evaluation of the impact of high school education programmes is a key practice for continuous improvement in educational outcomes and teaching methods. Indeed, contemporary educational policies are increasingly emphasizing the need to measure the effectiveness of interventions, whether in teacher training, student support, the integration of new technologies into educational practices. However, despite the importance of these assessments, several questions remain about the appropriateness of the methods used to fully capture the impact of educational programs.

The main problem lies in the choice and application of evaluation methodologies adapted to the specificities of the school context. Experimental models, such as randomized controlled trials, while useful in establishing clear causality, are often limited by ethical and practical constraints in schools (Sherman et al., 2017). In addition, quasi-experimental approaches and mixed methods, which allow for more flexible contexts, may introduce methodological biases that complicate the interpretation of results (Borko et al., 2010). Thus, the lack of consensus on the optimal method for assessing the impact of high school education programs creates a vacuum that requires systematic exploration of the different approaches available.

Recent research has shown that well-structured educational programs can improve not only students' academic skills, but also their emotional and social well-being. For example, a differentiated curriculum has been shown to increase student engagement and reduce the achievement gap between students (Tomlinson et al., 2020). In addition, initiatives such as mentoring and psychological support programs have been shown to significantly reduce stress and anxiety levels among students, contributing to their academic success (Wilkins & Hines, 2020). Active and collaborative learning programs have shown also positive results on student engagement and performance in secondary school, improving motivation and the ability to solve problems independently (Johnson et al., 2021). Similarly, targeted mental health and well-being interventions have a measurable impact on reducing stress and improving students' academic performance (Martin et al., 2022).

In this context, the present study proposes to examine the most common methodological components and evaluation models used to measure the impact of high school-level educational programmes. It aims to answer the following questions: how to choose the most appropriate models and evaluation methodologies to measure effectively and rigorously the impact of educational programmes in high schools, while considering the specificities of these intervention contexts?

In addressing this issue, the study focuses on three major aspects: (1) identifying key components of educational programs such as teacher training, student support and technology integration; (2) Critical analysis of methodological approaches, comparing experimental, quasi-experimental and mixed models; and (3) evaluation of key theoretical models such as the CIPP (Context, Input, Process, Product) model (Stufflebeam, 1966) and the Kirkpatrick model (1959), for their ability to provide relevant results in the school setting.

1.1. The main components of the evaluation

Teacher training and professional development is widely recognized as essential to improving academic outcomes. The National Math and Science Initiative (NMSI) University Preparation Program (CRP) demonstrates the effectiveness of comprehensive teacher training through workshops and mentoring, this results in improved teaching practices and student performance in advanced level (AP) courses, particularly in STEM subjects (Sherman et al., 2017). These empirical data underline the need for continuous professional development adapted to the changing educational landscape.

While evidence supports strong teacher training, some studies argue that the effectiveness of these programs is highly dependent on the context in which they are implemented. For example,

Borko et al. (2010) suggest that without adequate follow-up even well-designed professional development programs may not produce the desired results. This indicates the need for ongoing evaluation and adaptation of teacher training programmes to ensure lasting impact.

Further more, Student support systems, including customized learning plans and after-school activities, are essential to improving academic outcomes. Programs such as RRRR and ACCESS have shown significant gains in literacy and STEM performance by aligning support systems to student interests and needs (Dadvand et al., 2019; Auman et al., 2019). These results highlight the importance of a comprehensive approach to student support.

Although the success of these programs is evident, some researchers believe that the scalability of these customized approaches is difficult. Slavin et al. (2009) point out that individualized support can be resource intensive, limiting its application to under-funded schools. Therefore, it is essential to find a balance between personalized support and available resources. Beside this, the effectiveness of adaptive learning frameworks is well documented, particularly in programs such as I-BEST where progressive learning approaches have improved core competencies (Narvekar et al., 2020). In addition, the implementation of the Merdeka program in Indonesia, which integrates local cultural contexts, has significantly improved student engagement and outcomes (Pertiwi et al., 2023). Despite the positive results, some researchers argue that adaptive learning frameworks may not be suitable for all subjects or populations of students. For example, Conati and Kardan (2013) point out that adaptive systems must be carefully designed to avoid reinforcing existing disparities in educational outcomes. Similarly, culturally sensitive curricula, while beneficial, require significant teacher training and resource allocation to be implemented effectively (Gay, 2018). Adding to this, It has been shown that integrating social ethics into the educational framework improves both social behaviour and academic outcomes, as demonstrated by the RRRR program (Dadvand et al., 2019) we talk about Social and emotional learning. In addition, the integration of ethics into the curriculum, as shown by the study of Henrietta Lacks' story, promotes critical thinking and social responsibility (Skloot, 2010).

There is widespread support for the integration of socio-emotional learning and ethical education into school curricula, but there is debate about the extent to which these programmes should be prioritised over traditional academic subjects. Some educators argue that the emphasis on socio-emotional learning and ethical education can undermine basic school learning, especially in resource-constrained environments (Humphrey, 2013).

More than that we find the integration of technology in education, as demonstrated by the FATIH project and the impact of COVID-19 on Turkish schools, highlights the importance of equipping teachers with digital skills and ensuring equitable access to technology (Kayaduman et al., 2011; Koçoğlu et al., 2020). In addition, the adaptation of GED to policy changes under the Labour Innovation and Opportunities Act (WIOA) illustrates the need for flexible and responsive education policies (Smith & Turner, 2018).

The rapid shift to online learning during the COVID-19 pandemic has sparked a debate about the effectiveness of integrating technology into schools. While some studies welcome the flexibility of e-learning, others, such as Selwyn (2020), argue that digital divides and inadequate infrastructure can exacerbate educational inequalities. In addition, policy adjustments require continuous review, which can be difficult in bureaucratic systems.

2. Impact Assessment Methodologies

The evaluation of the impact of educational programmes, particularly at the high school level, requires a robust methodological approach to capture the multidimensional effects of interventions. The choice of appropriate evaluation methods is crucial, as it directly influences the validity and

reliability of results. The following discussion examines the main methods used for impact assessment, drawing on a variety of authors and studies to highlight the strengths and limitations of each approach.

2.1. Experimental and quasi-experimental models

Proponents of this approach argue that randomized controlled trials (RCTs) are the absolute benchmark for impact assessment because of their ability to establish causality. Sherman et al. (2017) exemplify this approach in their evaluation of the NMSI University Preparation Program (CRP), which used experimental models to attribute improvements in PA course outcomes directly to intervention. The high internal validity of this method is often cited as its strongest asset, allowing researchers to isolate program effects from other variables.

However, the criticism is directed at the external validity of the RCTs. Borko et al. (2010) wonder whether the controlled conditions of such experiments can be generalized to broader educational contexts. In addition, ethical concerns arise when randomization deprives control groups of potentially beneficial programs, a point that calls into question the universal applicability of this method:

Pre-post test designs: Pre-post tests are simple and allow you to compare the results before and after an intervention directly. The MDRC research team (2018) likely relied on this methodology to evaluate the Bridge-to-College GED model, observing changes in student preparation attributable to the program.

However, critics such as Selwyn (2020) point out that the absence of a control group is an important limitation, making it difficult to attribute observed changes solely to the intervention. In addition, the risk of bias due to the Hawthorne effect, where participants change their behaviour simply because they know they are being studied, is a significant concern.

2.2. Longitudinal studies

Longitudinal studies are known for their ability to track changes over time, providing valuable information on the long-term effects of educational interventions. As Dadvand et al. (2019) and Auman et al. (2019) demonstrated, these studies have been instrumental in understanding the changing performance of students in literacy and STEM through supported support programs such as RRRR and ACCESS.

Despite their strengths, longitudinal studies are not without difficulties. The main problem, as Levin (2009) points out, is participant attrition, which can skew results if a large number of students drop out. In addition, the high costs and long lead times required for such studies make them less feasible in some research contexts.

2.3. Mixed approach

Mixed approaches are welcomed for their comprehensive nature, combining quantitative data with qualitative information to provide a more complete picture of the impact of an intervention. Pertiwi et al. (2023) illustrate this in their evaluation of the Merdeka school program in Indonesia, where qualitative assessments of cultural relevance complemented quantitative measures of student engagement.

However, the complexity of integrating quantitative and qualitative data poses significant challenges. Conati and Kardan (2013) argue that while mixed methods can produce richer information, the methodological rigor required to harmonize these types of data is demanding, often requiring considerable expertise and resources.

2.4. Data-Based Decision Making (DDD)

Advocacy for DDD: data-based decision making is increasingly recognized for its role in continuous program improvement. Sherman et al. (2017) highlight how regular data collection and analysis informed the iterative refinement of the NMSI RSC, thus ensuring that the program remains effective over time.

Some researchers are cautious about over-reliance on data, however. Biesta (2010) argues that a focus exclusively on measurable outcomes can marginalize other important aspects of education, such as creativity and critical thinking. Also, data quality is paramount; poor data quality can lead to wrong decisions, as Humphrey (2013) points out.

3. Evaluation models

In our literature review process, we were able to identify different models of evaluation as processes:

Models	Impact	Description	Authors
CIPP Model (Context, Input, Process, Product)	<p>Background: The aim is to assess the environment in which the programme operates, and identify specific needs, problems and opportunities.</p> <p>Input: This phase evaluates the strategies, resources and plans used in the program.</p> <p>Process: Monitoring of program implementation to ensure compliance with the intended design.</p> <p>Output: Measure program results and impact to determine whether objectives have been met.</p>	The Stufflebeam model has been widely applied in various educational settings. For example, the CIPP model was used effectively to evaluate a school curriculum inspired by Banjarmasin, Indonesia, which showed significant improvements in literacy, numeracy and school climate (Sumaryanta, 2015).	Stufflebeam (1966),
Kirkpatrick's four-level training	<ul style="list-style-type: none"> • Response: Measure participant satisfaction and engagement. • Learning: Measure the increase in knowledge or skills. • Behaviour: Assess changes in participants' behaviour and application of acquired skills. • Outcomes: Determine final outcomes, such as improved school performance. 	The Kirkpatrick model is particularly useful for assessing the immediate and long-term effects of educational programs, providing a comprehensive overview of their effectiveness.	Kirkpatrick (1959)
Logic model	<ul style="list-style-type: none"> • Inputs: Resources such as funding, personnel and equipment. 	Logic model has been widely used in educational program evaluations to map and clarify intended pathways of	(McLaughlin et al., 1999)

	<ul style="list-style-type: none"> • Activities: Actions or interventions implemented under the program. • Results: Immediate outcomes of these activities, such as the number of students served. • Outcomes: The short, medium and long-term changes resulting from the program. 	influence and expected outcomes	
Séries temporelles interrompues comparatives (STIC)	The CITS (Comparative Interrupted Time Series) approach is a quasi-experimental method used to assess program impact over time by comparing trends before and after program implementation in treatment and comparison groups.	This method has been effectively applied in the evaluation of the National Math + Science Initiative (NMSI) university preparation program, demonstrating significant and lasting improvements in participation and performance in advanced placement tests	(Sherman et al., 2017). (Shadish, Cook and Campbell, 2002).
Harvest results	Collaboration between teachers, students and administrators to identify tangible results. Better ownership of results by stakeholders. Identification of educational practices that generate positive outcomes. Readjustment of educational strategies in the light of observed results.	Identifies and verifies the results achieved and how a program contributed to those results. Unlike traditional methods, it does not start from pre-defined results but looks back at changes that have occurred. This model is particularly useful in complex educational environments where outcomes are not easily predictable.	Wilson-Grau and Britt (2012),
Value-added models	Ability of AVMs to identify programs that actually improve student learning. Identification of the most successful programmes for specific groups of pupils. Providing accurate feedback to teachers and education officials. Encourage the adoption of educational strategies based on MVA results.	Estimate the contribution of educational programs by measuring student progress over time, while considering past achievements and demographic factors. The value-added model is frequently used to assess teacher effectiveness or the impact of specific educational interventions	(Sanders & Horn, 1998).
Balanced Dashboard	Ensure consistency between the strategic objectives of the	Include multiple performance indicators,	Kaplan et

<p>school and the outcomes of educational programmes. Promote informed decision-making through balanced data. Facilitating dialogue between different stakeholders through clear and visual indicators.</p>	<p>such as financial, organizational, and stakeholder processes. In educational contexts, this can be used to assess the broader impact of programs on school management, resource allocation, and student engagement, thus providing an overall view of program effectiveness.</p>	<p>Norton (1992),</p>
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4. Material and Method

This study is part of a systematic and bibliometric review process aimed at providing an in-depth analysis of the evaluation methods and models used to measure the impact of educational programs in high schools. This methodology was chosen for its ability to identify, evaluate and synthesize the results of recent empirical research, thus ensuring a comprehensive view of evaluative approaches in education. Based on the recommendations of the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines, we have followed a rigorous process to identify, select and analyse relevant studies.

The first step in the methodological process was to identify the most relevant databases in the field of education. We chose to use the Scopus database, widely recognized for its wealth of educational science publications. Using these databases ensures access to the most recent and rigorous research. The research period was limited to studies published between 2010 and 2023, to ensure that the analysis is based on contemporary practices and results. A total of 2,345 articles were identified using search thesauri including the terms “EDUCATIONAL” and “PROGRAMS” and “SECONDARY” and “SCHOOL”. No additional restrictions were applied to maximize the number of documents collected on the subject.

Results were exported in CSV format, including detailed information such as author names and affiliations, article titles, abstracts and keywords. These data were the main basis on two Database, Bibliometrix (via R) and VOSviewer are used to filter and analyze bibliometric results. We used Bibliometrix to import, clean, and structure data from databases such as Scopus, remove duplicates, and standardize metadata (authors, affiliations, titles). It also facilitates the extraction of bibliometric indicators, such as the number of citations and the evolution of publications over time. Once the data has been processed, VOSviewer is used to visualize and analyze keyword co-occurrence networks, collaborations between authors and institutions, and emerging thematic clusters. The combination of these two tools guarantees an in-depth, structured analysis of research trends, enabling the identification of major contributions and future directions in the field under study.

Finally, the following elements were studied from the information obtained from the database: (i) the evolution of scientific production over time, (ii) scientific productivity by country, journal and author, as well as their impact, (iii) the most cited articles, and (iv) the analysis of bibliographic networks, including links between publications and the co-occurrence of terms.

5. PRISMA Method

The selection process was conducted in several stages, as per the PRISMA model:

The first step is identification; after an initial search using specific keywords (e.g., impact evaluation, educational programs, secondary education, CIPP model, Kirkpatrick model), we identified a total of 656 studies. The second one is the Screening, at this stage, 90 studies were excluded due to their lack of relevance (non-high school education levels, absence of detailed methodological framework, etc.). After that, we found the third step, eligibility assessment. We carefully reviewed 2,345 studies for methodological relevance and eventually included 28 studies in our systematic review. This rigorous process ensured that the selected studies meet the methodological requirements necessary to ensure reliable and applicable outcomes in the academic setting.

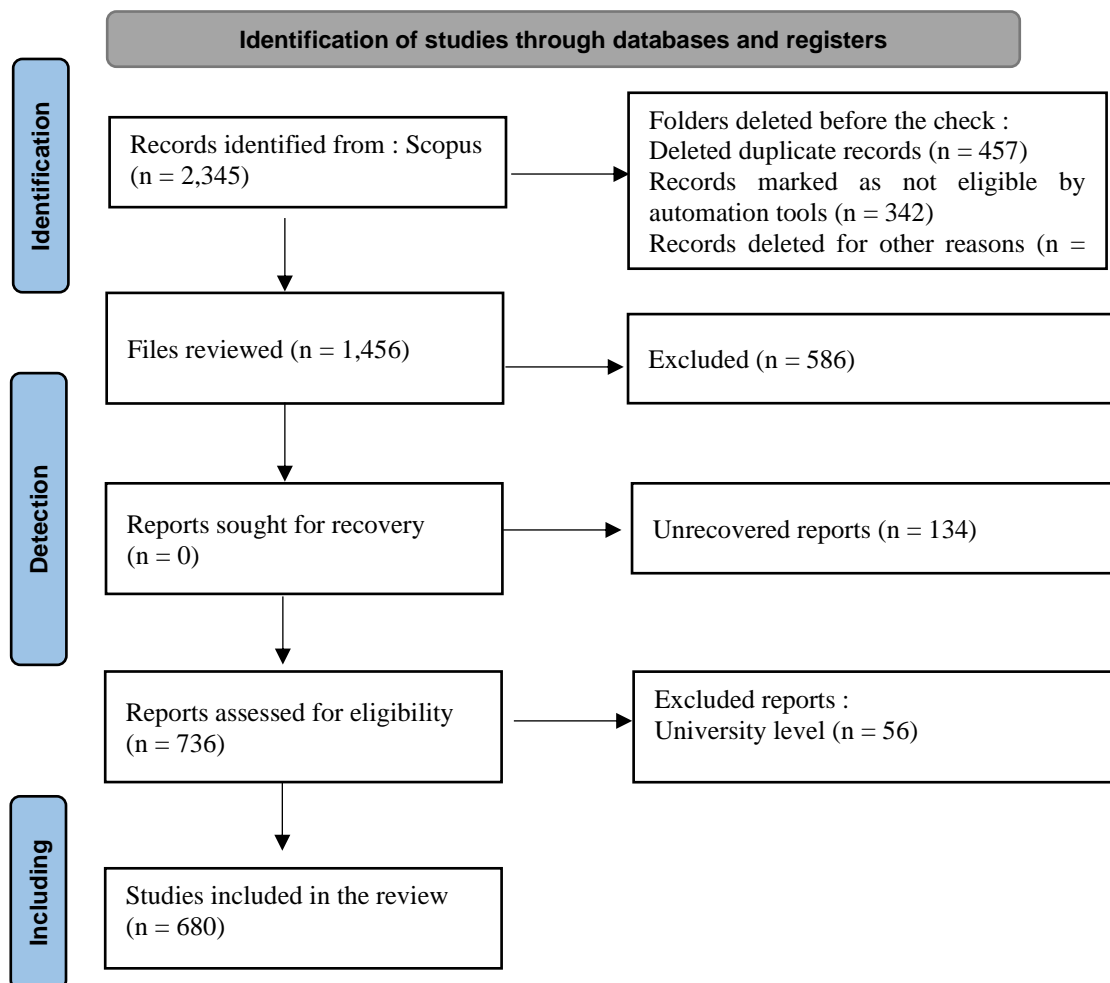


Figure 1. Resource analysis structure according to the PRISMA method

Source: Scopus

The studies included in this review had to meet specific criteria to ensure their relevance. The first criterion is Inclusion. The selected research was to assess the impact of educational programmes in high schools. Evaluation methodologies should include quantitative, qualitative or mixed approaches with clear documentation of empirical results.

We carried out a rigorous selection of the articles obtained through a two-stage process to ensure their relevance. First, we examined titles and abstracts, discarding those that did not meet our selection criteria. Next, we obtained the full texts of the remaining articles, which we analyzed before integrating them into our database for further scrutiny.

At this stage, articles were excluded if they, (a) did not contain original research data ; (b) were not published in journals with an impact factor, (c) did not present empirical data (e.g. theoretical and conceptual articles, essays, or tool demonstrations); (d) were not written entirely in English or French; (e) were published outside the 2009-2023 period.

In addition, we excluded review articles, government reports and grey literature, the latter referring to documents produced by public, commercial or industrial bodies, not subject to commercial publication controls, also we excluded studies on educational programmes outside the context of the high school, as well as works that do not offer a robust or theoretical methodological analysis. In addition, studies prior to 2015 were discarded to ensure temporal relevance.

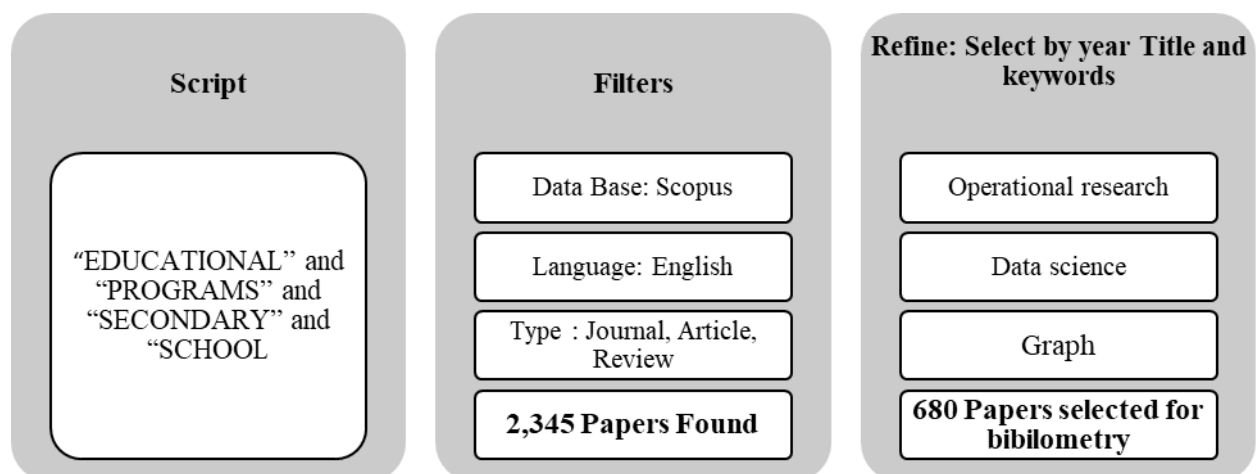
These criteria have eliminated irrelevant work and focused on studies that are most in line with the objectives of this review.

Criteria	Justification
Inclusion Criteria	<ul style="list-style-type: none"> ▪ English language. ▪ The article deals with “EDUCATIONAL” and “PROGRAMS” and “SECONDARY” and “SCHOOL”. ▪ Article published in 2010-2023.
Exclusion Criteria	<ul style="list-style-type: none"> ▪ Non-academic articles. ▪ Duplicate items.

6. Results of bibliometric analysis

The descriptive analysis provides an overview of quantitative trends in secondary school curriculum literature. A total of 2,345 articles were published in the Scopus international database, the first being from 2010. This reflects a growing interest in improving and adapting educational programs over time, particularly in response to societal, technological and economic changes.

The increase in publications over the years reflects a growing awareness of the importance of a secondary curriculum that is tailored to student needs and labour market expectations. The peaks in activity observed at the beginning of each decade may be related to major educational reforms or key educational advances. The results of this analysis are organized into three separate sections.



6.1. Descriptive analysis and trends

Table 1 below shows a classification of information extracted from the W, covering 2,345 documents published between 2010 and 2023. This work has been disseminated in 534 different

sources. The number of keywords mentioned in the publications was about three times higher than the total number of publications. In total, 4367 authors were identified, of which 303 worked individually, while 13.73 collaborated to write their articles.

Table 1. Descriptive Analysis

Description	Result
Period	2010 : 2023
CONTENTS OF THE DOCUMENT	
Keywords plus (ID)	2999
Author's keywords (DE)	4489
AUTHORS	
Authors	4367
Single person document authors	303
AUTHORS' COLLABORATION	
Single author documents	309
Co-authors by document	3.07
International co-authors	% 13.73
TYPES OF DOCUMENTS	
Article	1134
Conference paper	155
Book chapter	139

Source: Bibliometrix, R Studio

The graph presents an analysis of the evolution of scientific production between 2010 and 2023. Overall, the trend shows a steady increase over the years from about 50 publications in 2010 to a peak of nearly 250 in 2022. This growth, particularly significant after 2015, is likely to reflect increased research efforts such as investments in science infrastructure, research support policies or the rise of innovative topics. However, a slight decline is observed in 2023, although production remains at a high level. This decrease could be explained by external factors, such as budgetary constraints, redefined institutional priorities or a slowdown in some areas of research. In sum, the graph shows a sustained and significant increase in scientific output, with a slight slowdown at the end of the period.

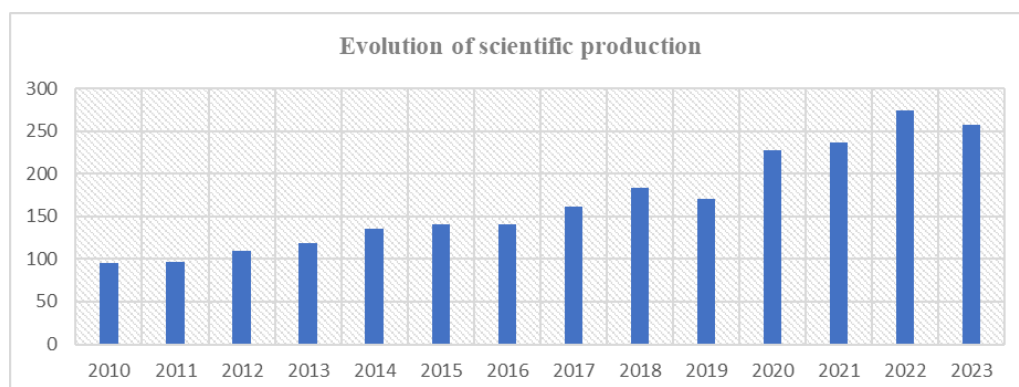


Figure 2. Evolution of scientific production

Source: Scopus

6.3. Location and affiliation statistics

The geographical distribution of publications Educational Programs at Secondary School is shown in Figure 3. The size of the circles shown indicates the level of concentration of items within each geographical area:

Following our analysis of the groupings, the affiliation data show that the US is the strongest on the publications side. Looking at the largest contributors in Figure 10, we find that these entities are mostly US, Chinese and Spanish. This observation leads us to the conclusion that research on the theme of "Educational Programs at Secondary School" has not yet reached its full maturity. Changes in researchers' affiliation with other entities likely explain the changes in their approach to studying this phenomenon, a trend that continues to grow.

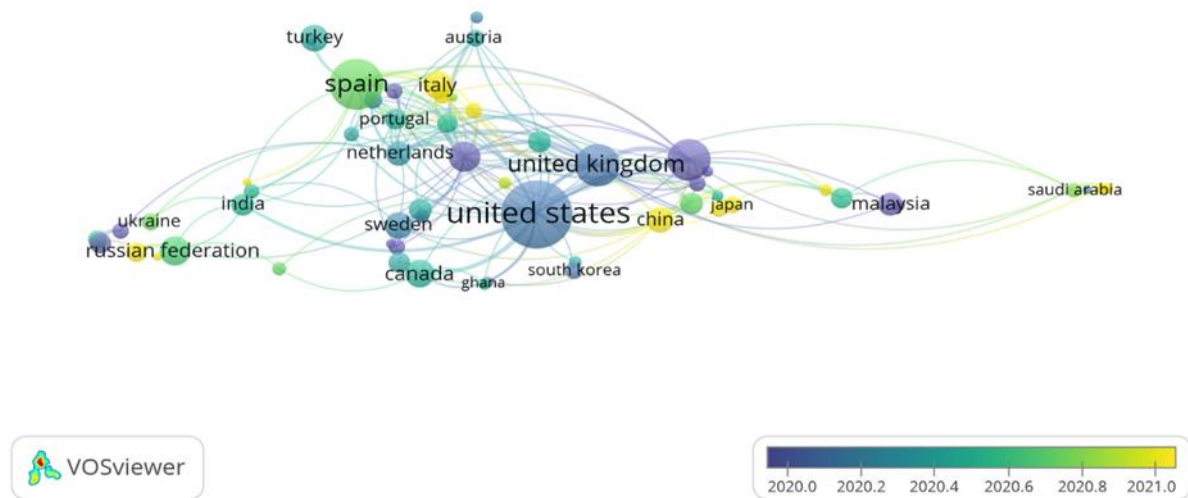


Figure 3 Location and affiliation statistics

Source: VOSviewer

6.4. The most influential journals

The following section highlights the scores and rankings of the 10 most influential journals in the field of secondary school curricula. The data reviewed includes number of publications, volume of citations received, rankings in the CiteScore index, and most-consulted journals. This ranking reveals differences in terms of rank and quality between journals, illustrating the growing interest of publishers in this topic.

As shown in Table 2, the first four journals cover the majority of published articles. Of the 2,345 articles examined in this study, 1,799 were published in 10 major academic journals specializing in education. The analysis reveals that the largest number of articles was published in the "Sustainability (Switzerland)" with a CiteScore of 6.8, followed by "Education Sciences" with a score of 4.8 and "International Journal of Educational Development" with a score of 4.2.

The table below shows the annual increase in the number of articles published in these 10 journals.

Table 2. Top 10 most frequent journals

N°	Journal	Total publication	Total Citation	Cite Score	The most frequency articles	Time Cited	Years	Publisher
1	Sustainability (Switzerland)	381357	55991	6.8	A Global Assessment: Can Renewable Energy Replace Fossil Fuels by 2050?	556	2022	Multidisciplinary Digital Publishing Institute (MDPI)
2	ACM International Conference Proceeding Series	50881	34510	1.5	Finding the greedy, prodigal, and suicidal contracts at scale	389	2018	Conference Proceeding
3	Economics of Education Review	1167	351	3.3	Economic growth in developing countries: The role of human capital	356	2012	Elsevier
4	Teachers College Record	827	256	3.2	The challenge and promise of complexity theory for teacher education research	240	2014	Teachers College Record
5	Education Sciences	15882	3334	4.8	What Is the Impact of ChatGPT on Education? A Rapid Review of the Literature	674	2023	Elsevier
6	Turkish Online Journal of Educational Technology	435	1185	0.4	Innovative teaching in higher education: The big data approach	84	2016	Sakarya University
7	Advances in Intelligent Systems and Computing	26852	29624	0.9	Deep Learning vs. Traditional Computer Vision	966	2020	Springer Nature
8	Journal of Physical Education and Sport	5001	1776	2.8	Sport management: Thematic mapping of the research field	40	2021	Editura Universitatii din Pitesti
9	Lecture Notes in Networks and Systems	35811	41485	0.9	Natural Language Processing Implementation for Sentiment Analysis on Tweets	95	2023	Springer Nature
10	International Journal of Educational Development	2178	514	4.2	Impact of vocational education and training on adult skills and employment: An applied multilevel analysis	56	2019	Elsevier

6.5. Frequency of keywords

Keyword analysis reveals important trends in the themes addressed by the studies on evaluation of educational programmes. In the first place, the concepts of "EDUCATION", "STUDENT" and "SECONDARY EDUCATION" stand out as one of the most frequently discussed. This predominance highlights the importance of teachers' role in the success of educational programmes. Continuing teacher education is crucial to ensuring that teachers have the up-to-date pedagogical skills and knowledge necessary for effective implementation of educational interventions. Studies often point out that investing in teacher training is one of the major levers for improving program effectiveness, especially in ever-changing contexts.

Student support is also a central element, illustrating the recognition of the importance of personalized coaching in the learning process. The frequent occurrence of this concept in studies suggests that educational programs are most successful when they consider the diverse needs of learners and put in place support mechanisms to help them achieve their goals.

Table 3. Frequency of keywords

Period: 2010 -2023			
Education	293	Adolescents	50
Students	246	Gender	41
Secondary Education	237	Education Program	39
Teaching	159	Vocational Education	37
Adolescent	136	Teacher Training	37
Secondary Schools	115	Educational Program	35
High School	115	Teacher Education	35
Schools	93	Motivation	35
Controlled Study	86	Learning Systems	34
Human Experiment	81	Health Education	34
E-learning	74	Knowledge	32
Learning	68	Educational Technology	30
Educational Development	65	Primary And Secondary Schools	29
Higher Education	64	Special Education	22



Figure 4. Cloud of words

Source: Scopus

6.6. Scientific production by country

Analysis of scientific output by country reveals a wide disparity between the contributions of different nations, highlighting various research dynamics. The US and the UK dominate with 864 and 837 publications respectively. This reflects their central role in global scientific production, supported by strong academic systems, massive investments in research, and a well-developed scientific infrastructure. Countries such as Spain (305 publications), Australia (300) and Germany (187) are among the major contributors. They demonstrate sustained scientific production through policies that foster innovation and international collaborations. France (169 publications), Pakistan (134) and Canada (118) are notable for their active involvement in research, although they produce less than the world leaders. These figures reflect their ability to contribute significantly despite sometimes smaller sizes or resources.

Table 4. Productions by country

Country	Pub	Country	Pub
United States	864	South Africa	47
United Kingdom	837	Belgium	40
Spain	305	Brazil	36
Australia	300	Japan	36
Germany	187	Switzerland	32
France	169	Bahrain	28
Pakistan	134	Ghana	27
Canada	118	Portugal	25
Italy	107	Taiwan	23
Malaysia	94	Bangladesh	18
Russian	80	Hungary	12
Indonesia	79	Jordan	10
South Korea	72	Nigeria	5
Hong Kong	56	Sweden	4

Source: Scopus

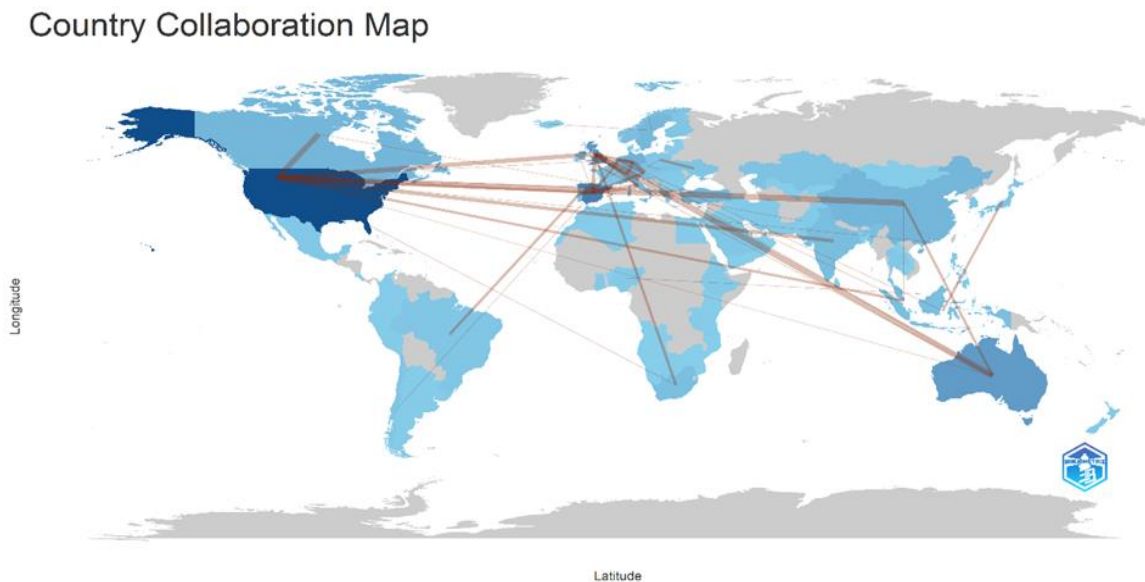


Figure 5. Country's collaboration Map

Source: Bibliometrix, Rstudio

The scientific output by country reflects marked gaps, influenced by factors such as research resources, quality of infrastructure, international collaborations and public policies. While developed nations dominate, many emerging countries are beginning to play an important role, indicating a growing internationalization of scientific research.

7. Conclusion

The present research aimed to approach the subject of secondary school curricula from an educational perspective through a bibliometric study complemented by a systematic review. It is important to note that the study is limited to exploring this theme only in the context of articles related to pedagogy and education sciences, although school curricula also influence other areas, such as Psychology and sociology. Despite the importance of these other disciplines for a comprehensive understanding of the curriculum, the study did not delve into the performance or interaction of each of these areas with the subject. It is also limited by the number of databases used to identify the articles in the sample since the sample does not cover all available publications on the subject. On the other hand, Impact assessment of high school education programmes is a key area for improving the quality and effectiveness of educational interventions.

This systematic review identified the key components, dominant methodologies, and evaluation models most used in this area. Models such as CIPP, the Kirkpatrick model, and experimental approaches provide robust tools to measure and understand the impact of educational programs. However, each model has specific advantages and limitations that must be considered in the particular context of the evaluated programs. The results of this study provide a valuable basis for future research and practices in impact assessment, promoting a rigorous methodological approach adapted to the needs of high schools. The diversity of methodological approaches in the impact assessment of educational programmes represents both opportunities and challenges for practitioners and researchers. This section explores the potential synergies between these approaches and their implications for education policy and future research.

In general, the increasing use of educational technologies and e-learning systems provides a unique opportunity to enrich evaluation methodologies. Big data tools can extract large-scale trends, while immersive technologies such as virtual reality could provide new perspectives for assessing

learner engagement. However, these innovations require adequate technological infrastructure and advanced digital skills, which are often absent from disadvantaged schools.

Declarations

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Ethical Approval: This study does not require ethical approval as it does not involve any experimentation with human subjects or sensitive data.

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