

Flipped Classroom Trends: A Bibliometric Analysis

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To Link this Article: <http://dx.doi.org/10.6007/IJARPED/v13-i1/20894>

DOI:10.6007/IJARPED/v13-i1/20894

Published Online: 15 March 2024

Abstract

Analysing the flipped classroom framework is a crucial framework for informing teachers and students about the evolving teaching and learning method. The connection for flipped classrooms has significantly arisen due to the diverse needs of the students in the educational field. In this research, a total number of 774 scholarly articles have been utilised with a bibliometric approach. The bibliometric analysis examines different trends in regards to the flipped classrooms model which can be considered as pedagogical concepts that reflect on the flaws in the traditional learning environment. Along with this, with the help of this bibliometric analysis, it has been possible for the researcher to focus on different learning tactics such as active learning and learning outside of the classroom. In this study, the researcher systematically reviews different literature in order to recognise various perspectives of the authors on the context of the topic of the flipped classroom. In order to reach the ultimate conclusion the researcher leverages the key techniques of bibliometric analysis which includes citation analysis, authorship analysis, and keyword analysis. In addition, the institutional and geographical distribution patterns have also been demonstrated in this study which will help the readers to recognise the current state of the flipped classroom model.

Keywords: Inverted Classrooms, Blending Learning, Flipped Classroom, Active Learning, Self-Regulated Learning and Flipped Learning

Context and Implications

The Rationale for this Study

The fact emerges addressing the impact of technologies in terms of changing the core of different aspects. In this regard, Nurtamam *et al* (2023) have addressed the importance of technological integration in terms of enhancing the overall foundation of both research and evaluation for a certain instance. The flipped classroom, thus links to the structured foundation of a student-centred learning paradigm developed for extracting positive value from the entire learning experience.

In this manner, these trends become crucial in terms of shifting the focus from the existing standards of teacher-led instruction from the perspectives of collaborative and interactive learning experiences. On the other hand, the presence of flipped classrooms becomes an

essential factor in accelerating the growth of active learning strategies regardless of the dominance of various traditional methods of learning. It eventually links to the presence of different factors including group projects, case studies, debates, interactive simulations, and others.

Understanding "Flipped Classroom Trends" is essential to comprehending the condition of education and pedagogical practices today. The potential of the flipped classroom paradigm to boost student engagement, encourage active learning, and improve overall learning outcomes has garnered a lot of attention in recent years (Tan *et al.*, 2022). In order to facilitate more participatory and collaborative learning during class time, flipped classrooms involve students interacting with instructional materials outside of class, usually through readings or videos. Examining flipped classroom patterns can help us understand how this method affects student participation in comparison to traditional lecture-based approaches (Apriska, 2020). All things considered, studying flipped classroom trends is critical to expanding our knowledge of efficient teaching and learning strategies, utilising technology in the classroom, and advocating for student-centered learning strategies that meet the demands and expectations of contemporary education.

Why do the new findings matter?

Considering the channels of flipped classrooms, the present study becomes pivotal in terms of improving the overall standards of assessment revisions and professional development. This is the thematic aim of the findings of this study to derive structural insights regarding the presence of instructional approach within the flipped classroom trends.

Implications for researchers, practitioners and policymakers

Researchers are crucial in terms of enhancing the overall foundation of knowledge management among practitioners, mainly for flipped classrooms. In other words, cross-disciplinary collaboration becomes an essential role, closely associated with the channels of policy-making scenarios¹. It eventually becomes a pivotal element, especially for the researchers to acquire higher standards of educational and evidence-based practices.

Introduction

In the changing landscape of education, students need to take innovative approaches for the betterment of their studies. As the educational process has continuously evolved, flipped classrooms emerged as a significant trend which helps students to engage effectively while the traditional teaching method creates several challenges for the students to continue their study in a creative way. As per the views of Zainuddin *et al* (2019a), a lack of empirical evidence has been recognised in recent research on the topic of flipped classrooms. From a contradictory point of view, it has been identified by Zainuddin *et al* (2019b), that between 2017 to 2018 near around 48 studies were published on the topic of flipped classrooms. This connected research will highlight the ongoing trends in flipped classrooms and will also analyse its current state and examine its implications in current days. Along with this, teachers these days categorise the traditional classrooms and give lectures during class hours which can be considered as a long norm for the students. As the teachers also deliver homework assignments to the students, it creates issues for students in terms of shifting the learning paradigm.

¹ George, A.S., George, A.H. and Martin, A.G., 2023. ChatGPT and the future of work: a comprehensive analysis of AI'S impact on jobs and employment. *Partners Universal International Innovation Journal*, 1(3), pp.154-186.

In this context, Haleem et al (2022) highlighted that due to the evolution of digital technologies, the needs of learners in education also changed. A flipped classroom model allows teachers to provide instruction to the students outside of the classroom. Corresponding with this, with the help of flipped classrooms it can be possible for the students to learn content outside of the class through online resources, videos and lectures. In this scenario, in the words of Al-Samarraie et al (2020), due to the emergence of diverse learning styles and increased engagement among students, the educators used flipped models in education. By considering the flipped model it can be possible for the students to access diverse learning content regarding the topic and get a deeper understanding of the topic. Due to the inversion of instrumental components in education, the trends in the flipped classroom extended. In line with this, virtual simulations, learning technologies and online spaces for collaboration can be considered as a few major components in flipped classrooms which showcase that technology plays a pivotal role². Owing to the significance of flipped classrooms, this research aims to evaluate the whole landscape of flipped classrooms in the contemporary educational landscape which allows readers to learn more about technical invention and the evolving nature of learning in this era of digitalisation.

This fact becomes crucial for the standards of flipped classrooms to acquire higher standards of learning experience. Several studies have addressed the significance of educators becoming a pivotal aspect in this entire manner to acquire higher channels of professional development among students. More precisely, it also links to the channels of creating effective flipped learning experiences through the process of structured training programs. It eventually becomes an essential element in terms of facilitating the conventional standards of active learning along with the prominent adjustment of different assessment methods. Personalisation, on the other hand, becomes an essential element in terms of using structured feedback both from students and educators (Torun, 2020; Bruggeman *et al.*, 2021; Langegård *et al.*, 2021). It carries the foundation of continuous improvement of existing classroom practices for generating positive learning experiences.

This study aims to answer three main questions which are as follows

1. How is flipped classroom research evolving and progressing?

- Number of published studies per year
- Sources and document types
- Sources titles
- Language of documents

2. What are the most predominant themes that have been addressed in flipped classroom research?

- Keyword analysis
- Title and abstract analysis

3. Who and what are the leading researchers and institutions in terms of publications on the flipped classroom?

- Publications by countries
- Main institutions
- Authorship analysis

² Toivola, M., Rajala, A. and Kumpulainen, K., 2023. Pedagogical rationales of flipped learning in the accounts of Finnish mathematics teachers. *Pedagogies: An International Journal*, 18(4), pp.767-787.

Method

Database Selection

This specific research paper has been conducted in order to analyse the significance of flipped classrooms in this modern era. Along with this, a language analysis has also been carried out in this study. For this study, the necessary materials have been collected from the Scopus database. In this regard, it has been identified that Scopus is one of the largest academic databases in the world which has more than 25000 active titles (Magadán-Díaz & Rivas-García, 2022). In this particular database, nearly 82 million papers with 1.7 billion references across various 240 fields have been included. Due to such popularity, the Scopus database has been mostly used in international scientific community research. Thus, the researcher has considered a Scopus database in order to extract significant components for this study.

Inclusion Criteria

During the time of the whole research, the researcher used different related documents which have been recognised through using keywords. The references for this work have been selected based on publication titles. In this scenario, according to Sarkis-Onofre et al (2021), using the PRISMA statement can prove effective in terms of increasing the transparency of the study while conducting scientific meta-analysis. In this way, the PRISMA diagram has been used for the selection of the sources of the material. In this study, the researcher has only utilised those databases which were published between the years of 2019 to 2023 which has proven beneficial in terms of using the most relevant and recent sources. Along with this, the collected documents have been further screened and few irrelevant documents have been excluded from the study. In terms of language, most of the studies have been considered which are conducted in the English language. Moreover, the researcher also maintains each of the ethics while collecting essential datasets for the study. In this regard, as stated by Pietilä et al. (2020), conducting a study with ethical consideration allows the researcher to improve the transparency and integrity of a study. Thus, maintaining ethics in data collection and analysis allows the researcher to include more transparency which allows the readers to accept this study.

Data Analysis and Tools

As highlighted by Chain et al (2019), bibliometric analysis can be considered as a quantitative method which is used by researchers to evaluate trends, patterns and relationships. Owing to this, the researcher considered bibliometric analysis as a methodological tool for conducting this study. By considering this process a statistical analysis of different articles and books on the topic of flipped classrooms has been conducted. In order to gain insights into the structure of academic papers on the topic and the impact of flipped classrooms on the student's learning process, different statistical methods have been considered within this study. Corresponding with this, in this study the teachers used citation analysis, authorship analysis and keyword analysis in order to gain the ultimate outcome. Along with this, VOS viewer has also been utilised in order to generate connections in relation to bibliometric solutions as well as define or illustrate them within this study. Moreover, the metric of citations also has been calculated effectively by the researcher by using the perish software.

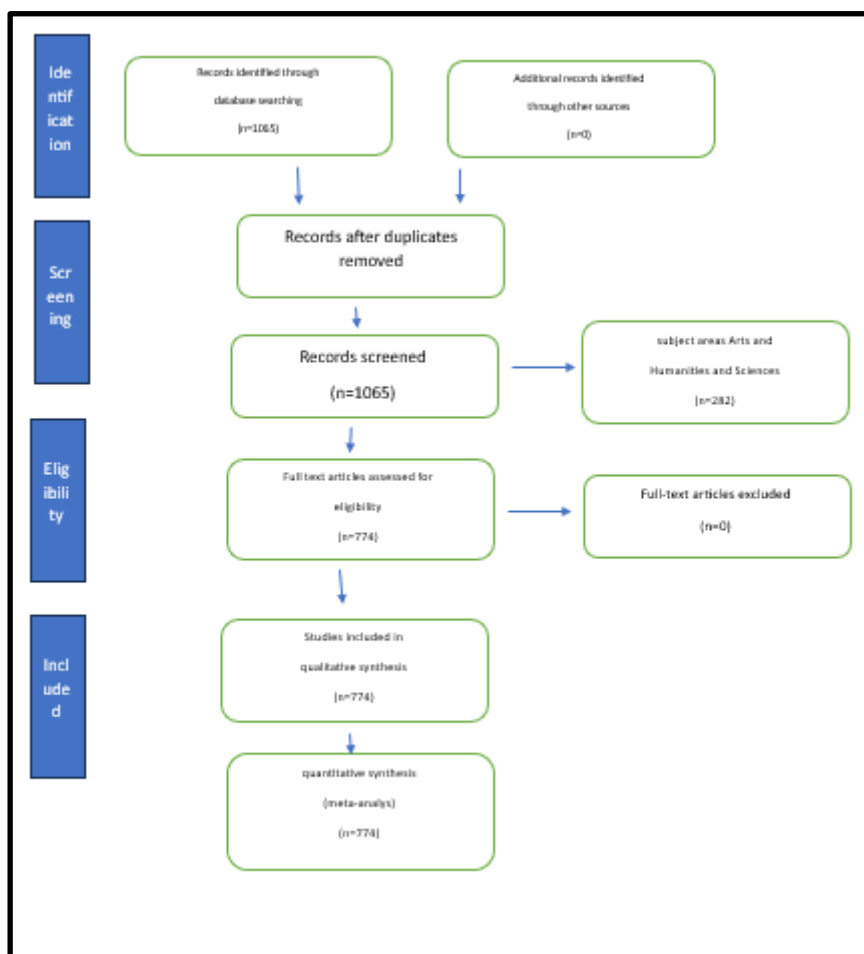


Figure 1: PRISMA flow chart

Research Gap

This research has been conducted by considering the secondary qualitative research methodology. Hence, the absence of primary methods including primary qualitative and primary quantitative method can be defined as the major research gap. As primary methods help in gathering real-time data, it can be a major gap of this research.

Results

Development and progress of the flipped classroom trends research

The researcher discussed the flipped classroom distributions in different terms which are the number of published studies each year, languages of documents and titles and sources. Describing such terms has been proven effective in order to answer the first question of how flipped classroom research evolving and progressing.

Number of published studies per year

Table 1

Number of published studies per year

Year	TP	%	NCP	TC	C/P	C/CP	h	g
2019	49	0.15	26	65	2.65	15.00	8	12
2020	122	2.22	32	44	1.56	25.64	6	14
2021	148	3.55	14	45	1.94	15.24	1	15
2022	181	1.57	60	56	5.89	2.15	5	6
2023	459	6.14	44	54	6.57	25.32	7	9

Abbreviations of the key terms used in Table 1: C/CP, average citations per cited publication; C/P, average citations per publication; g, g-index; h, h-index; NCP, number of cited publications; TC, total citations; TP, total number of publications.

Table 1 is the representation of the directory of the entire search work for this particular study. In this instance, the fact becomes prominent for this aspect addressing the increasing trend within the normalcy of *total publications*. On the flip side, this particular aspect has also been recognised to be closely associated with the instances of another increasing trend in the total number of citations. Structurally, the insights are derived from the collection of different databases including Scopus, Springer, Elsevier, and others. It also addresses the fact that the search directory finds the journals with the highest productivity standards in 2021 as it comes to the lowest point of 6 in 2022.

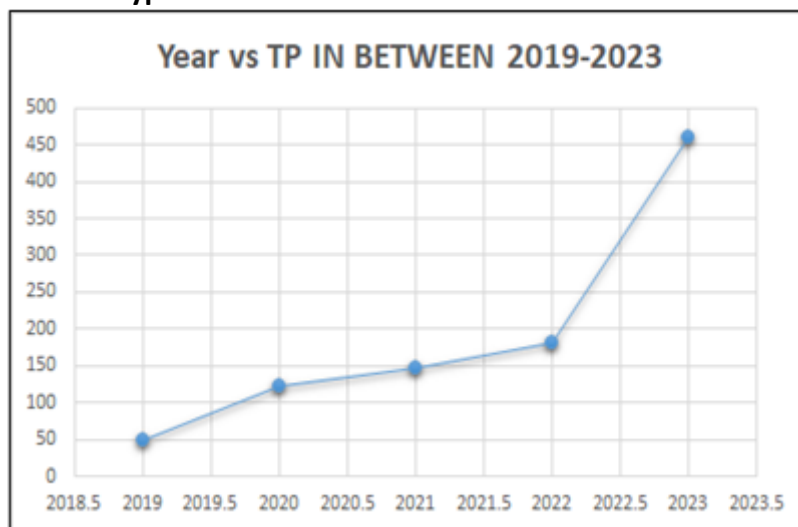
Sources and document types

Figure 2: Year vs TP

The value of "TP" has generally increased over time, with some fluctuations. The largest year-to-year increase in "TP" occurred between 2020 and the middle segment of the following year. This particular aspect has been recognised as being followed by the increase between a middle segment of 2021 and 2022. The value of "TP" was around 100 in 2019 in 2023 it encountered a spike to reach 450.

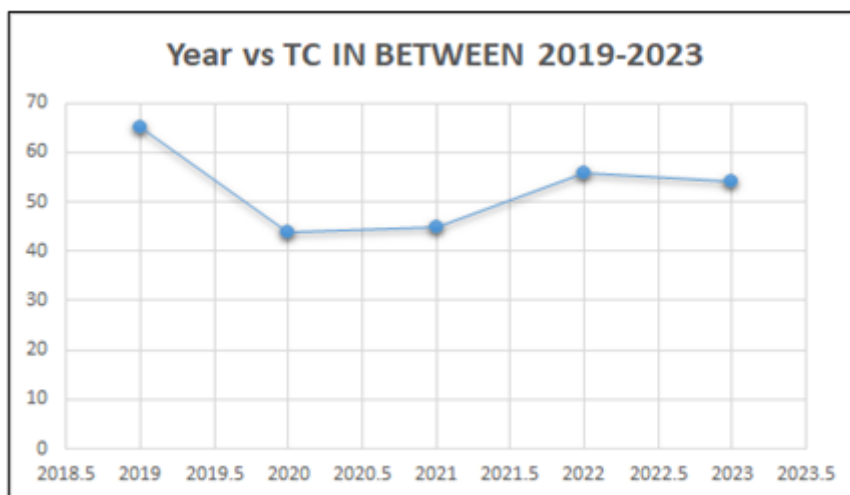


Figure 3: Year vs TC

The total citations have increased steadily over time, with some fluctuations. More precisely, the value of TC reached a spike of 70 between 2019 and 2018 reaching around 50 to 60 in 2023.

Table 2

Types of articles

Source Type	TP	%
Journal	250	62.5
Book	150	37.5
Total	400	100

(Source: Excel)

The fact becomes clear that Journals are the most common source for published articles, accounting for 62.5% of all articles. Secondly, books are the less common source, making up 37.5% of all articles.

Sources Titles

The journal "The Virtues of the Virtual Medical School Interview" published the most articles on the "flipped classroom" (n = 12). The "Knowledge Management Model" came next, with more than six publications (n = 10). Despite having fewer total articles, the Modern Language Journal led in total citations (n = 400) and had the highest cite score (n = 6.4) and g-index (n = 14). After detecting current trends in source titles, the final feature utilised to determine current trends is the usage of "flipped classroom," which implies that the efficacy of the learning experience has been determined.

Languages of Documents

The selection of journals, only written in English is associated with maintaining balance within the standards of multilingualism. Several studies have also mentioned the presence of structured citation impact through the channels of using English-written journals (Ramírez-Castañeda, 2020; Baidoo-Anu and Ansah, 2023; Abdulrahman et al., 2020). On the other hand, the searched articles are also found to be available in the databases acquiring the dominance of this particular language. It also becomes an essential factor in terms of increasing the

fundamental standards of accessibility along with the enhancement of existing visibility standards of the journals.

Predominant themes of the flipped classroom trends research

This research has also been conducted with the aim of providing an answer to the second question which is: What are the most predominant themes that have been addressed in flipped classroom research? In order to deliver answers to this question, terms have been evaluated which are keyword analysis and title and abstract analysis.

Keyword Analysis

Table 3

Different languages used for flipped classrooms research

Language	TP	Percentage
German	1	0.50%
Russian	2	0.45%
English	650	78.57%
Portuguese	3	2.56%
Croatian	4	4.35%
Serbian	2	0.52%
Lithuanian	1	0.31%
Italian	2	1.23%
Catalan	3	2.36%
Finnish	1	1.43%
Estonian	2	0.56%
Arabic	1	0.67%

Identifying and selecting keywords is essential for performing research successfully (Alam & Mohanty, 2022). Conducting research using keywords can prove effective in terms of increasing the value of writing. In this context in the guidance of Giannakos et al (2020), in the same piece of research while two keywords appear it showcases a significant connection between the researches. In this particular research few keywords have been demonstrated which are inverted classrooms, blending learning, flipped classroom, active learning, self-regulated learning and flipped learning. By using these six keywords the relevant resources have been recognised by the teachers which has proven helpful in terms of finding appropriate results for this study which exhibits that these keywords are effective in terms of increased relevance of the overall research process.

Title and abstract analysis

Table 4

Top six keywords in flipped classroom research

Keywords	TP	Percentage
Flipped classroom	150	56.67%
Flipped learnings	144	45.76%
Active learning	133	38.56%
Blending learning	65	18.65%
Inverted classrooms	98	24.56%
Self-regulated learning	54	16.45%

In the field of abstract six key terms have appeared within this study which showcases an intense connection among the terms. A binary counting method has been utilised in order to develop the research title. Along with this, using the keyword flipped classroom in the title showcases a strong connection with the research topic.

Major players and research collaboration

In this section, the third research question has been addressed through publications analysis, authorship analysis and citation analysis.

Leading researchers and institutions in terms of publications on the flipped classroom?

This section will primarily examine the third research question following who and what are the leading researchers and institutions in terms of application in the classroom. At the same time, it will primarily analyse the publication by the countries and main institutions as well as conduct and authorship analysis.

The following table has successfully identified the published country which is in the top 10 nations among which China has conducted most of the classroom studies. It is evident that the United States has 26% of overall studies while China has 28% of studies conducted in the fifth classroom. Apart from this Spain has 45% of studies while the United Kingdom has 26% of overall studies. This list also included Taiwan and Australia as well as Germany having 35% and 28% as well as 29% of studies respectively. Furthermore, Canada and Japan as well as Italian have conducted more studies respectively 24% and 14% as well as 21%. However, apart from the United States and China, most of the other countries have conducted classroom studies before 2018.

Main Institutions

In the context of flipped classrooms, the primary studies have been conducted by the University of California and Clemson University as well as Grand Rapids Community College. On the other hand, Boston University and Howard University as well as the University of Michigan also have conducted many studies and most of them are located in the United States. While on the other hand the School of Foreign Studies, Xi'an University, Xi'an, China. School of Foreign Studies, Northwestern Polytechnical University, Xi'an, China has conducted most of the studies on the flipped classroom context.

Authorship Analysis

It has been identified that there are 10 leading researchers who have contributed to the flipped classroom context and have published to publication. Most of these researchers are from China and the United States, however, two of the researchers are from the United Kingdom and Spain. The current research mostly uses VOSviewer software in order to effectively conduct co-author analysis for examining the author collaboration and the production of network visualisation. Based on the analysis the research comes to the fact that most of the good writers have cited at least one publication on the classroom context. The specific characteristics like text size and colour as elastic Ness have successfully increased the direction of researchers' context. The network visualisation map mostly included the country which has cited more than one article and more than one citation also has been included in this analysis.

Table 5

Geographic origins of flipped classroom research

Country	TP	% before 2018	% between 2018-19	Continent
United States	75	11	26	North America
China	19	14	28	Asia
Spain	126	19	45	Europe
United Kingdom	71	24	26	Europe
Taiwan	11	35	12	Asia
Australia	10	28	10	Oceania
Germany	9	29	10	Europe
Canada	12	24	6	North America
Japan	14	14	1	Asia
Italy	21	21	4	Europe

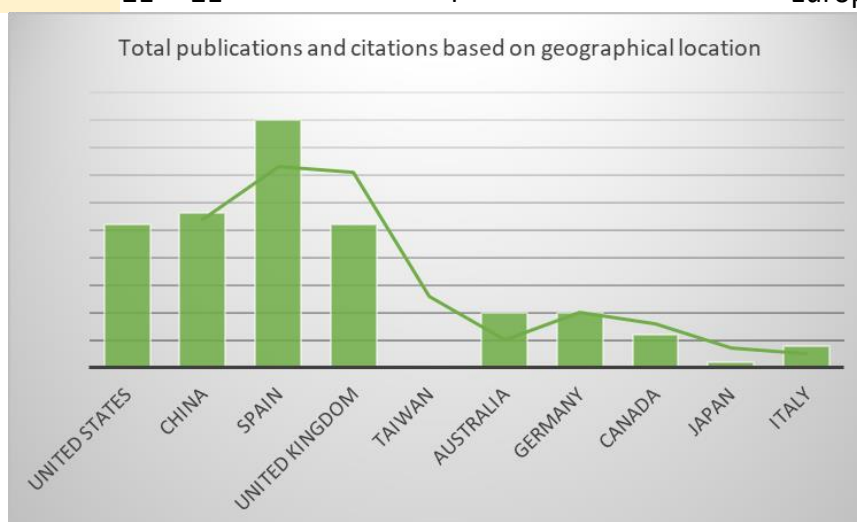


Figure 4: Total publications and citations based on geographical location

Discussion

The concept of the flipped classroom is specifically focused on the idea that all the lectures or direct institutions are not the best use of class time. It will be essential for the students to encounter the information before or after the class and it will successfully free the class time

and other activities which require high-order thinking. At the same time, it is a biological model which flips the traditional lectures and home and requires the lecture before the class and homework activity which needs to be done in the classroom with the instructor present to guide the students in their study process (Mandasari & Wahyudin, 2021). Since then, the flip classroom model has obtained a high level of validation from educators mostly in information and communication technologies and while including the technologies in the teaching process most of the attention has been given which allows the students to properly organise and design according to learning situations. It becomes essential to have learning activities in which the students can participate and activate in the teaching process within the schools and other colleges. Educational software and game-based learning environments as well as web-based learning environment content mostly contribute to the teaching in the teaching process. It is also dependent on modern technology as educators need to include information and communication technology to make learning easier mostly in the classroom model.

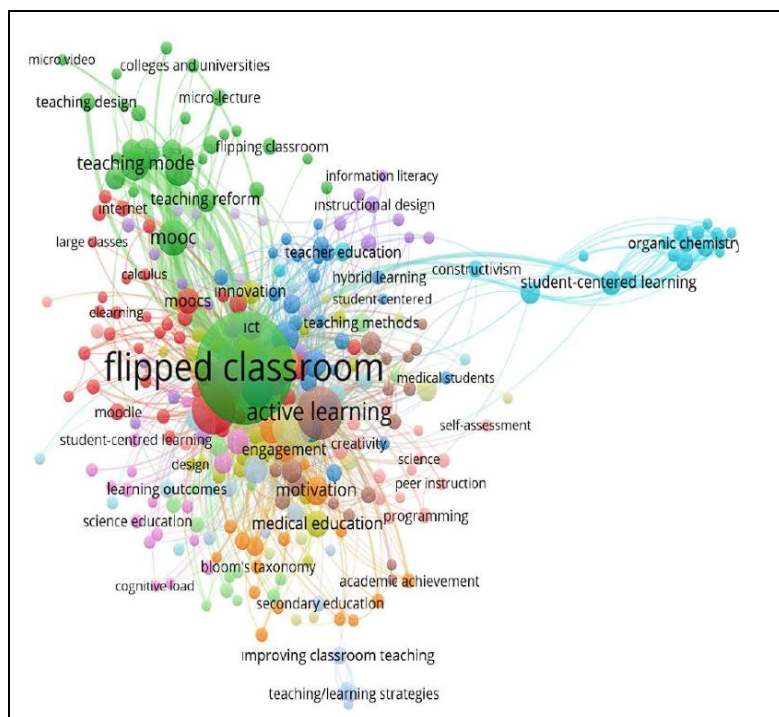


Figure 5: Network visualisation map of the FC model

In the analysis of the distribution of different articles by years, the author keywords and then an over-visualisation menu are selected. After deriving this map, it is observed that the flipped classroom concept was actually started in 2000 however the primary study conducted in the classroom is the Web of Science which was mainly conducted in 1992. At the same time, the keyword analysis took place which observed that all the yellow colour clusters focused on the studies made and most of the recent studies focused on academic achievement and the development of teaching-learning strategies as well as Teaching technologies used (Namaziandost & Çakmak, 2020).

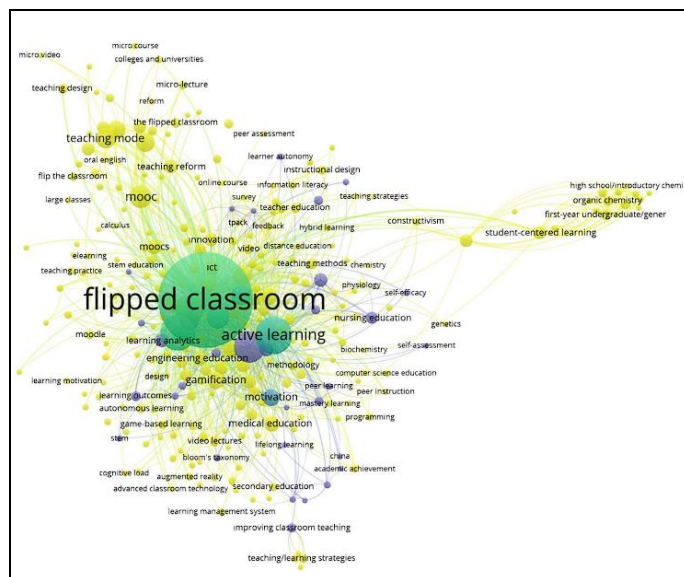


Figure 6: Distribution of the Number of Articles Using Keywords by Years

For the analysis of the word mostly used in the abstract parts and studies conducted related to the classroom the Web of Science biographic database is highly valid and after extracting the abstract and another binary counting method all the minimum numbers repeated have been established to 10 and further continued. The above map includes three classes in the abstract part and it is observed that the number of reputations mostly obtained in the commonly used word is the teaching and development as well as lectures and performances. The citation analysis and authors are mostly selected for analysing the most cited author while the minimum number of studies has been selected as one while the maximum number of citations selected is 10.

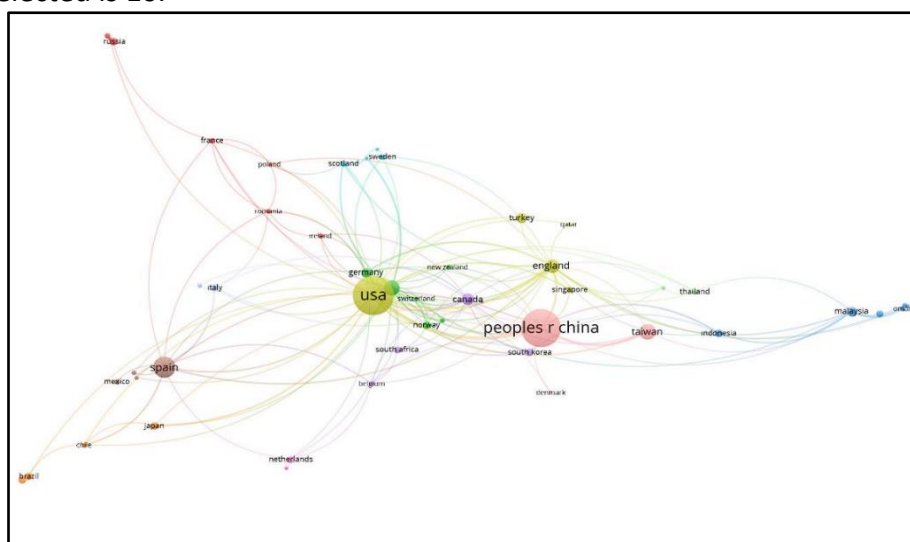


Figure 7: Distribution of the Number of Articles Using Keywords by Years

All the collected data has been selected for the last five years and the studies mostly related to the flipped classroom made on the papers followed by the articles and book section as well as review articles and new studies. Organisations like Hong Kong University and Caroline University as well as Michigan University have conducted most of the studies while from China the national Taiwan Normal University also conducted most of the studies. Therefore, it is evident that flipped classrooms are successfully best for the English language learner in order

to foster the active learning process. At the same time, the mobile technology-enhanced classroom is highly effective in covering learning strategies. This successfully enhances student engagement and most of the recent studies have covered all of these aspects. Still, in this field, There is a huge potential to work in the upcoming future.

Conclusion

It has been identified that there are several studies that have been conducted on the fifth classroom model and all these are based on the classroom and active learning as well as blended learning and teaching model as well as gamification. Most of the studies have been conducted between 2000 to 2019 and countries like the United States and China are the major contributors of the study on the classroom model. The content analysis related to flipped learning obtained the social constructivist approaches and most of the studies matched the literature properly. Looking at the words used in most of the abstract parts of studies can successfully provide insights about the classroom model and it is evident that teaching and development as well as lessons and preferences are also included in this. While examining the cortication network of the sources most of the computer and education as well as journal of pharma education and Internet and higher education journals comes into effect. In the last five years, countries like the United States and China as well as Australia have had most of the authors working together in different flipped classroom models.

Statistical analysis also has been included in this study and most of the studies are still on paper and there are very few universities present around the world that have actually implemented the concept of flipped classrooms. It is a fact that Valencia Polytechnic University is the first organisation which mostly conducted flipped classroom studies while at the same time, Hong Kong University and Carolina University are not lagging behind. The flipped classroom model is highly relevant in recent times as the technology is rapidly evolving and this creates a positive impact on the students so that they could successfully achieve their education goal. At the same time, the FC model also offers an autonomous studying environment for the students and it increases their internal motivation while ensuring advancement at their own pace (Fahmi, you Friatin & Irianti, 2020). The use of flipped classroom models in today's learning environment is highly recommended as it further improves learning performance and also provides an effective learning environment.

Therefore, with respect to the study, all the data has been obtained currently in the light of past conducted studies and also compared with the current literature. In the future, it is very important for researchers to use a different method in order to give an in-depth analysis of this flipped classroom model.

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