

## Bibliometric Analysis of "Learning Progression" Research in the Past Ten Years Based on the CNKI Database

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**Abstract:** Research on "learning progression" has been widely carried out in recent years, and many scientific research results have been achieved. In this paper, we take the data of "learning progression" related research papers in the CNKI database as the research object and use the bibliometric analysis method to analyze and research from the dimensions of the annual publication volume, journal, issuing institutions, authors, funding sources, keywords, and discipline distribution, in order to reveal the development trend of "learning progression" related research field in China, as well as the development trend of related research institutions, experts, funding sources. The analysis was conducted from the dimensions of annual publications, journals, authors, funding sources, keywords, and disciplinary distribution in order to reveal the development trend of "learning progression" in China, as well as the institutions, experts, funding sources, and research hotspots of related research, and to provide a reference for the development of research on "learning progression" in China.

**Keywords:** CNKI, "Learning Progression", Bibliometrics.

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## INTRODUCTION

One of the critical focuses of international competition in the 21st century is science and technology, of which the most intense is the talent competition [1]. In the rapid development of science and technology today, primary and secondary science education, which teaches how to breed competitive ordinary citizens and scientific and technological talents efficiently, has become one of the core issues of education. The exploration and practice of science education show that the science curriculum concept of "Less is more" is crucial to solving this problem, providing students with sufficient learning experiences within a limited time (primary and secondary stages), helping them to construct an in-depth understanding of the core concepts (big idea), and then reach an excellent scientific literacy [2, 3].

Many research institutes and scholars have studied and defined the "progression of learning," which was first defined by Smith in 2006 as "a series of progressively more complex thinking paths that students follow in the process of learning a core concept." In 2006, Smith first defined "learning progression" as "a series of progressively more complex thinking paths that students follow in the process of learning a core concept" [4]. Roseman and others pointed out that the learning progression is a logical, developmentally appropriate "conceptual sequence" from primary school to high school [5], Salinas, based on the previous definitions, pointed out that the learning progression is a verifiable hypothesis based on empirical evidence, which describes how students learn a core concept within a certain period. It describes how a student's understanding and use of scientific concepts, explanations, and practices develops and progresses

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over time under the guidance of a teacher [6]. Liu Enshan summarises "learning progression" as a description of the coherent and typical learning pathways that students follow when learning concepts on the same topic at various stages of learning, which are generally presented as a series of interrelated conceptual sequences from simple to complex concepts centered around a core concept [7]. Fan Zeng's view is that learning progression is a hypothetical description based on research, describing the typical learning path that students should follow when they continue to learn a core concept from school entry to high school graduation, which is expressed as a sequence of concepts around the core concept that continues from primary schools to high school [8]. In summary, the learning progression is a coherent and typical learning pathway that students follow when learning the same topic concepts at each academic level, which is generally presented as a series of interrelated conceptual sequences from simple to complex around the core concepts [7-9].

In 1969, Richard published "Is statistical bibliography or bibliometrics?" and proposed Bibliometrics [10]. Since then, the rapid development of Bibliometrics, its research methods, tools, and theoretical knowledge have gradually improved [11]. Bibliometric analysis methods have been widely used to predict various scientific and technological developments' current status and development trends [12]. In this paper, we take the research papers of CNKI journals about "learning progression" as the source, and the time range is 2005-2023. Using bibliometric analysis methods, we statistically analyze the authors, research directions, distribution of journals, publication time, research institutes, keyword frequency, and sources of funding projects of the literature related to the study of "learning progression" to further understand and grasp the current situation and development trend of the study of "learning progression," as well as the development trend of the study of "learning progression." In order to further understand and grasp the current situation and development trend of "learning progression" research and to provide some valuable references for future research on "learning progression," we have conducted a statistical analysis of the literature related to "learning progression."

## DATA AND METHODS

### *Literature Data Sources*

In order to scientifically show the research status of the field of "learning progression" in China

in the past ten years, this study chooses the journal database belonging to CNKI to carry out a subject search, with the following search conditions: subject = "learning progression," the period of 2005-2023, and the other search conditions as default options. The source category of journals was not set, and other search conditions were the default options.

In order to ensure the accuracy of the data, the results of the initial search were manually screened and excluded, and after excluding non-academic literature unrelated to the study of "learning progression," such as conference notices, calls for papers, the introduction of new varieties, literary works, biographies, and news reports, a total of 483 academic papers were obtained as the primary data for the present study and analyses.

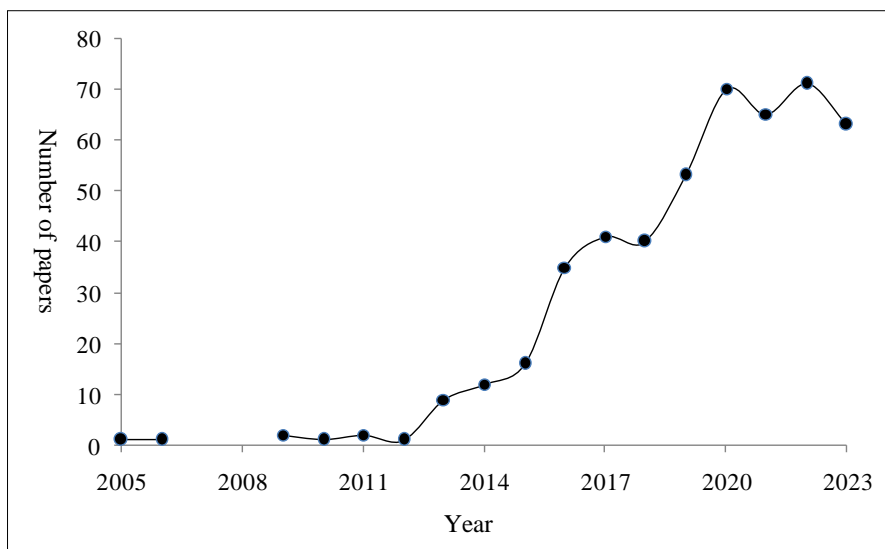
### *Research Analysis Tools*

In this study, VOSviewer software was used to show the cooperation of the authors of the published articles and to perform scientific knowledge mapping, such as the co-occurrence analysis of keywords in the literature. The literature format exported from CNKI has been converted accordingly and imported into VOSviewer 1.6.20 software [13], where the parameter Choose the type of data was set to "Create a map based on bibliographic data." Considering that the number of documents is not very large, the thresholds for co-occurrence of keywords and authors were set to 1.

## RESULTS AND DISCUSSION

### *Analysis of Annual Literature Quantity*

To a certain extent, the distribution of literature each year can reflect the heat and development level of the research in this field [12-14]. The annual distribution of literature (Figure 1) shows that the development of "learning progression" research can be divided into three stages. The first stage, 2003-2012, was a stable period, and the number of publications each year was relatively small; the second stage, 2012-2020, showed a rapid growth trend. During this period, the research intensity of "learning progression" has reached a peak in the past ten years, and in 2019, it exceeded 50 articles for the first time. In the third phase, 2020-2023, the number of articles stabilized at more than 60, and the number of articles in 2021 and 2023 was slightly lower, at 65 and 63, respectively. The number of articles published each year reflects the amount and breadth of research on "learning progression" in China in the past ten years.



**Figure 1: Yearly distribution of literature on "learning progression" studies**

**Analysis of Issuing Journals**

In this study, the source journals of 483 documents were statistically analyzed, and a total of 150 issuing journals were obtained, of which 101 journals with 1 article and 14 with two articles, and these two types of journals accounted for 77.67% of the total. The top 20 journals in terms of the number of articles are shown in Table 1.

As seen from Table 1, the top 20 journals in terms of articles carried are two physics journals, two geography journals, two chemistry journals, two biology journals, one language journal, and the rest are general. Among them, the journal "Physics

Teacher" has the highest number of articles, totaling 41, with an average of 2.28 articles per year from 2005-2023. In terms of the number of "learning progression" related research papers published by the journal over the years, the number of articles published per year is mostly more than 2. The number of articles published yearly from 2019 to 2023 is more than 5. The second-ranked journal, Geography Teaching Reference for Secondary Schools, has published 31 papers; in 2021, it will publish eight papers. Journals ranked 1-8 have more than 18 articles, and Foreign Primary and Secondary Education, ranked 20th, has more than five articles.

**Table 1: Top 20 journals in terms of number of publications**

No.	Title	Frequency
1	Physics Teacher	41
2	Secondary School Geography Teaching Reference	31
3	Geography Teaching	28
4	Teaching Chemistry	28
5	Teaching Biology	24
6	Curriculum, Textbooks, and Teaching Methods	22
7	Chemistry Education (Chinese and English)	18
8	Teaching of Physics	18
9	Basic Education Curriculum	15
10	Education Science Forum	8
11	Science and Technology Guide	8
12	Language Construction	8
13	Teaching and Management	7
14	Biology Bulletin	7
15	Journal of Tianjin Normal University (Basic Education Edition)	7
16	Chinese Teachers	6
17	Education Theory and Practice	6
18	Chinese Journal of Education	6
19	Secondary School Politics Teaching Reference	6
20	Foreign Primary and Secondary Education	5

**Statistical Analysis of Issuing Institutions**

Through the statistical analysis of the number of articles issued by the issuing institutions, the top 20 institutions ranked in terms of the number of articles issued are shown in Table 2, of which 127 are universities (universities and colleges), and 56 are scientific research institutions (institutes, academies). The number of articles issued by the top 20 institutions accounts for 34.72% of the total articles issued by all institutions.

As seen from Table 2, the institution with the most significant number of articles is Beijing Normal University, which has a high number of 68 articles.

Northeast Normal University and Central China Normal University ranked second in the number of articles issued, with 16 articles. East China Normal University (ECNU) ranked fourth in the number of articles published, with 14. The fifth largest institution regarding the number of articles is South China Normal University, which has 13 articles. Shaanxi Normal University ranked sixth in the number of articles published, with 12. The following institutions are People's Education Publishing House with 11 articles, Southwest University with 11 articles, Beijing Institute of Education with 11 articles, and Cheung Kong University with eight articles.

**Table 2: Top 20 issuing organizations in terms of the number of articles issued**

No.	Issuing Institution	Frequency
1	Beijing Normal University	68
2	Northeast Normal University	16
3	Central China Normal University	16
4	East China Normal University	14
5	South China Normal University	13
6	Shaanxi Normal University	12
7	People's Education Publishing House	11
8	Southwest University	11
9	Beijing Institute of Education	11
10	Cheung Kong University	8
11	National Institute for Curriculum and Textbook Research	8
12	Putian No.1 Middle School of Fujian Province	8
13	Capital Normal University	7
14	Anhui Agricultural University	6
15	Beijing Academy of Educational Sciences	6
16	Yancheng Normal College	6
17	Changting No.1 Middle School of Fujian	6
18	Fujian Normal University	5
19	Hangzhou Normal University	5
20	Shandong Normal University	5

**Statistical Analysis of Authors**

In this paper, the authors of 483 documents were statistically analyzed, and a total of 924 authors were obtained, of which 666 authors published one

paper and 42 authors published two papers, accounting for 76.62% of the total number of authors. The top 20 authors in terms of the number of publications are shown in Table 3.

**Table 3: Ranking of the number of publications by authors of studies related to "learning progression" (top 20)**

No.	Author	Frequency
1	Guo Yuying	18
2	Yao Jianxin	13
3	Wang Lei	9
4	Zhang Jing	9
5	Ding Zhaobao	8
6	Zou Guohua	8
7	Ding Lin	7
8	Lin Jianfen	6
9	Repo Le	6
10	Tong Wenzhao	6
11	Ye Chao	6
12	Li Xuefeng	5
13	Liu Enshan	5

No.	Author	Frequency
14	Ren Mingman	5
15	Wang Houxiong	5
16	Duan Wei	4
17	Li Huahuan	4
18	Yan Weiyun	4
19	Yu Mengshu	4
20	Zhang Guohong	4

As can be seen from Table 3, the top 20 authors are all core authors. The first-ranked author is Guo Yuying, who has 18 articles. The second-ranked author is Yao Jianxin, who has 13 articles. Wang Lei and Zhang Jing ranked the third and fourth in terms of the number of publications, both with nine articles. They were followed by Ding Zhaobao (8 articles), Zou Guohua (8 articles), Ding Lin (7

articles), Lin Jianfen, Repo Le, Tong Wenzhao and Ye Chao with six articles. Figure 2, on the other hand, shows the co-occurring authors in this type of study, and it can be seen that the structure is relatively simple, with only a relatively small number of authors collaborating, something that needs to be strengthened in the future.

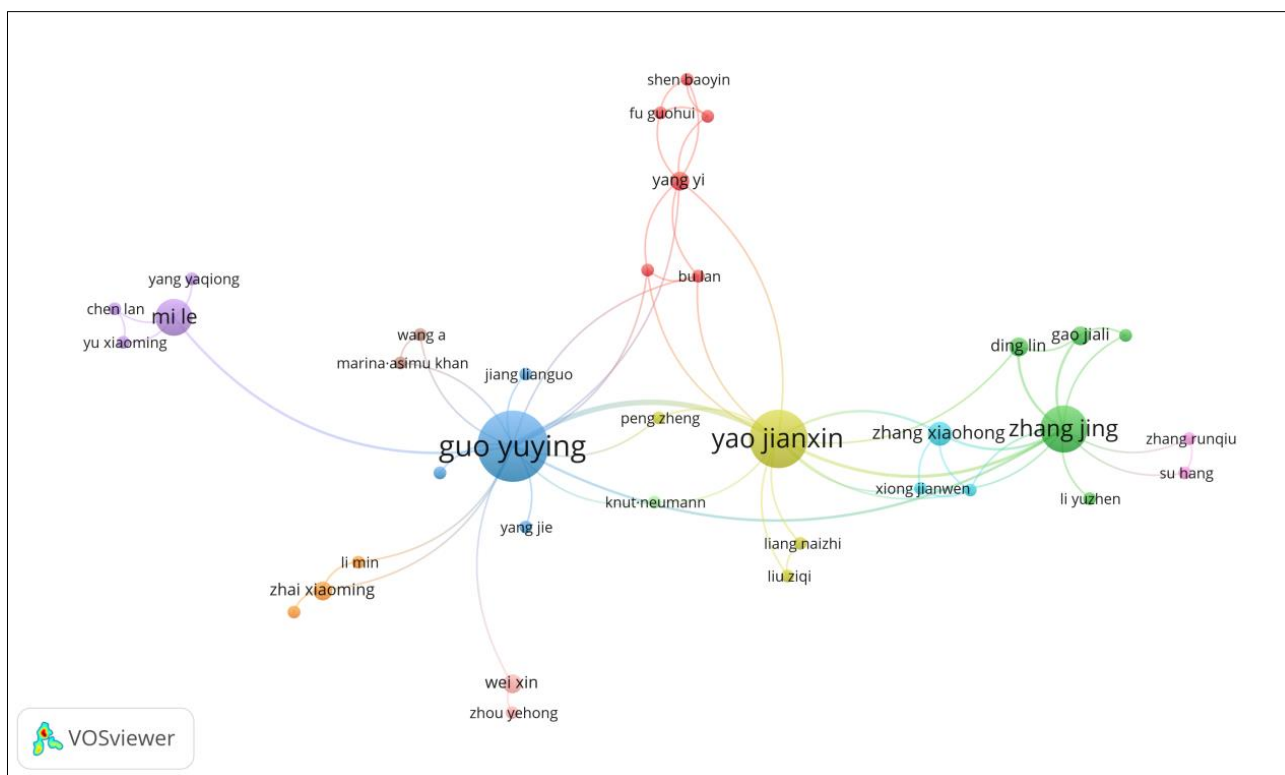


Figure 2: Co-occurring author mapping of studies related to "learning progression"

### Statistical Analysis of Funding

This paper statistically analyses the funding of 344 articles, and the top 10 types of funding for research related to "learning progression" are listed in Table 4. In the past ten years, the top two funding sources for research related to "learning progression" are the Ministry of Education's Philosophy and Social Science Research Project (4 articles) and Guangdong Province's Education Science Planning Project (4 articles), followed by Shaanxi Normal University's Education Project, Inner Mongolia Normal University's Project, the Ministry of

Education's Higher Education School Teaching and Research Project, Jilin Education Science Planning Project, Hubei Education Science Planning Project, and Hubei Province's Education Science Planning Project. Science Planning Project, Hubei Education Science Planning Research Project, Hubei Provincial Teaching Research Project of Higher Education Institutions, Hangzhou Education Planning Project, and Open Project of Basic Education Curriculum Research Centre of Fujian Normal University, all of which have three articles.

**Table 4: Statistical analyses of grants for "learning progression" related research funds (top 10)**

No.	Project Name	Frequency
1	Philosophy and Social Science Research Project of Ministry of Education	4
2	Educational Science Planning Project of Guangdong Province	4
3	Shaanxi Normal University Education Project	3
4	Project of Inner Mongolia Normal University	3
5	Research Project on Teaching and Learning in Higher Education Schools, Ministry of Education	3
6	Education Science Planning Project of Jilin Province	3
7	Hubei Province Education Science Planning Research Project	3
8	Provincial Teaching Research Project of Hubei Higher Education Schools	3
9	Hangzhou Education Planning Project	3
10	Open Project of Basic Education Curriculum Research Centre of Fujian Normal University	3

**Keyword Analysis of the Research Literature on "Learning Progression"**

This paper analyses the keywords of 483 research documents, with more than 990 keywords

in total. It can be seen that there is a wealth of research related to "learning progression." The top 20 keywords are listed in Table 5.

**Table 5: Statistical analysis of keywords (top 20) in research papers related to "learning progression"**

No.	Keywords	Frequency
1	Learning Progression	295
2	Core Concepts	42
3	Core Literacy	40
4	Instructional Design	30
5	Science Education	21
6	Deep Learning	15
7	Big Concepts	13
8	Teaching Strategies	11
9	Progressive Thinking	9
10	Progressive Learning Theory	9
11	High School Physics	7
12	Curriculum Standards	7
13	Rasch Model	6
14	Teaching Concepts	6
15	Scientific Thinking	6
16	Elementary Science	6
17	SOLO Classification Theory	5
18	Strategies	5
19	Large Unit Instruction	5
20	Unit Studies	5

As seen in Table 5, the highest word frequency was learning progression (295 times). The others, in order, were core concepts (42 times), core literacy (40 times), instructional design (30 times), science education (21 times), deeper learning (15 times), big ideas (13 times), instructional strategies (11 times), thinking progressively (9 times), learning progression theory (9 times), high school physics (7 times), curriculum standards (7 times), Rasch Model

(6 times), Conceptual Instruction (6 times), Scientific Thinking (6 times), Elementary Science (6 times), SOLO Categorical Theory (5 times), Strategies (5 times), Large Unit Instruction (5 times), Unit Instruction (5 times). The word cloud of keywords with a frequency of more than five times in the research papers related to "learning progression" can be seen in Figure 3.





## CONCLUSION

This paper analyses the research papers related to "learning progression" in China in the past ten years through the bibliometric analysis method, which can show the development status of the research field related to "learning progression" in China. Regarding the number of papers published annually, the research on "learning progression" in China has experienced three periods of low and steady development, rapid development, and high and steady development. From the journals, it can be seen that the papers in the research field of "learning progression" are mainly concentrated in the journals of physics, geography, chemistry, biology, language, and some general journals; from the authors and institutions, it can be seen that the papers in the research field of "learning progression" are primarily from teacher training colleges and universities and some scientific research institutes. From the authors and institutions, it can be seen that most of the research papers related to "learning progression" come from teacher training colleges and universities and some scientific research units, and a group of core authors have emerged; from the sources of funding, it can be seen that the Ministry of Education's Philosophy and Social Science Research Project and the support programmes of various regions' education planning projects have become the primary sources of funding; from the analysis of the keywords, it can be seen that the core concepts based on the "learning progression" are, From the analysis of keywords, it can be seen that the research related to the core concept of "learning progression", core literacy, instructional design, science education, deep learning, and big concepts are the research hotspots; from the analysis of research directions, it can be seen that the hotspots related to "learning progression" are mainly in the fields of physics, geography, chemistry, and biology.

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