Proceedings of the 3rd International Conference on Global Politics and Socio-Humanities
DOI: 10.54254/2753-7048/2024.24994

A Systematic Literature Review of the Impact of International Baccalaureate System of Mathematics Courses on Student Motivation and Learning Effectiveness for Adolescents in Mainland China

Sensen Lin[1*], Meng Lin[2], Lu Hu[3]

[1]*Faculty of Education, University of Hong Kong, Hong Kong, China*
[2]*Liberal Studies, New York University, New York, USA*
[3]*College of Arts and Sciences, New York University, New York, USA*
**Corresponding Author. Email: lsslucky@sina.com*

Abstract. This systematic review examines the impact of different educational systems on students' learning performance in mathematics among middle school students in China. In the current educational climate, an increasing number of adolescents are facing learning challenges in a variety of curriculum systems, from unified-textbook public schools to private schools adopting Western curriculum models such as IB, A-level, AP, and others. The increasingly dynamic and shifting environments call for further research in this field. This study employs a systematic screening process to identify 684 articles and a specific analysis of the 15 most relevant journal research papers is conducted through the lens of student learning motivation. The results indicate that numerous factors stimulate students' mathematical performance, including curriculum factors and other non-curriculum factors, such as parental expectations and the duration of private tutoring classes. Some of these factors directly or indirectly demonstrate that curriculum can promote motivation in mathematics learning, which has a positive impact on performance. This result offers insight into the potential future direction for curriculum design and its influence on students' performance and relevant factors.

Keywords: student effectiveness, curriculum, mathematics learning, learning motivation, evaluation of effectiveness

1. Introduction

In the current K12 education system in China, a variety of private schools have adopted different educational systems, including the International Baccalaureate (IB), the A-level system, and the Chinese government's public education system. This article seeks to narrow the research gap by elucidating the factors that influence student performance, with a particular focus on motivation. It also aims to ascertain whether Chinese private schools, operating under either the Western or public curriculum, are more effective in promoting students' mathematical abilities and creativity after

© 2025 The Authors. This is an open access article distributed under the terms of the Creative Commons Attribution License 4.0 (https://creativecommons.org/licenses/by/4.0/).

DOI: 10.54254/2753-7048/2024.24994

graduation. Additionally, it seeks to identify the non-curricular factors that enhance students' learning performance. A review of the literature reveals a paucity of articles examining the trend of student motivation in mathematics in private schools in China. A considerable number of articles adopt a perspective that encompasses student evaluation, school conditions, and other related factors. Consequently, this article presents a synthesis of the findings through a systematic review of the literature, with the objective of providing an overview of the teaching factors that affect student performance in contemporary Chinese public and private schools. Through a rigorous screening process, the article identifies the key factors in the literature that are most relevant to the research question. This is achieved through a series of studies, including research on private tutoring [1] and sociodemographic factors that affect motivation and participation [2]. In mathematics or science subjects, where Chinese students generally perform well but also face significant challenges, there is a trend related to learning motivation, which can impact on mathematical performance.

2. Problem framing

The objective of educators and those responsible for formulating educational policy has consistently been to facilitate students' effective acquisition of knowledge through metacognition. However, what kind of education policy, curriculum system, and pedagogies can be used to teach students to promote their better abilities and accurately reflect them in testing and measurement standards? Would it be reasonable to posit that there are more complex processes involved in the construction of mathematical knowledge? These are problems that many scholars are studying.

The curriculum of the IB system is renowned for fostering students' abilities while also encouraging their creativity to actively solve problems. The Chinese unified textbook curriculum and teacher-oriented classroom setting contribute to Chinese students' superior performance in mathematics tests compared to their counterparts in other countries. It thus follows that an investigation is required to ascertain whether the development of behavioral and psychological maturity entails the incorporation of psychological motivation factors. Furthermore, an investigation is required to ascertain whether these motivation factors can enhance students' learning performance, abilities, and other creative abilities.

A review of international research has identified curriculum as one of the essential factors affecting students' academic performance and learning efficiency. Emphasis has been placed on the acquired abilities and positive character traits as viewed through the lenses of psychological and motivational perspectives, with a particular focus on curriculum systems. In a case study conducted, it was determined that art teachers in schools with the IB (International Baccalaureate) program specifically designed educational goals to facilitate the development of students with the following traits: Inquirers, Knowledgeable Thinkers, Communicators, Principled, Open-minded, Decision-making, Risk-takers, Balanced Reflection [3]. The interviewer can discern four characteristics, but they vary considerably from one individual to another. This discovery indicates that teachers can ascertain that students are open-minded, principled, and risk-takers under the IB system.

Recent research has identified several psychological learning processes associated with mathematics through traditional pedagogical approaches that influence student success and learning efficiency in different effective evaluation instruments. To illustrate, scientists identified the importance of mathematical problem-posing and solving as cognitive processes in student learning and investigated the variations in these cognitive processes across different age groups [4]. Students can relate mathematical problems to their daily lives and engage in critical thinking. The teaching method of the traditional curriculum system can guide students' cognition. Although there is no

DOI: 10.54254/2753-7048/2024.24994

theory of motivation measured by this research paper, it has been verified that students have important cognitive abilities in problem-solving based on mathematical problems.

Similarly, in a recent study, other scientists investigated students' intrinsic motivation to engage with science subjects [5]. Their theoretical framework underscores the influence of social factors, positing that students, as active receivers of information, are shaped by the impressions they receive from their peers, parents, and educators. These impressions, in turn, manifest as personal motivations through students' participation in both classroom and extracurricular activities. Consequently, the quality of teaching can significantly impact students' engagement.

Recent research has identified several additional factors beyond the curriculum that influence student success and learning efficiency in different cultural and educational contexts. To illustrate, the study by researchers identified the influence of teacher relationships and parental expectations on students' learning emotions, including enjoyment, hope, pride, anger, anxiety, boredom, and hopelessness [6]. However, the analysis did not encompass the potential impact of the curriculum itself.

It is, therefore, of the utmost importance to gain an understanding of how the curriculum factors function on students' psychological changes, maturity, or learning motivation and whether these changes and motivation can influence learning efficiency, particularly within diverse educational systems such as public and private schools adopting international curricula. By addressing the psychological and emotional motivation stimulated by educational systems and pedagogies that accompany academic demands, educators can facilitate the development of motivation in students, which is essential for thriving in competitive environments. The integration of learning motivation into the curriculum may serve as a solution to one of the most pressing educational issues currently facing the international community: how to foster academic excellence while supporting student well-being. The objective of this study is to examine the impact of curriculum-related factors on adolescent students' motivation to learn mathematics, with a view to enhancing their mathematical performance in China. Furthermore, it aims to identify the prevailing trends in the factors influencing Chinese students' learning efficiency in mathematics within the context of the country's diverse educational systems.

3. Research question

To this end, our research asks:

1. what is the role of curriculum-related factors in fostering adolescent students' motivation to learn International Baccalaureate Mathematics Courses, which in turn can enhance their mathematical performance in China?

2. what are the prevailing trends in the factors influencing Chinese students' learning efficiency in mathematics within the context of the country's diverse educational systems?

4. Theoretical framework

The research question is based on theoretical perspectives on motivation that focus on the dynamic trend of mathematical learning motivation and efficiency, including some STEM subjects. These perspectives are fundamental to the interpretation of the impact of diverse motivational strategies on mathematical learning in mainland China's international schools and private schools that have adopted the national public curriculum, the IB curriculum, or an alternative Western curricular context. The following sections will present these perspectives and demonstrate how they have informed our study.

DOI: 10.54254/2753-7048/2024.24994

4.1. Strategy of motivation

Researchers investigated the deleterious effects of shadow education on students engaged in IBDP learning, as identified by educational institutions and instructors [7]. Nevertheless, the study did not consider the IBDP program itself in terms of its capacity to foster student interest and engagement in the learning process. Additionally, in a study conducted by another research team, an MSLQ questionnaire was employed to investigate the relationship between intrinsic and extrinsic motivation in learning mathematical strategies [1]. The findings indicated that internal factors exert a greater influence than external factors. However, the study did not employ established research methods to measure specific courses or investigate the underlying reasons. Additionally, a study identified several influential factors, including anxiety, academic self-concept, and self-efficacy, from the perspective of the students themselves [8]. In our study, we considered the teacher perspectives outlined by researchers who identified ten attributes (inquirers, knowledgeable, thinkers, communicators, principled, open-minded, caring, risk-takers, balanced, reflective) that educators designed for their students to implement in line with their own beliefs [3]. The finding has drawn attention to the issue of mathematical problem posing (MPP) in mathematics education at grades 7-9[4]. Other findings have adopted the personal goal orientation as a means of motivating students [5]. Other research teams have identified the impact of extrinsic motivations, such as external rewards and stimuli, on creative performance [9].

4.2. Evaluation of efficiency on math learning

Scientists devised a two-stage experiment to ascertain the characteristics of the ability of primary and secondary school students to distinguish mathematical shapes [10]. However, this study did not explore how course design and motivational factors affect abilities but rather from the perspective of test papers. Furthermore, studies found that students exhibit varying degrees of creativity but did not analyze whether this is due to self-motivation, curriculum system, or teacher instruction [11]. However, scientists evaluated the efficacy of high school mathematics proficiency by gauging the perceived effectiveness of parents and teachers [12]. The researchers concluded that students who demonstrate a strong grasp of the subject matter are likely to receive positive feedback from their parents and teachers. This study does not focus exclusively on external factors from a pedagogical standpoint. In their 2024 study, scientists identified several factors influencing mathematical achievement, including self-expectations of education, demographic characteristics, and time spent on education [13]. In particular, the relationship between average weekly expenditure on education and mathematics achievement was examined. Additionally, the evaluation variables identified) encompass fluency (defined as the number of solvable mathematical problems), flexibility, and profundity [4]. Furthermore, scientists considered the behaviorist factors that influence engagement within and outside the classroom [5]. Mathematical metacognitive monitoring and experience had a direct impact on the mathematics achievement of students in the highly effective group, as evidenced by the outcomes of learning tasks [14]. Other scientists employed a multi-stage approach to evaluate the learning efficiency [8].

DOI: 10.54254/2753-7048/2024.24994

5. Methods

5.1. Literature search

A systematic literature search was conducted using the EBSCO database to identify peer-reviewed academic studies related to the International Baccalaureate (IB) program and its impact on mathematics education, teaching resources, and student outcomes in China. The search utilized a combination of keyword strategies, employing Boolean operators to connect related terms, which are shown in Table 1, as well as filters to focus on relevant publications. Several search parameters were applied to refine the results. Only peer-reviewed academic journal articles published between January 1, 2015, and December 31, 2024, were included. The search was limited to full-text availability to ensure comprehensive access to the studies identified. After applying these criteria, a total of 684 academic journal articles were found.

Table 1: Examples of search terms used in EBSCO database

Search Term Category (Joined with AND)	Search Terms in Abstract (Joined with OR)
Education system	“IB Progr*” OR "International Baccalaureate” OR "International Educa*” OR ”IB Curricu*” OR “IB (international teaching system)” OR “IB Educa* system” OR “International Baccalaureate (IB)”,
Student learning effectiveness	Effectiv*, score*, grade*, test*, exam*, performance*, behav*, memor*, stud*,efficien*, complet*, activ*, presentation*, satisf*, personal grow*, improve*, knowledge*,
Psychology Math learning Region	Constructiv*,behavor*, students’feeling*, stress*, joy*, negative feeling*, positive feeling*, sad*, worr*, brain*, memor*, cognitiv*, emotion*, “math*” OR “Preserv*” OR “teach*” OR “educat*” OR “Resourc*” OR “allocat*” OR "Math learning" OR "knowledge acquisition" OR "logic analysis ability" OR "deductive learning" OR "inductive learning" OR "calculation ability" OR ration* OR "achievement test" OR drill* OR flunk* OR prelim* OR resit* OR retake* OR trial* OR exercise* OR mock*, China*

Table 1 shows that we have several layers to search the keywords in the title, which are related to the education system, students' learning effect, learning motivation, mathematics, and Mainland China.

5.2. Literature screening

After conducting the initial search and importing the 684 articles into Covidence (Figure 1), the system identified and removed 141 duplicate studies. The remaining 543 articles were then screened manually by two independent reviewers to determine their relevance to the research focus. Each study was evaluated using predefined inclusion and exclusion criteria.

DOI: 10.54254/2753-7048/2024.24994

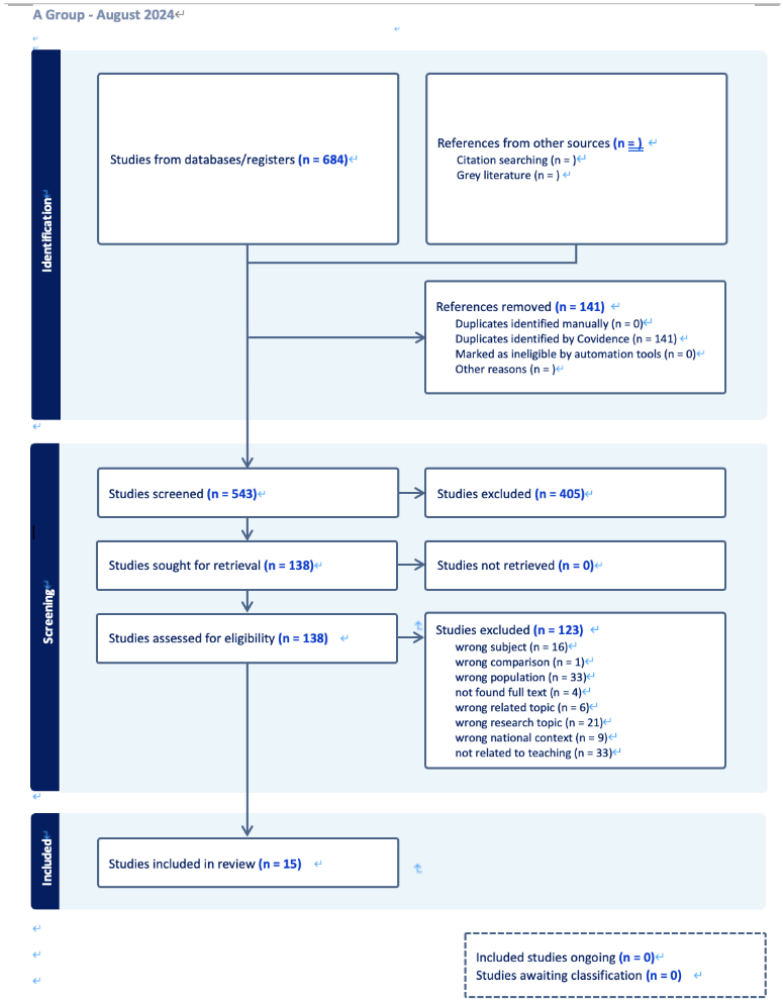

Figure 1: PRISMA diagram of the identification process through covidence

Inclusion Criteria:

Studies focused on education policy, teachers, students, or educational institutions (high schools and universities).

Research covering STEM disciplines, particularly mathematics.

Articles that explored aspects of leadership within educational settings.

5.3. Exclusion criteria

Studies focused on comparative education (e.g., China-Russia, China-Africa comparisons).

Case studies of Chinese universities, Confucius Institutes, or overseas schools.

Research related to religious disciplines, language disciplines, or fields unrelated to mathematics

Studies addressing parenting, IELTS, or the China University Thousand Talents Plan.

The research focused on the internationalization of higher education, including international students (whether in China or in other countries).

Studies addressing topics such as economic growth, urban-rural comparisons, COVID, sports, second language Chinese, or technology (e.g., AI).

During this process, 131 studies were identified as potentially relevant and were examined in detail. Of these, 15 studies were ultimately selected for inclusion in the final analysis. Any

DOI: 10.54254/2753-7048/2024.24994

disagreements between reviewers during the screening process were resolved through discussion and consensus.

5.4. Literature analysis

Table 2 is our classification based on the grade subjects of the research object in the literature and the cognitive learning theory used

Table 2: Overview of study characteristics

Study	Author, Date	Subject	Teaching Theory	Year of Learning
The Reciprocal Relationship among Chinese Senior Secondary Students' Intrinsic and Extrinsic Motivation and Cognitive Engagement in Learning Mathematics: A Three-Wave Longitudinal Study	Zhang, Y., Yang, X., Sun, X., & Kaiser, G. (2023)[1]	Math	Mixed	High School/ Upper-secondary School
The Investigation of critical thinking disposition among Chinese primary and middle school students.	Chen, J., Wang, X., & Zheng, X. (2024) [11]	Math	Behaviorism	Middle School/ Secondary School; High School/ Upper-secondary School
The Effects of Extrinsic Motivation on Scientific and Artistic Creativity among Middle School Students	Xue, Y., Gu, C., Wu, J., Dai, D. Y., Mu, X., & Zhou, Z. (2020) [9]	STEM(Mixed)	No clear theory	Middle School/ Secondary School
Relational Reasoning's Contributions to Mathematical Thinking and Performance in Chinese Elementary and Middle-School Students	Zhao, H., Alexander, P. A., & Sun, Y. (2021) [10]	Math	Cognitivism	Primary School ; Middle School/ Secondary School
Motivational Profiles in Mathematics among Chinese Secondary School Students and Their Relations with Perceived Parent/Teacher Goals and Academic Achievement	Luo, Z., Yang, Y., Sun, J., Yuan, W., Liu, S., & Wang, L. (2024) [12]	Math	Behaviorism	Middle School/ Secondary School
Motivation, Engagement, Academic Buoyancy, and Adaptability: The Roles of Socio-Demographics among Middle School Students in China	Yu, K., Martin, A. J., Hou, Y., Osborn, J., & Zhan, X. (2019) [2]	Other	No clear theory	Middle School/ Secondary School
Mathematical Metacognitive Characteristics of Chinese Middle School Students in Efficient Mathematics Learning	Wang, G., Zhen, Y., Chen, X., Kang, Y., & Cui, B. (2022) [14]	Math	Behaviorism	Middle School/ Secondary School
Investigating the Linkage between School Psychological Capital and Achievement Emotions in Secondary School Mathematics	Kang, X., & Wu, Y. (2022) [6]	Math	Cognitivism	Middle School/ Secondary School
Investigating Elementary and Middle School Students' Subjective Well-Being and Mathematical Performance in Shanghai	Yao, Y., Kong, Q., & Cai, J. (2018) [8]	Math	Behaviorism	Middle School/ Secondary School
Effect of private tutoring on students' non-cognitive mathematics learning outcomes in China.	Zhang, Y., Wu, X., Cui, C., Chen, S., He, Y., & Wang, L. (2024) [15]	Math	Other	Middle School/ Secondary School
Does Private Supplementary Tutoring Matter in Chinese Students' Learning of Mathematics: A Longitudinal Study	Zhang, Y., Cui, C., He, Y., & Wang, L. (2022) [1]	Math	Behaviorism	Middle School/ Secondary School
Disciplinary Learning Motivation and Its External Influencing Factors: Taking Physics in a 'Selection Crisis' as an Example	Jian-Xin, Y., Yu-Xuan, X., Tian, L., Chu-Fan, D., Yu-Ying, G., & Fortus, D. (2023) [5]	Nature Science (Physics, Chemistry.....)	Behaviorism	High School/ Upper-secondary School
Chinese Junior High School Students' Mathematical Problem-Posing Performance	Guo, Y., Yan, J., & Men, T. (2021) [4]	Math	Constructivism	Middle School/ Secondary School
Shadowing the International Baccalaureate: Private Supplementary Tutoring for the Diploma Programme in China	Wright, E., Lee, M., & Feng, S. (2018) [7]	Other	Other	High School/ Upper-secondary School
Interpreting and implementing the IB Learner Profile in an internationalised school in China: a shift of focus from the 'Profile as text' to the 'lived Profile'.	Poole, A. (2017) [3]	Other	No clear theory	Middle School/ Secondary School; High School/ Upper-secondary School

DOI: 10.54254/2753-7048/2024.24994

Based on the reviewed literature, the following hypotheses are proposed:

1. While many of the articles discuss psychological constructs such as motivation and metacognitive strategies, they do not explicitly examine the impact of structured psychological training programs. Instead, they explore how these psychological characteristics naturally occur in students or how they correlate with academic outcomes. None of the studies directly measure or intervene with psychological training programs.

2. Most of the articles are set within the context of the Chinese education system and do not specifically address the cultural and academic context of the educational system like IB system, curriculum. The Chinese education system is often more structured and examination-oriented, and thus the psychological and learning dynamics explored in the articles may not fully capture the distinct learning environment found in IB programs.

3. Psychological training programs tailored to the cultural context of Chinese IB students, addressing specific stressors such as parental expectations and societal pressures, will yield more significant improvements in learning efficiency compared to generic psychological interventions.

5.5. Extraction code

Focusing on Chinese students and secondary school students as the primary sample size and population.

The measurement of learning efficiency should whether be learning time, academic performance, or cognitive outcomes.

Examined mathematics-specific outcomes, such as problem-solving efficiency, exam performance, or mathematical metacognitive skills.

Examined the motivation behind the learning, which could be either intrinsic or extrinsic.

6. Findings

In our research, we have screened 684 articles. From the screening, we discovered that though we aimed to study the education of Mathematics in the educational curriculum, we had to expand our range of looking for papers to the Chinese national curriculum because there were relatively few papers discussing the Math subject in the multi-educational system in the Chinese context. So, the first finding is that in the studies focusing on education in China, most researchers chose to study the national curriculum and treated it as the main target curriculum. Few researchers studied students and teachers in the IB curriculum [3]. Researchers who studied the IB preferred Hong Kong or Singapore instead of the Chinese Mainland. This is one of the findings we discovered during the screening, and it focuses on the Education Curriculum. This situation might cause the diminishing of the voice and calls for rights of the middle school students or teachers being ignored or not being seriously dealt with. This might decrease the number of families who choose to learn the IB curriculum or go abroad.

The second finding is focusing on the content in the articles, including all Education curricula. In the abstract screening and full-text screening, we noticed that over two-thirds of the articles mainly took a deep look or included their findings on the student's academic performance. I am not saying that focusing on academic performance is wrong, but it shows that researchers and educators were more interested in the student's academic performance instead of students' motivation, which is one of the keywords that we want to explore. Students' emotions and feelings towards studying were not frequently seen. Therefore, most of the studies showed Behaviorism rather than cognitivism and constructivism. This might cause society and the decision-makers to be unaware of the feedback

DOI: 10.54254/2753-7048/2024.24994

from the students. So, there might be few calls from the society to support the students and there might be few and less effective policies from the government to improve the students' efficiency in learning.

For the third finding, we noticed relatively surprisingly that there were quite a few research (about 20% of the 543 research) aimed at teachers, textbooks, and new educational models. Besides students, which are the main target in educational research, other important compounds in an education system also attract researchers to do further investigation. It's a positive sign for the development and recognition of the whole education system. It might be significantly beneficial for some educational curricula, such as IB, as I mentioned in our first finding that the curriculum has not been paid much attention compared to the Chinese public national curriculum. This trend can raise the IB's authority and provide another path and choice for younger students.

7. Discussion

After those 3 main findings, the main question is, why do our findings matter?

For the first point, according to our first findings, the curriculum design for students' motivation doesn't get enough attention as it deserves from society and researchers. We think that more studies should involve the Chinese Mainland's curriculum to discover the grading system, students' academic and daily life, etc.

Secondly, raise awareness of students' emotions & psychological well-being. The studies are investigating the academic performance of students but ignoring the students' feelings. Through observation from daily life, students, both from the IB curriculum and the Chinese public national curriculum, complained about the schools and the courses, lunches, and other issues. Students have a lot of feelings and suggestions to call out. Governors and society should build a platform for students to express themselves and give out valuable advice.

Lastly, rethink the educational curriculum in the Chinese context. Is the national curriculum the only choice for Chinese teenagers? Does it have a systematic problem with the causes and ways of teaching? We would like to encourage people to rethink the pros and cons of the national curriculum and maybe make some changes to improve it in the future.

8. Conclusion

This study found that integrating instructional design with practical applications, such as graphic cognition, problem-solving, parental and teacher expectations, and teaching continuity, is a key factor impacting students' learning motivation and outcomes. In China, the impact of curriculum-related elements in increasing teenage students' willingness to learn mathematics, which can then improve their mathematical performance, has been consistently noted. For example, arithmetic and mathematic problem posing and solving is recognized as a key cognitive activity in students' learning, and its performance is investigated from various ages' perspectives. Scientists suggest that students may apply mathematical concepts to real-world situations [4][10]. Others stated that such mathematics or science curriculum design is related to practice and have a beneficial impact on student's creativity, and in the education process, parents' and instructors' expectations have an impact on students' learning efficiency [12].

Students' learning motivation is influenced by a variety of factors, including parents, teachers, and instructional approaches. The extent to which students participate in relevant learning activities can be used to assess their motivation. The curricular system is recognized as a comprehensive design that incorporates parent, teacher, and classroom activity assignments. As a result, this

DOI: 10.54254/2753-7048/2024.24994

structure is not unique to the IB system; it is also present in various government-run public mathematics teaching systems in China. It is worth noting that in shadow tutorial teaching, course design has a negative impact on student motivation but a positive one on learning outcomes. This demonstrates the association between two extreme parameters, but it does not imply a 100% positive link.

One of the key factors influencing the completion of the curriculum is the ability of teachers to observe improvements in students' creativity and abilities [3]. Future research should focus on investigating the impact of curriculum design on motivation and learning outcomes. Additionally, it would be beneficial to examine whether the curriculum system incorporates the influence of teachers' and parents' factors on motivation or if it directly affects the learning outcome.

Acknowledgement

Sensen Lin, Meng Lin, and Lu Hu contributed equally to this work and should be considered co-first authors.

References

[1] Zhang, Y., Cui, C., He, Y., & Wang, L. (2022). Does Private Supplementary Tutoring Matter in Chinese Students' Learning of Mathematics: A Longitudinal Study. ZDM: Mathematics Education, 54(3), 737–747.
[2] Yu, K., Martin, A. J., Hou, Y., Osborn, J., & Zhan, X. (2019). Motivation, Engagement, Academic Buoyancy, and Adaptability: The Roles of Socio-Demographics among Middle School Students in China. Measurement: Interdisciplinary Research and Perspectives, 17(3), 119–132.
[3] Poole, A. (2017). Interpreting and implementing the IB Learner Profile in an internationalized school in China: a shift of focus from the 'Profile as text' to the 'lived Profile.' Journal of Research in International Education, 16(3), 248–264.
[4] Guo, Y., Yan, J., & Men, T. (2021). Chinese Junior High School Students' Mathematical Problem-Posing Performance. ZDM: Mathematics Education, 53(4), 905–917.
[5] Jian-Xin, Y., Yu-Xuan, X., Tian, L., Chu-Fan, D., Yu-Ying, G., & Fortus, D. (2023). Disciplinary Learning Motivation and Its External Influencing Factors: Taking Physics in a "Selection Crisis" as an Example. Research in Science Education, 53(4), 823–839.
[6] Kang, X., & Wu, Y. (2022). Investigating the Linkage between School Psychological Capital and Achievement Emotions in Secondary School Mathematics. Asia-Pacific Education Researcher, 31(6), 739–748.
[7] Wright, E., Lee, M., & Feng, S. (2018). Shadowing the International Baccalaureate: Private Supplementary Tutoring for the Diploma Programme in China. Educational Research for Policy and Practice, 17(2), 127–143.
[8] Yao, Y., Kong, Q., & Cai, J. (2018). Investigating Elementary and Middle School Students' Subjective Well-Being and Mathematical Performance in Shanghai. International Journal of Science and Mathematics Education, 16(1), 107–127.
[9] Xue, Y., Gu, C., Wu, J., Dai, D. Y., Mu, X., & Zhou, Z. (2020). The Effects of Extrinsic Motivation on Scientific and Artistic Creativity among Middle School Students. Journal of Creative Behavior, 54(1), 37–50.
[10] Zhao, H., Alexander, P. A., & Sun, Y. (2021). Relational Reasoning's Contributions to Mathematical Thinking and Performance in Chinese Elementary and Middle-School Students. Journal of Educational Psychology, 113(2), 279–303.
[11] Chen, J., Wang, X., & Zheng, X. (2024). The Investigation of critical thinking disposition among Chinese primary and middle school students. Thinking Skills & Creativity, 51, N.PAG.
[12] Luo, Z., Yang, Y., Sun, J., Yuan, W., Liu, S., & Wang, L. (2024). Motivational profiles in mathematics among Chinese secondary school students and their relations with perceived parent/teacher goals and academic achievement. Educational Psychology, 44(4), 395–414.
[13] Zhang Y, Yang X, Sun X, et al. The reciprocal relationship among Chinese senior secondary students' intrinsic and extrinsic motivation and cognitive engagement in learning mathematics: A three-wave longitudinal study [J]. ZDM–Mathematics Education, 2023, 55(2): 399-412.
[14] Wang G, Zhen Y, Chen X, et al. Mathematical metacognitive characteristics of Chinese middle school students in efficient mathematics learning [J]. ZDM–Mathematics Education, 2022, 54(3): 543-554.

DOI: 10.54254/2753-7048/2024.24994

[15] Zhang, Y., Wu, X., Cui, C., Chen, S., He, Y., & Wang, L. (2024). Effect of private tutoring on students' non-cognitive mathematics learning outcomes in China. International Journal of Educational Development, 107, N.PAG. https: //doi.org/10.1016/j.ijedudev.2024.103029