A Meta-Analysis-Based Study of the Factors Influencing Students' Engagement in Classroom Learning

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ABSTRACT

In response to the inconsistent findings in current research on the factors influencing students' classroom learning engagement, this study aims to systematically review and re-explore empirical findings in this field through a meta-analysis to derive more generalizable conclusions. [Method/Process] Employing a meta-analytic approach that integrates both qualitative and quantitative methods, 43 high-quality empirical studies meeting the selection criteria from both international and domestic sources were rigorously screened. The Comprehensive Meta-Analysis (CMA) software was used to integrate the effect sizes (correlation coefficients) reported in the literature, followed by heterogeneity testing, publication bias assessment, and moderation effect analysis.[Results/Conclusion] The analysis ultimately identified 13 factors significantly influencing student classroom engagement. Effect size analysis revealed that teacher-student relationships, students' thinking skills, emotional factors , and teacher behaviors exhibited moderate correlations with engagement, identifying them as key influencing factors. Furthermore, moderation analysis indicated that the educational stage (basic education vs. higher education) significantly influenced the impact of three factors on student engagement: personality traits, thinking skills, and learning background. For instance, the correlations for personality traits and thinking skills were stronger in the basic education stage. [Innovation/Value] By quantifying the strength of various factors' influence through meta-analysis and identifying the moderating role of educational stage, this study not only clarifies the heterogeneity in existing research but also provides a theoretical basis and practical insights for developing targeted strategies to enhance student engagement across different educational phases.

Keywords: basic education, classroom learning, higher education, meta-analysis, student engagement

INTRODUCTION

Learning engagement, a multifaceted construct encompassing cognitive, behavioural, and affective investment in classroom activities, is fundamentally defined as the quantity and quality of students' psychological, cognitive, emotional, and behavioural responses throughout the learning process and in academic-social activities, aimed at achieving successful learning outcomes (Selim, 2015). According to Astin's (1984) foundational theory of involvement, the extent of a student's engagement exerts a broad influence on individual development. Beyond directly impacting academic achievement, it significantly fosters positive learning attitudes, enhances perseverance in the face of academic challenges, boosts self-efficacy, and increases overall satisfaction with learning experiences.

The learning engagement is theoretically recognized to serve both cognitive and non-cognitive functions, playing a crucial role in the personal and social development of students across various educational stages.

In the specific context of classroom education, student engagement is influenced by a complex interplay of factors. These can be broadly categorized into direct individual factors, such as students' personality traits and thinking skills, whose influence may vary across different educational levels, and external factors that intervene and shape participation behaviours. As underscored by related educational theories, the efficacy of any educational intervention is directly linked to its capacity to enhance student engagement. Key external factors include teaching quality, the nature of teacher-student relationships, and the application of educational technology, all of which significantly impact the depth and extent of student involvement.

Student classroom participation and its facilitation remain a central issue in educational research and practice. While numerous scholars have investigated this area, their findings often present variations and inconsistencies. Some researchers have delved into the conceptualization and significance of engagement, whereas others have conducted empirical analyses on its determinants. For instance, findings suggest that factors like students' self-expectations, teacher quality, personality traits, major satisfaction, and learning motivation are all positively linked to classroom participation. However, a comprehensive and integrated understanding of the relative strength of these factors and how their influence might differ between educational stages, such as basic education and higher education, is still needed.

To address these gaps and synthesize the existing body of empirical work, this study employs a meta-analytic approach. This research is guided by the following key questions: What factors have been identified in existing international and domestic research as influencing students' classroom learning engagement? To what extent do these factors affect students' willingness and behaviour to engage in classroom learning? Furthermore, do the effects of these factors on student classroom participation differ significantly across basic and higher education levels?

By systematically answering these questions, this study aims to provide a clearer and more integrated picture of the factors influencing student classroom learning participation. Theoretically, it seeks to reconcile the scattered and heterogeneous discussions in existing literature, identify sources of variation, and thereby contribute to enriching the theoretical framework concerning teaching and learning coherence across educational stages. Practically, the findings are expected to offer valuable evidence and insights for schools and teachers to formulate effective, stage-appropriate strategies to promote student engagement, ultimately enhancing classroom participation and overall teaching effectiveness.

RESEARCH THEORETICAL FRAMEWORK

Research Methods

This study uses the meta-analysis method of qualitative and quantitative combination to further explore the empirical data. Meta-analysis, proposed by American educational psychologist GV Glass, is a comprehensive statistical analysis method for a large number of existing empirical research results on the same topic, also known as secondary analysis, meta-analysis, and integration analysis. With the application and development of meta-analysis, scholars have found that meta-analysis includes both quantitative and qualitative analysis. In general, meta-analysis is a quantitative analysis of

existing research results by using specific design and statistical analysis methods. The most controversial issue of meta analysis method is the "orange and apple problem", which combines the results of different studies, but this problem can be explained by the heterogeneity test of this method. At the same time, compared with the traditional literature review, the meta-analysis method carries out a strict analysis and evaluation of the included literature, which can avoid personal subjective ideas and make the research conclusions more objective and universal.

At first, meta-analysis was mainly used in the field of medicine and psychology. With the development of meta-analysis, this method has also attracted the attention of scholars in other fields and has been accepted by more and more scholars. In the field of management, Huang Yongchun uses the method of meta-analysis to study the strong correlation between product innovation and performance, which provides theoretical support for enterprise management; Li Jinghua analyzed the empirical research literature on the influencing factors of knowledge transfer, and found that knowledge receptors and network characteristics are the most important influencing factors; In the field of information science, Xie Juan found that there was a significant strong correlation between the number of papers downloaded and the number of papers cited. The successful application of the meta-analysis method by these scholars gives us reference and enlightenment, and also confirms the feasibility of secondary analysis and review on the influencing factors of students' learning participation by using meta-analysis technology to a certain extent.

Research design

The overall research technical route of this paper is shown in Figure 1. This study strictly follows the standardized process of meta-analysis, and the specific steps are as follows:

Firstly, based on the pre-set literature retrieval and screening criteria, systematically collect domestic and international empirical research literature related to the theme of students' learning participation. Through a combination of cross-database search and manual screening, the literature pool that meets the conditions is initially obtained.

Subsequently, the included literature was encoded and preprocessed. Two researchers independently extracted the basic information of the literature (such as author, publication year, sample size, etc.) and the effect size data reported in the study (such as correlation coefficient r, t value, p value, etc.) to ensure the consistency and accuracy of the coding process, and finally formed the basic information coding table of the literature.

During the data entry and analysis stage, the preprocessed valid data is entered into the professional Meta-Analysis software CMA (Comprehensive Meta-Analysis) for integration and processing. The software automatically calculates the combined effect size of each influencing factor and generates corresponding visualization results such as forest maps.

After obtaining the preliminary results of the meta-analysis, further statistical tests and in-depth analyses are conducted. It mainly includes: heterogeneity test, publication bias analysis, moderating effect identification. Finally, based on the above statistical analysis results, a comprehensive explanation and discussion are conducted on the key influencing factors of students' learning participation, their influence intensity, and their differences in different situations, thereby forming the final research conclusion.

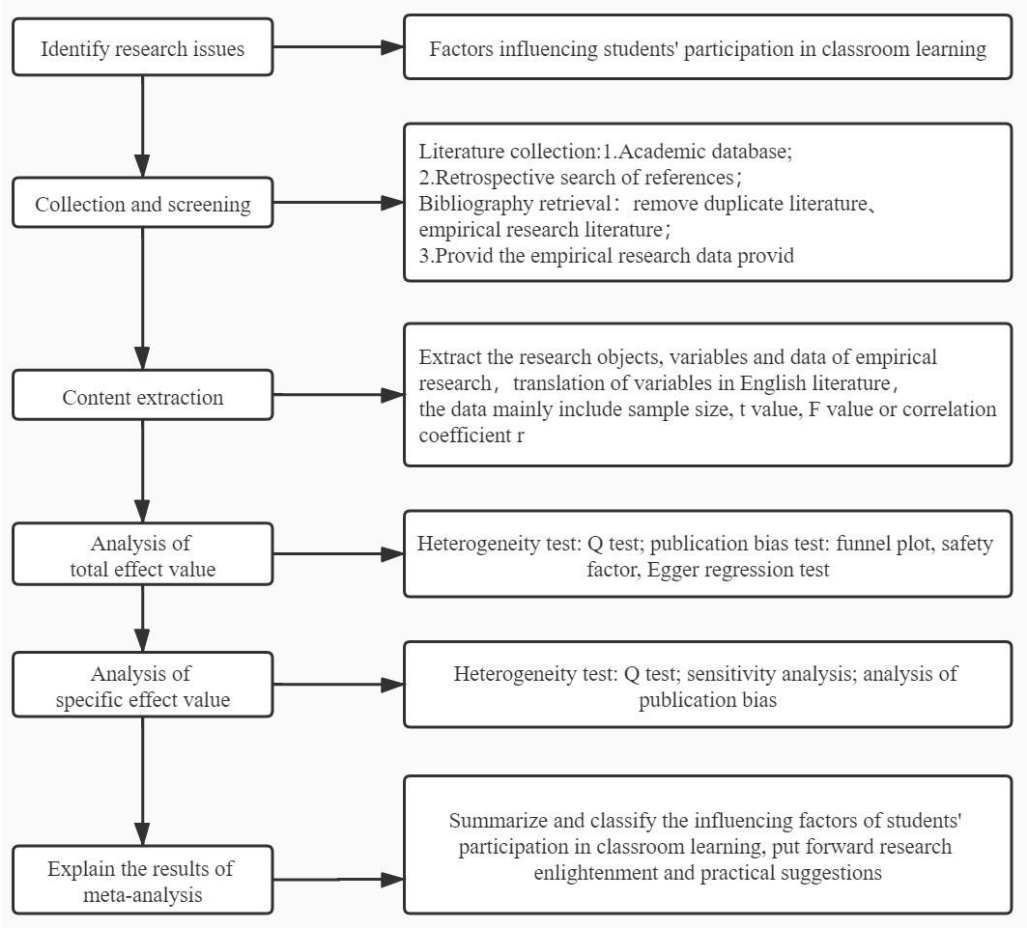

Figure 1 The framework of meta analysis on the influencing factors of learning participation

（1）Literature collection and screening. In order to comprehensively obtain relevant literature on students' learning and participation in research and overcome the problem of publication bias, data is collected from multiple sources. This article uses relevant keywords such as "engagement", "student engagement", "attendance", and "absence" in Web of Science, Emerald, and ProQuest The full-text database of dissertations, Scopus and other foreign language databases were used for searching with subject fields such as "student participation", "learning engagement", "classroom learning participation" and "influencing factors". The search objects included separate and combined searches in Chinese databases such as China National Knowledge Infrastructure (CNKI), VIP Full-text Journal Database, Wanfang Database, and Baidu Wenku, and backtracking searches were conducted on the references of important documents. A total of more than 400 relevant documents were obtained. After careful verification, it was found that there are still many literatures that are not suitable for meta-analysis. The main reason is that some of the literatures are not empirical studies, and different studies adopt different analytical methods. Due to the limitations of current meta-analysis methods, the following literature screening criteria were set when selecting meta-analysis samples:

① The sources of literature must be empirical research both at home and abroad. Theoretical research, review papers and other literature are excluded. ② The object of literature research must be student engagement. Delete the literature where the dependent variable is not student classroom engagement. In addition, the literature must report the correlation coefficient r between the

independent variable and students' classroom participation, as well as the standard error SE or t value, P value, and other data that can calculate the correlation coefficient. ③ Ensure the independence of the samples, that is, it must be an independent study without the same samples.

（2）Literature coding and preprocessing. Meta-analysis is the synthesis and analysis of existing research data. Therefore, it is necessary to extract the characteristic information of the literature and the data reported in the research from the existing studies, and encode and organize the extracted information. The author adopted an open coding approach. Based on the coding schemes of other meta-analysis related studies, a small number of literatures were initially used for trial coding. The coding schemes were continuously modified to initially formulate a coding scheme suitable for the sample data of this study, and the coding variables and corresponding values were gradually improved and modified. Literature coding consists of two parts: basic information and content analysis of the literature, and summary of effect size statistics required for meta-analysis. The description of literature content mainly includes basic information such as the author of the literature (showing the first author), research objects, research content and conclusion extraction. The effect size statistics mainly include sample size (sample size) and correlation coefficient r or t value, P value, etc. that can be converted according to the Fischer Z formula. In cases where comparison is impossible or there is factor duplication, the average of multiple measurement results is adopted to obtain comparable and most efficient data results. To avoid the bias of personal subjective understanding and ensure the accuracy of the literature coding information results, the coding work was carried out simultaneously by two people, with a coding reliability as high as 96.1%. Each person independently coded the literature. After rechecking, the parts with inconsistent codes were retrospectively retrieved from the original literature and renegotiated, and finally the coding table was obtained.

（3）Data entry and analysis. The meta-analysis of the influencing factors of students' learning participation was conducted using the user-friendly, well-organized and convenient CMA (Comprehensive Meta-Analysis) 2.0 meta-analysis professional software. The correlation coefficient r could be used as the effect value input for most of the literatures, and for a few literatures that did not provide the correlation coefficient, The required effect size can be obtained by converting the statistics such as t value and P value in the literature through the Fisher Z formula.

METHOD

Sample coding results

The final sample data was selected from 43 pieces of domestic and international empirical literature that met the criteria, including 16 pieces in Chinese and 37 pieces in English. Some of the literature coding results are shown in Table 1.

Table 1: Selected examples of literature coded information

No.	sample size	Factors
1-21	256	Teaching and learning factors (r=0.272)
1-22	558	Individual student characteristics (t=3.538) Learning context (t=2.340)
1-23	443	Teaching and learning factors (r=0.530)
1-24	1714	Teacher behaviour (r=0.188) Learning resources support (r=0.117)

.Due to the different theoretical bases and references adopted by various scholars in their articles, as well as the subjective deviations in the reading and translation of international literature, there may be differences in the definitions of the names of independent variables. As a result, the expressions of influencing factors with the same or similar meanings may vary. According to the requirements of the meta-analysis method, this paper needs to translate and organize the factors influencing students' classroom participation, and combine the same and similar factors to analyze the comprehensive effect size of each influencing factor. Before the analysis, the author conducted a search on the definitions of independent variables in the literature and the specific questions in the questionnaires or interviews involved, and carried out literature coding preprocessing. At the same time, the meta-analysis requires that the number of combined effect values be no less than two, that is, select independent variables with a frequency greater than two and the corresponding literature for meta-analysis to ensure that the number of relevant literature is greater than two when conducting the meta-analysis. After translating 43 pieces of literature and their discussion results, summarizing similar concepts and sorting them out, a total of 13 influencing factors were identified that could be included in the scope of meta-analysis.

Test of heterogeneity

Heterogeneity is generally tested using Q and I^2 statistics. The results of the heterogeneity test in this study are shown in Table 2. It can be seen that the results of the Q test are all significant ($P < 0.05$), indicating that there is heterogeneity among multiple studies. At the same time, the value of I^2 is greater than 80% and mostly above 95%, indicating that the proportion of each influencing factor in its effect value is relatively high. Therefore, all the influencing factor tests in this study were analyzed using the random effects model. However, the study by Higgins J P T et al. suggested that the large value of I^2 was not suitable for meta-analysis. In response to this situation, Xie Juan et al. conducted a simulation analysis based on the calculation formulas of Q and I^2 and concluded that the judgment of Higgins J P T et al. was more applicable to small-sample studies rather than large-sample ones, which better explained the results of the heterogeneity test.

Table 2: Heterogeneity test results

Factors	K	N	Heterogeneity (Q test)			Tau-squared			
			Q-value	P-value	I^2	τ^2	SE	Variance	τ
Environmental support	9	44771	739.739	0.000	98.919	0.041	0.036	0.001	0.204
Partnerships	7	22507	451.417	0.000	98.671	0.050	0.043	0.002	0.223
Teacher behaviour	20	160253	7707.823	0.000	99.753	0.087	0.069	0.005	0.294
Teaching Factors	10	21309	272.628	0.000	96.699	0.030	0.023	0.001	0.173
Emotional factors	12	21752	1320.599	0.000	99.167	0.082	0.055	0.003	0.286
Teacher-Student Relations	8	70187	1396.584	0.000	99.499	0.076	0.074	0.005	0.275
Individual student characteristics	9	22503	124.131	0.000	93.555	0.012	0.009	0.000	0.110
Student personality traits	5	16797	129.457	0.000	97.683	0.018	0.019	0.000	0.133

Student thinking skills	4	84197	754.048	0.000	99.470	0.182	0.153	0.023	0.427
Student Learning Behaviour	14	144695	1993.275	0.000	99.348	0.045	0.038	0.001	0.211
Student Learning Ability	5	93663	66.853	0.000	94.017	0.009	0.009	0.000	0.092
Learning Context	6	4214	105.380	0.000	95.255	0.031	0.022	0.001	0.175
Learning Resources Support	5	20521	81.931	0.000	95.118	0.011	0.010	0.000	0.104
Total	114	727369	19821.565	0.000	99.430	0.024	0.014	0.000	0.155

Publication bias analysis

The test of publication bias is a very important step in meta-analysis methods. Due to authors' preference for high-quality research results and their tendency to have their papers published preferently, publication bias is prone to occur. The existence of publication bias in literature can pose significant obstacles to the results of meta-analysis, lead to deviations in conclusions, and even cause meta-analysis research issues to lose their value. Therefore, in the existing meta-analysis literature, scholars mostly adopt a combination of multiple techniques to determine whether there is publication bias.

This study was a multivariate analysis. Sensitivity analysis was conducted under the assumption that these factors were independent of each other, and it was found that the stability of this study was relatively good. The publication bias test of this paper adopts the Egger test method, combining the total unsafe factor with the Egger regression intercept to make a relatively reasonable and accurate judgment. The total unsafe factor of each influencing factor (N=2789) is much greater than the total value of K (K=114), that is, for each observed study, the results of 2789 negative experiments are needed to reverse the conclusion. The Egger regression intercept is 4.560. The intercept value is relatively small and does not deviate significantly from 0, indicating that there is no significant difference between the intercept term and 0. All factors are relatively robust, and the meta-analysis results are not easily affected by obvious publication bias.

Effect value analysis

For different types of effect value indicators, the reference values corresponding to different degrees of correlation are also different. Cohen et al. (1988) proposed empirical criteria for judging the strength of the correlation coefficient r: An r value of 0.00 to 0.09 indicates basically no correlation, 0.10 to 0.29 indicates weak correlation, 0.30 to 0.49 indicates moderate correlation, and 0.5 to 1.0 indicates strong correlation. Based on this criterion, we analyzed and summarized the correlation between all influencing factors and students' participation in classroom learning, as shown in Tables 3 and 4. Based on the results of the effect value analysis, it can be seen that all factors meet the screening criterion that independent variable factors must occur more than twice. Additionally, the range without confidence intervals, including 0.000, has all passed the test and can be fully adopted.

Table 3. Specific results of meta-analysis of factors influencing student learning engagement

Influencing factors	K	N	Effect value	95% confidence interval		Two-tailed test	
				Lower limit	Upper limit	Z-value	P-value
Environmental support	9	44771	0.252	0.093	0.399	40.481	0.000
Partnerships	7	22507	0.313	0.136	0.471	17.338	0.000
Teacher behaviour	20	160253	0.346	0.244	0.440	63.321	0.000
Teaching Factors	10	21309	0.270	0.119	0.409	17.556	0.000
Emotional factors	12	21752	0.367	0.237	0.484	25.826	0.000
Teacher-Student Relations	8	70187	0.460	0.311	0.587	147.451	0.000
Individual student characteristics	9	22503	0.175	0.012	0.330	9.887	0.000
Student personality traits	5	16797	0.292	0.054	0.498	60.016	0.000
Student thinking skills	4	84197	0.445	0.252	0.640	19.443	0.000
Student Learning Behaviour	14	144695	0.350	0.229	0.460	57.461	0.000
Student Learning Ability	5	93663	0.168	-0.050	0.372	66.245	0.000
Learning Context	6	4214	0.291	0.097	0.464	15.076	0.000
Learning Resources Support	5	20521	0.183	-0.036	0.386	9.968	0.000
Total	113	727369	0.308	0.243	0.370	189.953	0.000

Table 4. Correlations of factors influencing student learning

Correlation coefficient	Influencing factors
Medium correlation ($0.3 \leq r < 0.5$)	teacher-student relationships, students' thinking skills, emotional factors, teacher behaviour, students' learning behaviour, partnerships
Weak correlation ($0.10 \leq r <$ 029)	student personality traits, learning context, teaching and learning factors, environmental support, learning resource support, individual student characteristics, student learning ability

Based on the summary results presented, it was concluded that the relationship between the 13 influencing factors and all independent variables and students' classroom learning engagement was statistically significant at the $p < 0.05$ level. The results show that there are six factors such as teacher-student relationship (0.46), students' thinking skills (0.445) and affective factors (0.367) that are moderately strongly correlated, seven factors such as students' personality traits (0.292), learning background (0.291) and teaching factors (0.27) that are weakly correlated with learning engagement, and zero factors that are largely uncorrelated with students' classroom learning engagement. This indicates that the research related to the factors influencing students' classroom learning engagement in the domestic and international empirical literature is relatively scattered, and there is no highly unified paradigm of expression and generally accepted research findings, which is one of the implications of this study.

Analysis of moderating variables

In terms of heterogeneity testing, this study employed a random-effects model for analysis based on Q statistics. If the heterogeneity detection results were significant, the samples were divided into multiple groups according to the set moderating factors, and the Q statistics of each group were calculated to assess whether the inconsistencies among different groups were caused by moderating variables. According to the results of the overall and individual Q statistics of the influencing factors reported in Table 2, the Q value test results of all influencing factors are significant, indicating that the effect values of these variables not only come from the expected variables of sample error, but also from the characteristic differences among different studies, that is, the variables in this paper are heterogeneous among different studies. This article will continue to delve deeper into subsequent studies based on the research characteristics, grouping the variables for research as shown in Table 5, in order to identify the moderating variables that cause heterogeneity among different studies.

Table 5. Results of the analysis of stage of education as a moderating variable

Influencing factors	Adjustment variables	k	Effect value	95% confidence interval		Two-tailed test		Heterogeneity between groups		
				Lower limit	Upper limit	Z-value	P-value	Qb	df (Q)	P-value
Student personality traits								9.721	1	0.002
	Basic Education	2	0.840	0.604	0.941	26.949	0.000			
	Higher Education	3	0.287	0.036	0.504	12.898	0.000			
Student thinking skills								3.928	1	0.047
	Basic Education	2	0.428	0.232	0.591	18.049	0.000			
	Higher Education	2	0.142	-0.075	0.346	57.728	0.000			
Learning Context								13.155	1	0.000
	Basic Education	2	0.491	0.361	0.603	13.696	0.000			
	Higher Education	4	0.182	0.079	0.281	10.593	0.000			

This paper takes the educational objects at different learning stages, namely the basic education stage and the higher education stage, as moderating variables to further analyze the influence of the moderating variables on different influencing factors of students' participation in classroom learning. According to the criterion of k≥2 after grouping the moderating variables, several factors that were insufficient in the number of single-type studies, such as the teacher-student relationship, students' personality traits and learning resource support, which did not meet the conditions, were excluded. From the results of the moderating variables, it can be seen that when the educational objects at different stages are used as moderating variables, the Qb corresponding to students' personality traits, students' thinking abilities and learning backgrounds is significant. It is indicated that the differences in research objects between basic education and higher education have a certain moderating effect on the relationship between students' learning background before classroom participation and their thinking ability during the classroom participation process and their classroom learning participation. Through the review of relevant literature,

it is found that personality traits include introverted, extroverted, active and lively, passive and sociable, and other different traits. People with good self-awareness and identity are more likely to interact with others, adapt to environmental changes, self-regulate and self-defend, and develop a lively, cheerful, optimistic and kind personality. Students' high-level thinking includes innovative thinking, deep thinking ability, meta cognitive strategies, psychological capital, etc. Learning background factors include the student's subject and major category, the time of enrollment, whether the content learned is relevant to employment, the student's previous academic performance, the educational level of parents and the extent to which they participate in their children's learning, etc. These are the individual background factors that a student already possesses before participating in classroom learning, and are mainly reflected in the student's admission scores, admission status, and whether they are class cadres, etc.

From the perspective of correlation coefficients, the participation of students in the basic education stage (0.840) is more influenced by personality traits than that of students in the higher education stage (0.287), which is consistent with the research findings of Chen Dandan: The higher the academic mood and academic self-efficacy of junior high school students who are cheerful and optimistic in their studies, the higher their learning engagement. This study also confirms that students' personality traits have a significant impact on their participation. During the basic education stage, students are in their adolescence, with a confused self-awareness and large emotional fluctuations. They are prone to extreme personality problems such as extremism, conflict, and autism, and their learning behaviors are greatly influenced by their personalities. During the higher education stage, students have basically completed the construction of self-awareness and the formation of their personalities, and can better control and adjust their emotions and personalities. Their learning behaviors are relatively less influenced by their personalities.

The correlation coefficient between students' thinking ability (0.428) in the basic education stage and students' participation is greater than that in the higher education stage (0.142), indicating that students' thinking ability in the basic education stage is more obvious in influencing students' classroom participation behavior. This is in line with George D. Kuh's proposal of "participating in diversified activities". Moreover, courses that emphasize higher-order thinking abilities are offered consistently. Basic education attaches great importance to the imparting of knowledge and the response to examinations.
Classroom teaching content revolves around the curriculum standards and examination syllabi. The exam-oriented education model has promoted the improvement of students' metacognitive strategies and the systematic construction of their basic knowledge structure. The teaching model in the higher education stage places greater emphasis on student autonomy. Generally, students' autonomy is under the guidance of teachers. Teachers assign course tasks, and students complete them independently, reducing the frequency of interaction between teachers and students in the classroom and the need for student participation.

The correlation coefficient between the learning background factor of students in the basic education stage (0.491) and students' classroom learning participation is larger than that in the higher education stage (0.182), indicating that the learning background has a greater influence on the learning of students in the basic education stage and their learning participation in the classroom. Consistent with Yang Wenjing's viewpoint that "students from different family economic situations rank their average scores in learning participation and various dimensions from high to low", this article holds that the reasons for the differences may lie in the variations of family and academic backgrounds. In the basic education stage, the new curriculum standards reform and teaching method innovation reform implemented in China in recent

years require timely communication and feedback between teachers and students. It has increased the frequency of students' participation in classroom interaction, The influence of parents' educational level and educational participation on students' classroom learning participation is also quite significant. The higher the frequency of parents' educational participation, the higher the level of students' learning participation. During the higher education stage, children lose their parents' supervision. Teachers' guidance and students' autonomy replace the management and control in basic education, reducing the opportunities and necessity of classroom participation and resulting in a relatively low level of students' classroom engagement. However, the Qb of the other seven eligible influencing factors was not significant, indicating that the differences among the research subjects at different educational stages had no obvious moderating effect on the correlation between factors such as teachers' behaviors, teaching factors, and individual student characteristics and students' participation in classroom learning.

FINDINGS AND DISCUSSION

Factors influencing students' classroom participation and the extent of their influence

The factors that have a significant impact on students' participation in learning activities include the teacher-student relationship (0.460), teachers' behavior (0.346), students' thinking ability (0.445), and learning ability (0.168), etc. This is consistent with the conclusion of many researchers such as Berti et al. (2010), Conner and Pope (2013), and Cooper (2014) that "the teacher-student relationship and positive teacher behavior are the key factors influencing students' participation in classroom learning". Students with a high degree of knowledge acceptance, quick response, a willingness to think and a high level of thinking ability tend to participate in classroom learning more actively. At the same time, it is in line with the concept proposed by Zhou Yan that the belief in cognition promotes or inhibits students' learning participation through their metacognitive strategies and learning abilities, as well as the influence of other cognitive factors.

The low-correlation influencing factors include students' personality traits (0.292), students' learning backgrounds (0.291), teaching factors (0.270), etc. This is inconsistent with the research conclusions of many scholars that "positive teacher-student relationships and peer support are the key influencing factors affecting students' participation in learning activities", but it supports the research conclusions of scholars such as Tong Yangshuai. That is, students with open and extroverted personality traits are more willing to actively participate in the classroom. The following discussions and inspirations can be drawn:

(1) At the teacher level: A good teacher-student relationship brings students a relaxed and pleasant learning state. Positive teacher behaviors such as teacher guidance, positive motivation, and timely feedback all promote students' participation in learning. Teachers should constantly update teaching content, innovate teaching methods, enhance students' interest in learning, prolong the duration of students' positive emotions, and pay more attention to students' psychological states and emotional changes. They should improve their ability to perceive emotions in a timely manner and be able to carry out targeted psychological counseling to prevent students from being affected by negative emotions and thus delaying their studies and lives. Teachers should always observe students' reactions in class, offer incentives to positive learning behaviors, and criticize and correct negative learning behaviors such as daydreaming and failing to complete homework on time. During classroom teaching interactions, more attention should be paid to students who previously performed poorly in their studies. Simple interactions should be

conducted, starting from the simple to the complex, guiding them step by step. While encouraging their participation, help these underachieving students build confidence in their studies.

(2) At the school level: As the primary venue for students' learning and interaction, schools are the concentration point of important interpersonal relationships during students' growth process. They shoulder the significant responsibility of providing students with a good learning and educational environment, as well as offering support for their growth and value guidance. Schools should, based on ensuring complete teaching facilities, provide high-quality teaching resources and environmental support, guarantee students' learning experience, carry out diverse learning activities and academic atmosphere construction, enhance students' sense of collective honor and belonging to the school, and thereby build an emotional network among schools, teachers and students. In addition, teaching materials that are in line with students' cognitive levels and vivid and intuitive multimedia teaching technologies will enhance students' participation in learning.

Different educational stages are used as moderating variables

According to the results of the moderating variables in this paper, there are mainly three sources of heterogeneity in the factors influencing students' classroom learning participation in the basic education and higher education stages: students' personality traits, students' thinking abilities, and students' learning backgrounds.

The main reasons for the differences among various educational stages lie in the distinct educational goals of each stage, as well as the variations in students' individual physical and mental development levels and learning abilities and qualities. The complexity of educational activities, the diversity and particularity of educational subjects, and the uncertainty of teaching activities and their effects determine that education is not an activity with a single force at a certain stage. Each stage does not act independently. If separated, Rather, it is a step-by-step and interconnected development process that achieves a continuous and progressive progression. This requires that the educational goals and activities at each stage should carry forward the past and build on the future, serving as a foundation for each other. Teaching strategies and curriculum designs should be constantly improved to ensure the continuity and development of students' learning.

(1) Main problems in the basic education stage During the basic education stage, students' emotions fluctuate greatly, and their self-awareness is confused and conflicted, making them prone to rebellious emotions and psychological problems. Teachers should enhance their perception of students' emotional changes in teaching activities, strengthen communication with parents, understand students' emotional dynamics, talk to special students on time, provide them with psychological counseling and emotional support, and help students develop a sound and healthy personality.

(2) Main problems in the higher education stage: In the higher education stage, learning is highly specialized, with both the breadth and depth of knowledge suddenly increasing. Students often find it difficult to cultivate sufficient professional knowledge reserves and expand related knowledge, and their abilities of deep thinking and extension are somewhat lacking. To prevent a gap in students' abilities after further education, teachers should, based on individual development needs, intentionally cultivate students' abilities of deep thinking and expansion of thinking. Enable students to achieve multi-dimensional development of their thinking abilities in the colorful campus life and rich and interesting learning activities.

(3) Issues with the connection process: In the basic education stage, the classroom teaching mode for students is relatively concentrated. The class teaching system places more emphasis on teacher-led classroom learning, attaching importance to cultivating students' knowledge system and thinking construction. In the higher education stage, students are required to learn independently. Students have stronger innovative and divergent thinking. Classroom teaching is relatively free and loose. Teachers pay more attention to cultivating students' practical abilities. Due to the limited research content and insufficient practice on the connection between basic and higher education in our country, students' discomfort and confusion in the early stage of their studies have increased sharply, which has greatly affected their lives and studies. For educational researchers, it is necessary to attach importance to the connection between basic and higher education and make improvements in both individual development and teaching and education aspects. At the same time, innovating the talent cultivation model and course selection system in our country is an important measure to break through the limitations of learning background and professional disciplines and enhance the connection between different educational stages. It is also the direction and goal of future educational reform in our country.

CONCLUSION

This paper collected relevant domestic and foreign literature, selected 43 sample literatures, summarized 13 factors affecting students' participation in classroom learning, used the method of meta-analysis to summarize the content of the literature, calculated the strength of the correlation, heterogeneity, publication bias, etc., and grouped according to the characteristics of the research objects The moderating variables that cause the influence of independent variables on the dependent variable among different studies were analyzed and tested. The research finds that, on the one hand, according to the different degrees of correlation between independent variables and dependent variables, the most crucial factors influencing students' participation in classroom learning are the teacher-student relationship and students' thinking ability. On the other hand, the differences in students' educational stages to some extent explain the heterogeneity among the studies on the factors influencing classroom learning participation. This discovery holds significant implications for both school management and teaching reform. For instance, regarding the relationship between teachers and students, maintaining good communication and a harmonious relationship between them can directly boost students' classroom interaction and participation enthusiasm. School administrators and teachers should break away from the outdated hierarchical concepts between teachers and students, truly understand students, deeply care for them, and befriend them. This encourages students to actively participate in the classroom and promotes mutual growth through teaching and learning.

REFERENCES

Astin, A.W. (1984) .Student involvement ,A developmental theory for higher education. J. Journal of College student personel. 25, 297-308.

Cao Shujin,Wang Zhihong. (2018). Factors influencing knowledge sharing willingness and behavior of virtual communities and their moderating variables,A meta-analytic study. J. Library and intelligence work. 62(08), 74-83.

Cohen J, Cohen J, Cohen D, et al. (1988). Statistical power analysis for the behavioral sciences. J. Technometrics, 31(4), 499-500.

Glass G V. (1976). Primary, secondary, and meta-analysis of research. J. Educational Researcher. 5(10), 3-8.

Selim Gunuc, Abdullah Kuzu. (2015). Student engagement scale, development, reliability, and validity. J. Assessment & Evaluation in Higher Education. 40,4, 587-610.

Tong Yangshuai,Wu Hao,Huang Zhongdong. (2016). A study on the factors influencing college students' learning engagement in applied undergraduate institutions. J. Journal of Liaoning Agricultural Vocational Technology College, 18(03), 50-51.

Wang Jianya,Niu Xiaorong,WAN Li. (2020). A study of online learning users' usage behavior based on meta-analysis. J. Modern Intelligence, 40(01), 58-68.