

# A survey of junior middle school students' involvement in mathematics learning under the wisdom classroom

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**Abstract:** In order to explore the status of students' learning engagement in the math smart classroom environment of junior high school, this paper conducts a questionnaire survey of 275 junior high school students, uses SPSS19.0 to make statistics and analysis of the data, and explores the status quo and improvement strategies of junior high school students' learning engagement in the math smart classroom environment. The research finds that the overall level of junior high school students' learning investment in the mathematics wisdom classroom environment is above the middle level, but the development level in various dimensions and indicators is uneven; The score of emotional involvement in mathematics learning is the highest, while the score of cognitive involvement is the lowest; There is a significant gender difference in the degree of involvement in learning, and boys' involvement in mathematics learning is higher than girls'; There is a significant difference in the class role in the degree of learning engagement. Students who are class leaders or mathematical group leaders in the class have a higher degree of mathematical learning engagement.

**Keywords:** Wisdom classroom, Commitment to learning, Promotion Strategy

## 1. Introduction

The rapid development of "Internet plus education" has accelerated the integration of smart devices into classroom teaching. In order to meet the needs of the development of quality-oriented education in the current information age, the smart classroom environment emerges at the right moment. Relying on various information technologies, it integrates intelligent interactive system, tablet computer, wireless projection screen and other intelligent devices to create a strong authenticity of teaching situation for students and provide rich teaching resources. Teaching activities carried out in the smart classroom environment can enhance the interaction between teachers and students, arouse students' learning enthusiasm, promote the development of students' thinking and ability, and cultivate intelligent students.

The main body of education is students, and students' learning input has a direct impact on the learning effect. But the research shows that the investment of junior middle school students in mathematics learning is not optimistic. Junior high school students are at a stage of obvious changes in psychology and physiology, which is a critical period to cultivate their independent consciousness and ability. The learning input of junior high school students should be paid attention to. Therefore, in the wisdom classroom environment, it is of great significance to investigate the learning engagement of junior high school students, analyze their current situation and propose improvement strategies.

## 2. Literature Review

### 2.1. Wisdom Classroom

#### 2.1.1. Definition of the concept of smart classroom

Wisdom classroom is derived from wisdom education. At present, the concept of wisdom classroom has not been uniformly defined in academia. Professor Zhu Zhiting pointed out that the smart classroom in the smart learning space extends the classroom from the traditional inside class to outside class, from the physical environment to the virtual network environment<sup>[1]</sup>. According to Tang Yewei, smart classroom integrates modern information technology and classroom teaching by changing traditional

classroom teaching methods, and adopts intelligent and personalized classroom teaching methods [2].

Based on the definition of smart classroom by various experts and scholars, the concept of smart classroom in this paper is defined as a classroom teaching model that can optimize content presentation, obtain teaching and learning resources in real time, promote classroom interaction and provide timely feedback by relying on modern information technology and equipment.

### **2.1.2. Environment Construction of Smart Classroom**

For teachers and students to carry out teaching and learning activities, the classroom teaching environment is very critical. Zhu Zhiting and He Bin conducted in-depth research on the smart terminals used in smart classrooms, such as sharing pictures, videos, teaching content and demonstration files with Pads [3]. Tang Yewei believes that the construction of smart classroom should take smart education as the core concept, focus on solving the bottleneck problems in teaching, and change the learning methods [2]. Professor Liu Bangqi has built an information platform that conforms to the development of different stages, and an "cloud network end" information platform with artificial intelligence, big data and other technologies; The construction of "technology platform+teaching system"; The construction and application of the "cloud platform end" intelligent service platform based on the Internet of Things, artificial intelligence and other information technologies, and the intelligent classroom and other service platforms have subverted the teaching environment and teaching structure of the traditional classroom [4].

## **2.2. Learning engagement**

### **2.2.1. Definition of the concept of learning engagement**

Fredricks believes that there are three dimensions of learning engagement: emotional engagement, behavioral engagement and cognitive engagement. Emotional engagement refers to learners' positive emotional responses to school and teachers. Behavioral engagement refers to learners' active participation in academic and extracurricular practical activities. Cognitive engagement refers to the learner's belief that increased personal value can be obtained through success in a subject [5]. Kong Qiping, starting from the concept of "student engagement", believes that students' learning engagement includes emotional involvement, cognitive involvement and behavioral involvement [6]. This study holds that the mathematical learning input is an organic whole composed of behavioral input, emotional input and cognitive input, which are independent and interacting with each other.

### **2.2.2. Measurement of learning engagement**

As for the measurement research of learning engagement, scholars at home and abroad tend to use the corresponding scales to investigate the learning engagement of learners, and have been widely used to measure the learning engagement of middle school students and mathematics subjects. Among them, the questionnaire method is the most common method. Each researcher has compiled a scale for measuring and evaluating learning engagement according to their specific research objects and contents.

## **3. Research Process**

### **3.1. Research objects**

This survey takes the students of a middle school wisdom class in L City, S Province as the research object. The wisdom class set up by the school has created a wisdom classroom environment and adopted tablet computers and other smart devices to carry out teaching activities in mathematics teaching. The method of cluster sampling is adopted to select five students of wisdom class to carry out relevant investigation. In this survey, students in the smart class of a middle school in L City, S Province are taken as the research object.

### **3.2. Research tools**

In this study, questionnaire was used for investigation. The scale mainly referred to the learning engagement scale designed by Zhang Lei and Li Shuang, and combined with the mathematics intelligent classroom environment, the math learning engagement scale for junior middle school students in the intelligent classroom environment was prepared.

The first part of the questionnaire contains personal information, including gender. The second part investigates the current situation of learning engagement, including behavioral engagement, emotional

engagement and cognitive engagement, with a total of 40 questions, including a test question. The specific item design is shown in the following table 1.

*Table 1: Distribution of Questionnaire Items*

Dimension	Second level dimension	Number
Engagement in behavior	Join	1、 2、 3
	Absorbed	4、 5
	Interactive	6、 7、 8、 9
	Insist	10、 11、 12、 27
Engagement of cognition	Interest	13、 14、 15
	Happy	16、 17、 18
	Identification	19、 20、 21、 22
	Boredom	23*、 24*、 25*、 26*
Total learning engagement	Metacognitive strategies	28、 29、 30、 31、 32、 33
	Deep level strategy	34、 35、 36、 37、 38
	Self reflection	39、 40

### 3.3. Data collection and processing

A total of 275 questionnaires were issued in this survey, all of which were recovered on the spot. In order to facilitate the calculation and analysis of data, five-point Likert scoring method was adopted for the questionnaire scoring statistics. Excel and SPSS19.0 software were used for quantitative processing of the data, and the data results were statistically analyzed. Through the test, the reliability and validity values of the questionnaire are both greater than 0.9, indicating that the questionnaire has good reliability and validity.

## 4. Results of the Study

### 4.1. An analysis of mathematics learning involvement

Descriptive statistics were conducted on the overall math learning engagement and scores of each dimension of the samples, and the results were shown in Table 2.

*Table 2: Descriptive statistics of learning engagement*

	Minimum	Maximum	Mean	Standard deviation
Engagement in behavior	1.00	5.00	3.24	0.948
Emotional involvement	1.21	5.00	3.45	0.820
Engagement of cognition	1.00	5.00	3.16	0.963
Total learning engagement	1.08	5.00	3.29	0.834

As can be seen from Table 2, the maximum score of students' total learning engagement in the environment of math wisdom classroom is 5 points and the minimum score is 1.08 points, indicating that there are individual differences in the degree of students' math learning engagement. The mean value of total learning input is 3.29 points, which is slightly higher than the medium level by 3 points, indicating that students' learning input in math wisdom class is above the medium level on the whole, and there is great room for improvement. In the smart classroom environment, the overall level of junior high school students' mathematical learning investment is above the medium level. The level of students' behavior input, emotional input and cognitive input in mathematics wisdom class is above the middle level, and the level of input from high to low is emotional input, behavioral input and cognitive input.

At the same time, we can also see that the average score of all dimensions of learning engagement is higher than 3 points, indicating that students' math learning engagement presents a positive trend in all dimensions. Among them, the score of emotional involvement is the highest, indicating that on the whole, students like to learn mathematics in the environment of math wisdom classroom and have high interest.

Although the level of cognitive engagement is above the medium level, the score is the lowest. It is necessary to strengthen students' autonomous learning ability and knowledge construction ability, and pay attention to the cultivation and application of students' learning strategies.

#### 4.2. Correlation analysis of learning input

Table 3: Descriptive statistics of learning engagement

		Total learning engagement	Engagement in behavior	Emotional involvement	Engagement of cognition
Total learning engagement	Pearson correlation	1	.925**	.913**	.916**
Engagement in behavior	Pearson correlation		1	.787**	.770**
Emotional involvement	Pearson correlation			1	.738**
Engagement of cognition	Pearson correlation				1

It can be seen from Table 3 that the correlation coefficient between the total learning input and each dimension is large, greater than 0.9, and each dimension is positively correlated, greater than 0.5, indicating that learning input is an organic combination of behavioral input, emotional input, and cognitive input, which are closely related and mutually affected. Among them, behavioral input has the strongest correlation with total learning input, with a correlation coefficient of 0.925, followed by cognitive input and emotional input.

Among them, behavioral input has the strongest correlation with total learning input, with a correlation coefficient of 0.925, followed by cognitive input and emotional input. Among them, emotional input has a strong correlation with behavioral input, and behavioral input will increase with the increase of emotional input. When students feel the joy of learning mathematics in the math wisdom class, they will learn and explore mathematical knowledge with curiosity and curiosity, and get a sense of value and pleasure from it. They can also pay more attention and listen carefully in the class, so as to learn and develop good learning habits. There is also a close relationship between behavioral input and cognitive input. Students seriously participate in mathematics learning in a smart classroom environment, focus on learning mathematical knowledge, and will actively think about and use learning methods and strategies when they can persist in thinking of various solutions to problems, thus improving cognitive input. The correlation coefficient between emotional input and cognitive input is 0.738, indicating a positive correlation between them. In mathematics learning, students feel the value of learning mathematics and good emotional experience, and their cognitive investment will also be improved. Therefore, these three dimensions are closely linked, and changing any dimension will affect the other two dimensions.

#### 4.3. Gender difference analysis of junior middle school students' mathematical learning involvement in smart classroom

Table 4: Descriptive statistics and differences of learning engagement of junior middle school students of different genders

	Gender	Mean	Standard deviation	T	Sig
Engagement in behavior	Man	3.44	0.97890	3.178	.002
	Woman	3.08	0.89414		
Emotional involvement	Man	3.53	0.87763	1.545	.124
	Woman	3.38	0.76807		
Engagement of cognition	Man	3.31	1.04367	2.376	.018
	Woman	3.03	0.87811		
Total learning engagement	Man	3.43	0.90882	2.531	.012
	Woman	3.17	0.75408		

In this study, questionnaire was used for investigation. The scale mainly referred to the learning engagement scale designed by Zhang Lei and Li Shuang, and combined with the mathematics intelligent

classroom environment, the math learning engagement scale for junior middle school students in the intelligent classroom environment was prepared.

Of the 275 students, 121 were boys and 154 were girls. Both male and female students are at the above average level of learning engagement, and the average scores of male students in the overall and all dimensions of learning engagement are slightly higher than that of female students. The independent sample t test was used to analyze the gender difference of junior middle school students' learning engagement. The results showed that the mean score of junior middle school students' learning engagement in mathematics had a significant difference in gender (P value was 0.012, less than 0.05). From the perspective of each sub-dimension, there is no significant difference between male and female students in the mean score of emotional engagement dimension, but there is significant difference in the mean score of behavioral engagement dimension and cognitive engagement dimension.

Compared with the traditional classroom, the smart classroom is equipped with more information technology equipment. The degree of adaptability and operation ability of the smart classroom environment are different. Boys are generally better than girls, and they can actively participate in classroom learning with the help of smart equipment.

#### **4.4. Analysis on the differences of junior middle school students' mathematics learning involvement in the smart classroom**

*Table 5: Descriptive statistics and differences of junior high school students' learning involvement in different class roles*

	Gender	Mean	Standard deviation	T	Sig
Engagement in behavior	Yes	3.71	0.81288	5.029	.000
	No	3.07	0.93837		
Emotional involvement	Yes	3.79	0.77916	4.216	.000
	No	3.33	0.80174		
Engagement of cognition	Yes	3.59	0.89159	4.495	.000
	No	3.01	0.94372		
Total learning engagement	Yes	3.70	0.75079	5.008	.000
	No	3.14	0.81573		

It can be seen from Table 5 that the average scores of students who are class leaders or math group leaders in the overall and all dimensions of learning investment are higher than those of students who are not class leaders or group leaders. The independent sample t-test was used to analyze the differences of the class roles of junior high school students' learning investment. The results showed that there were significant differences in the mean scores of junior high school students with different class roles in mathematics learning investment (P value less than 0.05), and there were significant differences in the mean scores of each sub dimension (P value less than 0.05). That is to say, there are significant differences in class roles in the level of mathematical learning investment of the subjects.

The students who are class leaders or mathematical group leaders in the class are more motivated to learn. As an example for students, they have higher requirements for themselves. They can listen carefully in class, maintain a positive learning attitude, and actively participate in classroom interaction, so their learning investment is higher.

## **5. Promotion strategy**

### **5.1. Strategies to improve learning engagement**

In the pre class preview stage, teachers can use the smart education platform to push the excellent teaching resources in the pre recorded micro classes or teaching resource library to students, and students can choose their favorite learning methods to preview, so as to better understand the content of this class. After the students have finished the preview, the teacher can design exercises at different levels according to the teaching objectives, so that the students can use the tablet computer to solve the problems. The teacher can prepare lessons according to the analysis of the results, so that the teaching can be determined by learning, so as to improve the efficiency of classroom teaching; In the course stage, we will adopt diversified teaching methods, set up interesting classroom activities and authentic learning situations, organize and guide students to carry out cooperative inquiry activities, and students will quickly show

their homework by taking pictures and uploading as required. Teachers will use the platform to accurately capture students' learning dynamics, use the praise or scoring function to give reasonable evaluation, and achieve effective interaction between teachers and students, students and vitality, Make students keep positive emotion of mathematics learning; In the post class stage, we will design learning tasks with different difficulties, so that students at different levels can choose their own learning tasks, which will help students review and consolidate the knowledge learned in this lesson, teach students in accordance with their aptitude, and thus improve the involvement of different students in mathematics learning; Teachers should also help students establish systematic learning strategies and guide students in learning strategies through various teaching methods; Help students determine learning objectives and plans, guide students to manage available resources and environment, etc., cultivate students' autonomous learning ability in many ways, and promote their cognitive input.

### **5.2. Strategies for improving girls' learning engagement**

In this study, gender differences exist in mathematics learning investment, boys' learning investment is higher than girls'. Therefore, in mathematics learning, teachers should pay more attention to and guide girls, so that they can face learning with a positive attitude, change their misconceptions that they cannot learn mathematics well, enhance their self-confidence in learning mathematics, reduce their anxiety in mathematics learning, and improve their mathematical learning investment.

### **5.3. Strategies for Promoting the Learning Investment of Non class Cadre Students**

In this study, there are differences in mathematics learning investment between class roles, and students who are class leaders or mathematical group leaders have higher learning investment. Therefore, in class management, teachers should pay attention to finding the bright spots of students, and give each student the opportunity to play his or her specialty by organizing a variety of class activities. In order to enable more students to participate in the class management, the class cadre or group leader rotation system can be adopted. Cultivate students' sense of responsibility, exercise their ability of expression and cooperation, and urge students to participate in teaching activities more actively.

In short, the smart classroom environment provides technical support and rich teaching resources for teachers and students to participate in teaching activities. In the process of teaching activities, teachers should effectively use the wisdom platform to stimulate junior high school students' enthusiasm for mathematics learning input and promote their learning input from the perspective of behavioral input, emotional input and cognitive input.

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