Kurdish Studies
Apr 2023
Volume: 11, No: 02, pp. 2377-2386
ISSN: 2051-4883 (Print) | ISSN 2051-4891 (Online)
www.KurdishStudies.net

Received: May 2023 Accepted: June 2023 DOI:
https://doi.org/10.58262/ks.v11i02.171

Learning Initiative Managament in A Mathematics Class at Jingshan Middle School, Beijing, China

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Abstract

This study focuses on learning initiative management in a mathematics class at Jingshan Middle School in Beijing, China, aiming to address existing problems and provide solutions to enhance its education quality. A literature review on classroom learning initiative management and middle school mathematics classroom teaching management was conducted to establish a theoretical foundation. A questionnaire titled "Questionnaire on Learning Initiatives in Middle School Mathematics Classroom" was administered to 150 mathematics teachers at Jingshan Middle School. From the initial sample, 108 teachers were selected, and 105 valid questionnaires were collected and analyzed using SPSS 25.0 data analysis software. Based on the teacher questionnaire survey, three hypotheses were tested, and the results concluded that teaching time, classroom atmosphere, and teaching ability significantly influence learning initiative. Specific issues were identified through the investigation, and corresponding measures and future research directions were proposed. This research emphasizes the importance of enhancing learning initiative in middle school mathematics classrooms. By examining various factors and their impact on student engagement, this study provides valuable insights and recommendations for improving the efficiency of classroom learning in mathematics. The findings contribute to the existing literature and serve as a guide for educators and policymakers in promoting effective learning initiatives and learning opportunites in middle school mathematics classrooms.

Keywords: *Learning Initiative, Mathematics Class, Middle School, Classroom Management, Education Quality.*

Introduction

Students with poor academic performance enter vocational high schools for further study after graduating from junior high school. However, in modern society, the educational requirements are basically undergraduate or above, so every parent hopes that their children can be admitted to a good school in the future, which increases the learning pressure of students (Yang, 2022).

The current reality is that as the grades continue to rise, many middle schools' students' mathematics learning becomes more and more difficult, and their learning efficiency in the classroom is not very high (Wang Junwei, 2022). These students with low learning efficiency will consolidate their learning by participating in off-campus subject training institutions; however, the number of off-campus subject training institutions has decreased, and many parents' knowledge is insufficient to guide their children's middle school learning, particularly in middle school mathematics. (Zhu Jinxiu, 2021).

Many parents are unaware of it; therefore, they pay a large fee for teachers to come to their home for one-on-one tutoring, and the profession of live-in teachers has quietly begun to rise (Liang Wanchang, 2021).

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Obviously, this is contrary to the country's original objective in implementing the double reduction programme, and it also raises financial strain on parents. This study contends that improving the efficiency of students' learning in the classroom is the most direct way (Hou Yanxue, 2021). If students comprehend everything they need to know in class, they don't need to spend time re-learningeverything after class; they just need to perform a good job of consolidation review. Furthermore, thereis still much opportunity for improvement in the efficiency of middle school mathematics classroominstruction, and because classroom teaching and management have always been inextricably linked, enhancing teaching efficiency necessitates improving management (Shi Xiaomin, 2021).

The transition from junior high school to vocational high school poses challenges for students with poor academic performance. In today's society, where higher education is increasingly emphasized, parents aspire for their children to be admitted to reputable schools, thereby intensifying the academic pressure on students (Yang., 2022). Unfortunately, many middle school students struggle with mathematics learning as their grades advance, leading to reduced learning efficiency within the classroom (Wang Junwei, 2022). Consequently, these students seek supplemental education from off-campus subject training institutions (Mingey, A.et al 2022). However, the availability of such institutions has diminished, leaving parents ill- equipped to guide their children's learning, particularly in the field of middle school mathematics (Zhu Jinxiu, 2021). Unaware of alternative options, many parents' resorts to hiring live-in tutors, resulting in a surge in the demand for private tutoring services (Liang Wanchang, 2021).

This trend not only contradicts the government's efforts to reduce academic burdens but also places a significant financial strain on parents. This study argues that improving learning efficiency within the classroom offers a more direct solution (Hou Yanxue, 2021). If students can fully comprehend the material during class, the need for extensive post-class revision is minimized, and consolidation review becomes more manageable. However, there is still considerable room for improvement in the efficiency of middle school mathematics classroominstruction. Recognizing the intrinsic connection between teaching and management, enhancing teaching efficiency necessitates improvements in classroom management as well (Shi Xiaomin, 2021).

Research Problem

Based on comprehensive research and my professional experience, a research problem has emerged in the realm of mathematics education. It has been observed that a considerable number of students exhibit a noticeable lack of self-efficacy and interest in the area of mathematics learning, with only a minority displaying enthusiasm for the subject (Xu Haiying, 2022). This intriguing phenomenon can be attributedto a prevailing sense of low accomplishment in mathematics education. A significant concern amongparents of newly enrolled junior high school students revolves around the abrupt decline in their children's mathematical performance upon entering this educational phase(Bezzerra, Reis, & Prichoa, 2019).

This shift is often accompanied by a waning enthusiasm for mathematics learning (Li Meiqiong, 2021). Such observations raise pertinent questions about the transition between primary and high school mathematics education, which is orchestrated by junior high school, a crucial juncture for instilling effective study habits(Markiewicz, Van Til, & IJzerman, 2017). Additionally, this phase presents the challenge of grappling with more complex mathematical concepts, thereby demanding a higher level of classroom teaching management (Ma Zhonglin, 2022).

In another study conducted by Lee.J (2019), the study delved into the intriguing connection between students' studying environments and variations in learning styles, even among individuals with comparable backgrounds. The insights gleaned from Lee's investigation propose the possibility of transformative shifts in learning initiatives. Such shifts could potentially foster distinct teaching methodologies, diverse learning encounters, and innovative assessment strategies (Lee, 2019).

These findings highlight the significance of exploring new approaches to educational delivery that could potentially address the dynamic relationship between learning environments, styles, and the overarching learning experience.

Research Objectives and Research Questions

The research objectives encompass three main goals. The first objective (RO1) aims to investigate whether the allocation of teaching time exerts a substantial influence on the propensity for learning initiative. The second objective (RO2) seeks to ascertain whether the overall ambiance within the classroom environment holds a significant sway over the promotion of learning initiative. The third objective (RO3) centers on determining if the proficiency of the teaching staff, captured through teaching ability, bears a notable impact on the cultivation of learning initiative.

The research objectives are as follows.

RO1*: To determine whether teaching time has a significant effect on learning initiative.*
RO2*: To determine whether classroom atmosphere has a significant effect on learning initiative.*
RO3*: To determine whether teaching ability has a significant effect on learning initiative.*

In parallel, the research questions correspond to these objectives. Research Question 1 (RQ1) delves into the specifics of how the allocation of teaching time indeed wields a significant impact on learning initiative. Research Question 2 (RQ2) inquiries into the ways in which the classroom atmosphere significantly shapes the development of learning initiative. Lastly, Research Question 3 (RQ3) investigates the avenues through which teaching ability significantly contributes to or hinders the fostering of learning initiative. These research questions collectively form the foundation for the study's exploration of the relationship between teaching time, classroom atmosphere, teaching ability, and learning initiative.

The Research Questions Are as Follows.

RQ1*: How does teaching time significantly affect learning initiative?*
RQ2*: How does classroom atmosphere significantly affect learning initiative?*
RQ3*: How does teaching ability significantly affect learning initiative?*

Research Methodology

General Background

Reliability and validity tests were conducted to ensure the accuracy of the collected data. Scientific sampling methods were employed to select representative samples from the mathematics classroom at Jingshan Middle School in Beijing, considering factors such as teachers' experience, gender, and age for comprehensive research results (Scott, Bodine, & Yust, 2014).To enhance the reliability of the research, students were invited to participate in a survey to gather their perspectives and suggestions on proactive management of mathematics classroom learning. In terms of analysis methods, appropriate statistical techniques such as descriptive statistics, correlation analysis, and regression analysis were employed to explore the relationships between classroom teaching time, atmosphere, teaching ability, and learning initiative (Jouladeh-Roudbar, Eagderi, Ghanavi, & Doadrio, 2016).

Research Design

The questionnaire survey method entails utilizing a meticulously compiled questionnaire to conduct surveys within the selected educational institutions. The participating schools in this survey employed a

combination of online and offline approaches to ensure comprehensive coverage. Specifically, the targeted recipients of the student questionnaire were mathematics teachers assigned to the first, second, and third grade levels. A majority of these mathematics teachers completed the survey using the online platform, Questionnaire Star, or by filling out a paper questionnaire.

Subsequently, all the collected questionnaire data were meticulously imported into the advanced statistical analysis software, SPSS25.0. Thorough statistical analysis was then performed on the obtained data to furnish substantial empirical support for the ongoing research focused on assessing the prevailing conditions of mathematics classroom teaching management within secondary educational institutions.

Sampling and respondent

This survey adopts a combination of online and offline methods. The online questionnaire is filled in by sending the electronic questionnaire link designed by the questionnaire star, and the offline questionnaire is distributed and collected by the school leaders. The original intention of the middle school teacher questionnaire survey in this study is to select teachers of the three grades in equal proportions.

However, due to the heavy teaching of the teachers in grade 9, most of the teachers who finally filled in were in grade 7 and 8. According to the research of Krejie & Morgan (2017), the sample size should be about 108 people. We distributed 108 questionnaires through online and offline surveys, 105 valid questionnaires, and the recovery rate was as high as 97.2%. After the questionnaire survey, this study uses SPSS25.0 statistical analysis software to analyze the reliability of the teachers' questionnaire.

Data Analysis

Correlation analysis is suitable for preliminary testing of the correlation between hypothetical variables, and the Pearson coefficient (correlation coefficient R) is the most widely used test index. The correlation coefficient should be between -1 and 1.

In this paper, SPSS25.0 multiple linear regression is used to deeply reflect the influence relationship of each dimension, and the analysis results are diagnosed by observing the relevant parameters in the output tables:

Research Results

Pilot Test

The 30 questionnaires obtained from the survey of Jingshan Middle School were analyzed by the variance rotation method. When the KMO is closer to 1, it indicates that the correlation between variables is better (Krejcie and Morgan, 1970).

As shown in Table 1, the result of the KMO Bartlett sphericity test is 0.745, indicating that the correlation between variables is very good, and the next step of analysis can be carried out.

Table 1: KMO and Bartlett's Test

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.745
Bartlett's Test of Sphericity	Approx. Chi-Square	79.755
	df	107
	Sig.	.000

As shown in Table 2, the detailed factor loadings of all variables are greater than 0.7. Show that all items of the designed questionnaire are relevant and acceptable.

Table 2: Communalities Table

Communalities		
	Initial	Extraction
Teaching time	1.000	.784
Classroom atmosphere	1.000	.820
Teaching ability	1.000	.779
Learning initiative	1.000	.786
Extraction Method: Principal Component Analysis.		

Reliability Test

The reliability of the 12 items in the questionnaire was analyzed, and the results are shown in Table 4.3. The value of the Cronbach's Alpha is 0.922, and the Cronbach's Alpha after standardization is 0.917,both of which are greater than 0.7. This shows that the reliability of the questionnaire items is highlyconsistent, the interviewed teachers have the same understanding of this questionnaire.

Table 3: Reliability Test

Reliability Statistics		
Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.922	.917	12

The detailed reliability of each item in the questionnaire is shown in Table 3. The validity of all questionnaires is greater than 0.9, indicating that the questionnaire items have high internal consistency. This shows that the items in the questionnaire have good reliability and can be used for large-scale analysis.

Table 4: Descriptive Analysis

Item-Total Statistics					
	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
B1	38.43	96.047	.626	.669	.917
B2	38.43	91.426	.674	.571	.916
B3	38.63	92.171	.739	.617	.913
C1	38.53	86.533	.773	.754	.911
C2	38.53	91.361	.730	.780	.913
C3	38.40	95.834	.687	.708	.915
D1	38.30	88.562	.807	.777	.909
D2	38.47	94.947	.638	.633	.917
D3	38.60	92.938	.699	.570	.914
E1	38.63	90.171	.772	.709	.911
E2	38.73	93.789	.675	.766	.915
E3	37.93	107.099	.186	.355	.930

It can be seen from Table 4 that the number of female teachers (73.33%) surveyed in this study is far greater than the number of male teachers (26.67%). From the perspective of the grades taught by the teachers surveyed, the proportion of respondents in grade 7 (42.86%) and grade 8 (51.43%) is willing to be more than that of grade 9 (5.71%). In terms of educational background, the number of teachers with a junior collegedegree (4.76%) and a doctoral degree (5.71%) is relatively small, and the number of teachers with a bachelor's degree (72.38%) is the largest, followed by teachers with a master's degree (17.14%).

Table 5: Demographic Profile of Respondents

Demographic Profile		Frequency	Percentage
Gender	Male	28	26.67%
	Female	77	73.33%
The grade you teach	Grade 7	45	42.86%
	Grade 8	54	51.43%
	Grade 9	6	5.71%
Educational qualifications	Junior college	5	4.76%
	Undergraduate	76	72.38%
	Master	18	17.14%
	Doctor	6	5.71%

Pearson Correlation Coefficient

As shown in Table 5, the results of Pearson correlation analysis are usually between -1 and +1. When the r value is greater than 0, the relationship between variables is positively correlated. When the r value is less than 0, the relationship between variables is negative. It can be seen from the table that there is a positive correlation between teaching time, classroom atmosphere and teaching ability and learning initiative, among which classroom atmosphere (r=0.797) is most related to learning initiative, followed by teaching ability (r=0.711), and finally teaching time (r = 0.635).

Table 6: Pearson Correlation Coefficient

Correlations					
		Teaching time	Classroom atmosphere	Teaching ability	Learning initiative
Teaching time	Pearson Correlation	1	.747**	.772**	.635**
	Sig. (2-tailed)		.000	.000	.000
	N	105	105	105	105
Classroom atmosphere	Pearson Correlation	.747**	1	.675**	.797**
	Sig. (2-tailed)	.000		.000	.000
	N	105	105	105	105
Teaching ability	Pearson Correlation	.772**	.675**	1	.711**
	Sig. (2-tailed)	.000	.000		.000
	N	105	105	105	105
Learning initiative	Pearson Correlation	.635**	.797**	.711**	1
	Sig. (2-tailed)	.000	.000	.000	
	N	105	105	105	105
**. Correlation is significant at the 0.01 level (2-tailed).					

Multiple Linear Regressions

Table 7: Model Summary

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	835[a]	697	662	.46269
a. Predictors: (Constant), Teaching time, Classroom atmosphere, Teaching ability				

It can be seen from Table 6 that the correlation coefficient between the three independent variables and the dependent variable is 0.835, which belongs to strong correlation.

The regression equation could explain 66.2% of the dependent variable, according to the model adjusted R-square value of 0.662. Through the R square greater than 0.6, we can see that there is a strong correlation between teaching time, classroom atmosphere and teaching ability and learning initiative.

Table 8: Multiple Regression ANOVA

ANOVA[a]						
	Model	Sum of Squares	df	Mean Square	F	Sig.
1	Teaching time	12.789	3	4.263	19.914	.000[b]
	Classroom atmosphere	5.566	101	.214		
	Teaching ability	18.356	104			
a. Dependent Variable: Learning initiative						
b. Predictors: (Constant), Teaching time, Classroom atmosphere, Teaching ability						

Based on Table 8, the significant value of ANOVA test towards the proposed model was significant at p-value of 0.00, which means that the proposed model of this research is fit as a whole. The F tests all reached a significant level, and the p value was less than 0.05, which proved the effectiveness of the regression model constructed. It can be seen that teaching time; classroom atmosphere and teaching ability have a significant impact on learning initiative.

Recommendation

By understanding the relationship between the independent and dependent variables of learning initiative as learning initiative in the mathematics classroom of Beijing Jingshan Middle School, learning initiative is extremely important for improving students' academic performance. Several recommendations can be made to secondary schools in Beijing that may benefit all secondary schools in Beijing to gain insight into how teaching time, classroom atmosphere, and teaching ability can enhance students' learning initiative (Popov, 2020).

(a) Create a classroom atmosphere and teaching environment for students to actively learn in the classroom.

Classroom atmosphere has the most positive correlation with learning initiative in mathematics classroom of Beijing Jingshan Middle School. Therefore, it is recommended that middle schools in Beijing create a good classroom atmosphere to improve students' learning initiative. According to the results of this study, Beijing Middle School believes that teachers and students can jointly create a positiveand healthy classroom atmosphere that can help students improve their learning initiative (Li, L, 2022). In addition, teaching ability also has a significant impact on the learning initiative of Beijing JingshanMiddle School mathematics classroom. Here, it is recommended that schools focus on training teachers to improve their teaching ability, thereby increasing students' initiative in learning (Maastrup, R., 2022). Teaching ability plays a crucial role in the proactive management of mathematics classroom learning at Jingshan Middle School in Beijing. A high level of teaching ability can effectively stimulate students' interest in learning, improve the quality of classroom interaction, and thereby promote students' learning initiative. Therefore, strengthening the training and ability enhancement of teachers is particularly important. In this context, we suggest that schools take the following measures to strengthen training and support for teachers: Firstly, regular professional development training is provided to help teachers improve their knowledge and skills in mathematics education, enabling them to better tailor their teaching methods and improve teaching quality. Secondly, encourage teachers to participate in domestic and international academic seminars and exchange activities to broaden their horizons and acquire the latest educational

concepts and teaching methods. Finally, establish teaching demonstration courses to allow excellent teachers to showcase their teaching practices, thereby promoting advanced teaching methods and concepts, and stimulating the innovative teaching awareness of other teachers.

(b) Proactively creating vivid teaching situations.

Teachers should try their best to create a large number of teaching situations that are more real, vividand close to their real life, such as game guessing and role-playing. The success of the game is that it canmake as many students as possible actively participate in the learning process, and take turns to conduct mathematics training, so that not only can they understand and consolidate the learned mathematics knowledge in an all-round way, but also in the process, improve the learning effect as much as possible, and cultivate their active learning ability and awareness.

(c) Teaching feedback should be bidirectional and should run through the entire process of mathematics classroom teaching.

At present, feedback in the classroom is mostly one-way, that is, teachers give students some feedback after listening to their answers in the classroom. The feedback from students to teachers has not been well utilized, so teachers need to improve their abilities in this area. The changes of students' speech,behavior and emotion in mathematics class are important dynamic information in mathematics class. Teaching feedback methods need to develop in a diversified direction. In addition to using traditional feedback methods to provide students with information or obtain information from students, teachers can creatively develop diverse feedback channels through modern science and technology. Based on the actual situation of the students, teachers can also timely obtain the actual situation of students' classroom learning through the terminal and adjust their classroom teaching progress based on the feedback information from students. Students can also timely understand their mastery of mathematical knowledge in each class and unit through online apps and can review and consolidate them in a targeted manner after class. Thirdly, teaching feedback needs to be given to the other party in a timely manner. Teachers in the classroom not only need to be able to timely receive feedback from students, but also need to have the ability to promptly support students to pass the T4 test. They should not be hasty incriticizing students, but rather when they find that no one has answered for a long time in the classroom, teachers should not be hasty in criticizing students. Instead, they should immediately reflect on whether the problem they just raised is too difficult or their language expression is not clear enough. Teachers should immediately change the way they ask or reduce the difficulty of the questions step by step to guide students to answer the questions.

(d) Increase incentives for managing students' learning enthusiasm.

Mathematics teachers should pay more attention to stimulating students' learning enthusiasm in the process of classroom teaching management. Firstly, mathematics teachers can stimulate students' enthusiasm for learning mathematics by formulating some reward and punishment measures. Secondly, mathematics teachers can integrate mathematical culture with teaching content and use mathematicians' exploration skills to motivate students to study mathematics seriously. Once again, teachers can enhance students' enthusiasm for classroom participation by increasing the fun of their classes. Finally, teachers should help students improve their sense of classroom learning efficacy, pay more attention to their learning experience in the classroom, and enable students with low learning enthusiasm to find their own sense of existence in the mathematics classroom.

Conclusion

This study found that the learning initiative in the mathematics classroom of Jingshan Middle School in Beijing still needs to be improved. In response to this practical background, this study first systematically

reviewed relevant literature on classroom teaching management and middle school mathematics classroom teaching management both domestically and internationally. Cronbach's Alpha coefficient and other relevant indicators verified that all items in the questionnaire met the purpose and requirements of this study, ensuring the reliability and effectiveness of the data. This process lays a solid foundation for subsequent data analysis and result interpretation. Pearson correlation analysis method explored the relationship between many variables involved in the questionnaire results. By calculating the correlation coefficients between various variables, it was found that teaching time, classroom atmosphere, and teaching ability are significantly positively correlated with learning initiative, indicating that these factors have a positive promoting effect on learning initiative to a certain extent. In order to further reveal the interrelationships between these variables and their impact on learning initiative, multiple regression analysis method was adopted. By constructing appropriate regression models, independent and collective effects of teaching time, classroom atmosphere, and teaching ability on learning initiative were explored. The analysis results indicate that these variables still have a significant positive impact on learning initiative even when controlling for other factors. This discovery provides us with valuable insights that in practical teaching, by optimizing teaching schedules, creating a good classroom atmosphere, and improving teachers' teaching abilities, we are expected to further enhance students' learning initiative. In summary, the correlation analysis, and multiple regression analysis, reveals positive correlation between teaching time, classroom atmosphere, teaching ability, and learning initiative. These research results provide us with strong theoretical support and will provide useful references for subsequent empirical research and educational practice.

Acknowledgments

The authors express their sincere gratitude to INTI International University for making available the latest research resources that were necessary to conduct this study.

Conflicts of Interest

The authors declare no conflict of interest.

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