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Research on Classroom Interaction Behavior in a Mobile Tablet-based Unit Teaching Setting

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Abstract: In February 2022, the Ministry of Education issued the *Key Points of the Ministry of Education's Work in 2022*, pointing out the importance of implementing educational digitalization strategy. To implement the requirements of China's policy and newly released discipline curriculum standards, this study developed a mobile tablet-based unit teaching setting and explored its effects on classroom interaction behavior. The research sample comprised 45 middle school students from western China. Combined with the Improved Flanders-type Analysis System, two Chinese course videos were analyzed before and after implementation. Results show that the mobile tablet-based unit teaching setting had positive effects on the quality of teacher-student interaction, student-student interaction, student-technology interaction, and the classroom interaction quality. The conclusions provide practical teaching guidance and references for various subjects' unit teaching implementation under the context of the educational digitalization transformation.

Keywords: Mobile tablet, Unit teaching, Classroom interaction behavior

1. Introduction

Rose (1999) argued that interaction often has the duality of privilege and neglect. In the teaching environment, classroom interaction behavior refers to the transmission of teaching information between several elements of classroom teaching (Sun, 2021). It can be found that previous studies provide various definitions of interaction generally as well as classroom interaction specifically. In this study, we define classroom interactive behavior as various transactions between teachers, students, teaching media, and resources. Example lists are teachers imparting knowledge, students' use of information technology, and students' active speech.

Many researchers have examined classroom interaction in different environments. For example, Balaji (2010) pointed out that adding an online discussion module to a traditional classroom can encourage students to participate more actively in classroom interaction. Another study found that the electronic whiteboard environment promotes interaction between students and improves teaching efficiency (Qi, 2011). Moreover, Fang et al. (2012) proposed an interactive analysis system that improved Flanders Interaction Analysis System (iFIAS) based on a digital classroom teaching environment. Though these previous studies provide important insights in terms of classroom interaction in various environments, there is still a lack of research on exploring class interaction behavior with the iFIAS method of learning behavior, particularly in the context of mobile tablet-based settings. Therefore, this study developed a mobile tablet-based unit teaching setting, and aimed to use the methods of iFIAS to answer the following questions:

1. Does the mobile tablet-based unit teaching setting elicits better classroom interaction behavior?
2. What kind of classroom interaction behavior changes significantly in a mobile tablet-based unit teaching setting?

2. Development of the Mobile Tablet-based Unit Setting

In this part, we present detailed information about the developed mobile tablet-based unit environment, to explore classroom interaction behavior effects.

2.1 Mobile Tablet-based Unit Teaching Setting Overview

Based on learning theories such as constructivist learning theory and zone of proximal development. T his study selected middle school Chinese as a subject and developed the mobile tablet-based Chinese p rogressive unit teaching setting to promote classroom interaction behavior and improve the classroom teaching effect. This setting uses online learning tools and resources and integrates both of them into t he learning activities, which are organized and conducted through nine steps, to be conducive to the op timization of classroom interaction behavior, as shown in Figure 1.

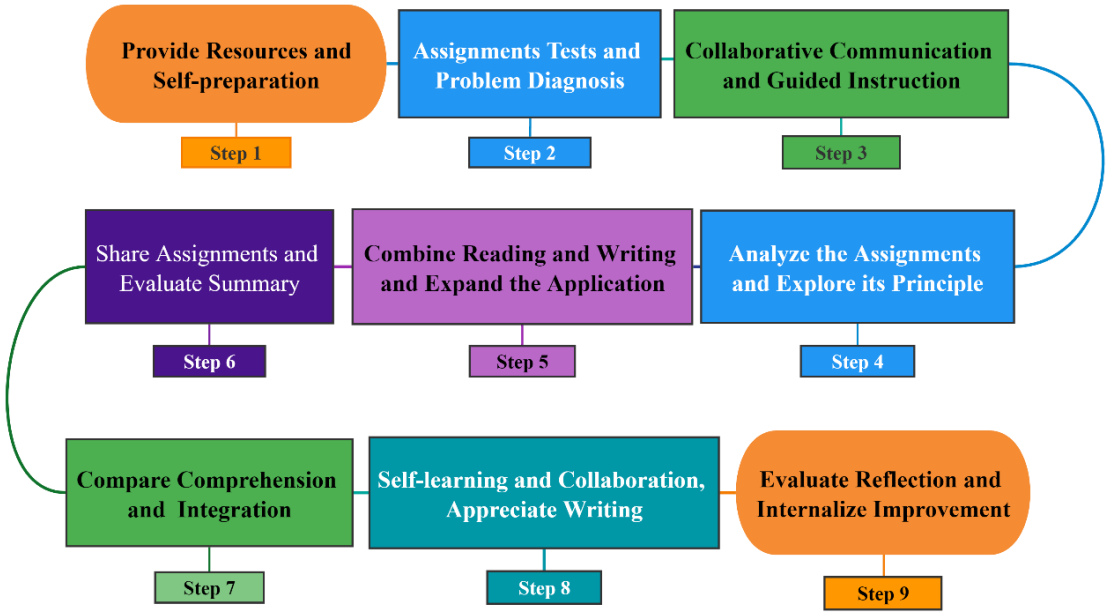

Figure 1. The Mobile Tablet-based Unit Teaching Setting

Among them, Step 1 is designed to help students complete the preview by using study task sheets and online resources. Step 2 is used to understand the students' basic situation for learning new knowledge from the text, such as basic word recognition, author background introduction, etc. Step 3 helps students gain high understanding levels of the new knowledge. Step 4 analyzes the works and explores the rules based on consolidating and deepening learning, aiming to achieve a level of understanding of new knowledge. Step 5 mainly focuses on practical application and evaluation, to detect the creative level of students' mastery of methods and laws. Step 6 guides students to continuously revise and improve the learning results. To promote students to form strategic knowledge and metacognitive knowledge in the process of practice, reflection, and summarization. Step 7 is the cultivation of the ability to comprehend unit knowledge, which aims to improve the student's overall cognitive structure of the unit. Steps 8 and 9 are comprehensive applications and evaluations of unit knowledge in real situations.

To further verify the effect of classroom interaction behavior under the mobile tablet-based subject unit teaching setting, this study conducted an empirical study.

3. Methodology

3.1 Participants

The study sample included 45 middle school students (25 boys and 20 girls) and a female teacher who taught middle school Chinese courses in Wuzhong City. The students had not been exposed to a mobile tablet-based subject unit teaching environment before, nor had they been exposed to the course content, by the study requirements.

3.2 Classroom Environment

The school completed the construction of the information technology teaching environment in June 2018. The classrooms are equipped with interactive electronic whiteboards, and mobile networks, and each student is equipped with a mobile tablet. The classroom mainly uses teaching assistant software such as "Class Optimization Master." This software can provide teaching functions such as random grouping, random questions to students, group grading, real-time display of student content, distribution and sharing of various resources, etc. The teaching environment is shown in Figure 2.

Figure 2. The Mobile Tablet-based teaching environment

3.3 Course Content

The texts in the sixth unit of the first volume of the eighth grade are all classics from ancient countries. This unit aims to cultivate students' ability to independently read classical Chinese using annotations and reference books, practice reading, and accumulate knowledge of classical Chinese. The texts in the sixth unit of the second volume of the eighth grade are all traditional masterpieces. The theme is the philosophical thoughts and emotions of the characters. This unit also aims to cultivate students' ability to read classical Chinese, practice reading, and accumulate knowledge of classical Chinese. Therefore, the themes of the two units are similar and the requirements are consistent. The two lessons collected in this study are the curriculum content of the sixth unit of the eighth-grade Chinese volume, "Born in distress, died in peace," and the sixth unit of the second volume, "Zhuangzi and Huizi in the trenches." The content of the courses is roughly similar and meets the experimental requirements.

3.4 Procedure

The experimental process is as follows: A 40-minute classroom teaching of "Born in distress, died in peace" was video recorded in a traditional teaching setting. The new model was adopted to teach "Zhuangzi and Huizi in the trenches." and another video of about 40 minutes was recorded, the two videos were then analyzed.

3.5 Instrument

To grasp the classroom interaction behavior and its changes, this study adopts the iFIAS. specifically, it includes four categories: Teacher language, Student language, Stillness, Technology, and 14 behaviors.

3.6 Data Analysis

After finishing the video recording, we cut out footage that was not related to the classroom b efore and after and kept two classroom videos (36 minutes each) as research samples. Classro om interaction behavior was encoded. The proportion of 14 behaviors after two-dimensional matrix statistical analysis according to the iFIAS coding system is shown in Table 1.

Table1. *Statistical comparison of interactive behavior coding two lessons*

Category		Coding	Specific behavior	*Born in distress, died in peace* Coding	*Zhuangzi and Huizi in the trenches* Coding
Teacher language	Indirect influence	1	Teachers accept feelings	0.70%	0%
		2	Teachers praise or encourage	0.56%	1.94%
		3	Teachers adopt students' views	1.11%	2.22%
		4	Teacher questions 4.1 Ask open questions 4.2Ask closed questions	5.56%	3.05%
	Direct influence	5	Teacher teaching	27.4%	3.47%
		6	Teacher instruction	7.37%	11.37%
		7	Teachers criticize or defend teachers' authority	0%	0%
Student language		8	Students' passive response	19.05%	4.58%
		9	Students speak actively 9.1 Students' active response 9.2 Learn to ask questions actively	0%	17.34%
		10	Discussion between students and peers	0%	32.18%
Stillness		11	It doesn't help the confusion of teaching	0.97%	1.39%
		12	Conducive to the silence of teaching	21.42%	1.53%
Technology		13	Teacher manipulation technology	15.86%	6.24%
		14	Student manipulation technology	0%	14.7%

4. Results

The iFIAS analysis tool was used to analyze the statistical proportions in the cases. For example, the first seven behaviors were all teacher language. The proportion calculation formula is shown in the next column. Statistical analysis was carried out on fifteen items including the silent proportion of teaching, the statistical items, and calculation formulas shown in Table 2.

Table 2.*Coding statistics of the proportion of interactive behaviors in two classes*

Statistics	Calculation formula	*Born in distress, died in peace* Coding	*Zhuangzi and Huizi in the trenches Coding*
Teacher language ratio	$\sum_{i=1}^{7}$ tally(i)/Total	42.7%	22.05%
Student language ratio	$\sum_{i=8}^{10}$ tally(i)/Total	19.05%	54.09%
The proportion of silence that is beneficial to teaching	tally(12)/Total	21.42%	1.53%

Technology application ratio	tally(12)/Total	15.86%	20.94%
The ratio of indirect influence to direct influence on students in teacher language	$\sum_{i=2}^{4}$ tally(i)/ $\sum_{i=5}^{7}$ tally(i)	20.8%	48.6%
The ratio of positive reinforcement to negative reinforcement to students in teacher language	$\sum_{i=2}^{3}$ tally(i)/ $\sum_{i=6}^{7}$ tally(i)	22.64%	36.59%
The proportion of questions asked in the teacher's language	$tally$ (4) / $\sum_{i=1}^{7}$ tally(i)	13.03%	13.84%
The proportion of students actively speaking in the student language	$tally$ (9) / $\sum_{i=2}^{10}$ tally(i)	0%	22.77%
The proportion of teachers manipulating technology in the application of information technology	$tally$ (13) / $\sum_{i=13}^{1014}$ tally(i)	100%	29.8%
The proportion of students who manipulate technology in the application of information technology	$tally$ (14) / $\sum_{i=13}^{1014}$ tally(i)	0%	70.2%
Teachers ask open-ended questions as a percentage of teachers' questions	tally(4.1) /tally(4)	0%	72.73%
Teachers ask closed questions as a percentage of teachers' questions	tally(4.2) /tally(4)	100%	27.27%
The proportion of students who actively responded to students who actively spoke	tally9.1) /tally(9)	/	57.6%
The proportion of students taking the initiative to ask questions to the students taking the initiative to speak	tally(9.2) /tally(9)	/	42.4%
The proportion of students who responded actively to the students who responded	$\frac{\text{tally}(9.1)}{\text{tally}(8)}$ + tally(9.1)	0%	68.57%

As shown in Table 2, the proportion of teacher language and student language in the classroom changed significantly after the practice, which shows that the classroom interaction behavior under the mobile tablet-based Chinese unit teaching setting underwent significant changes. There were significant increases in the proportion of students' language (from 19.05% to 54.09%), the proportion of students manipulating technology in classroom teaching, which rose to 70.2%, the proportion of indirect influence and direct influence on students of teacher language (from 20.8% to 48.6%), the proportion of students taking the initiative to speak (from 0% to 57.6%), and so on.

5. Discussion and conclusions

This study developed a mobile tablet-based unit teaching setting, in the context of middle school Chinese subjects. Using the iFIAS method for analyzing two videos (students in the same class in traditional mode and new mode, two lessons with the same teacher), we conclude the following findings.

5.1 Teacher-student Interaction, Student-student Interaction Changes

Under the mobile tablet-based Chinese subject unit teaching setting, the proportion of students' language increased significantly (from 19.05% to54.09%). The data show that in the mobile tablet-based subject unit teaching setting, classroom interaction behavior changed significantly, teacher-student interaction, and student-student interaction behavior significantly improved, and the classroom changed from being teacher-led to both student-centered and teacher-led.

5.2 Interaction with the Media Improved

In traditional setting, the proportion of students operating technology was rare. After implementing the mobile tablet-based subject unit teaching setting for one semester, the proportion of students who used technology in classroom teaching rose to 70.2%. The proportion of students using technology has also increased significantly (from 0 to14.7%). indicating that students' use of information technology also improved under the mobile tablet-based subject unit teaching setting.

5.3 Improvement in the Quality of Classroom Interaction

The proportions of indirect and direct influences on students of teacher language increased significantly (from 20.8% to 48.6%), and the ratio of positive reinforcement and negative reinforcement in teacher language to students also increased noticeably (from 22.64% to 36.59%), the proportion of teachers asking open-ended questions increased significantly (from 0% to 72.73%), and so on. It can be concluded that the mobile tablet-based subject unit teaching setting is more conducive to allowing the lecturer to control the balance of classroom interaction, mobilize the enthusiasm of students to answer questions, and thus promote a dynamic balance of classroom interaction and improve classroom teaching efficiency, implementing the new curriculum requirements.

6. Limitations and future research

This study developed a mobile tablet-based unit setting under the context of a middle school Chinese subject and explored its impact on classroom interaction behavior. Combined with the improved iFIAS method. The results show that the mobile tablet-based unit setting had a positive impact on the quality of classroom interaction. The research conclusions provide practical teaching guidance and reference for the implementation of education digitization strategy in specific subject unit teaching.

However, the current study had certain limitations. First, the teaching content before and after the experiment was different. Second, quantitative analysis of teachers' subject teaching ability and students' learning level has not been carried out. Further research should select similar course content and add a qualitative method to explore the educational effect of this new setting.

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