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Exploring Interactive Pedagogy to Enhance Students' Engagement in ECE in Southwest China

Lu Zhang*

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Abstract

Purpose: This study aims to examine the significance between learner-content interaction, learner-instructor interaction, learner-learner interaction and students' emotional, behavioural, and cognitive engagement in the classroom. **Research design, data and methodology:** The Index of Item-Objective Congruence (IOC) rating and a pilot test (n=30) were used for validity and reliability. 280 responses from ECE students at an application-oriented private university in southwest China were analysed using multiple linear regression (MLR) to test the significant relationship between variables. 6 teachers and 12 students were interviewed to make suggestions for the intervention process. Subsequently, a group of 40 students underwent a 12-week intervention design and implementation (IDI). Results were then compared using paired samples t-test before and after the intervention and the same 6 students were interviewed for feedback. **Results:** MLR results showed that there were significant influences between learner-content interaction, learner-learner interaction and students' emotional, behavioural and cognitive engagement, but not between learner-instructor interaction. In addition, paired samples t-test results showed significant changes in learner-content interaction, learner-learner interaction, and students' emotional, behavioural and cognitive engagement before and after the intervention. **Conclusions:** Although there are both benefits and challenges, interactive pedagogy is worth promoting as it improves learning efficiency, emotional experiences, and overall student development.

Keywords : Learner-Content Interaction, Learner-Instructor Interaction, Learner-Learner Interaction, Students' Emotional, Behavioural and Cognitive Engagement, Early Childhood Education

JEL Classification Code: A30, I23, O31

1. Introduction

Since the beginning of the new era, driven by the globalization of knowledge economy and the information revolution, education has undergone a profound transformation. Higher education is shifting from content-based educational model to outcome-based educational model, which means paying more attention to what students can actually learn and do, rather than sitting quietly and passively accepting the teacher's wisdom in class (Catalano & Catalano, 1999; Manzoor et al., 2017). In North America, the National Survey of Student Engagement (NSSE) has become a commonly used tool to assess students' level of engagement in effective educational practices (Lutz & Culver, 2010). In Australia, students are asked to report the frequency of their progress in knowledge and skills that serve their employability during the school year (Lamb et al., 2020). In Finland, the traditional self-contained classroom has increasingly been replaced by more flexible, versatile, informal and changeable open learning space (Niemi, 2021). Therefore, educational reforms around the world have led to an increasingly open and flexible design of the classroom (Hartikainen et al., 2021).

Meanwhile, according to the Ministry of Education of the People's Republic China (2011), the fundamental task of colleges and universities is to cultivate high qualified professionals and innovative talents by improving the quality of teaching, strengthening the basic construction of

1* Lu Zhang, Assumption University. E-mail: 5079757@qq.com

laboratories, the design of course and textbooks, etc., and fully mobilizing students' enthusiasm and motivation to learn and developing a good style of study. In addition, in 2015, the National Development and Reform Commission and the Ministry of Finance of China jointly issued "Guiding Opinions on Guiding the Transformation of Some Local Ordinary Undergraduate Universities to Application-oriented Universities" (Xinjian et al., 2018), pointing out that it is imperative to improve the teaching level and cultivate high-quality application-oriented talents with strong social adaptability and competitiveness to establish the word "application" in the construction of teaching system.

However, the premise of cultivating high-quality application-oriented talents is that students can actively engage in the classroom, and teachers can adjust the course structure and pedagogy according to the needs of students, but in practice, there are many challenges. For example, students majoring in early childhood education (ECE) not only have to master theoretical knowledge but need to have practical ability, especially learning how to give lessons to kids in the kindergarten, but not all of them are good at this, and many of them are shyness, fear, lack of confidence, let alone engaging in. Therefore, as a teacher of an application-oriented private university in southwest China, the researcher intents to explore interactive pedagogy to improve students' engagement in ECE.

2. Literature Review

2.1 Interactive Pedagogy

There are several theories about interactive pedagogy, such as reciprocal teaching developed by Palinscar and Brown (1984) to improve students' reading ability, scaffolding teaching dating back to Lev Vygotsky's Zone of Proximal Development, which referred to the amount of learning that learners can achieve with help or guidance (Piamsai, 2020) and three-types of interaction labelled by Moore (1989): learner-content interaction, learner-instructor interaction, and learner-learner interaction. In this study, the researcher used Moore's three-types of interaction as a theoretical basis.

2.1.1 Learner-Content Interaction

Learner-content interaction (LCI) was the defining element of education, including textbooks, PowerPoint, web pages, discussion forums, case studies, reports, videos and so on through which the learner can understand the subject of the study, interact with the content, gain opinions and integrate the cognitive structures (Moore, 1989). Furthermore, Sher (2009) pointed out that learner-content interaction also meant the use of communication tools in e-learning environments, which brought teachers and students together as a virtual community in the physical and time dimensions. Muir et al. (2022) investigated using interaction online pedagogical approaches to promote student emotional engagement and showed that multimedia e-learning environments led to more learner-content interaction and engagement than traditional learning environments. Meanwhile, Tang and Hew (2022) examined influence of using mobile instant message on student engagement, indicating those who were in the mobile instant messaging group took part in more in discuss activities, produced more information, more words and had higher rates of behavioural engagement, task completion and interaction. In addition, Wang and Newlin (2002) found that lacking the motivation to read the course content would be one of the reasons to cause students to drop out, so the presentation of the content was not only important but also crucial to the effectiveness of the study (Allen, 2016), which was conductive to facilitating the learning environment to help the learner's understanding of text, sharing knowledge, creating information, or even motivate their desire to learn (Ifinedo & Usoro, 2016).

2.1.2 Learner-Instructor Interaction

Learner-instructor interaction (LLI) was crucial during the instructional progress. The instructor planned lessons, engaged learners, facilitated testing and practice, and feedback was provided to aid learners progress (Moore, 1989). Thach and Murphy (1995) defined seven types of learner-instructor interactions, including setting up learning goals, providing timely and useful feedback, improving the presentation of information, observing and assessing students' progress, increasing learning activities, facilitating discussion and determining learning needs and preferences. Miao et al. (2022) pointed that instructors were important in supporting learners' knowledge construction and emotional development. Instructors created learning experience through interaction with learners, which was an important predictor of the existence of students' satisfaction and helped to improve learning engagement. Besides, instructors helped group members to avoid internal conflicts and promote attractive learning situation, which had a positive impact on learner's emotional engagement (Molinillo et al., 2018). Meanwhile, the positive relationship between students and teachers was essential to improve students' behavioural engagement (Crosnoe et al., 2004). And it was also supported by Dixson (2012) that instructors who not only created opportunities for learners but also provided requirement to make learners reported higher engagement, such as announcements on the home page of the course delivery system, emails to students, interactive discussion forums, online lectures or connecting conversations and chats. In addition, instructor-learner interaction had a

positive impact on students' perception and learning, which was helpful to guide students to understand the curriculum theme, encourage students to self-study, ask questions and participate in discussion in learning process (Leite et al., 2022). However, there were some negative aspects on instructor-learner interaction, for example, when the teacher-student relationship was poor, it would lead to a reduction in the cognition of workload (Xerri et al., 2018), or if the teacher had more uncertain attitude to the course, or blamed the students too much, students' satisfaction to the course was lower (Tsai, 2017）

2.1.3 Learner-Learner Interaction

Learner-learner interaction (LLI) referred to students interacting with each other through peer cooperation, which helped in stimulating and motivating students to complete teaching tasks. This was extremely essential and valuable in a class or group setting (Moore, 1989). According to Elizondo-Garcia and Gallardo (2020), learner-learner interaction could be improved through incorporating some factors about peer interaction, for example, social involvement, level of expertise, anonymity, training, and scoring the feedback. Meanwhile, learner-learner interaction was useful to enhance student emotional engagement to prevent students from experiencing potential boredom and isolation in the learning environment. The activities helped students feel connected and created a dynamic sense of community, and icebreaker discussions were described as the most important engagement strategy (Martin & Bolliger, 2018), and Beck (2010) pointed students who cannot ask questions directly and get feedback from their teachers relied more on other students and would eventually collaborate with each other. In addition, some activities, such as discussion board, chat sessions, group tasks, or peer assessment can promote learner-learner interaction to engage learning (Banna et al., 2015). Dixson (2012) found learners who worked together on group projects, reviewed each other's papers, and interacted on a specific topic in discussion forums might feel more engaged in the course, especially in online courses. Additionally, Miao et al. (2022) noted that learner-learner interaction not only was directly related to active learning but also can stimulate students' cognitive engagement and game-based learning strategy and cooperative strategy were the most effective strategies to boost students' engagement (Munna & Kalam, 2021). However, Gnusowski and Schoefer (2022) found some students felt dissatisfaction during weeks or months of group interaction. For example, some group members didn't care about the assignment at all, only one or a few of students would like to do the work and others just sat and did nothing, or someone tried to in charge of the group and ordered what everyone should do, or the work was assigned unfair and those who did more got the same marks as others. Therefore, unfair workload was the most common dissatisfier in student group work (Pfaff & Huddleston, 2003) and "social loafing" was an important problem in students' groups (Aggarwal & O'Brien, 2008).

2.2 Students' Engagement

Researches about the concept of student engagement could date from decades of years ago. Astin's Input-Environment-Outcome (IEO)model could be regarded as the first overall model of student engagement (Zhang, 2015), which was the involvement about the physical and psychological energy that students put into academic experience (Astin, 1999). Fredricks et al. (2004) identified three dimensions to student engagement, which was behavioural engagement, emotional engagement and cognitive engagement. Then, Coates (2007) described engagement was to cover a broad range of visible academic and non-academic aspects in the student experience and Reeve (2012) described engagement was the degree to which students actively participate in learning activities, and it was a multidimensional structure. In this study, the author used three-types of engagement from Fredricks et al. (2004) as the foundation theory.

2.2.1 Students' Emotional Engagement

Students' emotional engagement (SEE) referred to students' emotional reactions in class, including interest, boredom, happiness, sadness, and anxiety (Fredricks et al., 2004). According to Reschly et al. (2020), student emotional engagement included sense of belonging and school connection, relationship with teachers and peers and could be assessed via student or teacher report, such as positive and negative reactions to teachers, classmates, scholars and schools, which was considered to have established contact with an institution and affected willingness to work. And it also described a sense of confidence, especially when getting problems solved, or acquiring knowledge that students wanted to learn, or helping others in the group (Naibert et al., 2022). Hartikainen et al. (2021) investigated the relationship between open learning spaces and students' engagement in classroom-based physical activity and stated open learning spaces seemed to related with better emotional engagement than in conventional classrooms. Martin and Rimm-Kaufman (2015) studied the relationship between students' self-efficacy and teacher-student interaction about emotional engagement and explained that those with high level of teachers' emotional support, students' emotional and social engagement were similar, regardless of their initial self-efficacy. Besides, Anjarwati and Sa'adah (2021) found that students' perception of their emotional participation in online classes positively impacted their role as learners, leading to increased learning engagement and improved learning

outcomes. Meanwhile, compared with students who had poor interaction with teachers, students who had good interaction with teachers had higher emotional engagement (Sagayadevan & Jeyaraj, 2012).

H1: Learner-Content Interaction has the significant influence on Students' Emotional Engagement.

H2: Learner-Instructor Interaction has the significant influence on Students' Emotional Engagement.

H3: Learner-Learner Interaction has the significant influence on Students' Emotional Engagement.

2.2.2 Students' Behavioural Engagement

Students' behavioural engagement (SBE) meant students who participated in behaviour would usually abide by the code of conduct, such as engaged in academic, social or extracurricular activities, and was considered essential to achieving positive academic outcomes and preventing dropout (Fredricks et al., 2004). According to Reschly et al. (2020) student behavioural engagement included students' attendance, participation in extracurricular activities and disciplinary events and it also referred to students' positive behaviour and involvement in the classroom, such as asking for feedback, working hard, taking a leadership role in the group and paying attention (Naibert et al., 2022). Lai et al. (2021) investigated factors impacting university students' behavioural engagement in flipped classrooms and stated that autonomous motivation, controlled motivation, perceived self-efficacy, and perceived teaching quality were the key determinants of university students' behavioural engagement. Meanwhile, Huang et al. (2019) stated that it was effective to use gamification to encourage students' behavioural engagement in extracurricular activities in flipped classrooms, and the improvement of students' behavioural engagement could directly affect students' achievement- the more students actively participated in the course activities, the more they could learn the course content (Gregory et al., 2014). Anjarwati and Sa'adah (2021) found Instagram could improve student engagement by active participation. In addition, those who had more conflicts with teachers or had avoidance feelings towards school tended to be more disengaged in the classroom (Yang & Lamb, 2014) and when the class size increased, students' behavioural engagement decreased but teachers' behavioural engagement decreased, too (Pilotti et al., 2017).

H4: Learner-Content Interaction has the significant influence on Students' Behavioural Engagement.

H5: Learner-Instructor Interaction has the significant influence on Students' Behavioural Engagement.

H6: Learner-Learner Interaction has the significant influence on Students' Behavioural Engagement.

2.2.3 Students' Cognitive Engagement

Students' cognitive engagement (SCE) referred to the ability to realize higher-level understanding of materials and concentrate on levels of analysis, evaluation, and creativity; or make an effort to understand complex ideas and master difficult skills (Fredricks et al., 2004). According to Blumenfeld et al. (2006), surface cognitive engagement involved the use of memory and deep level cognitive engagement involved used elaboration and organizational strategies when students tried to connect new ideas with old ones. Yogev et al. (2018) mentioned that it was difficult for teachers to evaluate students' engagement in reading and learning, but a combination of automatic classification and visualization of cognitive engagement could give teachers valuable information about students' thinking. Sanders (2013) studied classroom design and student engagement, pointing that group-centred students showed higher cognitive engagement in the classroom organized around the group table and Anjarwati and Sa'adah (2021) found using the cooperation of Google Classroom and Google Meet could get active cognitive student engagement. Moreover, Böheim et al. (2021) did intervention to help teachers to carry out a more dialogic discourse practice and indicating when teachers changed their discourse practice, the students' cognitive engagement increased.

H7: Learner-Content Interaction has the significant influence on Students' Cognitive Engagement.

H8: Learner-Instructor Interaction has the significant influence on Students' Cognitive Engagement.

H9: Learner-Learner Interaction has the significant influence on Students' Cognitive Engagement.

3. Research Methods and Materials

3.1 Research Framework

The conceptual framework shown in Figure 1 was developed from studying the theoretical frameworks related to this research, which is adopted from Panigrahi et al. (2022), Wang et al. (2022) and Luo et al. (2022).

In addition, this study is to explore interactive pedagogy to enhance students' engagement in ECE in an application-oriented private university in southwest China. Therefore, the causal relationship between learner-content interaction, learner-instructor interaction, learner-learner interaction and students' emotional, behavioural, and cognitive engagement need to be explained.

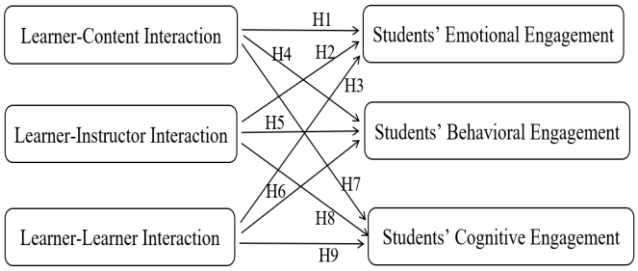

Figure 1: Conceptual Framework

3.2 Methodology

The researcher has adapted qualitative and quantitative methods to conduct this research and there were three stages. In the first stage, 3 experts were invited to do the Index of Item-Objective Congruence (IOC) rating for validity test and a pilot test was conducted for 30 samples to ensure reliability. Meanwhile, 280 valid responses were analysed by Multiple Linear Regression (MLR) to verify the significant relationship between variables, and 6 teachers and 12 students were interviewed for offering suggestions to intervention process.

In the second stage, a group of 40 students underwent a 12-week Intervention Design and Implementation (IDI) and the same 6 students were interviewed for giving feedback after IDI.

In the third stage, paired samples t-test was used to compare mean differences and verify whether there were significant changes before IDI and after IDI.

3.3 Research Population, Sample Size, and Sampling Procedures

3.3.1 Research Population

In this study, research population are sophomore students majoring in early childhood education in an application-oriented private university in southwest China, and these students have been studying theoretical knowledge for around two or three semesters and are about to enter the internship stage, so it is essential for them to combine theoretical knowledge with practical knowledge, and it is also necessary for them to improve their practical ability in class. There are 3 categories students selected: some are from junior college students (totally studying 3 years), some are students upgraded from junior college to undergraduates (totally studying 3+2 years), and the others are undergraduates (totally studying 4 years).

Table 1: Research Population

Sophomore students in ECE department	The total number of current students	Research population randomly selected
Junior college students (Totally studying 3 years)	506	100
Students upgraded from junior college to undergraduates (Totally studying 3+2 years)	325	100
Undergraduates (Totally studying 4 years)	80	80
Total	911	280

Note: Data from Student Affairs Department of Faculty of Education

3.3.2 Sample size

First, there were 30 students chosen randomly to verify the reliability by a pilot test, and 280 students were tested by MLR to verify the significant relationship between variables, meanwhile, 6 teachers and 12 students were interviewed for offering suggestions to intervention process. Afterwards, 40 students were chosen as the participants for IDI sample size to fill out the same questionnaire pre-IDI and post-IDI, and the same 6 students were interviewed for giving feedback after IDI.

3.3.3 Sampling Procedures

Sampling procedures were as follows:

Procedure 1: Sampling for pre-IDI

First, 30 students were randomly selected to complete the questionnaire by conducting a pilot test to check the reliability. Then 280 students were randomly selected from 2 classes of each category of students for MLR. The questionnaire was sent via WJX, an online questionnaire tool, and the results of MLR were used to create the final intervention design and implementation model. Meanwhile, 6 teachers and 12 students were interviewed to give their opinions on the intervention, among whom there were 3 associate professors and 3 lecturers from the department of early childhood education, and 6 students were randomly selected from the researcher's class which would be intervened and 6 students were randomly selected from other classes.

Procedure 2: Sampling for IDI

40 students were selected from one of the researcher's classes as the researcher would intervene in this class to check whether the interactive pedagogy can enhance students' engagement or not.

Procedure 3: Sampling for post-IDI

The same 40 students were asked to complete the questionnaire again, and 6 students who had already been interviewed before IDI were selected again to join the interview part to evaluate the results and provide feedback o n the IDI.

4. Results and Discussion

4.1 Demographic Factors

The demographic information shown in table 2 consisted of 2 sample sizes, which were respondents in MLR (n=280) and IDI stage (n=40).

According to table 2, 280 students from 6 classes filled out the questionnaire for MLR, and 262 respondents (93.6%) were female and 18 respondents (6.4%) were male, showing that female respondents represented the majority of the classes. Besides, more than 50% students attended the kindergarten for at least 3 years in their childhood and 188 students were ethnic Han and 169 students are the oldest child in their family.

In addition, there were 40 students from one of the author's classes participating in IDI stage, among whom 37 respondents (92.5%) were female and 3 respondents (7.5%) were male. Meanwhile, 82.5% were educated in the kindergarten for a minimum of three years and 70% were ethnic Han, and 72.5% were the first child born in the family.

Table 2: Demographic Profile

Sample size for MLR (N=280)		Frequency	Percent
Gender	Male	18	6.4%
	Female	262	93.6%
Class	Class 3 and Class 5 (studying 3 years)	100	35.7%
	Class 2 and Class 6 (studying 3+2 years)	100	35.7%
	Class 1 and Class 2 (studying 4 years)	80	28.6%
Kindergarten years	0	3	1.1%
	1 year	39	13.9%
	2 years	85	30.4%
	3 years	141	50.4%
	4 years	12	4.3%
Ethnic group	Han	188	67.1%
	Minority Groups	92	32.9%
Birth order	1	169	60.4%
	2	89	31.8%
	3	13	4.6%
	4	9	3.2%
	Others	0	0
Sample size for IDI (N=40)		**Frequency**	**Percent**
Gender	Male	37	92.5%
	Female	3	7.5%
Class	Class 3	40	100%
Kindergarten years	0	1	2.5%
	1 year	3	7.5%
	2 years	2	5%
	3 years	33	82.5%
	4 years	1	2.5%
Ethnic group	Han	28	70%
	Minority Groups	12	30%
Birth order	1	29	72.5%
	2	8	20%
	3	2	5%
	4	1	2.5%
	Others	0	0

4.2 Pre-IDI Stage

In this stage, IOC and a pilot test were used to test validity and reliability. The index of item-objective congruence (IOC), which was developed by Rovinelli and Hambleton (1976) is a tool used in testing development of evaluating content validity at the item development stage. There were totally 54 items rated by three experts and 2 items didn't pass the IOC rating, which meant when doing pilot test, these 2 items should be removed from the questionnaire.

Cronbach (1951) firstly proposed the pilot test for reliability analysis named Cronbach's Alpha, which is the most common measure of internal consistency, and acceptable value should have the alpha coefficient with the value of 0.60 or more. The questionnaire with 52 questions were delivered to 30 respondents for the reliability test and 1 item was removed, which meant 51 items were kept for MLR.

Multiple Linear Regression (MLR) is used to verify whether the independent variables have significant influences on dependent variables, which assumes a linear relationship between the variables and constructs a regression equation to predict the dependent variable based on the independent variables (Montgomery et al., 2021). 280 valid responses were analysed by MLR and the results were presented in the following tables.

Table 3: The MLR Results on Students' Emotional Engagement (n=280)

Variables	t-value	p-value	Stand. Estimate (β)	R^2
Learner-Content Interaction	4.36	< .001	0.3728	0.588
Learner-Instructor Interaction	-1.07	0.287	-0.0915	
Learner-Learner Interaction	10.97	< .001	0.5541	

Table 4: The MLR Results on Students' Behavioural Engagement (n=280)

Variables	t-value	p-value	Stand. Estimate (β)	R^2
Learner-Content Interaction	8.044	< .001	0.5813	0.705
Learner-Instructor Interaction	0.182	0.856	0.0132	
Learner-Learner Interaction	7.718	< .001	0.3298	

Table 5: The MLR Results on Students' Cognitive Engagement (n=280)

Variables	t-value	p-value	Stand. Estimate (β)	R^2
Learner-Content Interaction	5.402	< .001	0.4528	0.603
Learner-Instructor	-0.910	0.363	-0.0766	

Variables	t-value	p-value	Stand. Estimate (β)	R^2
Interaction				
Learner-Learner Interaction	9.667	< .001	0.4791	

The results from above tables showed all hypotheses were supported with a significance at p = 0.05, excepting H2, H5 and H8 were not supported. Learner-learner interaction has the strongest influence toward students' emotional engagement (β = 0.5541) and cognitive engagement (β = 0.4791), and learner-content interaction has the strongest influence toward students' behavioural engagement (β = 0.5813). In addition, R square value is 0.705 in table 4, which is relatively higher, suggesting that the independent variables account for 70.5% dependent variables, in other words, learner-content interaction and learner-learner interaction have a substantial influence on students' behavioural engagement.

Meanwhile, in order to create Intervention Design and Implementation (IDI) Model, 6 teachers and 12 students were interviewed to offering opinions about intervention process. IDI is a key part of this research, guiding the entire process, from identifying the issue or challenge, selecting appropriate interventions to implementing and evaluating the effectiveness of the interventions, which guides the design and implementation of effective interventions aiming at bringing about positive changes in a targeted system or population (Argyris, 1970). Based on the interview of teachers and students, team collaboration, meaningful interactive activities or specific teaching strategies could create a positive learning environment, stimulate students' interest and motivation in learning, and thereby improve their engagement and learning effectiveness.

Afterwards, the Intervention Design and Implementation (IDI) Model can be finalized as the following:

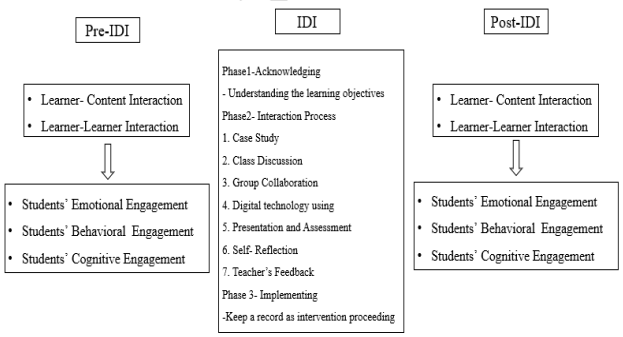

Figure 2: Intervention Design and Implementation Model Finalized

The finalized IDI model hypotheses are related to the changes between pre-IDI and post-IDI, which are conducted to follow below hypotheses:

H10: There is a significant difference in Learner-Content Interaction Pre-IDI and Post-IDI.
H11: There is a significant difference in Learner-Learner Interaction Pre-IDI and Post-IDI.
H12: There is a significant difference in Students' Emotional Engagement Pre-IDI and Post-IDI.
H13: There is a significant difference in Students' Behavioural Engagement Pre-IDI and Post-IDI.
H14: There is a significant difference in Students' Cognitive Engagement Pre-IDI and Post-IDI.

4.3 IDI Stage

Students were intervened by the researcher, whose major is early childhood education (ECE), meaning they not only have to master theoretical knowledge but need to have practical ability, such as designing the syllabus, learning to write a lesson plan, organizing teaching activities, especially learning how to give lessons to kindergarten children. In 1956, Benjamin Bloom proposed "Bloom taxonomy", an educational goal classification system, aiming to assist teachers in designing and evaluating teaching objectives to promote student cognitive development and improve learning outcomes (Krathwohl, 2002). Based on this theory, a group of 40 students underwent a 12-week IDI and the intervention was carried out in a curriculum named "Picture Books Teaching in Early Childhood Education" in this study.

4.3.1 Intervention to Improve Learner-Content Interaction

Learner-content meant learners engaged with instructional material and planned activities (Tuovinen, 2000). Being a further kindergarten teacher, students need to know both the content of the textbook and real picture books.

Figure 3: Students Reading Picture Books

Figure 3 illustrates a scene where students are engaged in reading picture books. These books not only aid in their comprehension of the textbook's content, but also expose them to a diverse range of picture books, providing a visually stimulating and engaging medium that encourages active learning, fosters a deeper understanding of concepts and

improves their comprehension skills, thereby enhancing their learning experiences. In addition, a mind map is an approach to the organization of the human mind that prepares the ground for thinking and peer collaboration and mind mapping was more effective, which can promote learning motivation and facilitate the co-construction of conceptual knowledge (Fung & Liang, 2023). Therefore, the researcher encouraged students to use a mind map to have a thorough understanding of the contents of each picture book. Two mind maps are presented in figure 4, and picture books named "A Growing Diary of Cavities" and "Grandpa Became a Ghost" were explained by students to guide children to develop good brushing habits and face the death of a loved one correctly.

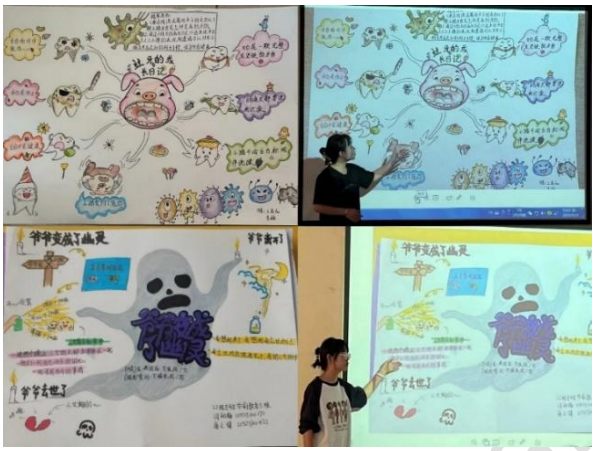

Figure 4: Mind Maps Created and Explained by Students

When organizing teaching activities, it is essential for students to interpret picture books from different aspects, for example, creating handicrafts or designing activities, which can help children gain a deeper understanding of the story plot and character characteristics and also exercise their hands-on ability and creativity (Benic & Jambresic, 2020). Figure 5 illustrates students' handmade works of two groups. One group tells a story about Mid-Autumn Day, when family members get together and eat mooncakes. The other group tells a story about Dragon Boat Festival, and painting eggs symbolizes peace and luck. Students believe it is meaningful for children to make mooncakes and paint on eggs by themselves.

Figure 5: Students' Handmade Works

In brief, there are many ways about learner-content interaction, for example, using digital tools and platforms to interact with learning content, conducting experiments in laboratories or practice sites, or integrating and organizing information from multiple sources (Kumar et al., 2021). In this study, the researcher chose some ways of learner-content interaction to do intervention.

4.3.2 Intervention to Improve Learner-Learner Interaction

Learner-learner interaction could be improved through incorporating some factors about peer interaction, for example, social involvement, level of expertise, anonymity, training, and scoring the feedback (Elizondo-Garcia & Gallardo, 2020).

Figure 6: Group Presentation

According to Figure 6, students were divided into seven groups, each sitting around a table for discussions, online research, and completing assignments. The group at the front of the class were presenting their teaching plans for the picture book.

Figure 7: Students' Role-Playing

In addition, in the role-playing games, children were more interested in other aspects of surrounding reality and developed emotional expressiveness of movement, gestures, facial expressions (Nabievna, 2023). Seen from figure 7, this group presenting a picture book about "The Goddess Chang'e Flying to the Moon" was highly praised by classmates.

序号	同学互评（1非常不符合；2不太符合；3一般；4比较符合；5非常符合）						建议		
	物质准备和经验准备充分度	活动导入有趣度	教学内容难易程度与年龄段符合度	师幼互动程度	教师教态及语言	教学目标达成度	讲师1	讲师2	讲师3
1	4	4	4	4	5	4	声音柔和，态度亲切	问的问题可以再拓展一点	游戏结束得有点快
2	4	4	4	5	3	3	内容简单	小朋友的回答有问题时进行纠正	针对适合的情绪处理方式的部分再细化一下
3	4	3	4	4	4	4	导入可以再有趣一点	互动很多不错	游戏环节可以再丰富一点
4	5	3	4	4	4	4	声音很温柔，导入有点简单	可以放松一点	可以做一个验证，看看分类对不对，顺便复习一下
5	4	4	3	3	4	4			
3	4	3	4	4	4	4	声音稍微有点小，可以再大声点	互动多，声音还可以再大声点流畅点就更好了	游戏环节比较单一，可以再丰富一些
7	3	3	3	4	4	4	导入可以再丰富一点	声音可以再洪亮一点	游戏环节有点乱
8	4	3	4	4	4	4	导入可以再有趣点	互动很多，照顾到大多数幼儿	声音可以再大一点
9	3	2	3	2	3	3	声音小了点，教态还可以自然一些	对于幼儿的回答处理得不得当，互动过于干燥，没有处理好纪律，封闭性问题太多，其他都不错	不错，有点羞涩
10	4	4	4	4	4	4			
11	4	4	4	5	4	3	声音可以大点	回答完问题可以鼓励和分析一下	
12	3	3	4	5	5	3	声音亲和	互动多	游戏结束有点仓促、延伸很好
13	4	4	3	4	4	4	教师教态好，声音好听	活动过程时间有一点多	教师教态好
14	3	3	2	5	4	4		问问题的质量可以高一点哦	
15	4	4	5	4	4	4	态度亲切	互动多	延伸很有意义
16	4	4	4	4	4	4	声音温和特别适合当幼儿教师	继续加油，你是最棒的	游戏环节有一丢丢乱，结尾挺不错的
17	5	3	3	4	4	3	挺好的，声音也很好听	老师的无效提问可以多注意一下哦	老师在小朋友活动结束以后，应该有一个评价的环节，既然是比赛，就需要一个评价和结果，不要笼统的表扬
18	4	3	4	4	4	3	声音都很温柔	第二位老师讲得挺好，但是可能存在一点点紧张，还有就是没有给中班小朋友讲为什么红色就是代表生气，而吹风那会的颜色就是平静呢，总体挺好的，加油哦	我觉得游戏太短了哦雪雪老师，但还是很厉害👍

Figure 8: Peer Assessment Online Simultaneously in Anonymous Way

As figure 8 showed, when one group was conducting a demo class, the remaining groups were playing the role of kindergarten children and made peer assessment online simultaneously in anonymous way to evaluate teaching methods, teaching effectiveness and give suggestions, for example, being relax, please speak louder, hoping more interesting etc. Afterwards, the group doing a demo class just now did self-reflection based on their presentation. Because the assessment was done in anonymous way, students could speak out what they really felt and thought, helping each other to do self-reflection and facilitate mutual learning and growth, especially simulating their teaching processes when they write lesson plans next time.

Through interaction between students, it is possible to enhance their interest in learning, enhance learning outcomes, and cultivate their cooperation and communication skills.

4.4 Post-IDI Stage

After the intervention, paired samples t-test was used in this research. The paired samples t-test can calculate the difference between corresponding observations in the two samples and tested whether this difference is statistically significant (Ross & Willson, 2017).

Table 6: Results of Paired Samples T-Test (n=40)

Variables		Mean	Std. Deviation	t-value	df	p-value
Pair 1	Pre-LCI	3.99	0.573	-2.25	39.0	0.030
	Post-LCI	4.22	0.460			
Pair 2	Pre-LLI	3.52	0.746	-4.55	39.0	< .001
	Post-LLI	4.15	0.626			
Pair 3	Pre-SEE	3.56	0.702	-2.49	39.0	0.017
	Post-SEE	3.94	0.750			
Pair 4	Pre-SBE	3.86	0.509	-2.40	39.0	0.021
	Post-SBE	4.14	0.592			
Pair 5	Pre-SCE	3.70	0.587	-2.09	39.0	0.043
	Post-SCE	3.96	0.693			

Table 6 illustrates the results of paired samples t-test before IDI and after IDI of each variable to verify whether the intervention create a significant change or not.

There was a significant difference in learner-content interaction between pre-IDI (M=3.99, SD=0.573) and post-IDI (M=4.22, SD=0.460) condition; t (39) =-2.25, p =0.030 (<0.05) and the mean difference was -0.231.

There was a significant difference in learner- learner interaction between pre-IDI IDI (M=3.52, SD=0.746) and post-IDI (M=4.15, SD=0.626) condition; t (39) =-4.55, p < .001and the mean difference was -0.631.

There was a significant difference in students' emotional engagement between pre-IDI (M=3.56, SD=0.702) and post-IDI (M=3.94, SD=0.750) condition; t (39) =-2.49, p =0.017 (<0.05) and the mean difference was -0.378.

There was a significant difference in students' behavioural engagement between pre-IDI (M=3.86, SD=0.509) and post-IDI (M=4.14, SD=0.592) condition; t (39) =-2.40, p=0.021 (<0.05) and the mean difference was -0.278.

There was a significant difference in students' cognitive engagement between pre-IDI (M=3.70, SD=0.587) and post-IDI (M=3.96, SD=0.693) condition; t (39) =-2.09, p=0.043 (<0.05) and the mean difference was -0.260.

In summary, the above quantitative results showed that there were significant differences between pre-IDI and post-IDI stages on LCI, LLI, SEE, SBE and SCE. Hypotheses H11-H14 were supported. Meanwhile, 6 students were interviewed after IDI and they hoped to have more choices and innovations in teaching methods, activities, resources,

and technology, and also emphasized the importance of preview, interaction, and feedback.

5. Conclusions and Recommendation

5.1 Conclusion

In this study, the researcher focuses more on exploring interactive pedagogy to enhance students' engagement in ECE. The hypotheses were developed as the conceptual framework to examine the causal relationship between learner-content interaction, learner-instructor interaction, learner-learner interaction and students' emotional, behavioural, and cognitive engagement. The questionnaire was distributed to sophomore in ECE of an application-oriented private university in southwest China. IOC and a pilot test were used to verify validity and reliability. MLR and interviews were carried out to test the significant relationship between variables and support the finalized IDI model. Paired samples t-test were used to compare mean difference before and after IDI.

Based on the findings, the researcher has made conclusions and conducted discussions from benefits and challenges of interactive pedagogy.

First, learner-content interaction and learner-learner interaction have significant influence on students' emotional, behavioural and cognitive engagement, especially after IDI, there are significant differences, indicating this interactive pedagogy boosts student interest and engagement by incorporating diverse activities like brainstorming, case studies, and group discussions to enhance curiosity, encourage active engagement, and foster self-learning skills and lifelong learning awareness. As Tsai et al. (2021) mentioned higher interaction in courses revealed the most favourable perceptions of engagement and learning outcomes. Besides, it is conductive to improving critical thinking skills, fostering intrinsic enthusiasm, resilience, and strategic task management among students. Meanwhile, peer engagement helped students develop confidence in building rapport with their peers and understanding the course content (Prior et al., 2016), which can cultivate students' teamwork and communication skills. Moreover, it promotes students' learning motivation and strengthened their sense of learning achievement and confidence.

However, time management, student diversity, teacher professional requirements, and the application of technical resources are all challenges that need to be overcome. Interactive teaching requires more time to organize activities and guide student discussions, which may lead to slow progress and affect the overall teaching plan. Gnusowski and Schoefer (2022) found some students felt dissatisfaction during weeks or months of group interaction. Therefore, it is worth discussing how to cater to students' individual needs and develop teaching plans based on their aptitude. Meanwhile, professional development such as training or workshop can help teachers develop the skills and knowledge to effectively engage students, especially focusing on social, management and technology promotion strategies, which can lead to more presence and active participation of teachers, in turn having an influence on motivating students to participate in online learning (Muir et al., 2022)

In a word, interactive teaching strategies (learner-content and learner-learner interaction) are the teaching methods worth promoting, which helps to improve students' learning effectiveness, promote their comprehensive development and enhance their emotional, behavioural and cognitive engagement.

5.2 Recommendation

The findings of this research indicates that interactive pedagogy (learner-content and learner-learner interaction) has indeed enhanced students' engagement, and recommendations will be offered from five aspects.

Firstly, establishing a better teacher-student relationship. A good teacher-student relationship was an important foundation for classroom interaction, which affected students' learning attitudes, engagement, and learning outcomes (Gunn et al., 2021), especially, teachers should ensure that students feel safe in the classroom and are not criticized or ridiculed for answering incorrectly or providing multiple solutions, and students should be allowed to raise different perspectives and questions.

Secondly, creating a richer interactive atmosphere. An active, open and inclusive interactive atmosphere is an important foundation for classroom interaction. In such an atmosphere, students were more willing to actively participate in classroom interaction (Han, 2021). Teachers can design more diverse interactive methods based on the teaching content and student characteristics. In addition to group discussions, role plays and case analysis, activities such as debate, field visits, experiential learning, flipped classroom, cross-disciplinary interactions, etc. can also be added.

Thirdly, cultivating students' self-directed learning abilities. Brandt (2020) pointed that self-directed learning skills was one of the essential abilities for students. students should learn to develop study plans, arrange their time reasonably, and develop good study habits and methods, for example, using rich learning resources and materials (books, articles, videos, etc.) to assist in self-directed learning, which not only allows for a better understanding of knowledge, but also broadens their own horizons and fosters a spirit of exploration.

Fourthly, developing students' abilities to utilize modern educational technology. The application of modern educational technology can enrich the forms and contents of classroom interaction, improve students' learning interest and participation. Alaidi et al. (2020) pointed that online learning platforms could provide students with personalized learning resources and online testing functions, helping them better understand their learning status and progress. In addition, online learning platforms could promote communication and interaction between teachers and students, allowing students to ask or discuss questions with teachers at any time, improving learning effectiveness and experience.

Last but not least, promoting professional development of teachers. Teachers who participated in the professional development program may have a greater positive impact on their students' school engagement than teachers who didn't receive the training (Powers et al., 2015) Therefore, universities should regularly train and develop teachers to master more interactive skills and methods, such as how to ask questions, how to guide student discussions, how to provide effective feedback and evaluation, etc. Besides, teachers should be encouraged to engage in teaching reflection and experience sharing, and summarize and reflect on their teaching methods, identify their shortcomings, and seek improvement.

5.3 Limitation and Further Study

This research has certain limitations that should be explored in further research. Firstly, the data of MRL covered only students from one department, the results of which showed there were significant impacts only between learner-content interaction, learner-learner interaction and students' emotional, behavioural and cognitive engagement. However, some experts, such as Panigrahi et al. (2022) found that learner-content, learner-instructor, and learner-learner interactions had significant influences on students' engagement. For this reason, future research should choose students from different department to fill out the questionnaire, and the results may be more comprehensive.

In addition, the students who were intervened were from early childhood education and the curriculum was "Picture Books Teaching in Early Childhood Education", which was interesting and vivid, so it is easier for teachers to carry out learn-content and learn-leaner interaction, but if it is a purely theoretical course, it will be challenging for teachers to design activities. Therefore, it is vital to think about how to create some interactive teaching strategies to meet the needs of different curriculum in further study.

Lastly, this study mainly focused on interactions in class, so the future study may connect the interactions before, during and after class, which could truly achieve the student-centred teaching philosophy.

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