Students' English Language Learning Experiences And Effects In The Smart Classroom At A Private High School In Zhengzhou, China

Yan Ye[1]*, Chunxia Lu[2], Yunxiang Chen[3], Feng Chen[4]

[1]Stamford International University, Thailand; Email: yan.ye@stamford.edu
[2]Yancheng Normal University, China; Email: 31396455@qq.com
[3]Henan Normal University, China; Email: janechen1993@hotmail.com
[4]Zhejiang Ocean University, China; Email: 406956449@qq.com

*Corresponding Author; Yan Ye
Email: yan.ye@stamford.edu

ARTICLE INFO	ABSTRACT
	The purpose of this study is to investigate the perceived English language learning experiences and learning effects of high school students after learning in smart classrooms, to understand the current situation of high school students' English language learning in smart classrooms and whether there are differences in their English language learning experiences and effects compared with their demographic factors, as well as to explore whether the high school students' English language learning experiences and effects in smart classrooms are related. The study collected 293 questionnaires from high school students in a private high school in Zhengzhou, China. The researchers used descriptive statistical analysis, independent sample t-test, one-way ANOVA, Pearson product moment correlation analysis to analyze the data. The results showed: 1) the overall level of high school students English language learning experiences and effects in smart classrooms was high, with higher effect in terms of improved student English language interaction; 2) students in higher grade perceived English language experiences and effects highly; female students perceived English language experiences and effects was higher than that of male students; 3) there was a significant relationship between high school students' perceived English language learning experiences and effect in smart classrooms. The researchers discussed on each finding and provided the recommendations for encouraging more students' English language learning at smart classroom in private schools, China.

Keywords: English Language, Learning Experiences, Learning Effect, Smart Classrooms, Private High School in Zhengzhou. |

Introduction

The rapid development of information and communication technology, artificial intelligence, internet of Things, and other cutting-edge technologies has led the development of campus informatization to a new stage (Liu, 2018). The development and application of information technology has a certain impact on each industry, which is both an opportunity and a challenge for the development of the times. Education is no exception, as an important part of national development, many countries have begun to study and apply future smart education. Malaysia, the first country to start the exploration, put forward the smart campus plan as early as 1999, and equipped primary and secondary schools with smart campus facilities such as laptop computers, Internet, and servers to conduct pilot research on future classrooms. Graham Primary School in the United States has carried out a smart classroom project, which enables students to access massive learning resources through cloud computing, and students can access computers anytime and anywhere (Yu, 2010). South Korea also issued the " Smart Education Promotion Strategy " in 2015, which will implement the construction of smart education environment in schools at all stages, carry out smart education, invent and implement digital

textbooks, so that Korean students can read electronically through various terminals (Chen, 2018). Singapore has a smart education programme where students can learn individually anytime and anywhere. Various countries in the world are exploring information technology to promote the integration of technology and education, to promote the development of education.

Smart classrooms are the concrete product of the development of education informatization, and their emergence is the concrete practice of intelligent education. Classroom is an important place and key support for teachers' teaching and students' learning. The technology-rich classroom environment will directly affect the learning experience and learning effect of learners (Whiteside et al., 2010). In 2018, the Ministry of Education of the People's Republic of China issued "*Education Information Action Plan*" and put forward the action plan of "*smart education innovation*", takes learners as the center to carry out smart environment facilities and practices supported by smart teaching, and comprehensively promote the "construction and application of smart campus". In this context, the learning experience and learning effect of classrooms have gradually attracted public attention.

In recent years, the related research issues of smart classroom have been widely concerned by scholars at home and abroad, it is hoped that the teaching environment can be optimized, and a new classroom teaching mode can be created by studying the environmental construction, teaching mode and interactive behavior analysis of smart classroom, to promote the fundamental change of teaching methods. However, most of the research focuses on the structural definition, technical construction and future development of smart classrooms, and there is still a lack of research on the learning experience and learning effect of smart classrooms in the smart environment (Wu, 2014; Wang, 2022). Compared with the traditional classroom, the smart classroom has significant advantages in the development of teaching and learning process, the experience of students' learning, the perception of physical space, the design of teaching methods and the support of smart technology (Song, 2015). Therefore, the perception of learners after learning experience is an important indicator to measure the learning effect of smart classrooms, and the construction and development of smart classrooms should be implemented in the study of the learning effect of smart classroom teaching in the final analysis (Shi, 2018).

At the same time, through reading the literature, it is also found that the research on smart classrooms has been mostly summarized and commented on the smart environment (Wu, 2015, Zhang, 2019). In China, empirical studies on students' learning experience inquiry and classroom teaching effect in the smart classroom environment with different subjects are still limited. Based on the above, this study tries to analyse the students' English language learning under the environment of smart classrooms, to understand the levels of students' English language learning experiences and effects in smart classrooms, compare the learners' English language learning experiences and effects, explore the relationship, and puts forward specific suggestions for improvement.

Research Objectives

1) What are the current levels of students' English language learning experiences and effects in the smart classrooms at private high school in Zhengzhou, China?
2) Are there any differences in students' English language learning experiences and effects in smart classrooms under different demographic factors at private high school in Zhengzhou, China?
3) Is there a significant relationship between students' English language learning experiences and effects in smart classrooms at private high school in Zhengzhou, China?

Literature Review

Smart Classroom in Education

Smart classroom is a new form of offline learning space in the future, which is the internal demand of the development of educational informatization to a certain extent. Smart classroom is a digital innovation form that rapidly changes teachers ' teaching methods and students ' innovative learning methods. As we all know, most of the teaching activities are carried out in the classroom. The rapid development of the economy has brought about the continuous change of information technology. However, the layout of existing classrooms is mostly the traditional form of ' row and seat ' in the period of industrial revolution. The desks and chairs are fixed, and there is only one blackboard, which is not conducive to the development of modern teaching activities. At the same time, in the traditional classroom environment, most teachers still focus on "teaching", students' participation in learning is low, and there is a lack of communication and communication among students (Guo, 2001). Previous studies have shown that flexible learning space can better innovate teacher teaching (Neill, 2008) and encourage students' creativity (Ciu, 2016). Therefore, under the background of teaching reform, it is particularly important to change the classroom environment from traditional layout to flexible and open layout.

In the early 21st century, to promote teachers' teaching and students 'learning, research on learning space began to rise internationally, which is the frontier of the connotation of "smart classroom". Rescigno (1988) put forward the concept of "Smart Classroom", which is the earliest concept of "Smart Classroom". Meanwhile, the form of the Smart Classroom was first developed in the junior science curriculum as a high-tech curriculum

facility integrating a personal computer, interactive laser video, closed-circuit television programming, satellite link chain, local area network, and telephone modem.

With the rapid development of artificial intelligence in recent years, researchers have begun to pay attention to the application research of smart classrooms. Compared with traditional classrooms, at the 2011 China Education Information Summit, Brian Gonzalez, Intel's director of education, proposed in his speech that the teaching in smart classrooms is different from that in traditional classrooms. The classroom in smart classrooms is divided into two parts for teaching. The first is to accept teaching in a personalized way outside the teaching process, that is, according to the individual differences of students after class. The second is to internalize the knowledge learned after class into their own knowledge through cooperation and communication with teachers and peers in class. Timms (2016) mentioned that the application of artificial intelligence in modern education has gradually matured. "Artificial Intelligence + Education" has participated in classroom learning and teaching in a new way, improving the interaction between students, teachers, and students, and greatly improving the teaching efficiency. Scholars predict that in the future education, the emergence of educational cooperative robots can assist teachers to appear in the intelligent classroom and provide relevant cases (Pearshouse et al, 2008).

Related Research on Learning Experiences and Effects at Smart Classroom

Since 2001, multi-media classrooms featuring "computer + projection" have been built in schools of all stages in China. However, traditional multimedia teaching, which focuses on "knowledge instilling", does not provide more learning experience for learners (Wang & Zheng, 2005; Shi & Lei, 2003), causing the phenomenon of "human irrigation" turning into "electric irrigation". From the perspective of learners, scholars began to explore the learning experience and actual perception of learners and explore the advantages and disadvantages of the smart classroom and its teaching design, which will further improve the level and application ability of the smart classroom construction.

From the perspective of learners, learners' experience of learning perception in the smart classroom is deeply explored, and learners' perception of learning experience in the smart classroom is grasped. The learning experience of the smart classroom refers to the satisfaction degree of learners' learning needs in terms of psychological perception, subjective response, and explicit behaviour in the process of learning. Learners are the subjects of learning behaviours and learning experience, and the connotation of learning experience is "recognition of learning" (Zhu & Li, 2017). Learners obtain learning experience through the stimulation of the external environment, and different stimulation objects produce different learning experiences. Research shows that exploring the stimulus objects of the smart classroom is of great significance to the determination of the components of learning experience. Therefore, Hu (2016), in combination with Pedagogy-Space-Technology (PST), divided the indicators of learning experience in smart classrooms (Vercellotti, 2018), and analysed the evaluation indicators of perception, interaction and performance of learning experience in smart classrooms.

Hynes (2017) showed that art design, science and liberal arts have different preferences for classroom space, he also found that learners ' participation in smart classrooms will increase. The interactive learning environment will affect the types of teachers' teaching practice activities, thus affecting students ' academic engagement (Stoltzfus & Libarkin, 2016). Studies also confirms that in smart classrooms, students will increase their learning engagement and work harder (Ciu et al, 2020). Meanwhile, students ' learning motivation will improve in the smart classroom environment (Whiteside, Brooks & Walker, 2020). However, Vercellotti (2018) found that students' learning participation is high whether in smart classrooms or in traditional classrooms. This may be caused by many reasons, Nicol et al. (2018) listed the factors that affect students ' participation in learning, such as students being forced to take compulsory courses, students having difficulties in using technical equipment, and excellent students being better at independent learning. In addition, the grade level will also affect students ' participation consciousness. Oluwatayo's (2015) study found that older students showed higher participation in active learning environment.

Analysis of Chinese literature on smart classrooms found that smart classrooms can enhance students ' perception of learning space, but also on smart classrooms can bring happy learning experience to teachers and students, improve students ' learning satisfaction. In addition, Chinese researcher studies have also carried out different gender comparisons. It is found that gender differences will also affect students ' perception of the smart environment. Song (2015) found that female students ' satisfaction with smart classrooms is higher than male classmate in art class, and grade and professional differences will also affect students ' perception of the smart environment. Shi (2018) found that senior students can better perceive the changes brought by the transformation of learning space, and liberal arts students have stronger spatial perception. Zhang et al.(2019) found that smart classroom environment can effectively improve students' enthusiasm, and learners are more engagement in learning, behaviour, emotion, and cognition. Wu (2014) also found that there were significant differences in autonomous learning and cooperative communication between students in smart classrooms and students in traditional classrooms. Smart classroom can provide strong technical support for the development of group cooperative learning, but the media function setting of smart classroom has little effect on cooperative learning (Xu, 2017). At the same time, Zhai's (2016), research showed that smart classrooms have different impacts on learners at different knowledge levels. The results show that in the smart classroom, the interest of high, middle, and low-level students in physics decreases in turn, and the learning effect of

students with different genders is also different. In science, the smart classroom has no significant effect on the academic performance of female students, but there are significant differences in the interest of physics learning between Male classmate and Female students (Zhou, 2013).

English Language Learning at Smart Classroom

Smart classroom is a learning mode that uses modern educational information technology equipment to promote students' autonomous learning. And the interactive interest in intelligent classroom encourages students to make positive responses based on analysing a large amount of data and information, so that students' learning behaviors can get feedback quickly, which plays the role of timely reinforcement and can reduce the error rate, which is beneficial to students' learning (Wang, 2022).

The cultivation of international language ability, particularly in English language and literature, plays a vital role in enhancing students' comprehensive language literacy (Zhang, Sun & Deng, 2023). However, traditional teaching methods have been found to be less effective in achieving desired learning outcomes. As such, there is a need to adopt more innovative teaching methods that stimulate students' interest in learning and facilitate their experience of English language and literature in authentic cultural contexts.

The teaching of English language and literature is a crucial aspect of education that aims to develop students' high-quality and practical English language skills. By teaching the connotation and background of English literature, students can enhance their cognitive level of English language and culture, gain a deep understanding of social customs and practices of English-speaking countries, and become well-rounded individuals (Chen et al. 2022; Zhao et al. 2022). However, traditional English language and literature teaching modes often fail to engage students and hinder their active participation in learning. Furthermore, certain indoctrination teaching methods discourage students' enthusiasm for learning. Therefore, the effectiveness of teaching mainly relies on the teacher's professionalism and English language and literature teaching level (Hasan, 2019).

The education department should actively introduce modern teaching concepts to provide English language and literature teachers with more room for development of their teaching activities. The Smart Classroom aims to investigate the opportunities and difficulties posed by the intelligent environment, to create an intelligent classroom that minimizes the need for teachers to carry hardware and maximizes their use of lecture time. The Smart Classroom has the capability to actively monitor and engage teachers in class discussions, even with students.

Research Methodology

Population and Sample

The target group of this study was from a private high school students in Zhengzhou, China during the second term of year 2023. A total population was 1401 students in the study, according to the sample size requirement of Krejcie and Morgan (1970), 302 students must be selected as the sample, based on convenient sampling method. The researcher distributed 302 questionnaires among students for investigation in the 2nd term of year 2023. All the questionnaires were distributed and collected through the class WeChat group; the questionnaire link was sent to the sampling students. By the end, the researchers collected 293 valid questionnaires from the students, and the effective return rate reached 97%.

Research Instrument

This study used a questionnaire, according to the research purpose and research questions of this study, the adopted questionnaire was from Song (2015). The reliability alpha value of the overall questionnaire was 0.973, which was greater than 0.9. This indicated that the consistency of the questionnaire data was strong.

The questionnaire was divided into three parts: 1) The first part contains basic information about high school students, including gender, grade, and Smart classroom learning length. 2) The second part investigates the current situation of high school students' English language learning experiences in smart classrooms. It is mainly composed of five aspects, namely ccontext awareness, content presentation, classroom management, resource acquisition and teacher support, a total of 9 questions. 3) The third part surveys high school students' English language learning effect in smart classrooms. Dimension analysis of smart classroom perception learning effect questionnaire, it consists of 7 sections with a total of 28 questions. They are divided into learner motivation, learning atmosphere, creative ability, independent learning, and interaction behaviour.

There are 46 questions in the questionnaire, of which the second and third parts are the main questions. The scale was based on a 5-point Likert scale, with scores of 5, 4, 3, 2 and 1 respectively.

Findings

Participants' Demographic information

Based on the data analysis results, Table 1 presents the students' demographic background information in the selected private high school of Zhengzhou, China. Out of the total sample of 293 participants, 146 (49.8%) were male and 147 (50.2%) were female. Among them, grade 1 students are 101 (34.5%), grade 2 students are 94 (32%), grade 3 students are 98 (33.5%). As for the length of learning at Smart classroom, 45(15.4%) students

are less than 1 year, 68(23.3%) students are between 1-2 years, and 180(61.4%) of them are learning more than 2 years.

Table 1. Students' Demographic Background Information

Variables	Group	Number	Percentage
Gender	Male	146	49.8
	Female	147	50.2
Grade	Grade 1	101	34.5
	Grade 2	94	32.0
	Grade 3	98	33.5
Smart Classroom Learning length	Less than 1 year	45	15.4
	1-2 years	68	23.2
	2 years above	180	61.4

For Research Objective One
Table 2 and 3 below shows the mean, standard deviation, and interpretation of the levels of students' English language learning experiences and effects in the smart classrooms, as the overall mean scores showed that the students' English language learning experiences and effects in the smart classrooms at the private high school of Zhengzhou, China were regarded as a high level.

Table 2 also showed each dimension of the students' English language learning experiences in the smart classrooms, including their context awareness, content presentation, classroom management, resource acquisition and teacher support were high, though the classroom management was relatively lower than the other dimensions, teacher support was regarded as the highest among all these dimesons.

Table 2. Students' English language learning experiences in the smart classrooms

Dimensions	M	SD	Interpretation
Context Awareness	3.68	.635	High
Content Presentation	3.56	.676	High
Classroom Management	3.52	.701	High
Resource Acquisition	3.69	.679	High
Teacher Support	3.71	.545	High
Overall	3.66	.678	High

Table 3 also showed each dimension of the students' English language learning effects in the smart classrooms, including learner motivation, learning atmosphere, creative ability, independent learning, and interaction behaviour. As shown, all the dimensions were at a high level, though creativity ability was relatively lower than the other dimensions, students' learning motivation was regarded as the highest among all 5 dimensions.

Table 2. Students' English language learning effects in the smart classrooms

Dimensions	M	SD	Interpretation
Learner Motivation	3.66	.848	High
Learning Atmosphere	3.65	.821	High
Creative Ability	3.53	.876	High
Independent Learning	3.56	.862	High
Interaction Behaviour	3.55	.876	High
Overall	3.61	.862	High

For Research Objective Two
1). Differences in Students' English Language Learning Experiences and Effects with Gender
Table 3 below shows the resulting data of the Independent Samples t-test between boys and girls for their English language learning experiences and effects. The result data shows that the Sig (2-tailed) were more than .05. Therefore, it indicated that boys were not significantly different from girls in terms of the level of their English language learning experiences and effects at the private high school of Zhengzhou, China.

Table 3. Differences in Students' English Language Learning Experiences and Effects with Different Genders

Variables	Gender	Mean	SD	T	P
English Language Learning Experiences	Male	3.610	.631	.386	.618
	Female	3.635	.644		
English Language Learning Effects	Male	3.556	.590	.234	.789
	Female	3.567	.600		

2) Differences in Students' English Language Learning Experiences and Effects with Grades
As the One-way ANOVA results from Table 5 showed, Students' English language learning experiences and effects with different grades was significantly different, which was reflected by mean value. Students in higher grade perceived English language experiences and effects highly.

Table 4. Differences in Students' English Language Learning Experiences and Effects with Different Grades

Variables	Grade	Mean	SD	F	P
English Language Learning Experiences	Grade 1	3.38	.962	3.738	0.003*
	Grade 2	3.51	.572		
	Grade 3	3.69	.687		
English Language Learning Effects	Grade 1	3.42	.562	3.657	0.002*
	Grade 2	3.53	.802		
	Grade 3	3.61	.887		

Noted: * P<0.05.

3) Differences in Students' English Language Learning Experiences and Effects with Different Smart Classroom Learning Length.
As the One-way ANOVA results from Table 5 showed, Students' English language learning experiences and effects with different grades was significantly different, which was reflected by mean value. Students who learned in smart classroom with longer time had higher levels of English language learning experiences and effects.

Table 4. Differences in Students' English Language Learning Experiences and Effects with Different Smart Classroom Learning Length

Variables	Smart Classroom Learning Length	Mean	SD	F	P
English Language Learning Experiences	Less than 1 year	3.28	1.067	4.008	0.000*
	1-2 years	3.56	.672		
	2 years above	3.70	.787		
English Language Learning Effects	Less than 1 year	3.42	.962	2.798	0.012*
	1-2 years	3.53	.602		
	2 years above	3.71	.721		

Noted: * P<0.05.

For Research Objective Three

Table 5 shows the students' English language learning experiences and effects at the private high school of Zhengzhou, China. As the Pearson coefficient of students' English learning experiences and effects was 0.781 and had a significant p-value of less than 0.01, indicating that there was a significant positive correlation between students' English learning experiences and learning effect, in other words, it indicated the students with higher English language learning experiences may have the higher learning effect.

Table 5. Correlation between Students' English Language Learning Experiences and Effects

Variables	English Language Learning Effects	
English Language Learning Experiences	Pearson Relevance	.781**
	Sig.	0
	N	293

Noted: * P<0.05; ** P<0.01.

Discussion

This study found that students' English language learning experiences and effects in the smart classrooms at the private high school of Zhengzhou, China were regarded as a high level. Students' English language learning

experiences in the smart classrooms, including their context awareness, content presentation, classroom management, resource acquisition and teacher support were high, though the classroom management was relatively lower than the other dimensions, while teacher support was regarded as the highest among all these dimesons. The students' learning experiences in the smart classrooms were all better than those in the traditional classrooms, which is consistent with the findings of Wang (2022).

Meanwhile, this study also found that students' English language learning effects in the smart classrooms, including learner motivation, learning atmosphere, creative ability, independent learning, and interaction behaviour were at a high level, though creativity ability was relatively lower than the other dimensions, students' learning motivation was regarded as the highest among all 5 dimensions. This proved that smart teachers were able to produce a good effect on the students' learning experience (Wang, 2022). Wu (2014) also found that there were significant differences in autonomous learning and cooperative communication between students in smart classrooms and students in traditional classrooms. Smart classroom can provide strong technical support for the development of group cooperative learning, but the media function setting of smart classroom has little effect on cooperative learning (Xu, 2017). Zhang et al. (2019) also mentioned that smart classroom environment can effectively improve students' enthusiasm, and learners are more engaged in learning, behaviour, emotion, and cognition. As in the traditional classroom environment, most teachers still focus on "teaching", students' participation in learning is low, and there is a lack of communication and communication among students (Guo, 2001). Previous studies have shown that flexible learning space can better innovate teacher teaching (Neill, 2008) and encourage students ' creativity (Chiu, 2016). Therefore, under the background of teaching reform, it is particularly important to change the classroom environment from traditional layout to flexible and open layout. Wang (2022) also explained that the interactive interest in intelligent classroom encourages students to make positive responses based on analysing a large amount of data and information, so that students' learning behaviours can get feedback quickly, which plays the role of timely reinforcement and can reduce the error rate, which is beneficial to students' learning.

Comparing the differences in students' English language learning experiences and effects in smart classrooms with gender, grade and smart classroom learning length at private high school in Zhengzhou, China, this study found boys were not significantly different from girls in terms of the level of their English language learning experiences and effects at the private high school of Zhengzhou, China. However, students' English language learning experiences and effects with different grades was significantly different. Students in higher grade perceived English language experiences and effects highly. The finding about the gender difference is a bit different from Song (2015), who found that female students' satisfaction with smart classrooms is higher than male classmates in learning art. In science, the smart classroom has no significant effect on the academic performance of female students, but there are significant differences in the interest of physics learning between male classmate and female students (Zhou, 2013).

Moreover, students' English language learning experiences and effects with different grades was significantly different. Students who learned in smart classroom with longer time had higher levels of English language learning experiences and effects. As Song (2015) pointed that the grade and professional differences will also affect students ' perception of the smart environment. Similarly, Shi (2018) supported that senior students can better perceive the changes brought by the transformation of learning space, and liberal arts students have stronger spatial perception. The results show that in the smart classroom, the interest of high, middle, and low-level students in physics decreases in turn, and the learning effect of students with different genders is also different. Oluwatayo's (2015) study found that older students showed higher participation in active learning environment.

Finally, this study also found there was a significant positive correlation between students' English learning experiences and learning effect, in other words, it indicated the students with higher English language learning experiences may have the higher learning effect. This is in line with the findings of (Xu, 2017) that collaborative learning in smart classrooms is more interesting and enjoyable, and it is also consistent with Zhang, et al. (2019), who found that the smart classroom environment was effective in enhancing high school students' interest and enthusiasm for learning, it was believed that smart classroom environments are effective in increasing high school students' interest and enthusiasm for learning, and that high school students' behavioral, emotional and creative engagement is increased (Wang, 2022; Chen et al. 2022).

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