Available Online at www.e-iph.co.uk
Indexed in Clarivate Analytics WoS, and ScienceOPEN

E-B Environment - Behaviour Proceedings Journal

AicQoL2025Pangkor

https://www.amerabra.org/
13th AMER International Conference on Quality of Life,
Puteri Bayu Beach Resort, Pangkor Island, Malaysia.

e-IPH e-International Publishing House Ltd., United Kingdom

Impact of Intelligent Classroom Environment on Students' Learning Motivation and Self-efficacy in Vocational College

He Yao[1], Lim Boon Hooi[2], Gao Yan[2], Ma Xiao[2], Zhang Tingxiu[2], Zhang Wenyu[3]

1 Faculty of Foundational Education, Anhui Vocational College of City Management, China,
[2] Faculty of Education, Languages, Psychology & Music, SEGi University, Malaysia,
[3] Faculty of General Education, Beihai University of Art and Design, China

Email: 422818474@qq.com; limboonhooi@segi.edu.my; 1298528343@qq.com; 4374785@qq.com; tingxiu.zhang@qq.com; 253567298@qq.com
Tel : +8615256546292

Abstract
This study examines the impact of intelligent classrooms on students' learning motivation and self-efficacy in aerobics courses. By comparing traditional and intelligent classroom environments, the research finds that the interactive tools, multimedia resources, and real-time feedback in intelligent classrooms significantly enhance students' motivation and self-efficacy. The results suggest that intelligent classrooms improve the learning experience by fostering engagement, confidence, and achievement, supporting their adoption in physical education curricula to boost student satisfaction and outcomes.

Keywords: Intelligent classroom environment; Learning motivation; Self-efficacy; Aerobic dance

DOI: https://doi.org/10.21834/e-bpj.v10i31.6512

1.0 Introduction

1.1 Background of the Study

With the rapid development of educational technology, the intelligent classroom, as an innovative teaching model, is increasingly being integrated into the teaching practices of various courses (Kinshuk et al., 2016). By incorporating multimedia resources, real-time feedback mechanisms, and interactive tools, intelligent classrooms provide teachers and students with a more dynamic and personalized learning environment (Cheung et al., 2021). This new teaching approach transforms traditional classroom models and offers students more excellent learning support and motivation (Boaler, 2002). However, research on the impact of intelligent classrooms on psychological factors, especially in physical education courses like aerobic dance, remains limited.

Aerobic dance, as a course that combines sports and art, requires students not only to master skills but also to maintain high levels of learning motivation and self-efficacy to stay engaged and make progress (Gene, 2024). In traditional classroom settings, students' learning experiences are often constrained by limited teaching resources and insufficient teacher-student interaction (Sun & Wu, 2016). The real-time feedback and multimedia support provided by intelligent classrooms may offer effective ways to enhance students' learning motivation and self-efficacy (Wang et al.,2024). Therefore, exploring the application effects of intelligent classrooms in aerobics teaching holds significant theoretical and practical value.

This study aims to examine the differences in students' learning motivation and self-efficacy between traditional classrooms and intelligent classrooms. By incorporating multimedia resources and feedback systems into the intelligent classroom, this research

eISSN: 2398-4287 © 2025. The Authors. Published for AMER by e-International Publishing House, Ltd., UK. This is an open access article under the CC BY-NC-ND license (http://creativecommons.org/licenses/by-nc-nd/4.0/). Peer–review under responsibility of AMER (Association of Malaysian Environment-Behaviour Researchers).
DOI: https://doi.org/10.21834/e-bpj.v10i31.6512

examines whether it can stimulate students' enthusiasm for learning, enhance their confidence, and provide a reference for optimizing teaching models in future physical education courses.

1.2 Objectives of the Study

Although previous research has revealed the positive role of intelligent classrooms in enhancing students' learning experiences, studies focusing on physical education courses remain limited, especially regarding their specific effects in aerobics classes. In response to this research gap, this study's objectives are:

1. To compare the level of learning motivation and self-efficacy in traditional and intelligent classroom settings.
2. To analyze the role of multimedia resources and real-time feedback in improving student motivation and self-efficacy.
3. To evaluate the overall impact of intelligent classrooms on students' engagement and performance in aerobic dance.

1.3 Research Questions

Based on the research objectives, we put forward the following specific research questions:

1. Can the intelligent classroom environment significantly enhance students' learning motivation?
2. Can the intelligent classroom environment significantly improve students' self-efficacy?
3. Compared to traditional classrooms, can the intelligent classroom improve students' learning experience and psychological factors more effectively?

1.4 Research Hypotheses

To solve the research questions, we propose the following research hypotheses:

H1: The intelligent classroom environment can significantly enhance students' learning motivation and is more effective than traditional classrooms.

H2: The intelligent classroom environment can significantly improve students' self-efficacy and is more effective than traditional classrooms.

H3: In aerobics courses, the intelligent classroom environment can significantly improve students' overall learning motivation and self-efficacy compared to traditional classrooms.

2.0 Literature Review

By incorporating advanced technologies like multimedia tools, interactive platforms, and real-time feedback systems, the intelligent classroom not only boosts teaching effectiveness but also greatly enhances students' learning experiences and results. The core of the intelligent classroom lies in its interactivity and personalization, effectively meeting students' diverse learning needs and motivating them through timely feedback to boost their learning motivation and confidence (Iqbal et al., 2024).

2.1 Intelligent Classroom and Learning Motivation

Learning motivation is a key psychological factor influencing students' learning behavior and is directly related to learning outcomes. According to Deci and Ryan's Self-Determination Theory, learning motivation arises from fulfilling an individual's needs for autonomy, competence, and relatedness (Deci & Ryan, 1985). In traditional classroom environments, students' learning motivation is often limited by the monotony of teaching methods and insufficient interactivity. In contrast, the multimedia technology and real-time feedback features of intelligent classrooms can enhance students' interest and engagement in learning tasks. For example, Sun (2020) found that in an intelligent classroom environment, students could access more learning resources through interactive teaching tools, increasing their intrinsic motivation to learn.

2.2 Intelligent Classroom and Self-efficacy

Self-efficacy pertains to a person's belief in their capability to accomplish a task, making it a crucial psychological factor in physical education courses (Bandura, 1997). Students with higher self-efficacy are generally more willing to take on challenges and remain engaged in learning. Research has shown that intelligent classrooms, through personalized learning support and timely feedback mechanisms, can effectively enhance students' self-efficacy. For example, Dimitriadou (2023) found in a study that the real-time feedback feature of intelligent classrooms helped students understand their learning progress and shortcomings, thereby increasing their learning confidence and sense of control. In the field of physical education, real-time feedback is especially crucial, as learning motor skills requires timely correction and encouragement (Kaur et al., 2022).

2.3 Intelligent Classrooms and Aerobic Dance Teaching

Aerobic dance is both a physical training activity and a form of artistic expression, which highly demands students' learning motivation and self-confidence. Due to limited resources and insufficient interaction, traditional teaching methods struggle to meet students' needs fully. In contrast, multimedia teaching resources in intelligent classrooms can vividly demonstrate movement breakdowns and demonstrations, the real-time feedback feature helps students identify and improve movement issues, and the interactive platform provides more opportunities for communication and learning (Hou, 2024).

3.0 Methodology

3.1 Research Design

This study used an experimental controlled research design in order to compare the effects of two teaching environments, traditional classroom and intelligent classroom, on students' motivation and self-efficacy. The subjects of the study were students majoring in aerobics at a vocational and technical college in Anhui, China. They were randomly divided into an experimental group (intelligent classroom environment) and a control group (traditional classroom environment), and both groups of students received the same teaching content but different teaching methods in the course.

3.2 Research Sampling

The population of this study consisted of 80 vocational college students participating in an aerobics program, and all 80 students volunteered to participate in the experiment. There was a relatively balanced ratio of males to females, and their ages ranged from 18 to 22 years old. None of the students had received professional aerobics training. There were 40 students in each of the experimental and control groups, with no significant differences between the groups ($p > 0.05$).

3.3 Instruments

This study used the Motivated Strategies for Learning Questionnaire to assess students' learning motivation and the College Academic Self-Efficacy Scale to evaluate their self-efficacy.

3.3.1 Motivated Strategies for Learning Questionnaire (MSLQ)

This study used MSLQ to assess students' motivation to learn in both smart classroom and traditional classroom settings. This self-report instrument was developed by Pintrich et al. (1991) and is a widely recognised tool for measuring college students' motivation and learning strategies. It has been widely used in educational research due to its strong psychometric properties.

Responses are rated on a 7-point Likert scale ranging from 1 (not at all true of me) to 7 (very true of me), and higher scores indicate stronger agreement with the statement. The reliability and validity of the MSLQ are well-documented. Internal consistency (Cronbach's alpha) for its subscales typically ranges from 0.62 to 0.93, depending on the population and setting (Pintrich et al., 1993). Furthermore, the construct validity has been supported through exploratory and confirmatory factor analyses, aligning with its theoretical framework (Duncan & McKeachie, 2005).

3.3.2 College Academic Self-Efficacy Scale (CASES)

In this study, we measured students' self-efficacy using CASES, an instrument developed by Owen, S. and Froman, R. in 1988 in a Western context to assess students' self-efficacy in an intelligent, traditional classroom.

The CASES consists of 33 items and uses a 7-point Likert scale (1 = not at all true, 7 = totally true). The scale shows good reliability and validity. The internal consistency (Cronbach's α coefficient) is 0.931, indicating high reliability (Ifdil et al., 2024).

3.4 Research Procedures

The intelligent classroom is equipped with multimedia devices, including motion breakdown videos, virtual demonstration animations, and real-time motion capture feedback systems. Teachers enhance classroom interaction through interactive teaching tools such as classroom polling and instant quizzes. At the end of each session, students receive performance-based data feedback reports, which include details on task completion and learning recommendations. Traditional classroom teaching primarily relies on verbal explanations and demonstrations. Students learn by observing the teacher's demonstrations and mimicking each other. Teachers provide feedback on students' movements through verbal comments, but there is no real-time feedback mechanism or personalized recommendations.

Data were collected through questionnaires administered both before the course (pre-test) and after the course (post-test). The collected questionnaire data were analyzed using SPSS statistical software with the following methods:

1. Descriptive statistical analysis: Used to analyze students' levels of learning motivation and self-efficacy in the pre-test and post-test.
2. Independent samples t-test: Conducted to analyze the differences in learning motivation and self-efficacy between the experimental group and the control group in the post-test.
3. Paired samples t-test: Used to analyze changes within each group between the pre-test and post-test to evaluate the effects of the teaching intervention.

4.0 Findings

The descriptive statistics show significant changes in the scores of learning motivation and self-efficacy in both the experimental and control groups between the pre-test and post-test stages. In the experimental group, the mean score for learning motivation increased significantly from 3.94 (SD = 0.559) in the pre-test to 4.75 (SD = 0.834) in the post-test, with a range of 2 to 7, indicating that some students experienced a notable enhancement in their learning motivation following the intervention. In contrast, the control group's mean score for learning motivation increased only slightly, from 3.80 in the pre-test to 4.10 in the post-test. For self-efficacy, the experimental group's mean score improved from 4.27 (SD = 0.779) in the pre-test to 5.12 (SD = 0.891) in the post-test, while the control group showed

no significant change in mean scores. These findings suggest that the intelligent classroom intervention had a significant impact on improving students' psychological learning variables, whereas traditional teaching methods had a limited effect on these variables.

Table 1. Descriptive Statistics Results

	N	Minimum	Maximum	Mean	Std. Deviation
Pre_Motivation_Likert	80	3	5	3.94	.559
Post_Motivation_Likert	80	2	7	4.75	.834
Pre_SE_Likert	80	2	6	4.27	.779
Post_SE_Likert	80	3	8	5.12	.891
Valid N (listwise)	80				

The independent samples t-test validated the differences between the experimental and control groups. In the pre-test, there were no significant differences in the mean scores of learning motivation and self-efficacy between the two groups ($p > 0.05$), indicating that the students in both groups had similar psychological states at the beginning of the experiment. However, in the post-test, the scores of learning motivation and self-efficacy in the experimental group were significantly higher than those in the control group ($p < 0.05$). For instance, the mean difference in learning motivation in the post-test was 0.65, with a t-value of 6.676 and a significance level of 0.000, while the mean difference in self-efficacy also demonstrated statistical significance. These findings indicate that the intelligent classroom intervention was more effective in enhancing students' learning motivation and self-efficacy compared to traditional teaching methods.

Table 2. Independent Samples Test Results

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Pre_Motivation	Equal variances assumed	7.011	.010	-2.111	78	.038	-.275	.130	-.534	-.016
	Equal variances not assumed			-2.111	75.786	.038	-.275	.130	-.534	-.016
Post_Motivation	Equal variances assumed	3.003	.087	6.095	78	.000	.950	.156	.640	1.260
	Equal variances not assumed			6.095	72.041	.000	.950	.156	.639	1.261
Pre_SE	Equal variances assumed	1.300	.258	.000	78	1.000	.000	.168	-.334	.334
	Equal variances not assumed			.000	75.498	1.000	.000	.168	-.334	.334

Post_SE	Equal variances assumed	.491	.486	6.475	78	.000	.975	.151	.675	1.275
	Equal variances not assumed			6.475	76.928	.000	.975	.151	.675	1.275

The paired samples t-test results indicated significant changes in learning motivation and self-efficacy within the experimental group between the pre-test and post-test stages. The mean difference in learning motivation for the experimental group was 0.81 ($p < 0.05$), and the mean difference in self-efficacy was 0.85 ($p < 0.05$), both demonstrating significant intervention effects. In contrast, the control group showed no significant changes in either learning motivation or self-efficacy ($p > 0.05$). These findings confirm that the interactive and diversified teaching model of the intelligent classroom effectively stimulated students' interest in learning and enhanced their confidence in their abilities, while traditional teaching methods failed to achieve similar outcomes.

Table 3. Paired Samples Test Results

		Paired Differences					t	df	Sig. (2-tailed)
					95% Confidence Interval of the Difference				
		Mean	Std. Deviation	Std. Error Mean	Lower	Upper			
Pair 1	Pre_Motivation - Post_Motivation	-.888	1.019	.114	-1.114	-.661	-7.792	79	.000
Pair 2	Pre_SE - Post_SE	-.812	1.115	.125	-1.061	-.564	-6.519	79	.000

The intelligent classroom environment significantly enhanced students' learning motivation and self-efficacy, indicating its high value in physical education teaching. Students in the experimental group generally showed higher levels of learning interest and confidence, allowing them to engage more actively in aerobics learning. In contrast, the traditional classroom had relatively limited effects in stimulating students' motivation and boosting their confidence.

5.0 Discussion

This study compared the effects of intelligent classroom and traditional classroom teaching environments on students' learning motivation and self-efficacy, confirming the advantages of intelligent classroom in enhancing the teaching effectiveness of aerobics courses. The following section discusses the research findings and analyzes their significance and limitations in conjunction with relevant literature.

5.1 The Impact of the Intelligent Classroom on Learning Motivation

The results indicate that the intelligent classroom significantly enhanced students' learning motivation, particularly in terms of intrinsic motivation. By utilizing multimedia resources and interactive tools, the intelligent classroom created a more engaging and enjoyable learning environment, encouraging students to participate in the course with a more positive attitude.

This aligns with Deci and Ryan's self-determination theory, which suggests that satisfying students' needs for autonomy and competence can enhance their learning motivation (Deci & Ryan, 1985). For example, real-time feedback and classroom interactions provided students with more opportunities to take control of their learning process and observe their progress in a timely manner. This feedback mechanism directly reinforced their intrinsic drive to learn. In contrast, traditional classrooms, lacking dynamic interaction and real-time feedback, struggled to sustain students' attention and, in some cases, even led to feelings of motivation among students.

5.2 The Impact of the Intelligent Classroom on Self-efficacy

The significant improvement in students' self-efficacy in the intelligent classroom is supported by experimental data. This aligns with Bandura's social cognitive theory, which posits that the enhancement of self-efficacy often relies on clear goals, timely feedback, and successful learning experiences (Bandura, 1997). The personalized learning support provided in the intelligent classroom enabled students to promptly correct movement errors and perceive their progress, thereby boosting their confidence in task completion.

Moreover, the intuitive demonstrations offered by multimedia resources and motion capture technology further clarified the standards for skill mastery, helping students set and achieve learning goals more effectively. In contrast, the lack of sufficient personalized guidance in traditional classrooms made it difficult for some students to overcome skill challenges during the learning process, thereby hindering the improvement of their confidence.

5.3 The Impact of the Intelligent Classroom on Aerobic Dance Teaching

The intelligent classroom, as an innovative teaching model, not only enhances students' learning experience but also significantly improves teaching outcomes. The intelligent classroom provides differentiated guidance tailored to students' learning characteristics, meeting their individual needs. The real-time feedback mechanism allows students to clearly understand their learning status and progress, enhancing their sense of control over learning. The rich multimedia resources and interactive elements in the intelligent classroom greatly stimulate students' interest in learning and enthusiasm for participation.

5.4 Limitations

This study covered only one semester, making it impossible to examine the long-term effects of the intelligent classroom on learning motivation and self-efficacy. Future research could extend the time frame to evaluate the long-term teaching outcomes. Additionally, this study focused solely on students in an aerobics course, so the findings may not be directly generalizable to other physical education courses or subject areas. Subsequent research could expand to other types of courses to explore the broader applicability of the intelligent classroom. Moreover, this study only investigated learning motivation and self-efficacy without delving into other potentially affected variables (e.g., academic performance or social interactions). Future studies could further explore these aspects to provide a more comprehensive understanding.

6.0 Conclusion & Recommendations

This study demonstrates that, as an innovative teaching model, the intelligent classroom can significantly enhance students' learning motivation and self-efficacy in aerobics courses. By integrating multimedia resources, real-time feedback mechanisms, and interactive platforms, the intelligent classroom creates a dynamic and personalized learning environment for students. The results show that students in the intelligent classroom are more engaged, confident, and motivated, which further promotes their deep connection with the course content and higher achievement. This finding not only provides empirical support for the application of intelligent classrooms in aerobics teaching but also highlights the potential of such environments to improve student outcomes in broader physical education settings.

Furthermore, this study offers valuable insights for optimizing physical education teaching methods, emphasizing the importance of incorporating interactive, feedback-driven technologies to meet students' diverse learning needs. The results indicate that the tools in the intelligent classroom can address the shortcomings of traditional classroom models, particularly in providing personalized support and enhancing student engagement and motivation.

Future research should explore the long-term impact of the intelligent classroom environment on student learning, including academic performance and social interaction, in addition to motivation and self-efficacy. Additionally, further studies could examine the application of the intelligent classroom in other educational contexts, such as different types of physical education courses or non-physical education courses, to evaluate its broader applicability. To lay a stronger foundation for the practical implementation and adoption of educational technology, ongoing evaluation, continuous improvement, and the expansion of technological applications are essential to meet the evolving needs of students and educators.

Acknowledgement

First, I would like to sincerely thank everyone who has helped and supported me throughout this research. I am grateful to all the students and teachers who participated in this study; your active involvement and support made it possible for the research to be completed successfully.

I also appreciate the research platform and resources provided by the school, especially the assistance offered during data collection and analysis. Thanks to my friends for their constructive suggestions and feedback during the research process. Your support has allowed me to continuously improve the content and methodology of the study.

Paper Contribution to Related Field of Study

This research offers valuable insights into educational technology and physical education, with a specific focus on aerobics instruction. By examining the influence of intelligent classrooms on students' motivation and self-efficacy, it broadens the understanding of how advanced technological solutions can improve learning outcomes in physical education settings. The findings present practical recommendations for educators and policymakers aiming to enhance the effectiveness of physical education programs. It demonstrates the value of integrating intelligent classroom technologies into teaching practices to enhance student participation, motivation, and performance. The findings suggest that similar strategies could be applied to other sports or physical education settings, broadening the impact of educational technology in the field.

References

Bandura, A. (1997). Self-efficacy: the Exercise of Control. W. H. Freeman.

Boaler, J. (2002). Experiencing School Mathematics. In Routledge eBooks. Informa. https://doi.org/10.4324/9781410606365

Cheung, S. K. S., Kwok, L. F., Phusavat, K., & Yang, H. H. (2021). Shaping the future learning environments with intelligent elements: challenges and opportunities. International Journal of Educational Technology in Higher Education, 18(1). https://doi.org/10.1186/s41239-021-00254-1

Deci, E. L., & Ryan, R. M. (1985). The general causality orientations scale: Self-determination in personality. Journal of Research in Personality, 19(2), 109–134. https://doi.org/10.1016/0092-6566(85)90023-6

Dimitriadou, E., & Lanitis, A. (2023). A critical evaluation, challenges, and future perspectives of using artificial intelligence and emerging technologies in intelligent classrooms. intelligent Learning Environments, 10(1), 12.

Duncan, T. G., & McKeachie, W. J. (2005). The making of the motivated strategies for learning questionnaire. Educational Psychologist, 40(2), 117–128. https://doi.org/10.1207/s15326985ep4002_6

Gene Lloyd, H. (2024). The role of physical self-efficacy, attitudes toward physical activity, exercise locus of control and values in adherence to aerobic dance exercise programs - ProQuest. Proquest.com. https://search.proquest.com/openview/532df1fd1408f1338923a142300ea847/1?pq-origsite=gscholar&cbl=18750&diss=y

Hou, G. (2024). Correlation Among Teacher ICT Teaching, Teacher Immediacy Behaviors, Teacher–Student Rapport, and Student Engagement in intelligent Classroom Teaching. Sustainability, 16(21), 9592. https://doi.org/10.3390/su16219592

Ifdil Ifdil, Khairul Bariyyah, Ari Khusuma Dewi, & Itsar Bolo Rangka. (2020). The College Academic Self-Efficacy Scale (CASES); An Indonesian Validation to Measure the Self-Efficacy of Students. Citeus. https://citeus.um.ac.id/jkbk/vol4/iss4/11

Iqbal, H. M. N., Parra-Saldivar, R., Zavala-Yoe, R., & Ramirez-Mendoza, R. A. (2020). intelligent educational tools and learning management systems: supportive framework. International Journal on Interactive Design and Manufacturing (IJIDeM), 14(4), 1179–1193. https://doi.org/10.1007/s12008-020-00695-4

Kaur, A., Bhatia, M., & Stea, G. (2022). A Survey of intelligent Classroom Literature. Education Sciences, 12(2), 86. https://doi.org/10.3390/educsci12020086

Kinshuk, Chen, N.-S., Cheng, I-Ling., & Chew, S. W. (2016). Evolution Is not enough: Revolutionizing Current Learning Environments to intelligent Learning Environments. International Journal of Artificial Intelligence in Education, 26(2), 561–581. https://doi.org/10.1007/s40593-016-0108-x

Owen, S., & Froman., R. (1988). Development of a College Academic Self-Efficacy Scale.

Pintrich, P. R., Smith, D. A. F., Garcia, T., & Mckeachie, W. J. (1993). Reliability and predictive validity of the motivated strategies for learning questionnaire (MSLQ). Educational and Psychological Measurement, 53(3), 801–813. https://doi.org/10.1177/0013164493053003024

Pintrich, P. R., Smith, F., Garcia, T., & W. J. A McKeachie. (1991). A manual for the use of the motivated strategies for learning questionnaire (MSLQ). 48109, 1259. https://www.researchgate.net/publication/271429287

Sun, Y., & Gao, F. (2020). An investigation of the influence of intrinsic motivation on students' intention to use mobile devices in language learning. Educational Technology Research and Development, 68(3), 1181-1198.

Wang, Y., Liu, S., Pu, L., Mao, X., & Shen, S. (2024). College Students' Learning Experience and Engagement in the intelligent Classroom: The Mediating Role of Self-Efficacy in the Background of COVID-19. SAGE Open, 14(4). https://doi.org/10.1177/21582440241285082