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Research Article

THE EFFECTS OF BLENDED LEARNING CULINARY ART COURSE ON STUDENTS PERFORMANCE AT GUANGDONG, CHINA

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Abstract

This study investigates the effects of blended learning culinary art on student performance and satisfaction at the Guangdong Institute of Arts and Sciences, China. The research employs a quasi-experimental design, comparing a treatment group of 45 participants using the Intelligent Cloud Vocational Education (ICVE) with a control group with 35 participants following traditional face-to-face teaching. Over eight weeks, student performance was assessed through culinary exams at the beginning and end of the course, while satisfaction was measured via questionnaires from all 75 students. The findings revealed that the ICVE significantly enhanced Cooking Skills ($F(72) = 21.023$, $p < .001$), Culinary Culture ($F(72) = 11.051$, $p = 0.001$) and satisfaction ($t(72) = -2.38$, $p = 0.020$) in the treatment group compared to the control group. However, the hypothesis related to Nutritional Quality ($F(72) = 3.269$, $p = 0.075$) and Culinary Creativity ($F(72) = 0.958$, $p = 0.331$) did not show significant differences between the two groups. Additionally, student satisfaction was notably higher in the treatment group, indicating that the blended learning approach provided a more engaging and effective learning experience. These results suggest that integrating technology through the ICVE platform can substantially improve certain aspects of culinary education. The study contributes to the fields of educational psychology, technology integration, and vocational training, particularly within the context of Chinese culinary Education. Furthermore, these findings can inform curriculum design and teaching methods globally by highlighting the effectiveness of blended learning models that incorporate technological tools, ultimately enhancing both educational outcomes and student satisfaction in culinary arts programs worldwide.

Keywords: Blended Learning, Culinary Art, Satisfaction

Introduction

The landscape of education is rapidly evolving, driven by technological advancements and changing societal needs. In the realm of culinary arts education, traditional face-to-face instruction has long been the norm, emphasizing hands-on experience and practical skills. However, the integration of digital technologies and online learning platforms has opened new possibilities for enhancing culinary education through blended learning approaches. Blended learning, which combines face-to-face instruction with online learning components, has gained significant traction across various educational disciplines (Ma & Hao, 2024; Singh, 2021). This pedagogical approach offers the potential to leverage the strengths of both traditional and digital learning environments, providing students with a more flexible, engaging, and comprehensive educational experience. In the context of culinary arts education, blended learning presents unique opportunities and challenges, given the highly practical nature of the field (Hrastinski, 2019).

The culinary industry is experiencing rapid changes, influenced by globalization, evolving consumer preferences, and technological innovations in food preparation and presentation (Hanan & Hemanto, 2019; Polak et al., 2016). As a result, culinary education must adapt to prepare students for a dynamic and competitive industry. Blended learning approaches offer the potential to enhance traditional culinary instruction by incorporating digital resources, interactive simulations, and online collaboration tools, thereby broadening students' exposure to diverse culinary traditions, techniques, and theoretical knowledge.

In China, the vocational education sector, including culinary arts programs, has been undergoing significant reforms to meet the demands of the country's evolving economy and workforce needs. The Chinese government has emphasized the importance of modernizing vocational education through the integration of technology and innovative teaching methods. This study focuses on the implementation of blended learning in culinary education within the context of Guangdong, China, a region known for its rich culinary heritage and rapidly developing hospitality industry.

The Intelligent Cloud Vocational Education (ICVE) platform, a digital learning system designed specifically for vocational education in China, serves as the technological foundation for this study (Xia et al., 2024; Yu et al., 2024). For example, the previous study shows industry–an education cooperation system improves the effect of the application of big data technology in this system (Wu et al., 2022). Smart vocational education leverages new information technologies like IoT, cloud computing, and big data to innovate teaching methods, enhance learning experiences, and improve educational outcomes in vocational colleges (Wang et al., 2020). The Intelligent Teaching Platform is an advanced educational system that integrates smart devices and information technology to enhance teaching and learning experiences in Chinese language education, promoting student engagement and effective knowledge acquisition (Qi & Huang, 2022). By integrating the ICVE platform into traditional culinary instruction, this research aims to explore the potential benefits and challenges of blended learning in enhancing students' culinary skills, knowledge, and overall educational experience.

This study investigates the effects of a blended learning culinary art course on student performance and satisfaction at the Guangdong Institute of Arts and Sciences. By comparing a treatment group using the ICVE platform with a control group following traditional face-to-face teaching methods, the research seeks to provide insights into the effectiveness of blended learning in culinary education. Joaquim and Kandappan (2018) found that blended education in culinary arts combines traditional face-to-face instruction with online learning methods to enhance the training of chefs, addressing the need for specialized knowledge in a rapidly evolving gastronomic landscape (Sarıoğlan et al., 2021). The study examines various aspects of culinary education, including cooking skills, nutritional knowledge, culinary creativity, and cultural understanding.

The significance of this research lies in its potential to inform pedagogical practices in culinary education and contribute to the broader discourse on the integration of technology in vocational training. Although the literature highlights the growing integration of blended learning approaches in various educational fields, specific research on its application within culinary arts education remains limited. Most existing studies focus on broader educational contexts without analyzing the unique challenges and advantages posed by culinary training, which requires extensive hands-on experience. Furthermore, while the Intelligent Cloud Vocational Education (ICVE) platform has been identified as a significant technological advancement in vocational education, its direct impact on culinary arts education, particularly in enhancing practical cooking skills and fostering creativity, has not been thoroughly explored. Additionally, the dynamics of globalization and the evolving culinary industry necessitate an updated exploration of how blended learning can effectively prepare students to meet industry demands. As the culinary industry continues to evolve, educational institutions must adapt their teaching methods to prepare students for the challenges and opportunities of the modern workplace. By exploring the impact of blended learning on culinary education, this study aims to provide valuable insights for educators, policymakers, and institutions seeking to enhance the quality and relevance of culinary arts programs.

Through a rigorous examination of student performance and satisfaction, this research seeks to contribute to the growing body of knowledge on blended learning in vocational education, with a specific focus on culinary arts. The findings of this study have the potential to inform curriculum design, instructional strategies, and technology integration in culinary education, ultimately benefiting students, educators, and the culinary industry as a whole.

Objectives

The primary objective of this study is to evaluate the effectiveness of blended learning in enhancing culinary education at the Guangdong Institute of Arts and Sciences. Specifically, the research aims to compare students' cooking skills, nutritional quality scores, culinary creativity scores, and culinary culture scores between those participating in blended learning utilizing the Intelligent Cloud Vocational Education (ICVE) platform and those receiving traditional face-to-face instruction. Additionally, the study will assess students' overall

satisfaction levels within these two educational approaches. By examining these outcomes, the study will provide insights into how blended learning impacts various aspects of culinary education compared to traditional methods.

Hypothesis

H1: Students' cooking skills are different between blended learning and traditional classrooms.

H2: Students' nutritional quality scores are different between blended learning and traditional classrooms.

H3: Students' culinary creativity scores are different between blended learning and traditional classrooms.

H4: Students' culinary culture scores are different between blended learning and traditional classrooms.

H5: Students' satisfaction is different between blended learning and traditional classrooms.

Research Framework

The study's research framework displays the comparisons of the post-test scores between the traditional classroom and the blended learning classroom. The post-test scores included in the study are cooking skills, Nutritional Quality, Culinary Creativity, Culinary Culture, and Satisfaction. Figure 1 shows the visualization of the research framework and associated hypotheses.

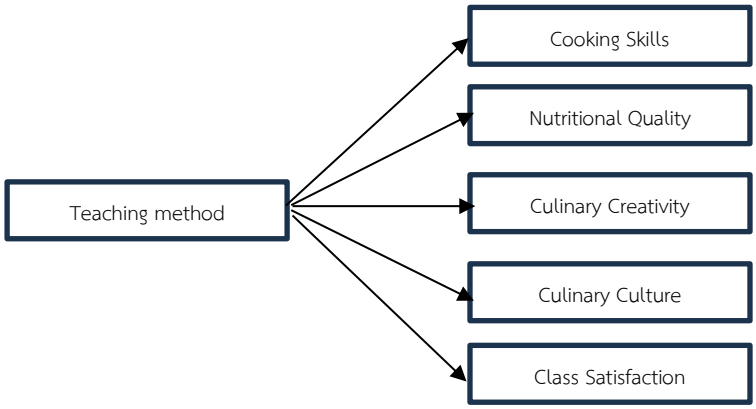

Figure 1 Research Framework

Methodology

This study employs a quasi-experimental design to investigate the effects of blended learning on culinary education at the Guangdong Institute of Arts and Sciences. The research focuses on second-year culinary students who are selected for purposive sampling because they possess the relevant experience and

knowledge to provide informed insights on the effectiveness of blended learning approaches in culinary education. It utilizes a purposive sampling technique to select 75 participants, divided evenly into a treatment group (45 students) and a control group (35 students). The treatment group is exposed to a blended learning approach integrating the Intelligent Cloud Vocational Education (ICVE) platform, whereas the control group continues with traditional face-to-face instruction. Intelligent Cloud Vocational Education platform (ICVE) is a vocational education digital teaching resource sharing platform and online teaching service platform built and operated by China Higher Education Press (He et al., 2023). ICVE platform is based on the innovation of resource application mode, and the construction of resource sharing mechanism explored the way of cloud service to build an online teaching environment in the "vocational education cloud platform", help teachers integrate teaching resources, open exclusive online courses for students, and carry out online and offline mixed teaching or training (Schmidtke & Chen, 2012). The ICVE platform provides a robust suite of digital resources, including interactive simulations and online collaboration tools (Xia et al., 2024). The intervention is structured into pre-class activities, where students use digital resources to prepare for their lessons, in-class activities that feature interactive simulations to enhance practical learning, and post-class activities involving online forums and collaborative projects to reinforce knowledge and peer interaction.

Data collection is designed to gather both quantitative and qualitative insights into student performance and satisfaction. Quantitatively, students undergo pre-test and post-test assessments to measure changes in their cooking skills, nutritional knowledge, and culinary creativity. The measure includes two main categories: Skills Assessment (80%) and Theory Assessment (20%). The Skills Assessment focuses on cooking skills (30%), nutritious dishes (30%), and culinary creativity (20%). Cooking skills for dishes evaluate students' technical abilities in various cooking methods, knife skills, seasoning, and plating to create visually appealing and well-prepared dishes. Nutritious dishes assess the understanding of retaining nutritional value while minimizing nutrient loss and ensuring appropriate ratios of the seven major nutrients in meals. Culinary Creativity measures the ability to innovate in ingredient selection, cooking techniques, and dish presentation, encouraging students to push culinary boundaries and enhance nutritional value through creative approaches. These assessments are complemented by tracking attendance and participation rates to gauge engagement levels. Qualitatively, the study employs semi-structured interviews and focus groups with both students and educators, providing a rich, contextual understanding of their experiences with the blended learning approach.

For data collection, standardized tests validated by culinary education experts ensure the reliability of the quantitative assessments, while satisfaction surveys and in-depth interview guides capture a comprehensive range of qualitative data. These instruments are selected for their ability to provide a multifaceted view of the educational outcomes.

The data analysis process integrates quantitative and qualitative methodologies to give a holistic view of the study's impact. Statistical analysis is conducted using Jamovi software, employing descriptive statistics like means and standard deviations, along with inferential statistics, including t-tests and ANOVA, to compare

the treatment and control groups' performance and satisfaction levels. This quantitative approach is complemented by thematic analysis of qualitative data, wherein interview and focus group transcripts are coded and categorized using NVivo software. The combination of these analytical techniques allows for the identification of significant patterns and themes, providing an in-depth understanding of the blended learning model's effectiveness in culinary education. This approach captures both the statistical significance and nuanced perspectives necessary for comprehensive educational research.

Ethical considerations are meticulously addressed throughout the study to ensure the integrity and ethical soundness of the research process. Ethical approval has been secured from the Guangdong Institute of Arts and Sciences institutional review board, underscoring a commitment to adhere to ethical research standards. Informed consent is obtained from all participants, who are provided with comprehensive information regarding the study's goals, procedures, and potential risks before their involvement. To ensure participant anonymity, all personal identifiers are removed from the data collected, and a unique code will replace names in all documentation. Access to data will be restricted to the research team, and data will be stored in secure, password-protected files. In addition, potential conflicts of interest are thoroughly assessed. Researchers are required to disclose any affiliations or financial interests that could bias the study outcomes, and an independent party will oversee these assessments to maintain objectivity. Participants retain the right to withdraw from the study at any point without repercussions, reaffirming their autonomy and comfort. These ethical safeguards are integral to maintaining trust and credibility within the research framework.

Results

Table 1 summarizes descriptive statistics for the demographic variables across control (Group 0) and treatment (Group 1) groups. Both groups have complete data with gender showing a slightly higher female representation (mean = 1.600 for the control and 1.525 for the treatment), and a median of 2, indicating more females. Household income is slightly higher in the control group (mean = 2.914) compared to the treatment group (mean = 2.650), yet both have a median of 3. Parents' education levels are slightly higher in the treatment group (mean = 2.025 versus 1.886 in the control), with medians at 2 suggesting moderate education levels. The mean place score is marginally higher for the control group (2.343) compared to the treatment group (2.275), with a median of 2, indicating a diverse but similar distribution of residences. These demographic insights reveal minor variations but generally balanced groups, providing a solid foundation for evaluating the intervention's effects.

Table 1 Descriptive Statistics

Variable	*M*	*SD*
Group	0.533	0.502
Gender	1.600	1.525
Household Income	2.914	2.650
Parents Education	1.886	2.025
Place	2.343	2.275

Hypothesis 1: students' cooking skills between blended learning and traditional classrooms are different. To evaluate hypothesis 1, the post-test scores of the blended classroom and the traditional classroom are compared. The assumptions for ANCOVA were tested, and the results show a violation of the homogeneity of variances assumption (Levene's Test: F = 6.42, p = 0.013). However, the normality of residuals was met according to the Shapiro-Wilk test (p = 0.071). The pre-test scores of both groups are utilized as the covariance. The Analysis of Covariance ANCOVA statistics of the scores are shown in Table 2. The ANCOVA was conducted to examine the impact of group membership on cooking skills post-test scores, using pre-test scores as a covariate. The results indicate that the covariate, Cooking Skills Pre-test, was not a significant predictor of post-test scores (F = 0.441, p = 0.509, η^2 = 0.005), suggesting that initial cooking skills did not influence the post-intervention outcomes. The group comparison showed a statistically significant difference between the traditional classroom and the blended learning classroom (F = 21.023, p < .001).

Table 2 ANCOVA - Cooking Skills (Post-test)

	Sum of Squares	df	Mean Square	F	p	η^2
Cooking Skills (Pre-test)	5.54	1	5.54	0.441	0.509	0.005
Group	263.81	1	263.81	21.023	< .001	0.225
Residuals	903.52	72	12.55			

Hypothesis 2: students' nutritional quality scores between the blended learning and traditional classrooms are different. The ANCOVA analysis is conducted to test the differences in the post-test scores between both groups. The assumption checks showed that the homogeneity of variances was not violated (Levene's Test: F = 2.91, p = 0.092), indicating that variances between groups were equal. Additionally, the normality of residuals was met (Shapiro-Wilk Test: p = 0.195). The results of the ANCOVA analysis are shown in Table 3. The Nutritional Quality Scores between the traditional and blended learning groups did not have a significant effect on the post-test scores (F = 3.269, p = 0.075, η^2 = 0.043). Although this result suggests a trend toward group differences, it does not reach statistical significance, and the group membership only accounts for 4.3% of the variance in post-test nutritional quality scores.

Table 3 ANCOVA - Nutritional Quality (Post-test)

	Sum of Squares	df	Mean Square	F	p	η^2
Nutritional Quality (Pre-test)	0.685	1	0.685	0.038	0.846	0.001
Group	58.897	1	58.897	3.269	0.075	0.043
Residuals	1297.086	72	18.015			

Hypothesis 3: students' culinary creativity scores between the blended learning and traditional classroom are different. The ANCOVA analysis is conducted to test the differences in the post-test scores between both groups. The assumption checks revealed a violation of the homogeneity of variances (Levene's Test: F = 5.86, p = 0.018), suggesting that the variability in scores differs between groups. Additionally, the normality of the residuals assumption was not met (Shapiro-Wilk Test: p = 0.006), indicating that the residuals deviate from a normal distribution. The results of the ANCOVA analysis are shown in Table 4. The result of the comparison between groups did not show a significant effect on the post-test scores (F = 0.958, p = 0.331, η^2 = 0.013), indicating that there was no statistically significant difference between the groups' post-test creativity scores after controlling for the pre-test scores. The group factor accounted for only 1.3% of the variance in the post-test scores. Overall, the ANCOVA analysis suggests that group differences in post-test culinary creativity scores are not statistically significant.

Table 4 ANCOVA - Culinary Creativity (Post-test)

	Sum of Squares	df	Mean Square	F	p	η^2
Culinary Creativity (Pre-test)	23.7	1	23.7	1.521	0.222	0.020
Group	15.0	1	15.0	0.958	0.331	0.013
Residuals	1124.4	72	15.6			

Hypothesis 4: students' culinary culture scores between the blended learning and traditional classroom are different. The ANCOVA analysis is conducted to test the differences in the post-test scores between both groups. The assumption checks revealed that the homogeneity of variances assumption was not violated (Levene's Test: F = 0.151, p = 0.698), indicating that the variability in scores between the groups was consistent. However, the normality of the residuals assumption was not met (Shapiro-Wilk Test: p < .001), suggesting that the residuals deviate from a normal sampling. The results of the ANCOVA analysis are shown in Table 5. The group variable showed a statistically significant effect on the post-test scores (F = 11.051, p = 0.001, η^2 = 0.133). This result indicates that there is a significant difference between the groups' post-test culinary culture scores, accounting for 13.3% of the variance in post-test scores after adjusting for pre-test

levels. In conclusion, the Hypothesis 4 result showed that the Null hypothesis can be rejected. There were culinary culture score differences between the traditional and blended learning classrooms.

Table 5 ANCOVA - Culinary Culture (Post-test)

	Sum of Squares	df	Mean Square	F	p	η^2
Culinary Culture (Pre-test)	0.292	1	0.292	0.0159	0.900	0.000
Group	203.129	1	203.129	11.051	0.001	0.133
Residuals	1323.454	72	18.381			

Hypothesis 5: students' overall satisfaction between blended learning and traditional classrooms is different. In the normality test, the F statistic is 1.211, with degrees of freedom (df) of 1 and an error degrees of freedom (df2) of 72. The p-value is 0.275, indicating that there is no significant evidence to reject the null hypothesis of equal variances across the groups being tested. Thus, the assumption of homogeneity of variances holds for your analysis. An independent samples t-test was conducted to compare satisfaction levels between the Traditional and Blended Learning groups. The results in Table 6 showed a statistically significant difference in satisfaction scores between the two groups (t = -2.38, df = 72, p = 0.020). The Blended Learning group had a higher mean satisfaction score (M = 3.47, SD = 0.99) compared to the Traditional group (M = 2.97, SD = 0.79). These results suggest that participants in the Blended Learning group reported significantly higher satisfaction levels compared to those in the Traditional group.

Table 6 Independent Samples T-Test

		Statistic	df	p	Mean difference	SE difference
Satisfaction	Student's t	-2.38	72.0	0.020	-0.499	0.210

Note. H_a $\mu_{Traditional} \neq \mu_{Blended\ Learning}$

Discussions

This study provides compelling evidence for the efficacy of blended learning in culinary education, particularly through the integration of the Intelligent Cloud Vocational Education (ICVE) platform. The findings indicate significant improvements in cooking skills and culinary culture among students exposed to the blended learning model. These enhancements suggest that the dynamic and interactive nature of blended learning can effectively complement traditional hands-on training, offering a more comprehensive educational experience. The ICVE platform's interactive simulations and digital resources appear to facilitate active learning and knowledge construction, aligning with constructivist learning theories (Wang, 2024). It shares the positive opinion on the ICVE platform with the previous studies, such as Jiang et al. (2024); Liu and Guan (2022); Zhao and Sun

(2020). This also supports the notion that technology-enhanced learning environments can enrich both practical and theoretical aspects of education, providing students with the tools necessary for success in the culinary field (Yen et al., 2018).

The study's results have several theoretical implications, particularly in the context of educational psychology and technology integration. The significant improvements observed in the treatment group align with constructivist learning theories, which emphasize the importance of active engagement and interaction with learning materials (Harasim, 2017; Mateka et al., 2024; Zajda, 2021). Constructivist theories posited by Piaget (1972) and Vygotsky (1978) emphasize that learners construct knowledge through active involvement and interaction with their environment. Your findings indicate that the ICVE platform's interactive simulations promote this active engagement, allowing students to practice culinary skills in a safe and supportive virtual space. By enabling students to actively participate in their learning process, the ICVE platform supports the construction of knowledge and enhances understanding and retention of culinary concepts. The study also supports the ICVE platform, such as interactive simulations and collaborative tools, significantly enhancing culinary education by promoting active engagement and facilitating immediate feedback, which is essential for skill acquisition (Hattie & Timperley, 2007; Zhang et al., 2017). These simulations provide a safe learning environment that encourages experimentation and boosts learners' confidence, aligning with constructivist principles (Dede, 2009). Additionally, collaborative tools foster peer interaction and collective problem-solving, critical for developing both culinary skills and cultural understanding (Vygotsky, 1978; Johnson & Johnson, 1989). Overall, the integration of these features reinforces the effectiveness of blended learning models in vocational education contexts, supporting students' knowledge construction and retention (Jonassen, 1999).

Furthermore, the study extends the applicability of blended learning beyond theoretical and cognitive domains, suggesting its potential in vocational education and hands-on disciplines (Krismadinata et al., 2020; Žahin, 2010). This challenges traditional pedagogical approaches and highlights the need for further research to explore the long-term impact of blended learning on educational outcomes.

The study's limitations must be acknowledged. First, the findings may have limited generalizability due to the specific context and sample used, focusing on culinary education within a particular geographical and institutional setting. Second, The non-significant findings regarding nutritional quality and culinary creativity between the blended education group and the traditional teaching group warrant a critical analysis to better understand the potential limitations and confounding factors (for example, Variability in Student Backgrounds, classroom dynamics, instructor effectiveness, and the quality of resources and Limited Duration of the Study) that may have influenced these results. Third, the reliance on self-reported data for assessing student satisfaction introduces the potential for bias, and the quasi-experimental design lacks the random assignment of participants, which may affect the internal validity of the results (Rosenman et al., 2011). The study's limitations highlight several areas for future research. First, to enhance the generalizability of the findings, future studies should consider diverse educational contexts and larger, more varied samples. Exploring the long-term

effects of blended learning on student outcomes and satisfaction would provide valuable insights into its sustained impact. Second, Future studies should control for student backgrounds and utilize robust assessment tools to accurately measure changes in nutritional quality and culinary creativity. Researchers should also consider extending intervention durations to assess the impact of longer engagement on learning outcomes, alongside examining confounding factors like instructor effectiveness. Third, further research could investigate the specific features of blended learning environments that contribute most significantly to educational outcomes, such as interactive simulations and real-time feedback. By addressing these areas, future studies can build on the current research to develop more effective and inclusive blended learning models that cater to the diverse needs of learners in vocational education and beyond.

Recommendations

Educational institutions, particularly vocational colleges focusing on culinary arts, should embrace technology-enhanced learning platforms, like the Intelligent Cloud Vocational Education (ICVE) system, to revolutionize culinary curricula. These platforms provide interactive simulations and digital resources that enhance traditional hands-on training, creating a more robust and engaging educational experience. For effective integration, educators are encouraged to weave these tools into their teaching strategies to promote active learning and engagement, such as project-based assignments and collaborative cooking challenges, which are crucial for mastering both practical skills and theoretical knowledge in culinary arts (Zhang, 2020). Such integration not only modernizes the curriculum but also aligns with contemporary educational trends that recognize the value of technology in enhancing learning outcomes.

Blended learning programs must prioritize flexibility and accessibility to support the diverse needs of learners. Providing online resources and self-paced modules allows students to learn at their convenience, thus facilitating self-directed learning and greater autonomy. This approach is especially advantageous for non-traditional students and working professionals. Concurrently, educators need continuous professional development to smoothly integrate these digital tools into their teaching practices. Training sessions should emphasize the development of engaging online culinary content, effective video production for remote cooking demonstrations, and the use of data analytics tools for monitoring student engagement and progress. Additionally, vocational colleges should establish lending programs for kitchen equipment, such as mixers, burners, and professional-grade knives, enabling students who lack access to these tools at home to practice essential culinary skills effectively. To gauge the success of blended learning interventions, institutions should establish rigorous evaluation and feedback mechanisms. Routine assessments and feedback from students can highlight areas of success and potential improvement. Also, this includes creating workshops or resources for students to learn essential digital skills, particularly for those who may be less familiar with technology. It iterative process not only refines learning strategies but also enhances the educational experience. Furthermore, a commitment to equity and inclusivity must underpin all blended learning initiatives. Ensuring

all students have access to the necessary technological resources, such as devices and internet connectivity, is essential. By proactively addressing these barriers, institutions can create a more inclusive and equitable learning environment for all students.

Ongoing research and collaboration with industry partners and educational researchers are vital to understanding the long-term impacts of blended learning in culinary education. Such collaborations can yield valuable insights into the efficacy of various blended learning models and help identify best practices tailored to the evolving needs of the culinary industry. Pursuing evidence-based practices ensures that blended learning not only enhances current educational offerings but also prepares students for future challenges in their careers. Institutions should champion these efforts to both improve the quality of culinary education and contribute to the development of a highly skilled, adaptable workforce.

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