

# Exploring the Role of Digital Technology in Enhancing Culinary Students' Pronunciation of French Terms

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**Abstract:** *This study explores the impact of digital technologies, specifically Computer-Assisted Pronunciation Training (CAPT) systems and Automatic Speech Recognition (ASR), on improving culinary students' pronunciation of French culinary terms. Accurate pronunciation of these terms is crucial for students preparing for professional culinary careers, where effective communication in a global context is essential. The research adopts a qualitative approach, focusing exclusively on insights gathered through interviews and discussions. A sample of 20 culinary students from Universiti Teknologi MARA Pulau Pinang participated, with an experimental group using CAPT and ASR tools and a control group relying on traditional methods. The findings revealed that students using digital tools experienced increased motivation, confidence, and engagement in learning, alongside a better understanding of pronunciation nuances. Challenges in adapting to the technology were also discussed. By concentrating solely on*

*qualitative results, this study highlights the potential of technology-assisted pronunciation tools in enhancing student learning experiences and shaping their readiness for professional environments. These findings contribute valuable insights into integrating digital tools within specialized language education, particularly in culinary training.*

**Keywords:** *Automatic Speech Recognition (ASR), Computer-Assisted Pronunciation Training (CAPT), Digital technology, Culinary Education, Pronunciation improvement.*

## 1.0 INTRODUCTION

The integration of digital technologies in language learning has increasingly demonstrated its effectiveness, particularly in enhancing pronunciation skills in specialized contexts. Research indicates that these tools, especially when integrated with real-time feedback mechanisms, substantially improve learners' pronunciation capabilities. For instance, Silveira et al. (2022) highlight that Computer-Assisted Pronunciation Training (CAPT) systems offer adaptive and flexible practice environments crucial for effective language acquisition. Such systems provide learners with instant corrective feedback, fostering increased awareness and aiding accurate pronunciation development (Burri, 2023). Furthermore, the integration of Automatic Speech Recognition (ASR) technology has proven impactful, as it allows learners to receive immediate, precise feedback in low-stress environments, significantly supporting pronunciation improvement (Inceoglu et al., 2022). Martin et al. (2022) emphasizes the motivational benefits of audiovisual materials; instructional videos provide a personalized touch, helping students experiencing language anxiety by combining visual and auditory stimuli that encourage frequent practice (Herrera, 2023).

The rise of mobile applications has also transformed pronunciation training, offered varied phonological inputs, and enhanced engagement through ASR and peer feedback. A study by Dai and Wu (2021) illustrates that mobile-assisted learning platforms foster interactive environments conducive to engagement and learning (Geng, 2021). These advancements not only promote motivation but also tailor the learning experience to meet diverse learner needs. CAPT systems, equipped with speech recognition, have shown notable improvements in pronunciation accuracy, especially when

used collaboratively. Bogach et al. (2021) assert that CAPT's targeted feedback on phonetic and rhythmic elements significantly boosts articulation skills. Similarly, Tsai (2019) notes that a collaborative learning approach, where peers help interpret feedback, creates an engaging atmosphere for shared pronunciation practice. In support, Nasim et al. (2022) report that students using advanced digital tools outperform their peers who rely solely on traditional methods, underscoring the transformative role of technology in pronunciation learning.

Focusing on culinary education, French culinary terms are integral to the global industry, forming the foundation of professional kitchens worldwide. These terms, rooted in French culture, encompass essential techniques, ingredients, and practices widely adopted across various culinary traditions. However, for many culinary students, especially non-native French speakers, mastering the pronunciation of these terms presents a significant challenge. With the growing emphasis on precision and professionalism in culinary arts, accurately learning and pronouncing these terms is essential for global employability. Addressing this challenge, the integration of digital technology in culinary education offers promising solutions. For example, new technologies such as Virtual Reality (VR) and CAPT have created immersive environments where students can practice and perfect their pronunciation of French culinary terms. Jia and Liu (2019) describe how VR systems like "Words in Kitchen" allow learners to interact with virtual objects while practicing pronunciation, enhancing both engagement and retention.

The incorporation of audio-visual tools and interactive software in pronunciation teaching further enhances learning outcomes. Adawi et al. (2021) reveal that integrating pronunciation-focused multimedia tools in language learning improves the performance and retention of complex culinary terms. Specialized pronunciation media, such as video tutorials and guides, provide a structured and effective learning environment where culinary students can practice at their convenience. Technology-driven pronunciation training also offers real-time feedback, which has proven essential in improving pronunciation accuracy. CAPT systems, using speech recognition software, provide instant corrections and suggestions, enabling students to correct mistakes early in the learning process—a critical factor when mastering precise French culinary terms that align with global culinary standards (Meritan, 2022).

Moreover, the role of technology extends beyond practice; it fosters student confidence. By utilizing digital platforms and interactive exercises, students practice without the fear of public correction, building their skills in a supportive, non-judgmental environment (Samsul et al., 2022). This increased confidence positively influences their professional readiness, enabling effective communication in high-pressure kitchen settings. The flexibility of technology further enhances its impact on learning. Telecollaborative projects and online pronunciation tools offer flexible, convenient learning experiences, accommodating the rigorous schedules of culinary students (Diez, 2021). This flexibility allows students to access resources and practice skills anytime, fitting language learning into their demanding training schedules.

Given these findings, this study investigates the impact of digital tools, particularly CAPT and ASR technologies, on pronunciation accuracy among culinary students at the Universiti Teknologi MARA Pulau Pinang. By examining the effectiveness of these technologies in mastering complex French culinary terms, this research aims to contribute valuable insights into the integration of digital technology within specialized language learning in culinary education.

## **1.1 RESEARCH PROBLEM AND SIGNIFICANCE**

In culinary education, mastering the pronunciation of specialized vocabulary, particularly French culinary terms, is crucial. For culinary students, proficiency in these terms extends beyond linguistic ability; it is a core aspect of their professional development and employability in the global culinary field. Traditional teaching methods often lack flexibility, real-time feedback, and personalized support necessary for accurate pronunciation, leaving many students struggling to develop the required proficiency. This gap highlights a pressing problem in culinary education: the need to equip students with effective pronunciation skills in a field where accuracy and professionalism are paramount.

The importance of this study lies in its potential to revolutionize culinary education through the integration of advanced digital tools, notably Computer-Assisted Pronunciation Training (CAPT) systems and Automatic Speech Recognition (ASR) technologies. Current research highlights these tools' effectiveness in improving pronunciation accuracy and creating a supportive learning environment (Safavi, 2018). By utilizing CAPT and ASR, students receive immediate feedback on their pronunciation, promoting self-directed learning and effective error correction. This study seeks to demonstrate how digital tools can overcome traditional challenges, such as the lack of interactivity and adaptability, to enhance pronunciation training and build students' linguistic confidence.

Moreover, findings from recent studies emphasize the potential of digital tools to empower students with flexible learning options. AI-supported pronunciation education has shown to be particularly effective in enhancing vocabulary retention by enabling students to practice independently and track progress, a feature crucial for busy culinary students balancing demanding schedules (Kazu & Kuvvetli, 2023).

This AI-driven approach to pronunciation training not only addresses a critical challenge in culinary education but also contributes to the broader discourse on the role of technology in specialized language acquisition, offering valuable insights for educators. As technological tools like mobile applications continue to gain traction, they can make learning more accessible, engaging, and tailored to individual student needs, forming a foundation for future innovations in this field.

The following Central Question and Sub-Questions section emphasize the role of digital tools in addressing pronunciation challenges.

## **1.2 CENTRAL QUESTION**

How can the integration of digital technology enhance culinary students' ability to pronounce French culinary terms accurately and confidently?

### **1.3 SUB-QUESTIONS**

1. What are the primary pronunciation challenges culinary students face when learning French culinary terms, and how can technology address these difficulties? (This question explores the specific pronunciation challenges (e.g., phonetic, accent-related) and investigates how technological tools, such as speech recognition software and pronunciation apps, can help overcome these obstacles).
2. How do culinary students perceive the role of technology in improving their pronunciation skills, and what digital tools are most effective? (This question examines students' attitudes towards using technology for pronunciation practice and identifies the tools they find most useful (e.g., apps, CAPT systems, audiovisual resources)).
3. What strategies and resources can educators use to integrate technology into pronunciation teaching, and how can these tools improve student engagement? (This question focuses on pedagogical approaches, including blended learning and interactive digital resources, and their impact on student motivation and participation in pronunciation learning).
4. How can digital technology be used to assess and provide feedback on culinary students' pronunciation of French terms, and what are the most effective methods? (This question explores the use of technology for real-time feedback, self-assessment, and peer collaboration, highlighting effective methods for evaluating and improving pronunciation skills).
5. In what ways does the use of technology for pronunciation training impact culinary students' professional confidence and identity development? (This question investigates how mastering pronunciation with the aid of technology enhances students' professional confidence and shapes their culinary identity, preparing them for careers in the global culinary industry).

## **2.0 LITERATURE REVIEW**

The integration of technology in educational settings has significantly transformed how culinary students learn, especially in mastering the pronunciation of French culinary terms. This shift is essential, as accurate pronunciation is crucial for effective communication in the culinary field, where many terms are derived from French. Recent studies have explored various technological tools and methodologies that enhance pronunciation accuracy and retention, thereby supporting culinary students in developing essential language skills. This literature review synthesizes recent research on the effectiveness of technology-enhanced pronunciation instruction, specifically within culinary education.

To begin with, computer-assisted pronunciation training (CAPT) has emerged as a pivotal tool in enhancing pronunciation among culinary students, providing invaluable real-time feedback essential for mastering complex French culinary terms. This instant correction allows students to practice at their own pace, making CAPT an indispensable resource in culinary education. Furthermore, its individualized approach not only enhances learning outcomes but also supports teachers in effectively scaffolding instruction, and fostering professional development in culinary environments. The integration of CAPT systems into the curriculum aligns with the growing emphasis on personalized learning experiences, which is a cornerstone of modern educational practices (Cengiz, 2023).

Beyond CAPT, audiovisual tools have been widely adopted to improve pronunciation learning in culinary education. Espinoza et al. (2021) found that culinary videos as teaching aids create engaging learning experiences, promoting both comprehension and pronunciation. Audiovisual materials provide context-rich examples, allowing students to imitate and practice pronunciation more effectively. This approach supports the need for dynamic and interactive learning environments, where visual and auditory stimuli play an important role in enhancing vocabulary retention and pronunciation skills. The use of videos not only captivates students' attention but also helps them understand pronunciation nuances associated with French culinary terminology, making learning more enjoyable and practical.

Further, Silveira et al. (2022) investigated the role of digital technologies, such as mobile applications and interactive platforms, in pronunciation instruction. Their research highlights that these digital resources enhance accessibility and flexibility, allowing learners to practice pronunciation independently and efficiently.

For culinary students, who often manage demanding schedules, this flexibility is especially beneficial, enabling them to engage with pronunciation exercises at their convenience. The study underscores the importance of integrating digital tools into daily teaching practices to maximize their impact, ensuring that students can effectively improve their pronunciation skills.

Another notable advancement in pronunciation teaching involves ASR-equipped software that addresses suprasegmental features like intonation and rhythm. Gottardi et al. (2022) examined how ASR systems can provide learners with feedback on these nuanced elements of pronunciation. Their findings suggest that ASR-equipped tools offer unique advantages in helping students refine their speech patterns, which is especially beneficial for mastering the pronunciation of intricate French culinary terms that require attention to intonation and stress (Gottardi et al., 2022). This precision in pronunciation can significantly influence communication effectiveness and professional credibility in the culinary field.

Lastly, collaborative learning approaches, particularly when combined with Computer-Assisted Pronunciation Training (CAPT) systems, have proven effective in enhancing pronunciation instruction. For instance, Sobko et al. (2019) highlight that collaborative learning environments, where peers assist one another in addressing pronunciation challenges, significantly boost motivation and engagement. This integration of technology not only supports individual learning but also fosters peer interaction, making the educational experience more enjoyable and effective, an essential aspect for preparing culinary students for real-world kitchen environments, where communication and teamwork are crucial.



In summary, the integration of technology in pronunciation teaching has yielded promising results for culinary students. CAPT systems, audiovisual tools, and ASR-equipped software provide essential support for mastering the pronunciation of French culinary terms. This technological approach ensures that students are well-prepared for the demands of the global culinary industry. As educational technology evolves, it continues to present new opportunities for improving pronunciation instruction, making it an exciting area for future research and development (Rogerson-Revell, 2021; Silveira et al., 2022). Embracing these innovative teaching methodologies will be vital as the culinary industry grows more interconnected, highlighting the lasting value of pronunciation accuracy in the professional development of culinary students.

### **3.0 METHODOLOGY**

#### **3.1 RESEARCH DESIGN**

This study adopts a qualitative approach to explore the impact of technology-assisted pronunciation tools, specifically Computer-Assisted Pronunciation Training (CAPT) and Automatic Speech Recognition (ASR) systems, on culinary students' pronunciation of French culinary terms. A qualitative approach is particularly suitable for capturing detailed insights into students' experiences, perceptions, and challenges, offering a rich understanding of the role these tools play in enhancing learning outcomes (Tsai, 2019).

#### **3.2 PARTICIPANTS**

The participants of this study are culinary students from the Universiti Teknologi MARA Pulau Pinang, who are required to master French culinary terms as part of their professional training. The sample consists of approximately 20 students, divided into two groups: an experimental

group using CAPT and ASR tools and a control group using traditional pronunciation methods. This sample size is informed by prior research, which demonstrates that technology-based interventions are effective in improving learning outcomes in similarly sized groups (Cengiz, 2023).

### **3.3 DATA COLLECTION INSTRUMENTS**

The primary data collection methods for this study include semi-structured interviews and focus group discussions. The qualitative data will be collected through semi-structured interviews conducted with individual students to gather in-depth insights into their personal experiences, perceptions, and challenges with using technology-assisted pronunciation tools, such as CAPT and ASR systems. Semi-structured interviews allow researchers the flexibility to explore specific topics in depth while ensuring key research questions are systematically addressed (Rogerson-Revell, 2021).

In addition, focus group discussions will be held to facilitate broader exchanges of ideas and collective reflections among students. Focus groups encourage participants to share their experiences, strategies, and perceptions, providing a richer understanding of shared perspectives on the usability and effectiveness of these tools (Tsai, 2019). Together, these two methods provide a comprehensive approach to gathering qualitative data.

### **3.4 PROCEDURE**

The study will be conducted over 10 weeks and organized into three distinct phases. During the initial phase, participants will be introduced to the study objectives and provided with demonstrations of the CAPT and ASR tools. In the intervention phase, the experimental group will practice pronunciation using these tools, while the control group will continue with traditional methods, such as peer and instructor feedback. In the final phase, data will be collected through semi-structured interviews and focus group discussions.

### **3.5 DATA ANALYSIS**

Thematic coding will be employed to systematically analyze the qualitative data, identifying recurring patterns, common perceptions, and challenges

faced by students while using technology-assisted pronunciation tools (Mortelmans, 2019). This approach ensures the analysis captures both broad trends and subtle individual experiences. NVivo software will be utilized to organize and code the data efficiently, enabling the identification of key themes and patterns (Bonello & Meehan, 2019). The thematic analysis will provide valuable insights into the usability, effectiveness, and challenges associated with CAPT and ASR systems in improving pronunciation learning.

Sub-Questions	Common Themes	Focused Themes	Key Themes for Conceptual Framework
1. What are the primary pronunciation challenges?	Mispronunciation of stress and intonation, lack of phonetic awareness	Difficulty mastering the correct rhythm of French culinary terms when relying on traditional methods	Technological Intervention
2. How do students perceive the role of technology?	Technology as a facilitator for autonomous practice	Students feel more motivated and less anxious using CAPT systems as they receive instant corrective feedback	Learner Engagement and Motivation
3. What strategies and resources are effective?	Integration of digital resources enhances engagement	The use of multimedia, including videos and interactive apps, proved to be highly engaging for culinary students	Learner Engagement and Motivation
4. How can technology provide feedback and assessment?	Immediate feedback and self-paced learning support	ASR tools are particularly effective in providing real-time corrections on stress and rhythm patterns	Technological Intervention
5. How does technology impact professional confidence?	Increased confidence due to self-monitoring and self-correction	Technology provides a non-judgmental space, reducing anxiety and boosting professional readiness	Learning Outcomes

**Table 1:** Summary of Common, Focused, and Main Themes Derived from Research Sub-Questions for Conceptual Framework

Qualitative insights from interviews and discussion focus groups summarized in (Table 1) further support these findings. Students frequently mentioned that CAPT systems' immediate feedback was instrumental in enhancing their accuracy and confidence. Many expressed a preference for practicing independently with digital tools, which allowed them to control the pace of their learning and reduce anxiety associated with peer evaluation. The flexibility of the technology also enabled students to balance their practice sessions with other academic responsibilities, leading to higher motivation and engagement.

Moreover, students highlighted the role of multimedia elements such as videos and pronunciation apps in making the learning process more enjoyable. These tools not only maintained their interest but also encouraged consistent practice. The non-judgmental nature of ASR feedback provided a safe space for students to experiment with pronunciation, further boosting their confidence and professional readiness.

In summary, the results demonstrate that technology-assisted tools significantly improve students' pronunciation skills across multiple dimensions, including stress, intonation, and overall precision. The experimental group's superior performance underscores the value of integrating CAPT and ASR tools in culinary education. Additionally, the motivational benefits of these technologies contribute to better engagement and enhanced professional preparation. Together, the findings suggest that adopting digital tools can play a crucial role in equipping students with the communication skills necessary for success in the culinary industry.

#### **4.0 CONCEPTUAL FRAMEWORK FROM THE KEY THEMES**

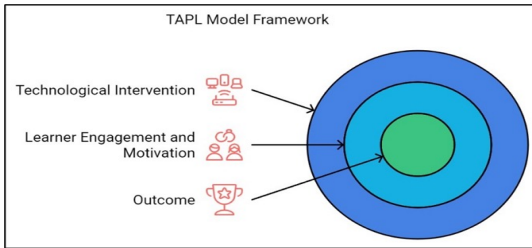
The conceptual framework, depicted in Figure 1 as the Technology-Assisted Pronunciation Learning (TAPL) Framework, was developed by synthesizing key themes identified from both qualitative and quantitative findings in this study. The framework is structured into three main components: Technological Intervention, Learner Engagement and Motivation, and Outcomes, each representing a phase in the learning process that starts with digital tool usage and progresses toward professional readiness in pronunciation skills.

The foundational element of the framework, Technological Intervention, focuses on the use of Computer-Assisted Pronunciation Training (CAPT) and Automatic Speech Recognition (ASR) tools. Positioned at the base of Figure 1, this component introduces digital tools that enable self-paced, interactive learning environments. These tools provide essential real-time feedback, allowing students to make immediate corrections in pronunciation areas like stress, rhythm, and intonation—challenges often not adequately addressed by traditional methods. This stage serves as the initiation point for students' pronunciation learning, equipping them with necessary resources that are flexible and supportive of autonomous practice.

The middle layer of the framework, Learner Engagement, and Motivation, reflects how technological tools foster a supportive environment that enhances student motivation. Derived from qualitative findings, this component highlights the CAPT and ASR tools' ability to reduce anxiety by allowing students to practice without external judgment. Students expressed that they felt more in control of their learning and were more inclined to engage in pronunciation practice, thus fostering intrinsic motivation. This component is critical as it bridges the technological intervention with the learning outcomes, emphasizing that student engagement is essential for sustained practice and improvement.

At the top of the framework in Figure 1, Outcomes represent the culmination of the learning process, focusing on Professional Readiness and Pronunciation Accuracy. Through continued engagement with CAPT and ASR tools, students showed improved pronunciation of complex culinary terminology, an essential skill for clear and professional communication in the culinary field. The Outcomes component illustrates the final objective of this framework: to prepare students effectively for professional environments by equipping them with accurate pronunciation and communication skills needed for success in the global culinary industry.

In summary, Figure 1 visually presents the TAPL Framework as a progression from Technological Intervention through Learner Engagement and Motivation to Outcomes. Each component builds logically upon the previous one, creating a structured and research-based pathway from initial technological support to the achievement of professional competencies. This structure illustrates how the integration of digital tools in pronunciation learning can significantly enhance engagement and support skill mastery in preparation for real-world applications.



**Fig. 1:** Technology-Assisted Pronunciation Learning (TAPL) Framework

## 5.0 DISCUSSION

The findings of this study highlight the enhanced engagement and motivation reported by students using technological tools, aligning with previous research that underscores technology's ability to create independent and flexible learning environments. Specifically, CAPT has been shown to boost learner autonomy and satisfaction, empowering students to practice at their own pace and receive tailored feedback that promotes mastery (Lou, 2024; O'Brien et al., 2022). This element of self-paced learning is essential in language acquisition, particularly in contexts like culinary arts, where mastery over specific terms significantly enhances professional communication.

Furthermore, technological advancements in CAPT and ASR systems have paved the way for highly personalized pronunciation training. Recent studies reveal that systems leveraging machine learning techniques, such as multi-task learning and context-aware models, can detect pronunciation errors and deliver corrective feedback essential for learners without access to traditional instruction (Wu & Ji, 2023; Bi et al., 2023). The success of these systems

in improving pronunciation demonstrated in diverse linguistic contexts, is echoed in research by Tejedor-García et al. (2021), who reported that ASR-based pronunciation assessment improved L2 Spanish pronunciation among Japanese speakers after minimal sessions. The effectiveness of these tools, noted for their capacity to offer immediate, individualized feedback, offers convenience and economic advantages over traditional classroom settings (Gong, 2022). Therefore, as CAPT and ASR technologies continue evolving, incorporating sophisticated algorithms and user-centered designs will likely increase their pedagogical impact.

The implications of enhanced pronunciation skills for culinary students are far-reaching, particularly for articulating French culinary terminology accurately. This ability is crucial in the culinary industry, where precise terminology facilitates effective communication and reflects a sense of professionalism. Research indicates that mastering culinary terms contributes to confidence and professional identity, essential for students aiming for international careers (Li, 2023). By accurately pronouncing these terms, students can confidently engage in professional culinary dialogues, underscoring the value of pronunciation training as a foundational aspect of professional development within the field. Innovative methods such as tongue twisters alongside CAPT have shown considerable effectiveness in refining pronunciation skills, offering educators reliable strategies to enhance students' articulation (Li, 2020; Saleh & Gilakjani, 2020). The dual approach of traditional and tech-based techniques aligns with contemporary educational practices that prioritize learner autonomy and individualized instruction, supporting students in mastering complex culinary language (Tejedor-García et al., 2021).

However, limitations in this study indicate areas for improvement in technology-assisted pronunciation training. The relatively brief intervention period may not fully capture long-term skill retention, a concern reflected in the literature suggesting that extended interventions might provide more comprehensive insights (Nurmala et al., 2023; Iberahim et al., 2023). Another limitation lies in the one-size-fits-all approach of these tools, which may not suit all learners. This issue is consistent with findings from studies advocating for tailored technological approaches to accommodate diverse learning styles (Panagiotidis et al., 2023). Additionally, interpreting feedback from CAPT systems poses challenges for some students, potentially

affecting engagement and pronunciation improvement (O'Brien et al., 2022). Future research should prioritize several key areas to maximize the effectiveness of CAPT systems. First, investigating the long-term effects on pronunciation retention is essential. Current literature points to a gap in understanding how well learners retain skills acquired through CAPT over time, underscoring the need for longitudinal studies (Mahdi & Khateeb, 2019). Furthermore, integrating adaptive learning technologies within CAPT systems could allow for tailored feedback that addresses individual pronunciation challenges, fostering a more effective learning environment (Semerikov, 2021; Su & Zou, 2020). Incorporating immersive technologies like Virtual Reality (VR) into CAPT also shows promise; VR's potential for rich, interactive environments could enhance language learning experiences, especially in simulated culinary contexts where pronunciation practice becomes more contextually relevant (Li, 2020).

Finally, combining CAPT with collaborative learning environments can enrich the learning experience, as peer feedback reinforces learning and enhances engagement in language acquisition (Jie, 2023).

In summary, the findings of this study demonstrate that technology-enhanced tools significantly improve pronunciation learning among culinary students. By incorporating CAPT and ASR systems into the curriculum, educational institutions can equip students with essential communication skills, bolster their confidence, and prepare them for professional success in a globalized culinary industry.

## **6.0 CONCLUSION**

In conclusion, this study demonstrates that the integration of digital technologies, particularly Computer-Assisted Pronunciation Training (CAPT) systems and Automatic Speech Recognition (ASR), significantly enhances culinary students' ability to accurately pronounce complex French culinary terms. The findings underscore the importance of real-time feedback and personalized learning offered by these tools, which result in improved pronunciation accuracy, heightened student engagement, and greater professional confidence. The significance of these results lies in their potential to transform culinary education by equipping students with essential communication skills required for success in global culinary



environments. The study suggests that incorporating technology-driven pronunciation tools into educational curricula can provide substantial benefits, both in immediate learning outcomes and long-term professional preparedness. Overall, this research contributes valuable insights into the role of technology in specialized language education, offering a clear direction for future educational practices and research.

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