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TEMPLATE-ASSISTED LEARNING MATERIAL (TALM): A LABORATORY-BASED EXPERIENTIAL LEARNING RESOURCE FOR PIPING TECHNIQUES IN CULINARY EDUCATION

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Abstract:

Piping techniques are important psychomotor skills in culinary and pastry education, relying on precision, coordination and requiring a great deal of repetition to create mastery in the craft. Yet students need to learn and expand such skills effectively, which are often limited by constraints on instructional time and exposure to the pastry-based subject, particularly in programmes where pastry modules occupy a smaller portion of the programme structure. In this conceptual paper, we suggest template-assisted learning materials (TALM) as a laboratory-based experiential learning approach to improve the teaching and learning of piping principles and techniques. Based on Kolb's experiential learning theory (ELT), the proposed approach blends structured visual templates to scaffold guided practice, repetition and self-directed learning. Through a literature synthesis, the paper identifies challenges in current instructional practices and develops a conceptual reasoning that illustrates how template-assisted learning can improve skill acquisition, confidence, and consistency in piping performance. The paper further suggests that such an approach can maximise limited classroom time and support diverse learner needs in Technical and Vocational Education and Training (TVET) settings. The study provides a foundation for future empirical validation in culinary education.

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Keywords:

Culinary Education, Experiential Learning, Piping Technique, Template-Assisted Learning Materials (TALM), TVET



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Introduction

The development of psychomotor skills is a fundamental component of culinary and pastry education, particularly in areas requiring precision, consistency, and creativity (Abdul Latip et al., 2025). Among these skills, piping techniques are essential for producing aesthetically appealing cakes, pastries, and desserts, making them a core competency for students pursuing culinary and hospitality-related programmes (Agbunag, 2024). It is especially important in cake decoration and chocolate art and is a critical skill in pastry and bakery subjects. Effective piping requires learners to master techniques involving pressure control, hand coordination, and pattern consistency, all of which can only be achieved through repeated practice and hands-on experience. However, acquiring such competencies presents considerable challenges for novice learners, as traditional classroom demonstrations alone are often insufficient to ensure mastery of these skills (Zaenal et al., 2026).

Although piping techniques are important in culinary education, opportunities for students to develop and refine these skills are limited in the classroom. It is frequently constrained by curriculum structure and limited instructional time, as supported by Azlan & Goh (2026). Practical sessions are typically conducted in a relatively short time, ranging from three to six hours per class. However, students are expected to learn multiple concepts and complete assigned products during the class. The scenario results in limited time for repeated practice and skill refinement (Woodhouse & Rodgers, 2024). Considering the psychomotor core involved in piping techniques. It requires continuous practice and immediate feedback. Hence, limited contact hours often lead students to prioritise task completion over the development of precision and creativity, as endorsed by Zaenal et al. (2026). Therefore, many learners' face difficulty in attaining proficiency and retaining the skills acquired during practical classes.

Moreover, the level of exposure to pastry and bakery subjects among students varies between academic programmes. For example, students majoring in culinary arts, food service, hospitality management, and related disciplines who are not pastry and bakery majors are often required to complete a broad range of courses covering kitchen operations, nutrition, food service management, and other specialised areas (Yue Fen et al., 2026). So, pastry-related modules often represent only a small component of the overall curriculum. In many programmes, students may complete only a single pastry course throughout their diploma or undergraduate studies. So, it limits opportunities for repeated practice, skill reinforcement, and competency development. In contrast, students specialising in pastry and bakery programmes generally receive more extensive practical training and multiple opportunities to practice piping skills.

Despite the differences explained above, all laboratory-based experiential learning courses within culinary and hospitality programmes are expected to equip students with fundamental practical competencies of pastry and bakery. It is a basic skill required for industry and

workforce readiness among students. Nevertheless, the unequal level of exposure to pastry training suggests that students outside pastry specialisations may require additional instructional support to compensate for their limited learning opportunities. This need is consistent with previous studies advocating targeted learning interventions to enhance practical skill acquisition among students with limited hands-on experience (Abdul Latip et al., 2025).

The scenario and challenges outlined above highlight the need for innovative and learner-centred instructional approaches that can maximise learning opportunities both within and beyond the classroom (Ma et al., 2023). Learning materials that provide visual guidance and facilitate repeated practice are particularly valuable in developing psychomotor competencies. It can also reduce stress among students when acquiring a new skill in laboratory-based experiential classes, particularly for new students (Abdul Latip et al., 2025). Why is that? Because TALM offer a structured approach that enables learners to practise various piping patterns systematically and receive immediate visual feedback. More importantly, such materials enable students to engage in independent and self-paced learning. It extends the learning process beyond formal instructional settings and supports skill retention.

The application of TALM aligns closely with experiential learning theory (ELT) by Kolb (1984), which emphasises knowledge acquisition through concrete experiences, reflection, conceptualisation, and active experimentation, as supported by Malayao & Buniel (2025). Through guided practice using piping templates, students actively participate in the learning process by performing tasks, evaluating outcomes, and refining their techniques through repeated experimentation. This approach shifts learning from passive observation towards active engagement and skill construction, which is particularly important in psychomotor-based disciplines such as culinary and pastry education. Despite the increasing emphasis on active and experiential learning in Technical and Vocational Education and Training (TVET), limited attention has been paid to conceptualising instructional tools to support the acquisition of practical pastry skills among learners with limited instructional exposure.

Therefore, this conceptual paper proposes template-assisted piping techniques as an experiential learning approach to enhance psychomotor skill development in culinary education, with a focus on laboratory-based learning. The study is expected to provide pedagogical insights for educators and higher education administrators to maintain and improve program quality for the sake of student holistic development. It is also expected to serve as a foundation for future empirical investigations in culinary and vocational education.

Literature Review

Piping Techniques and Psychomotor Skill Development in a Laboratory-Based Culinary and Hospitality Education

Piping techniques are a fundamental component of culinary and pastry work. The skill requires learners to develop good precision, hand-eye coordination, and consistency in executing decorative designs (Zaenal et al., 2026). The piping technique falls predominantly within the psychomotor domain. Unlike cognitive learning, which is acquired through lectures and reading materials, psychomotor skills are acquired through practice. It is developed through observation, imitation, and guided practice (Abdul Latip et al., 2025).

In skill-based disciplines such as culinary arts, the acquisition of technical competencies requires active engagement and opportunities for experimentation and practice. It will facilitate the integration of procedural knowledge with motor performance (Woodhouse & Rodgers, 2024). However, novice learners frequently encounter difficulties in controlling piping pressure, maintaining pattern uniformity, and coordinating hand movements. Such scenarios may impede both confidence and skill development. Such challenges underscore the importance of learner-centred instructional approaches that provide structured guidance to enhance the acquisition of psychomotor competencies (Malayao & Buniel, 2025; Sya'ni et al., 2025; Yue Fen et al., 2026). In particular, this is the case for non-major pastry and bakery programmes, as they have limited training time.

Challenges in Teaching Piping Techniques

The teaching of piping techniques is often challenged by pedagogical and practical constraints. In laboratory-based culinary courses, instructors must cover multiple learning outcomes within limited class time. Such a scenario leaves fewer opportunities to provide individual guidance and repeated hands-on practice (Woodhouse & Rodgers, 2024). Limited opportunities for repetition can hinder students' progress, as supported by previous scholars (Zaenal et al., 2026). Why? Because psychomotor skills develop gradually through continuous practice and constructive feedback. The issue is particularly evident among novice learners (Abdul Latip et al., 2025). This group frequently require structured guidance to develop consistency and precision.

Furthermore, variations in students' learning pace and prior practical experience make it difficult for instructors to provide personalised support during laboratory sessions. As a result, some students struggle to master fundamental piping skills within the allocated instructional time, which may affect their confidence and overall learning outcomes, as supported by Koerich et al. (2024). These challenges highlight the need for structured instructional resources that can support independent practice, reinforce laboratory instruction, and facilitate the progressive development of psychomotor competencies in culinary education.

Experiential Learning Theory (ELT)

Kolb's (1984) ELT theory provides a useful framework to understand the study context involving TALM and laboratory-based experiential learning. The ELT theory views learning as a continuous cycle involving four interconnected stages. It begins with concrete experience, reflective observation, abstract conceptualisation, and ends with active experimentation. Within the kitchen laboratory setting, students develop piping skills through direct participation in practical activities. It does not rely solely on theoretical instruction like a reading-based (theory-based) core programme (Malayao & Buniel, 2025; Zaenal et al., 2026). Each hands-on exercise offers a concrete learning experience for the students. Apart from that, feedback from instructors and peers encourages and gives students the opportunity to reflect on their performance. In response, learners can refine their understanding of proper techniques and apply improvements in subsequent practice. Through a complete cycle process, it builds confidence and proficiency in piping (Lehrer, 2024).

Experiential learning plays a vital role in connecting theoretical understanding with practical application, especially for culinary and hospitality education. It enables students to transform conceptual knowledge into hands-on technical skills through active participation in laboratory

activities (Agbunag, 2024; Malayao & Buniel, 2025). When students engage in repeated practice with continuous feedback, it progressively strengthens their competence in piping techniques.

It is particularly evident during cake and chocolate decoration sessions. Practice such as piping to create borders, lettering, floral patterns, and other decorative designs will allow students to practise and improve their skills. Authentic learning experiences allow students to apply classroom knowledge in realistic culinary settings. Furthermore, regular cycles of practice, observation, feedback, and correction help students improve the consistency and quality of their work overtime. Such phenomena reflect the principles of Kolb's (1984) ELT theory, which emphasises that practical mastery is achieved through continuous cycles of experience, reflection, and improvement

Visual Learning Materials and Guided Practice

For novice learners who are developing new practical competencies, visual learning materials play an important role in supporting skill acquisition (Tomita, 2022). Well-designed instructional resources provide clear guidance, help reduce cognitive load, and allow learners to progress at their own pace. In psychomotor learning (in the context of study, referring to piping technique), visual cues and demonstrations make procedural tasks easier to understand. Why is that? Because it supports the development of motor coordination. Besides, it encourages repeated practice and provides opportunities for learners to evaluate their own performance. This process helps build confidence and reduces the anxiety often associated with acquiring new practical techniques, as argued by Koerich et al. (2024). Such instructional approaches are especially beneficial in laboratory settings, because teaching time is limited, and opportunities for individual supervision are constrained.

Template-Assisted Learning in Practical Skill Development

TALM offers a structured approach to practical skill development, using visual references to guide learners through specific patterns and techniques. In the context of piping techniques, templates enable students to practise repeatedly and systematically while maintaining consistency in design execution. By reducing uncertainty and providing immediate visual feedback, templates may enhance learners' confidence and encourage self-directed learning beyond formal classroom settings (Zaenal et al., 2026).

Furthermore, template-assisted activities align with experiential learning principles by promoting active engagement, reflection, and repeated experimentation. Despite the growing emphasis on learner-centred pedagogies and experiential learning in TVET and culinary education (Koerich et al., 2024), limited conceptual attention has been paid to the use of TALM to develop piping competencies. Therefore, there remains a need to conceptualise how template-assisted piping techniques can serve as experiential learning tools that enhance psychomotor skill development among students with limited exposure to pastry education. Refer to Figure 1 for a sample of template-assisted learning in the practical skills programme of the culinary and pastry programmes.



Figure 1: Sample Of A Template For The Piping Technique

Source: Author's own sources

Methodology

This study adopts a conceptual approach to develop an underpinning reasoning for using TALM to teach piping techniques in laboratory-based culinary and pastry education. As a conceptual paper, it does not involve primary data collection or empirical testing. Instead, it is developed through an integrative review of the literature, an approach that synthesises existing knowledge to generate new conceptual insights and theoretical propositions (Gilson & Goldberg, 2015; Jaakkola, 2020).

Relevant literature was identified from peer-reviewed journal articles, books, and other scholarly publications on culinary education, TVET education, psychomotor skill development, instructional strategies for practical learning, and ELT theory. The review focused on studies addressing practical skill acquisition, guided learning, template-assisted instruction, and challenges associated with laboratory-based teaching, particularly limited opportunities for practice and instructional time in pastry and bakery subjects.

The reviewed literature was analysed using systematic synthesis to identify recurring instructional challenges, pedagogical principles, and opportunities to improve psychomotor skill development. These syntheses were subsequently integrated with Kolb's (1984) ELT theory to construct the conceptual reasoning of the study, which illustrates how TALM can support the experiential learning cycle by facilitating structured practice, reflective learning, conceptual understanding, and active experimentation, ultimately contributing to improved psychomotor competency, learner confidence, and self-directed learning.

The study is intended to provide a conceptual foundation for instructional design in culinary education and to serve as a basis for future empirical studies evaluating the effectiveness of template-assisted learning in laboratory-based environments.

Conclusion

The study proposes TALM as an instructional approach in experiential learning classes. With a proposition that TALM potentially enhances the teaching and learning of piping techniques in culinary education. With ELT theory as the underpinning foundation of reasoning, this approach highlights how structured visual templates can support psychomotor skill

development through guided practice and active learner engagement. Besides, TALM is helpful for classes with limited contact hours for repeated practice and for varying levels of exposure among students enrolled in different programmes. The integration of TALM with experiential learning processes may better support students in developing precision, consistency, and confidence in piping techniques. Likewise, TALM also promotes self-directed learning beyond formal classroom time, which is especially valuable in skill-based disciplines where mastery depends on continuous practice.

Academic And Practical Implications

This conceptual paper contributes to the growing discourse on psychomotor skill development in culinary education. It proposes a structured reasoning that integrates template-assisted learning with ELT theory.

Theoretically, it extends Kolb's experiential learning cycle to the context of piping techniques and culinary education. It guides the application of how structured visual guidance can enhance each stage of the learning process. The paper also enriches vocational education literature. Particularly, it emphasises the importance of instructional design in addressing skill acquisition challenges among novice learners with limited exposure to pastry and bakery training.

Practically, the study offers culinary educators a low-cost, easily implementable instructional strategy for use in class. TALM can be incorporated into existing practical classes without requiring curriculum changes or additional resources. The approach enables students to engage in repeated, self-paced practice, thereby maximising limited classroom time and improving skill retention. Instructors may also use the templates as structured teaching aids to provide more consistent feedback, reduce demonstration time, and support differentiated learning among students with varying skill levels. This approach is particularly beneficial in TVET and hospitality programmes where instructional time is constrained.

Study Limitations and Future Research Directions

The primary limitation of this study lies in its reliance on literature synthesis and theoretical reasoning rather than empirical validation. The study and TALM have not been tested through actual classroom implementation. So, it limits the ability to confirm their effectiveness in real instructional settings. In addition, the discussion focuses specifically on piping techniques in culinary education, which may limit the generalisability of the proposed TALM approach to other psychomotor skills or vocational disciplines.

Future research can operationalise and empirically test the proposed TALM. A systematic and validated piping practice template of TALM can be developed. Such a process should involve instructional design procedures, including expert review and iterative refinement. The template later can be implemented in structured classroom settings to examine its effectiveness.

Subsequent studies may employ mixed-method or quasi-experimental designs to evaluate learning outcomes between groups with and without template-assisted instruction. Quantitative data may be collected through pre- and post-tests using performance-based observation rubrics. Indeed, richer data can be obtained through survey instruments by measuring students' perceived confidence, learning engagement, and satisfaction with the learning process.

Qualitative data from classroom observations and student feedback may further enrich understanding of how TALM influence learning behaviour and skill development. Likewise, comparative studies are particularly encouraged to determine the extent to which TALM improves performance as compared to conventional demonstration-based instruction. Such empirical investigations would provide stronger evidence of the approach's effectiveness and support the integration of TALM into culinary and TVET curricula as an innovative pedagogical tool for psychomotor skill training.

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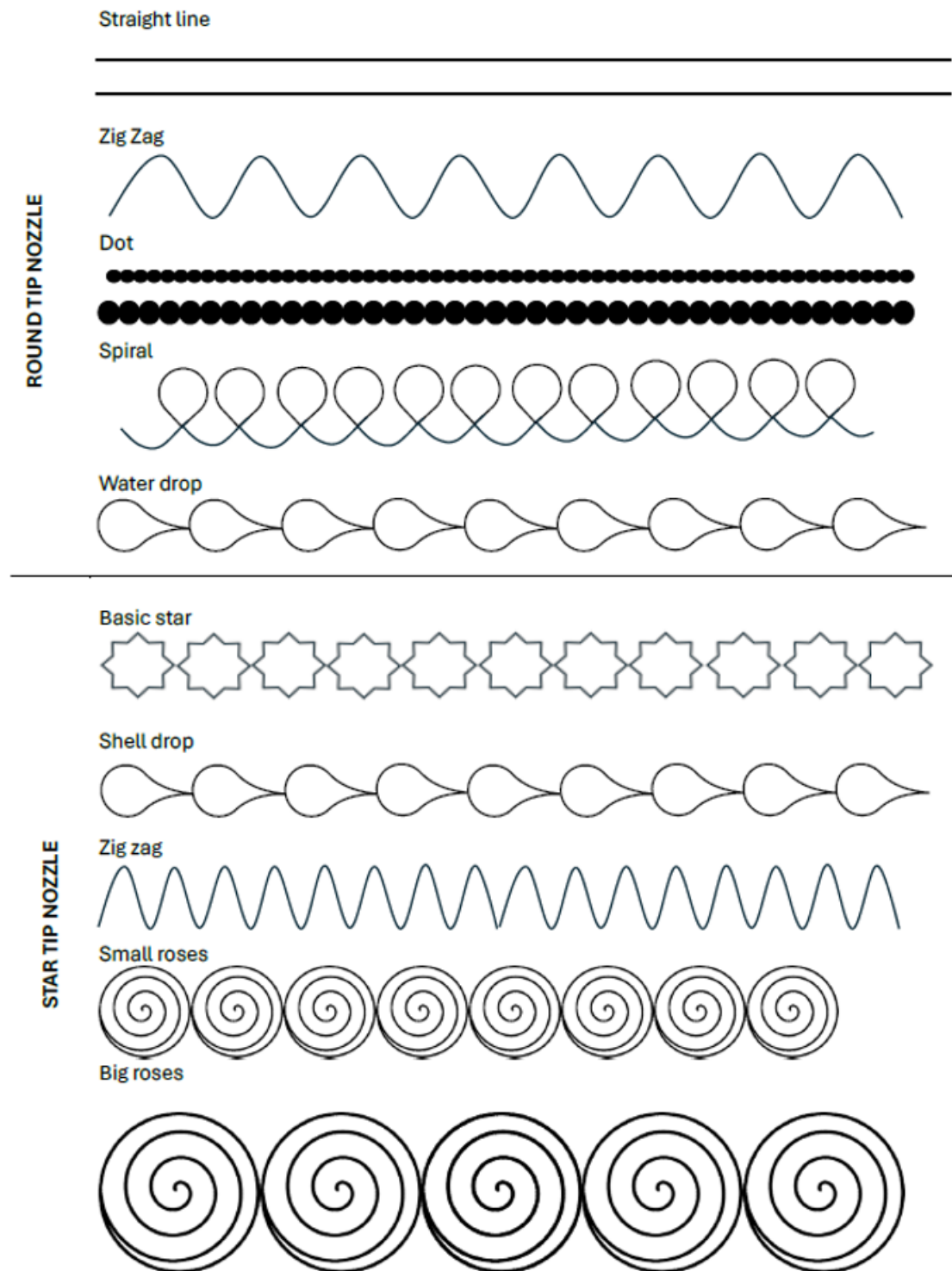
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Appendix 1 – Development of the Full-Size Template for Basic Piping Techniques in Cake Decoration (*The full-size template is available upon request from the corresponding author.*)

Basic Buttercream Piping Technique Template



Heart star



Curve shell



STAR TIP NOZZLE

Reverse shell



Swirl border



Fleur de lis



Standard leaf



LEAF TIP NOZZLE

Layer V leaf



Appendix 2 – Development of the Full-Size Template for Basic Piping Techniques in Chocolate Decoration *(The full-size template is available upon request from the corresponding author.)*

Chocolate Decoration Piping Template

