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COOPERATIVE LEARNING AND CREATIVE PROBLEM-SOLVING TEACHING METHODS: A BEVERAGE CREATION PRACTICE COURSE

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ABSTRACT

With the booming development of the beverage industry, "creativity" has become a key factor for success amid intense competition. This study focuses on cultivating college students' abilities in creativity and innovation through a Beverage Creation Practice course. The goal is to reduce the gap between academic training and practical application in the workplace after graduation, helping students succeed in future related industries. The research recruits sophomore students from the Department of Catering Management as the study sample. Through cooperative team-based learning, the Creative Problem-Solving (CPS) teaching method is integrated into the beverage creation course. The curriculum is divided into three themes: "Classic Items," "Social Media Worthy," and "Future Trendy Beverages." Industry professionals participate in co-teaching and implement the CPS teaching intervention for each theme, guiding students to develop theme-appropriate beverages and practice creative thinking—from identifying issues and brainstorming solutions to creating innovative beverages. After the course, students complete a cooperative learning questionnaire, a creativity questionnaire, a CPS questionnaire, and teachers' reflective records.

KEY WORDS

Cooperative Learning, Creative Problem Solving, Hospitality Education

1. Introduction

Amid the rapid development of modern society, today's workplace increasingly demands diverse competencies to meet emerging challenges. The primary goal of technical and vocational education is to enable students to apply what they have learned upon graduation. Students risk being eliminated from the job market after entering society if they fail to develop creativity and adaptability within their educational environments. Chung (2000) highlighted that professional competence in the catering field is the most critical

skill for hospitality graduates to achieve career success, underscoring the importance of cultivating such skills in the classroom.

Beverage-related courses in colleges and universities have traditionally adopted a didactic teaching approach, in which instructors provide recipes and procedures in advance and demonstrate them during class, followed by group practice sessions. This teaching method often leads to students becoming overly reliant on the instructor's demonstrations, diminishing their motivation to learn and weakening their capacity for independent thinking and problem-solving. Past research shows that education and training can enhance student creativity. Thus, by designing effective instructional strategies and creating a supportive learning environment, enhancing students' creativity in the classroom is possible.

Educational researchers have advocated cooperative learning as a means to shift away from traditional teacher-centered instruction in recent years. This shift is characterized by one-way lecturing and passive student listening that moves toward a student-centered learning model. Researchers are considering how to respond to the transformation of the hospitality industry and educational trends by including the cultivation of creativity and innovation as a key instructional goal in higher education. Since hospitality education is highly practice-oriented and industry-driven, integrating cooperative learning and creative problem-solving instruction can enhance students' ideation in beverage innovation and development. By leveraging group collaboration and brainstorming, students enhance creative thinking to produce products. Based on the above, this study explores the following questions: (1) How can designing a beverage creation practice course enhance student creativity in terms of beverage development during the learning process? (2) Can the application of cooperative learning and creative problem-solving instruction in a beverage creation practice course improve students' creative performance and learning outcomes?

2. Literature review

2.1 Current Status of the Beverage Industry

The 2024 statistics of the Ministry of Economic Affairs indicate that 16,070 bubble tea shops exist nationwide, accounting for 57% of the total. As bubble tea has become a daily staple and these shops continue to expand rapidly with growing revenues, by the end of the year, the annual revenue of bubble tea shops is expected to surpass NTD 130 billion.

Moreover, the beverage market is highly dynamic. Product life cycles can vary significantly, depending on consumer preferences across generations. A notable example is "tapioca balls with filling," which became a sensation in Luodong after its launch in early May 1991, gradually declining after the turn of the millennium. Similarly, *TRUEDAN*, which began as a small street stall in Shilin Night Market in 2010, rose to fame with its Brown Sugar Bubble with Milk, eventually diminishing in popularity. Modern consumers rely on the internet and social media as platforms for information sharing. Food and beverage businesses frequently engage bloggers, influencers, and YouTubers for culinary reviews and recommendations, while leveraging social media discussion forums to boost business performance and operations (Teng, 2020). Thus, creative ideation is an emerging trend in the beverage market, enabling the effective reinvention of vanishing products while recapturing consumer interest.

2.2 Theories, Implementation, and Related Research on Cooperative Learning

Cooperative learning emerged as a teaching strategy in the United States during the 1970s. Its theoretical foundation lies in sociology and psychology, while its development can be broadly categorized into social interdependence theory, motivation theory, and cognitive theory. Lin (2010) regarded cooperative learning as a structured and systematic instructional method that encourages peer collaboration. Based on this method, in heterogeneous groups of two to six members, students engage in group interactions, support one another, and work together to achieve both individual and collective learning goals. This teaching method emphasizes student participation and adopts a student-centered instructional design. It aims to cultivate students' abilities in active thinking, collaborative discussion, and knowledge sharing, while strengthening their social development. As a pedagogical strategy, cooperative learning requires teachers to organize students into heterogeneous groups. Throughout the learning process, the teacher serves as a facilitator, offering guidance while students support one another in collaborative learning activities.

2.3 Creativity and Creative Curriculum Teaching Methods

Creativity is essential to the development of food and beverage products, competitiveness, and sustainable operations. Examining the design and development of culinary creativity courses, Horng et al. (2009) noted that most scholars agree creativity can be enhanced through education and training, and that it is not entirely an innate ability. All students possess a certain degree of divergent and convergent thinking abilities. Thus, creativity is a complex phenomenon, involving multiple influencing factors from idea generation to new product development. Therefore, to enhance student creativity through coursework. Referencing Rowan (2003) and Yeh (2004), Horng et al. (2009) suggested that positive teacher-student interactions, suitable instructional strategies, and a supportive learning environment are key factors in enhancing students' creative potential and creativity.

Numerous scholars have conducted extensive research on creativity strategies, identifying several widely recognized thinking methods, such as brainstorming, mind mapping, attribute listing, wishful thinking, morphological analysis, the SCAMPER checklist, forced relationships, the 5W2H method, and the Creative Problem-Solving (CPS) method. These creative thinking techniques have been proven effective and feasible, with varying purposes and applicability. For instance, brainstorming is among the most used techniques in creative thinking instruction due to its ease of implementation and strong effectiveness. Thus, when designing creativity courses, instructors should select suitable creative thinking strategies that align with the course topic.

Scholars in hospitality education employ student-centered teaching methods (Kim & Davis, 2014), problem-based learning (Zwaal & Otting, 2010), and the Creative Problem-Solving method to enhance student learning outcomes. Kim and Davies (2014) emphasized that learner-centered environments are more effective than traditional teacher-centered models. Similarly, Zwaal and Otting (2010) indicated that focusing on the learning process and collaborative teamwork can significantly improve student learning outcomes and problem-solving abilities. Due to the multifaceted nature of the hospitality industry, the CPS model may also be applicable to fields such as marketing and human resource management (Horng & Lin, 2009). Like other disciplines, research on creativity is gaining increasing scholarly attention in hospitality and tourism. Creativity manifests in people, products, processes, and places. Hospitality education that integrates the CPS teaching model can encourage students to apply creativity in solving classroom problems. Numerous researchers have used CPS instruction to help students generate creative solutions (Treffinger, 1996); studies applying CPS in hospitality education have yielded positive findings. For instance, Lin and Horng (2011) used CPS-based courses to guide hospitality students in developing creative skills. Their findings indicate that CPS courses can enhance culinary students' creative problem-solving abilities.

2. 4 Industry–Academia Co-Teaching in Hospitality Education

A primary goal of higher education is to equip students with strong employability, demonstrated by their ability to seamlessly transition into the workforce after graduation. In the context of hospitality education, whether industry–academia co-teaching can enhance the capacity of both teachers and students to stay current with industry-relevant skills has been positively supported by past research. Feng et al. (2013) found that hospitality instructors at technical and vocational institutions exhibit a moderate to high demand for professional development in "industry research." Furthermore, in a study utilizing a dual-instructor model, Hsu et al. (2016) found that teachers and students reported high satisfaction with industry–academia co-teaching, eliciting a range of positive effects when industry professionals were invited to teach on campus.

The aim of industry–academia co-teaching is to provide real-world industry scenarios and challenges, enabling students to apply theoretical knowledge in practical contexts. Therefore, changes in students' learning motivation and approaches before and after course participation are key teaching outcomes that co-teaching seeks to achieve. Smith and Blake (2009) found that vocational students generally felt unable to integrate practical experiences with classroom learning and lacked the capacity for theoretical abstraction. In Taiwan, most practical courses in hospitality education rely heavily on technical orientation; students' learning styles have shifted toward operational learning. Thus, determining how to effectively incorporate industry–academia co-teaching into course design and planning to maximize its impact remains a critical research question.

3. Instructional design and implementation

3.1Curriculum Design Planning

This study's instructional design aims to cultivate students who possess both professional practical skills in beverage preparation and creative ideas. During the course, students are grouped and cooperative learning instruction is adopted; the involvement of industry instructors helps students seamlessly connect with industry beverage products and reduce the gap between learning and application. Creative Problem Solving (CPS) is applied to develop students' sensitivity to beverage trends, enhancing their creativity and equipping them with the capacity to create innovative new products. The beverage creation practice course in this study is structured around three main themes (namely A, B, and C). After each thematic unit, a CPS session is conducted to guide students in producing a beverage aligned with that theme. Upon completion of the third theme, each group presents their final project by creating an innovative beverage, which is evaluated by experts.

(1) Classic Items: Explanation and practice of making beverages that maintain a strong presence in the market.
(2) Social Media Worthy: Explanation and practice of making popular beverages that spark trends and attract the attention of social media check-ins.
(3) Future Trendy Beverages: Explanation and practice of making beverages that are healthy, innovative, and aligned with future consumer demands.

During Week 1, the course introduction helps students understand the instructional objectives, teaching methods, and course delivery, followed by group assignments. Based on the theory of cooperative learning, this study adopted heterogeneous grouping, assigning students with differing abilities, namely categorizing members into five areas of expertise (proficiency in preparation techniques, creativity in idea generation, sensitivity in taste, talent in the arts, and strong logical and organizational skills) into the same group for cooperative learning. The advantage of heterogeneous grouping is that students are exposed to peers with different personalities, characteristics, and abilities; through mutual adjustment, the learning process can further enhance students' interpersonal skills with their peers.

Starting in Week 2, a different thematic course is presented each week based on the instructional plan. The semester includes six sessions of co-teaching with industry instructors and three sessions of CPS instruction. After explaining the beverage preparation procedures according to the designated themes, students proceed with hands-on practice. Within the 18-week semester schedule, Weeks 1–5 focus on beverages that remain staples in the market, i.e., "Classic Items," with the intervention of CPS using brainstorming techniques. Weeks 6–12 include "Social Media Worthy" beverages that are currently trendy and eye-catching while also relying on CPS brainstorming. Weeks 13–16 surround innovative beverages aligned with future consumer demands, i.e., "Future Trendy Beverages," with the CPS intervention method surrounding nine-grid thinking. During instruction, industry instructors and the primary course instructor move among the groups to assist with problem-solving and further discuss operational details and points of attention. Industry instructors introduce novel creation techniques during the course to provide students with new insights and inspiration regarding beverage creation. Through CPS instructional methods, students are guided to engage in creative thinking exercises related to the three major themes: identifying issues, brainstorming solutions, and developing creative beverages. After completing these three themes, CPS assessment questionnaires and teacher reflection logs are administered. A thematic creative beverage presentation is held in Week 17, where experts are invited to evaluate students' creative beverages. The final week of the course includes a course summary, student learning portfolios, a post-course survey on course objective achievement, a post-test on cooperative learning, and a post-test on creativity, to collect supporting data for instructional outcome analysis.

3.2 Research Subjects and Implementation Method

The sample for this study comprised students who mainly possess basic prior knowledge and skills in beverage preparation while demonstrating a high level of interest in this field. Students with intense interest and motivation are able to acquire more techniques and methods of beverage preparation through this course. This enables them to create popular market beverages such as layered drinks, cheese foam beverages, brown

sugar-coated pearls, as well as molecular and clarified cocktails, preparing them to enter beverage-related industries upon graduation.

Based on the course design, the study implements six sessions of co-teaching with industry instructors and three CPS sessions, during which each group produces creative beverages. This enables students to learn how to prepare beverages that are more aligned with those sold in the industry. This serves to narrow the gap between academia and industry. During each class session, beverages prepared by each group are reviewed before the class ends. The instructor explains and demonstrates how to enhance the perceived value of the beverage creations by using different cups, vessels, and decorative elements to attract consumer interest. During the semester's final week, a "Future Trendy Beverage Final Presentation" is held. Two weeks before presentations, students are guided in class to learn how to identify problems, think through and propose solutions, conduct experiments, and finally produce their beverages. This process allows them to experience the complete procedure from ideation to the creation of an innovative beverage.

The hands-on course is conducted in groups using a cooperative learning model, combined with co-teaching with industry instructors. This enables students to develop the capacity to prepare more creative and distinctive beverages through practical operations, aligning with industry standards while reducing the gap between academia and industry. During the cooperative learning process, students complete a Cooperative Learning Experience Questionnaire during Weeks 4 and 18 (pre-test and post-test), based on the questionnaire developed by Chang (2019). CPS instruction is also integrated into the course, employing brainstorming and the nine-grid thinking method to encourage students' innovative and creative thinking in beverage preparation and development. It also serves to enhance their learning motivation and interest, thereby improving their learning outcomes and creativity.

3.3Data Processing and Analysis

In addition to students' personal background information, quantitative data collection tools include the Cooperative Learning Questionnaire, Creativity Questionnaire, CPS Teaching Effectiveness Questionnaire, Course Objective Achievement Questionnaire, and the Industry Instructor Co-teaching Feedback Questionnaire, all administered using a five-point Likert scale. To gain deeper insights into learning outcomes, qualitative data are collected: learning portfolios, learning feedback forms, teacher reflection records, and teaching outcome presentations for qualitative analysis and triangulation verification. Quantitative data are analyzed using SPSS statistical software to conduct descriptive statistics and t-tests to determine whether there are significant differences in student learning outcomes before and after the teaching methods are implemented. To further understand whether there is a gap between the course's instructional objectives and student learning outcomes, the researcher has designed a feedback questionnaire on industry instructor co-teaching. Focusing on the teaching content and interactive experience with the industry instructors, the questionnaire is completed by students at the end of the course.

4.Teaching And Research Outcomes

4.1The Process of Teaching Practice

4.1.1 Teaching Methods and Materials

This study moves away from traditional passive teaching methods, where instructors provide drink recipes and procedures through demonstration. In this study, before the class, the instructor provides the teaching topic for the lesson, explaining the principles and skills to be learned that week (Appendix 1 contains the course materials for the theme of coffee). Groups collaborate to discuss the recipe's proportions and preparation methods, subsequently preparing each type of beverage. During the discussion and practice process, group members divide tasks, collaborate, and test whether the recipe proportions meet the desired taste and flavor, as well as whether the drink's appearance is visually appealing. If the attempt fails, the group must immediately re-discuss, adjust the recipe proportions or preparation methods, and try again. During discussion, groups can consult the instructor or a professional if necessary, ensuring that the course maintains a two-way interactive effect.

After listening to the instructor's explanation of the principles and skills learned that week, each group is given a blank course unit discussion worksheet before starting the practical work. Students are asked to record their group's discussed beverage recipe and preparation process on the worksheet and submit it before

the class ends. After the course, each student documents the process of preparing their group's beverage and their reflections on the lesson, uploading this record to the course's assignment area.

4.1.2 Creative Problem-Solving Teaching Method (CPS) Introduction

Weeks 1–5: "Classic Items" and Weeks 6–12: "Social Media Worthy" beverages are taught using the brainstorming method; Weeks 13–16: "Future Trendy Beverages" are designed using the Nine-Grid Thinking Method.

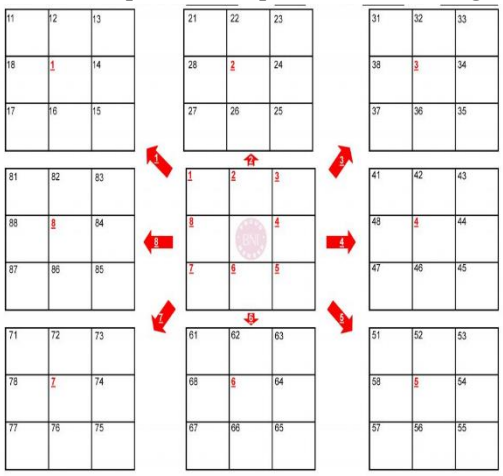
1.Intervention and implementation of the brainstorming method are as follows:

A. This course adopts the brainstorming method from creative problem-solving teaching within the "Classic Items" theme to stimulate students' awareness of enduring classic drinks on the market through divergent thinking.
B. Each group member is asked to propose their ideas for beverages regarding the "Classic Items" category. Through group collaboration and discussion, a product concept for the "Classic Items" is compiled.
C. After Week 5, students are guided to apply brainstorming and cooperative learning to create innovative beverages under the "Classic Items" category. Throughout the process, students are encouraged to generate and produce creative ideas, which are consolidated into a cohesive group effort.
D. By Week 12, after approximately two-thirds of the course, students are guided to apply brainstorming and cooperative learning to generate innovative beverages under the "Social Media Worthy" category. During this phase, students are encouraged to create and produce innovative ideas, compiled and written into a group discussion sheet regarding the social media-worthy creative beverage design.

2.Intervention and implementation of the Nine-Grid Thinking Method are as follows:

A. The course adopts the Nine-Grid Thinking method from creative problem-solving teaching for the "Future Trendy Beverages" theme, focusing on the features and themes that should be presented in the final results. The aim is to engage in divergent thinking. Through team collaboration, students conduct convergent discussions on feasible beverage possibilities that could be produced and reach a consensus.

Explanation—The Nine-Grid Thinking, also known as the Mandala Thinking method, is a thinking tool that simplifies complex ideas, making them easier to manage. The process of completing nine grids can guide divergent and convergent thinking. Therefore, the Nine-Grid method is a tool that engages left- and right-brain thinking. During this course, students use the Nine-Grid association method to generate creative ideas for "Future Trendy Beverages".



C. The following principles are encouraged:

- ☐ Write down ideas as they come
- ☐ Use concise language
- ☐ Fill out as much as possible
- ☐ Reorganize
- ☐ Use colors
- ☐ Review regularly
- ☐ Slow down thinking
- ☐ Take practical actions

B. Implementation Steps
   - Set the theme: Ask students to use "Elements of Creative Beverages" as the brainstorming theme.
   - Use the Nine-Grid method: Discover, clarify, and define the elements that attract group members to participate in the "elements of creative beverages."
   - Apply the Nine-Grid to thinking: Generate many ideas and select the best eight to complete the nine-grid.
   - Use the Nine-Grid for evaluation: After reaching a consensus, use a pen to highlight the best ideas.
   - Practical action: Explain the "elements of creative beverages" to the group in practice.

C. Concrete Practice: After the group converges on the results, they can be implemented in the creation of future trendy beverages: develop the recipe, decorations, preparation methods, glassware, product naming, etc.

4.2 Research Results

4.2.1 Personal Background Data Statistics

The research sample comprised 31 participants: 15 males (48.4%) and 16 females (51.6%). Among them, the majority of the student participants studied in the Catering Management Department in high school (29%). Additionally, 22 (71%) had completed courses related to beverage preparation, and 14 (45.2%) had obtained certification in beverage preparation.

4.2.2 Evaluation After Brainstorming and the Nine-Grid Intervention

This study uses brainstorming and nine-grid thinking from the creative problem-solving teaching method. A questionnaire is used to assess whether students' professional knowledge and abilities, learning motivation, and creative thinking improved after the CPS educational intervention. Table 1 shows that students' agreement levels on various items range from 4.29 to 4.52. Students report feeling that the CPS creative course activities are interesting and innovative, indicating that the CPS educational intervention is effective.

Table 1. Evaluation after Brainstorming and Nine-Grid Intervention.

No.	Item	Brainstorming Intervention	9-Grid Thinking Intervention
1	CPS improves my professional skills.	4.52	4.39
2	CPS increases my learning motivation	4.39	4.39
3	CPS activities are interesting..	4.39	4.48
4	CPS helps me think creatively.	4.48	4.45
5	CPS activities lead to novel ideas.	4.29	4.42

4.2.3 Cooperative Learning Scale – Cooperation Skills and Peer Interaction

This study employs a questionnaire to evaluate whether students' perceptions of cooperation skills and peer interaction have changed before and after the CPS educational intervention. Tables 2 show that after the CPS intervention, the post-test average score for cooperation skills and peer interaction is 4.52, significantly higher than the pre-test average score of 4.08. The paired sample t-test analysis results indicate that p-value < 0.05, illustrating a significant research effect.

Table 2. Cooperation Skills and Peer Interaction

No.	Item	Test Type	*M*	*SD*	*t*	*p*
1	I stay focused during group activities.	Pre-test	3.74	.729	4.491	.000***
		Post-test	4.32	.748		
2	I listen carefully to others.	Pre-test	4.10	.651	3.981	.000***
		Post-test	4.58	.502		
3	I can express my opinions.	Pre-test	3.97	.706	3.981	.000***
		Post-test	4.45	.624		
4	I can accept different opinions from classmates.	Pre-test	4.26	.631	3.503	.001**
		Post-test	4.65	.486		
5	I am willing to cooperate and help others.	Pre-test	4.39	.615	2.528	.017*
		Post-test	4.61	.558		
6	I enjoy sharing ideas and gathering information.	Pre-test	4.06	.727	3.013	.005**
		Post-test	4.45	.568		
7	I help classmates when they have difficulties.	Pre-test	4.16	.688	2.752	.010**
		Post-test	4.48	.570		
8	I seek help when I have difficulties.	Pre-test	4.06	.727	4.306	.000***
		Post-test	4.55	.568		
9	I feel supported and encouraged by classmates.	Pre-test	3.71	.973	3.712	.001**
		Post-test	4.32	.653		
10	I stay on topic and avoid personal attacks during conflicts.	Pre-test	4.13	.885	3.330	.002**
		Post-test	4.68	.475		
11	I discuss differences calmly and reach shared agreements.	Pre-test	4.29	.588	4.353	.000***
		Post-test	4.68	.475		

Note: * $p<0.05$, ** $p<0.01$, *** $p<0.001$

4.2.4 Cooperative Learning Scale – Cooperative Problem-Solving Ability

This study employs a questionnaire to ask students whether they perceive any differences in their cooperative problem-solving abilities before and after a Cooperative Problem-Solving (CPS) educational intervention. Tables 3 indicate that, after the CPS intervention, the post-test average score for students' cooperative problem-solving ability is 4.48, which is significantly higher than the pre-test average score of 4.11. The paired sample t-test analysis exhibits a *p*-value < 0.05, indicating the intervention's significant effects.

Table 3. Cooperative Problem-Solving Ability.

No.	Item	Test Type	*M*	*SD*	*t*	*p*
1	I recognize my group members' strengths.	Pre-test	3.94	.814	4.593	.000***
		Post-test	4.45	.506		
2	I work well with group members to solve problems.	Pre-test	4.23	.560	4.062	.000***
		Post-test	4.58	.502		
3	I understand each group member's role.	Pre-test	4.10	.597	4.427	.000***
		Post-test	4.55	.506		
4	I discuss problems with my group.	Pre-test	4.19	.601	2.516	.017*
		Post-test	4.48	.508		
5	I complete tasks with my group.	Pre-test	4.16	.523	3.503	.001**
		Post-test	4.45	.506		
6	I can explain our roles and rules.	Pre-test	3.97	.706	3.763	.001**
		Post-test	4.39	.667		
7	I talk with my group about tasks and solutions.	Pre-test	4.06	.574	3.248	.003**
		Post-test	4.42	.620		

8	I follow our group plans.	Pre-test	4.19	.601	3.588	.001**
		Post-test	4.55	.506		
9	I follow group rules and support others to do so.	Pre-test	4.06	.629	3.474	.002**
		Post-test	4.48	.570		
10	I care about our task results and suggest changes.	Pre-test	4.06	.680	3.230	.003**
		Post-test	4.45	.568		
11	I reflect on results with my group.	Pre-test	4.19	.654	3.588	.001**
		Post-test	4.55	.506		
12	I share ideas and adjust roles when needed.	Pre-test	4.13	.718	2.752	.010**
		Post-test	4.45	.624		

Note: * $p<0.05$, ** $p<0.01$, *** $p<0.001$

4.2.5 Creativity Questionnaire

A questionnaire is used to ask students whether they perceived any differences in their creativity before and after the CPS intervention. Tables 4 indicate that, following the CPS intervention, the post-test average score for students' creativity is 4.25, which was significantly higher than the pre-test average score of 3.79. The paired sample t-test analysis exhibits a *p*-value < 0.05, indicating the intervention's significant effect.

Table 4. Creativity Questionnaire

No.	Item	Test Type	*M*	*SD*	*t*	*p*
1	Adopting new methods to achieve learning objectives.	Pre-test	3.94	.629	6.892	.000***
		Post-test	4.55	.568		
2	Adopting newer and more practical ideas to improve learning outcomes.	Pre-test	3.87	.806	4.971	.000***
		Post-test	4.32	.702		
3	Proactively seeking new techniques, methods, and ideas.	Pre-test	3.97	.795	4.246	.000***
		Post-test	4.48	.508		
4	Suggesting new methods to teachers to improve learning quality.	Pre-test	3.71	.739	6.036	.000***
		Post-test	4.26	.773		
5	Developing good creative ideas.	Pre-test	3.74	.773	3.780	.001**
		Post-test	4.06	.814		
6	Willing to take risks.	Pre-test	3.84	.820	3.763	.001**
		Post-test	4.26	.855		
7	I enjoy recommending creative ideas to others.	Pre-test	4.06	.964	3.057	.005**
		Post-test	4.35	.709		
8	Applying creative ideas to learning and life.	Pre-test	3.90	.908	3.503	.001**
		Post-test	4.29	.739		
9	Developing appropriate plans to implement creative ideas.	Pre-test	3.65	.709	5.211	.000***
		Post-test	4.23	.762		
10	Using creativity to solve problems.	Pre-test	3.52	.890	3.724	.001**
		Post-test	3.97	.912		
11	Frequently using new ways to solve problems.	Pre-test	3.71	.864	4.030	.000***
		Post-test	4.16	.898		
12	Suggesting new methods for learning or performing tasks.	Pre-test	3.84	.898	3.860	.001**
		Post-test	4.23	.920		

Note: * $p<0.05$, ** $p<0.01$, *** $p<0.001$

4.2.6 Course Objective Achievement Ability Questionnaire

A questionnaire is used to ask students to evaluate their level of agreement regarding their ability to achieve the goals set during the beverage creation course, involving team-based cooperative learning and the intervention of creative problem-solving methods. Table 5 shows that the average scores for all items are above 4.00 (average of 10 items is 4.25). The results indicate that students are satisfied with the semester's course design that incorporates CPS teaching methods and cooperative learning.

Table5. Course Objective Achievement Ability Questionnaire.

No.	Item	*M*	*SD*
1	The creative thinking topics in this course interest me.	4.42	.765
2	I can understand the creative thinking content taught in class.	4.35	.608
3	I have learned beverage knowledge and preparation techniques from this course.	4.48	.570
4	The creative thinking course design enhances my motivation to learn about beverages.	4.19	.703
5	The course improved my creative thinking in beverage design.	4.26	.729
6	The course helped me better understand beverage market trends.	4.00	.775
7	The course enhanced my product development skills..	4.19	.749
8	Compared to previous courses, this course design better suits my learning needs.	4.26	.773
9	The course improved my problem-solving skills.	4.03	.752
10	The course enhanced my teamwork and practical learning abilities.	4.35	.709

4.2.7 Industry Instructor Co-teaching Feedback Questionnaire

Based on the results, students perceived that the presence of industry experts in the beverage creation practical course positively influenced their professional knowledge and practical skills. The average satisfaction scores on all the aspects range from 4.29 to 4.71. The average score for the three industry experts is 4.48, indicating a positive outcome of the collaborative teaching method involving industry experts in some course units. Among these, students expressed satisfaction with statements such as: "The expertise and teaching skills of the industry experts met my needs," "The content taught by the industry experts provided me with useful knowledge," "I am satisfied with the overall teaching method and attitude of the industry experts," and "The teaching provided by the industry experts was helpful for my practical learning." The agreement level of all three industry experts is higher than the average.

5.Conclusion and Further Research

5.1 Conclusion

Through the process of teaching practice, this study finds that after the cooperative learning and creative problem-solving teaching method intervention, students exhibit significant differences in cooperative skills, peer interactions, and ability to solve problems collaboratively, before and after the intervention. The team-based approach encourages students to actively contribute ideas and participate in discussions during the process. Moreover, introducing CPS-based creative thinking activities into the curriculum makes the course more engaging and enjoyable for students. During brainstorming sessions and discussions using the nine-grid thinking technique, students learn to think critically and search for relevant information to solve problems. The findings also indicate that the teaching plan and course design for this semester have effectively enhanced students' professional knowledge, practical skills, and creative problem-solving abilities. Thus, it achieves the expected outcomes and aligns with the research objectives. Students have shown strong agreement with the integration of industry expert collaborative teaching in specific course units, particularly in terms of enhancing professional knowledge and practical learning applications.

5.2 Teacher's Teaching Reflection

During the teaching process, the instructor guided students through small group teamwork and the CPS creative problem-solving method, enriching course implementation. The content was fulfilling and

intense, expanding the students' learning scope and perspectives on beverage preparation. It also provided greater opportunities for students to express their innovation and creativity. During Weeks 1 and 2, due to students' unfamiliarity with the new teaching model and the teacher's strict expectations, the class often experienced delays in starting and ending; students were unfamiliar with one another, which slowed down the process. However, after the instructor introduced course learning sheets and engaging teaching methods to lead students in brainstorming activities, the fourth week saw improvements. As students became more

familiar with each other, cooperation among teams and discussions among team members became livelier, eliciting a sense of accomplishment for the instructor.

This course is an elective course in the Department of Catering Management, with nine students from other departments. Among them, three students had no basic knowledge of beverage preparation and struggled to keep up with the course's pace. They were also unfamiliar with the tools required for beverage preparation. These students lacked basic knowledge and practical skills in beverage preparation. Throughout the semester, the instructor observed how the creative performance of these students was weaker compared to their peers, possibly due to their lack of prior knowledge. Even though they had innovative ideas, these students were often hindered by their lack of operational skills, making it challenging for them to implement their ideas effectively. Therefore, strengthening the foundational knowledge and practical skills of these students is crucial for this course. Particularly for students from high schools, vocational schools, and universities who are not majoring in restaurant management, the provision of after-class consultation and additional time by the instructor is essential.

5.3 Student Learning Feedback

The study asked students to submit a personal course progress portfolio at the end of the semester, including records of each class session and personal reflections. Most students indicated in their reports that this semester's creative beverage preparation course extended beyond the traditional focus of beverage preparation. The course incorporated industry instructors teaching, including topics such as coffee, bartending, and jelly flowers, with the jelly flowers being the most novel and interesting aspect they described. In the class, they also used various beverage preparation tools and learned about time management during the preparation process. They felt that they truly learned something valuable.

Students also mentioned that the course this semester integrated creativity. The teacher used a group-based cooperative learning method, where each group developed three beverages (non-alcoholic, coffee, and cocktails) for each theme. Students found this to be a great teaching model. Each group collaborated to brainstorm the beverage names, select ingredients, design materials, and create beverage introduction cards. This was accomplished through teamwork, which students felt would be highly beneficial when they enter the industry. During the creative process, group members could continuously experiment in the beverage-making process, learning from their failures. This hands-on approach left a more lasting impression than theoretical lessons, enabling students to apply creativity and transform an otherwise ordinary beverage into an innovative creation.

Declarations

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Conflict of interest: No Conflict of interest

Data availability: 36 students enrolled in the course, 31 questionnaires were collected

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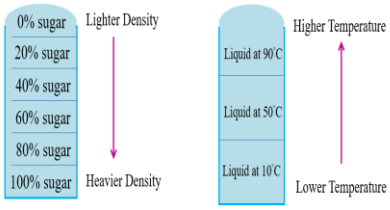
Appendix 1 Teaching Materials for the Coffee Module Course

Beverage Preparation ：Layering Techniques

The layering effect uses the principle of buoyancy：

1. Control the beverage's density　　2. Control the beverage's temperature



Methods of Changing Density: Add sugar, salt, alcohol, or oil.

Auxiliary tools: ice cubes, measuring cup, spoon, dropper, and syringe

Coffee Beverages : Common Decoration Techniques

Coffee Practical Class: Coffee Extraction Techniques & Flavored Coffee

Practical Application 1: Sicilian Blue Curacao Sparkling Coffee (Coffee – Top Layer)

Practical Application 2: Tropical Heineken Coffee (Coffee – Bottom Layer)

Practical Application 3: Mocha Chocolate Latte Coffee (Coffee – Middle Layer)

Group leader guide the team, discuss the necessary cups and materials for the beverages, and write down the relevant information below before starting the beverage preparation.

Practical Application 1: Sicilian Blue Curacao Sparkling Coffee

- Glassware: Please select a suitable layered cup (based on proportion)
- Ingredients & Proportions: Coffee (proportion?), Fruit syrup (proportion?), Sprite sparkling water (proportion?), Ice cubes (proportion?), Lemon (amount?)
- Decoration:
- Preparation Method:
- Steps: First, take..., then take...

Include a beautifully styled photo of the finished product

Coffee Practical Class: Coffee Extraction Techniques & Flavored Coffee

Practical Application 1: Sicilian Blue Curacao Sparkling Coffee (Coffee – Top Layer)

Practical Application 2: Tropical Heineken Coffee (Coffee – Bottom Layer)

Practical Application 3: Mocha Chocolate Latte Coffee (Coffee – Middle Layer)

Group leader guide the team, discuss the necessary cups and materials for the beverages, and write down the relevant information below before starting the beverage preparation.

Practical Application 2: Tropical Heineken Coffee

- Glassware: Please select a suitable layered cup (based on proportion)
- Ingredients & Proportions: Heineken (proportion?), Lemon (amount?), Coffee (proportion?), Ice cubes (proportion?), Fruit syrup (proportion?)
- Decoration:
- Preparation Method:
- Steps: First, take..., then take.....

Include a beautifully styled photo of the finished product

Coffee Practical Class: Coffee Extraction Techniques & Flavored Coffee

Practical Application 1: Sicilian Blue Curacao Sparkling Coffee (Coffee – Top Layer)

Practice 2: Tropical Heineken Coffee (coffee on bottom)

Practical Application 3: Mocha Chocolate Latte Coffee (Coffee – Middle Layer)

Group leader guide the team, discuss the necessary cups and materials for the beverages, and write down the relevant information below before starting the beverage preparation.

Practice 3: Mocha Chocolate Latte Coffee

- Glassware: Please select a suitable layered cup (based on proportion)
- Ingredients & Proportions: Fresh milk (proportion?), Chocolate syrup (proportion?), Coffee (proportion?), Ice cubes (proportion?)
- Decoration : Brown sugar, chocolate, or whipped cream
- Preparation Method:
- Steps: First, take..., then take.....

Include a beautifully styled photo of the finished product