

Phosob: A Game-based Learning Board Game Inspired by the Lanna Rice Goddess

Krittiya Saksrisathaporn¹, Khongthat Thongphun¹ and Ekkarat Boonchieng²

¹College of Arts, Media and Technology, Chiang Mai University, Thailand

²Faculty of Science, Chiang Mai University, Thailand

krittiya.s@cmu.ac.th

kongtat.t@cmu.ac.th

ekkarat.boonchieng@cmu.ac.th

Abstract: The Lanna Kingdom of northern Thailand is renowned for its distinctive culture, traditions, and beliefs, many of which are closely connected to rice cultivation. Transferring this cultural knowledge to younger generations is important for preserving local heritage and promoting understanding of its cultural and spiritual significance. This study presents the design, development, and evaluation of Phosob, an educational board game inspired by Mae Phosop, the Rice Goddess in Thai folklore, and designed with a Lanna retro theme. The game integrates cultural storytelling, four rice varieties, resource management, and strategic gameplay to support learning about Lanna rice culture and related beliefs. A design-based approach was adopted to guide the iterative development and evaluation of the game. The prototype supports two to four players and was evaluated with 36 undergraduate students aged 17–24 years, organised into nine playtesting groups. Participants played three consecutive rounds before evaluating the game. The evaluation covered three dimensions: Design and Aesthetics, Game Capability, and Learning and Cultural Promotion, using a five-point Likert scale and open-ended feedback. Results showed positive player perceptions of the core gameplay experience, with all Game Capability items receiving more than 80% positive responses and game uniqueness receiving 86.49%. Perceived educational and cultural value was also high, particularly for promoting awareness of Lanna rice (96%) and supporting learning about rice (100%). However, Design and Aesthetics received comparatively moderate ratings, and player feedback identified issues concerning visual differentiation, component complexity, gameplay balance, and reliance on random mechanisms. These findings suggest that Phosob has potential as a game-based learning tool for communicating Lanna rice culture while identifying areas for further design refinement. As the present evaluation focused on player perceptions rather than on objective knowledge gain, future work will employ pre- and post-test assessments with larger, more diverse samples. A digital version will also be explored to broaden accessibility and educational impact.

Keywords: Lanna culture, Board game, Rice culture, Game-based learning, Cultural heritage

1. Introduction

The COVID-19 pandemic accelerated the adoption of online learning and remote interaction. While digital technologies improved accessibility, concerns have emerged regarding reduced face-to-face communication, collaboration, and social engagement (Dhawan, 2020; Bao, 2020). Consequently, educators have sought alternative learning approaches that encourage meaningful interaction and active participation.

In response to these challenges, board games have emerged as a valuable pedagogical tool within the broader field of game-based learning. Unlike passive digital consumption, board games encourage direct interaction, cooperation, and critical discussion among players. Prior studies highlight their capacity to foster a wide range of skills, including patience, discipline, decision-making, analytical reasoning, and critical reflection (Hamari et al., 2014; Plass et al., 2015). Building on these insights, educational board games have been widely used to promote engagement, experiential learning, and knowledge sharing among diverse groups of learners (Tsarava et al., 2018).

Beyond supporting interaction and engagement, board games also offer opportunities to communicate cultural knowledge and preserve local heritage. The present study introduces Phosob, an educational board game inspired by the rice cultivation traditions and spiritual beliefs of the Lanna Kingdom in northern Thailand. By integrating cultural heritage with interactive gameplay, Phosob aims to address both contemporary educational needs—enhancing engagement and collaboration—and the preservation of local wisdom. Although previous studies have demonstrated the value of educational board games in areas such as experiential learning, digital literacy, computational thinking, and professional education, limited research has explored their use for preserving and communicating local cultural heritage. In particular, few studies have focused on integrating traditional agricultural knowledge and cultural beliefs into the design of educational board games.

The objective of this study is to design and develop Phosob, an educational board game that promotes learning about Lanna rice culture through a game-based learning approach. The study also evaluates players' perceptions of the game's design, usability, engagement, and perceived learning value. Accordingly, the study addresses the

following research questions: RQ1: How do players perceive the design, usability, and gameplay experience of the Phosob educational board game? RQ2: To what extent do players perceive Phosob as supporting learning and awareness of Lanna rice culture? The following section presents the cultural and scholarly background relevant to this research, including an overview of Lanna rice traditions and prior studies on board games as instruments of game-based learning.

2. Background and Related Work

2.1 Lanna Rice and Mae Phosop

The Lanna Kingdom, located in present-day northern Thailand, with Chiang Mai as its capital, was historically distinct from central Thai kingdoms such as Ayutthaya and, later, Bangkok (Siam). Lanna culture developed its own language, art, architecture, and agricultural practices, shaped by diverse ethnic influences including Tai, Khmer, and Mon peoples.

Rice cultivation has long been central to Thai society, not only as an economic foundation but also as a cultural and spiritual practice. Traditional agrarian rituals reflected community values and beliefs, many of which have gradually declined as agricultural practices have modernized (Thongphun and Punyalikhit, 2023). Within this context, Mae Phosop, the Rice Goddess, is revered as the guardian of rice. Rituals of worship were historically performed before planting and after harvesting, expressing gratitude and seeking blessings for fertile yields (Thongphun, 2023). Neglecting these rituals was believed to result in poor harvests. These beliefs highlight how rice cultivation extends beyond agricultural production to encompass spiritual, communal, and cultural dimensions.

The educational board game Phosob, developed in this study, draws on these traditions by embedding the narratives of Mae Phosop and Lanna rice heritage into its gameplay. This approach aligns with contemporary efforts in game-based learning to integrate cultural knowledge with interactive pedagogical tools (Plass et al., 2015).

Consequently, Lanna rice culture provides a rich narrative and an educational foundation for board game-based learning, enabling players to engage with cultural heritage through interactive, experiential activities.

2.2 Game-based Learning and Board Games

Games have historically played an important role in human societies, serving not only as a source of entertainment but also as a medium for learning, social interaction, and cultural transmission (Kiili, 2005; Plass et al., 2015). In Thailand, traditional children's games were closely connected to local ways of life. Activities such as Khima Kankluay (banana-stem horse riding), Riri Khao San (a group-based chasing game), and Mon Son Pha (hiding the cloth) reflect cultural practices and social values. Early Thai board games, such as Mak Game and Makruk (Thai chess), developed strategic thinking but often lacked structured educational content.

Globally, board games such as Monopoly have long demonstrated that gameplay can introduce concepts of budgeting, negotiation, and resource allocation while maintaining player engagement. As one of the most influential commercial board games, Monopoly has been adapted across different languages and cultural contexts, illustrating its flexibility as both an entertainment and educational medium (Sousa and Bernardo, 2019).

In recent years, educational board games (EBGs) have gained prominence as tools for active learning across a variety of domains. Examples include educational board games for medical education (Arayapisit et al., 2023) and board-game-based approaches to developing computational thinking skills (Tsarava et al., 2018). Research on educational games has also highlighted their potential to enhance engagement, motivation, and learning outcomes (Hamari et al., 2014).

Board games are increasingly recognized as effective instruments of game-based learning, fostering engagement, collaboration, and knowledge transfer (Hamari et al., 2014; Plass et al., 2015). Previous studies have applied educational games to diverse learning domains, including experiential learning, computational thinking, medical education, and cultural heritage (Kiili, 2005; Tsarava et al., 2018; Arayapisit et al., 2023; Saksrisathaporn and Maneewan, 2012). By situating gameplay within meaningful educational contexts, board games provide experiential opportunities for learners to develop both cognitive and social skills. The design of Phosob builds on these insights by integrating cultural heritage, rice cultivation knowledge, and local folklore into an interactive learning experience.

Table 1: Selected Studies on Educational Board Games

Author(s)	Game Type	Learning Domain	Contribution
Kiili (2005)	Digital educational game	Experiential learning	Proposed an experiential gaming model.
Saksrisathaporn and Maneewan (2012)	Web-based cultural game	Lanna cultural heritage	Applied GBL to Lanna cultural heritage.
Arayapisit et al. (2023)	Educational board game	Medical education	Compared collaborative and competitive learning.
Tsarava et al. (2018)	Educational board game	Computational thinking	Supported computational thinking through board games.
Hamari et al. (2014)	Educational game	Student engagement	Linked game challenge with engagement and learning.
This Study	Phosob (Educational board game)	Lanna rice culture and folklore	Integrates Lanna rice culture and folklore into board game-based learning.

As shown in Table 1, previous studies have applied educational board games to domains such as experiential learning, cultural heritage, medical education, computational thinking, and student engagement. Although these studies demonstrate the educational value of game-based learning, limited research has explored how to integrate cultural heritage, traditional agricultural knowledge, and local beliefs into the design of educational board games. This gap motivated the development of Phosob.

3. Research Methodology

This study adopted a design-based approach to guide the iterative development and evaluation of the Phosob board game (Design-Based Research Collective, 2003). As illustrated in Figure 1, the research process consisted of six sequential steps:

1. **Literature Review:** Relevant literature on Lanna rice culture, Mae Phosop beliefs, game-based learning, and educational board games was reviewed to establish the conceptual foundation of the game.
2. **Board Game Analysis:** Existing commercial and educational board games were analyzed through gameplay observation and comparative review to identify suitable mechanics and learning strategies.
3. **Game Design:** The conceptual design of Phosob was developed, including game objectives, narrative elements, gameplay mechanics, visual design, and educational content.
4. **Prototype Development:** A playable prototype was created by integrating the cultural narrative of Mae Phosop and Lanna rice culture into the game system.
5. **Playtest Design:** Playtesting procedures, participant grouping, and evaluation instruments were developed to assess player experience and educational value.
6. **Playtesting and Evaluation:** Implementation of playtests with nine groups (36 undergraduate students) to evaluate players' perceptions of the game design, usability, gameplay experience, and its perceived contribution to learning and awareness of Lanna rice culture. A five-point Likert-scale questionnaire and open-ended feedback were used for the evaluation. This methodology ensured that cultural content, game mechanics, and educational objectives were systematically aligned, while iterative testing and evaluation provided evidence regarding the usability, engagement, and perceived educational value of the Phosob board game.

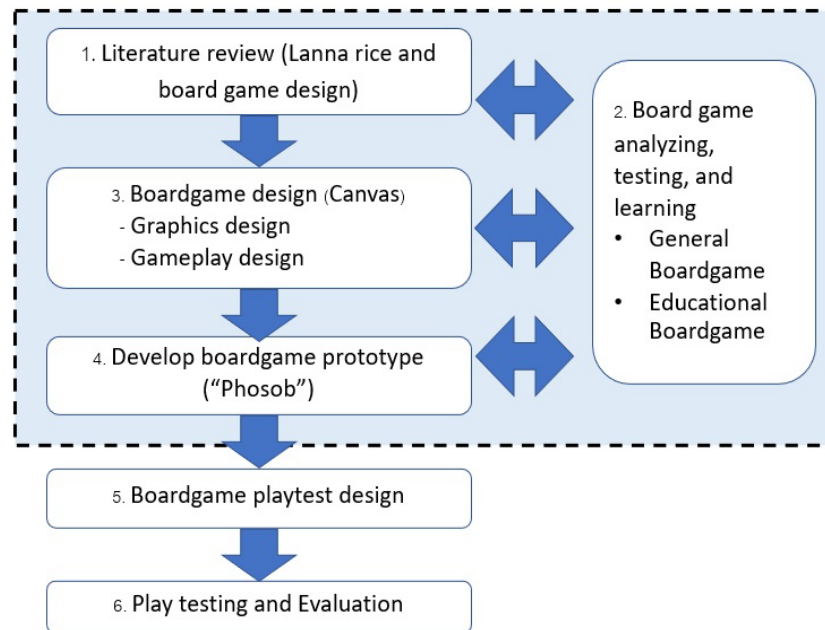


Figure 1: Research methodology

4. Board Game Design and Development

The design and development of Phosob followed an educational board game design process consisting of three main phases: (1) research, ideation, and concept definition; (2) design and prototyping; and (3) testing and refinement. This process ensured that educational content, cultural heritage, and gameplay mechanics were systematically integrated throughout development.

4.1 Research, Ideation, and Concept Definition

The first phase focused on defining the educational content, game concept, target players, and intended player experience. The goal was to develop an educational board game that promotes learning about Lanna rice culture while maintaining an enjoyable gameplay experience. The key design elements included:

- **Content:** Lanna rice culture, rice cultivation practices, local wisdom, and beliefs related to Mae Phosop, the Rice Goddess.
- **Concept:** Cultural heritage preservation through game-based learning.
- **Players:** Students, families, and casual board game players.
- **Market Research:** Analysis of commercial and educational board games, particularly Monopoly-inspired and resource-management games.
- **Player Experience:** Enjoyment, cultural learning, social interaction, and strategic thinking.

Although Phosob was inspired by Monopoly-style gameplay, the traditional mechanic of bankrupting opponents was modified to reflect Lanna culture's cooperative values. Rather than eliminating competitors, players earn coins and resources through rice cultivation activities, equipment collection, and objective completion. This approach encourages positive social interaction while maintaining strategic decision-making and player engagement.

4.2 Character and Scene Design

During the design phase, key elements included theme, mechanics, components, visual style, and game flow. Phosob adopts a rural theme inspired by traditional Lanna agricultural life. The visual design aims to strengthen cultural identity and support learning through immersion in the local context. Character designs were inspired by traditional Lanna mural paintings commonly found in Northern Thai temples. The game features four main player characters developed in this artistic style, reflecting the game's cultural heritage (Figure 2). In addition, the game board and scene elements incorporate Lanna-inspired architecture, rice fields, and agricultural resources to create a cohesive visual experience.

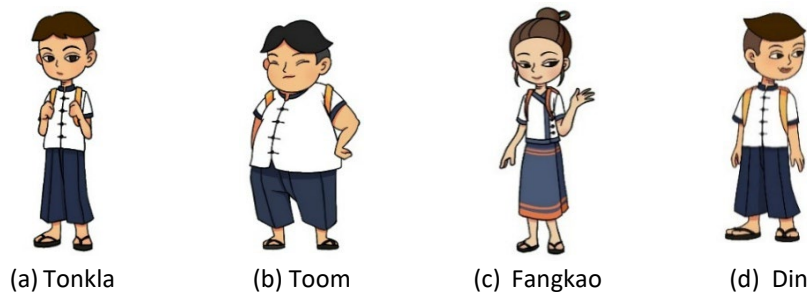


Figure 2: Character designs of the four playable characters

The overall visual style emphasizes a warm, vibrant atmosphere through earth-tone color palettes that reflect both natural and cultural elements of Lanna society. To support the game's narrative and educational objectives, a six-minute animated story entitled Phosob was developed and published on YouTube (Thongphun, 2023). The animation introduces the traditional belief in Mae Phosop, the Rice Goddess, historically associated with rice cultivation in Northern Thailand. According to local beliefs, rituals dedicated to Mae Phosop were performed to express gratitude and seek blessings for agricultural prosperity and successful harvests. The animation also presents common agricultural challenges, including insect infestations, ducks, and apple snails, which are incorporated into the game's narrative and learning content.

In addition, four popular rice varieties (Figure 3) from Northern Thailand are incorporated into the game:

- **San Pa Tong Sticky Rice (*Khao Niao San Pa Tong*) – brown:** A glutinous rice variety with long panicles and slender, brown-husked grains.
- **Kheiw Ngu Sticky Rice (*Khao Niao Kheiw Ngu*) – yellow:** A high-quality glutinous rice with small, slender grains, commonly used for sweet coconut sticky rice.
- **Northern Thai Black Rice (*Khao Kam Lanna*) – purple:** A short-grain glutinous rice with dark purple to black coloration, often used in traditional desserts.
- **White Jasmine Rice (*Khao Hom Mali*) – white:** A fragrant rice variety with a pandan-like aroma and long, slender grains.

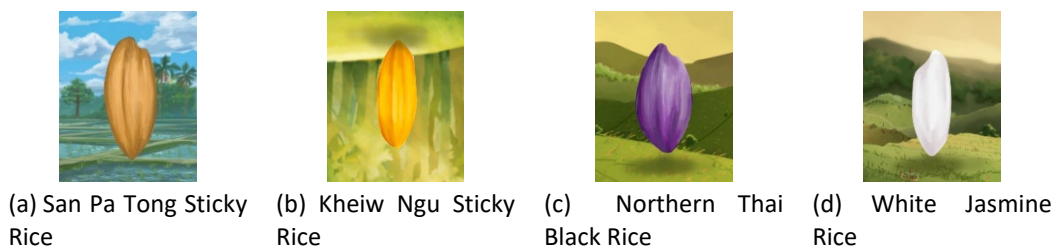


Figure 3: Four rice varieties represented in Phosob

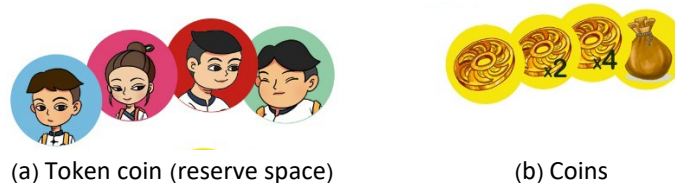


Figure 4: Two types of coins



Figure 5: Example design of Material cards



Figure 6: Example design of Action cards

4.3 Gameplay (How to Play)

Phosob combines resource-management mechanics inspired by the Stone Age with turn-based movement similar to Monopoly, while integrating Lanna cultural heritage and the belief in Mae Phosop, the Rice Goddess. The game supports two to four players and typically lasts approximately 45 minutes.

As shown in Figure 7(c), the game board consists of 32 spaces representing rice varieties, agricultural resources, and event locations. Players move around the board using two dice and perform actions based on the spaces they land on. These actions include collecting resources, acquiring farming equipment, completing objectives, and triggering special events related to rice cultivation. Certain Action Cards and board spaces impose monetary penalties for events such as pest damage or unfavourable weather, representing agricultural risks within the game. Unlike traditional Monopoly, players do not pay rent when landing on another player's space. Instead, resources may be shared between players, encouraging cooperation and positive social interaction. This design reflects the communal values associated with traditional Lanna culture while reducing direct player conflict. The game includes 14 Material Cards and 84 Action Cards. Material Cards define farming-related objectives and scoring opportunities, whereas Action Cards provide strategic options, resource-management decisions, and event-based effects. Players earn points and coins by efficiently managing resources and completing objectives. The game ends when a player successfully completes all five Material Cards, and the player with the highest score is declared the winner.

The prototype was developed as a physical board game featuring cards, tokens, dice, and a game board designed in a modern Lanna visual style. Multiple rounds of playtesting were conducted to refine the game mechanics, balance, and overall player experience.

5. Game Testing and Evaluation

5.1 Participants and Playtesting Procedure

The Phosob prototype was evaluated by 36 undergraduate students aged 17 to 24 years. The participants were organized into nine playtesting groups of four players each. Each group played three consecutive rounds, with each round lasting approximately 40 minutes. The first round allowed participants to become familiar with the rules, game components, and basic mechanics, while the subsequent rounds enabled them to develop strategies and experience the gameplay more consistently.

This procedure was intended to reduce the influence of initial unfamiliarity with the game before evaluation. As shown in Figure 7, the playtesting sessions involved game setup, interaction with physical components, and group-based gameplay. After the sessions, participants evaluated their experience and provided written feedback.



(a) game box and packaging



(b) game components and setup



(c) Phosob game board



(d) playtesting session conducted with undergraduate participants

Figure 7: Phosob prototype and playtesting activities

5.2 Evaluation Instrument and Data Analysis

The evaluation questionnaire covered 20 items across three dimensions: (A) Design and Aesthetics, (B) Game Capability, and (C) Learning and Cultural Promotion. As the playtesting was conducted iteratively across different sessions, minor refinements were made to some questionnaire items to improve clarity. Consequently, the number of valid responses varied across some evaluation items.

Items were rated using a five-point Likert scale: Very High, High, Medium, Low, and Very Low. For descriptive analysis, responses were grouped into three categories: Positive (Very High + High), Neutral (Medium), and Negative (Low + Very Low). Percentages were calculated based on the valid responses for each evaluation item. Open-ended feedback was also collected to identify areas for further improvement.

5.3 Evaluation Results

Table 2 presents the evaluation results across the three dimensions. Game Capability received consistently positive responses, with all items exceeding 80%, particularly game uniqueness (86.49%). Learning and Cultural Promotion also showed strong results, especially for promoting awareness of Lanna rice (96%) and supporting learning about rice (100%). In comparison, Design and Aesthetics received more moderate positive ratings (54.05–72.97%).

Open-ended feedback identified several areas for improvement, including visual differentiation of rice types, text readability, component and setup complexity, gameplay balance, and reliance on random mechanisms. These findings are further discussed in relation to the research questions in Section 6.

Table 2: Evaluation Results of the Phosob Board Game

No.	Evaluation Item	Positive (%)	Neutral (%)	Negative (%)
A Design and Aesthetics				
1	Character design	64.87	35.14	0.00
2	User interface (UI) design	64.86	27.03	8.11
3	Scene/environment design	72.97	21.62	5.41
4	Overall game design	56.76	35.14	8.11

No.	Evaluation Item	Positive (%)	Neutral (%)	Negative (%)
5	Gameplay design	54.06	37.84	8.11
6	Story design	54.05	37.84	8.11
B Game Capability				
7	Ease of understanding	80.55	19.44	0.00
8	Level of interest	80.56	19.44	0.00
9	Uniqueness of the game	86.49	10.81	2.70
10	Suitability for all age groups	81.08	10.81	8.11
C Learning and Cultural Promotion				
11	Promotes awareness of Lanna rice	96.00	0.00	4.00
12	Enhances knowledge of Lanna rice	80.00	16.00	4.00
13	Encourages productive use of free time	80.00	20.00	0.00
14	Helps remember rice varieties	80.00	12.00	8.00
15	Increases knowledge after playing	76.00	24.00	0.00
16	Supports learning about rice	100.00	0.00	0.00
17	Improves understanding of rice types	66.66	16.67	16.67
18	Applicable in real life	8.33	58.33	33.33
19	Has commercial potential	58.33	33.33	8.33
20	Inspires board game development	83.33	16.67	0.00

Note. Positive = Very High + High; Neutral = Medium; Negative = Low + Very Low.

The open-ended feedback provided additional information concerning the gameplay experience. Recurring comments concerned difficulty in distinguishing certain rice types and visual elements due to similar colours, the number of game components, and the time required for setup; the frequency of monetary penalties; and the influence of random mechanisms such as dice rolls and card draws. Participants also suggested simplifying some components, improving text readability, adjusting the resource and penalty systems, and introducing additional events or strategic elements. These qualitative observations are further interpreted together with the questionnaire results in the following Discussion section.

6. Discussion

The findings are discussed in relation to the two research questions concerning players' gameplay experience and the perceived learning and cultural value of Phosob.

6.1 Game Design and Gameplay Experience (RQ1)

Regarding RQ1, players generally perceived Phosob positively in terms of usability, interest, and uniqueness, with positive responses exceeding 80% for all Game Capability items. However, Design and Aesthetics received comparatively moderate ratings. Open-ended feedback identified difficulties in distinguishing similar colours and rice types, as well as issues related to text readability, component complexity, and setup time.

Feedback also highlighted gameplay balance issues, particularly the frequent imposition of monetary penalties and reliance on random mechanisms such as dice rolls and card draws, which may limit strategic decision-making. These findings support previous research emphasizing the importance of engaging and meaningful interaction in game-based learning (Hamari et al., 2014; Plass et al., 2015). RQ1 can therefore be answered by concluding that Phosob was generally perceived as understandable, interesting, and distinctive, although visual clarity, gameplay balance, and system complexity require further refinement.

Notably, "Applicable in real life" received the lowest positive rating (8.33%), suggesting that players perceived Phosob primarily as an educational and cultural learning tool rather than as a game with direct everyday applicability. The moderate rating for commercial potential (58.33%) may similarly reflect its niche cultural focus, indicating an area for further positioning and refinement.

6.2 Perceived Learning and Cultural Value (RQ2)

Regarding RQ2, participants reported strong positive perceptions of Phosob as supporting learning and awareness of Lanna rice culture. Positive responses were particularly high for promoting awareness of Lanna rice (96%) and supporting learning about rice (100%), while participants also reported positive perceptions of remembering rice varieties and increasing their knowledge after playing. These findings are consistent with previous research on engagement and experiential learning through games (Plass et al., 2015; Tsarava et al., 2018) and extend previous work on communicating Lanna cultural heritage through digital games (Saksrisathaporn & Maneewan, 2012) to a physical board game context. However, the evaluation measured perceived learning rather than objective knowledge gain. RQ2 can therefore be answered by concluding that players perceived Phosob positively as supporting learning and awareness of Lanna rice culture, although its measurable learning effectiveness remains to be examined through pre- and post-test evaluation.

7. Conclusions and Future Perspectives

This study presented the design, development, and evaluation of Phosob, an educational board game for learning about Lanna rice culture. Players generally perceived the game as understandable, interesting, and distinctive (RQ1), with positive perceptions of its potential to support learning and awareness of Lanna rice culture (RQ2). A key feature of Phosob is its adaptation of competitive mechanics into resource sharing, encouraging positive interaction while reducing competitive pressure. As the current evaluation focused on players' perceptions, future studies will use pre- and post-test assessments with larger and more diverse samples to examine learning outcomes. Further development will focus on improving visual clarity, gameplay balance, and strategic elements, as well as exploring a digital version to broaden accessibility.

Acknowledgements

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Ethics Declaration: This study involved voluntary participation from undergraduate students. Participants were informed of the study's purpose and provided consent prior to participation. No personally identifiable information was collected or reported.

AI Declaration: Generative AI tools (ChatGPT, OpenAI) were used to support language refinement, grammar checking, and manuscript editing. All academic content, research design, data analysis, interpretations, and final decisions remain the responsibility of the authors.

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