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## **Development of a Green Packaging Design Club Activity Curriculum for Upper Secondary Students**

Jirapat Khamboonma (Corresponding Author)  
Faculty of Education, Naresuan University, Thailand  
E-mail: Icelove14765@gmail.com

Wichian Thamrongsotthisakul  
Faculty of Education, Naresuan University, Thailand

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### **Abstract**

This research aims to 1) investigate essential data for the development of a green packaging design club activity curriculum for upper secondary students. 2) Construct and evaluate the quality of a green packaging design club activity curriculum for upper secondary students. 3) Compare the green packaging design abilities of upper secondary students. And 4) Explore students' opinions regarding a green packaging design club activity curriculum for upper secondary students. This research and development study engaged 81 participants across four groups: 44 for curriculum development, 3 for expert evaluation, 17 for competency assessment, and 17 for activity curriculum feedback. Data were collected via questionnaires, focus group records, suitability forms, and competency tools. Content analysis was used for qualitative data, while quantitative data underwent statistical analysis (percentages, means, standard deviations). Descriptive results indicated that: 1. Investigate essential data for the development of a green packaging design club activity curriculum. The curriculum must focus on design, planning, and marketing, offering hands-on practice and utilizing online educational resources. Diverse assessment methods are also crucial for comprehensive evaluation; 2. Construct and evaluate the quality of a green packaging design club activity curriculum. The developed curriculum was found to comprise a total of 7 components, incorporating 6 distinct learning topics, and was deemed to be highly appropriate; 3. Compare the green packaging design abilities of upper secondary students. Following curriculum implementation, upper secondary students significantly improved their green packaging design abilities, achieving an average score of 90.02%. This exceeded the 80% criterion ( $p < .05$ ); 4. The explore' students' opinions regarding a green packaging design club activity curriculum. Upper secondary students held a highly favorable view of the green packaging design club curriculum, expressing strong positive opinions on its content and activities.

**Keywords:** Club Activity Curriculum, Green Packaging Design, Ansoff Matrix, Design Thinking, Green Packaging Design Ability

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## 1. Introduction

In the contemporary business landscape, creating added value for sustainable enterprises necessitates that entrepreneurs adapt to maximize return on investment. This involves innovatively designing packaging that meets consumer demands. Packaging entrepreneurs seeking to differentiate their products should prioritize the development of environmentally conscious packaging. This approach aligns with current market trends and significantly enhances opportunities for sustainable business growth (SCGJWD Logistics, 2024). In the contemporary era, students must develop proficiency in green packaging design to address environmental sustainability challenges. This capability not only equips students for potential career pathways but also directly aligns with the Ministry of Education's policy emphasizing human capital development as a foundational element for national progress. This policy prioritizes accelerating the comprehensive development of Thai individuals across all age groups, focusing on teaching practical, income-generating skills (Learn to Earn). Furthermore, it advocates for fostering collaboration among governmental bodies, local administrative organizations, and the private sector in managing education at all levels to achieve these objectives (Ministry of Education, 2024). Therefore, to enhance student income generation, it is crucial to foster their proficiency in designing green packaging that effectively preserves products until they reach consumers. Packaging plays a vital role in adding value to products and ensuring consumer satisfaction, a significance underscored by its continuous and pervasive use. Green packaging specifically aims to minimize environmental impact by utilizing appropriate, biodegradable, and safe materials. This approach is essential for encouraging consumer engagement with sustainable practices and promoting greater environmental stewardship.

Rajapranugroh 57 School in Phetchabun, Thailand, operates as a boarding school where students reside in dormitories and are each engaged in agricultural product cultivation for sale. This aligns with the school's unique ethos of "vocational excellence, moral integrity, and adherence to royal initiatives." However, a significant challenge lies in the lack of appealing and distinctive product packaging, which leads to conventional sales approaches and inhibits students from developing innovative thinking. This issue is further compounded by the school's current educational framework, as its curriculum and faculty do not offer specific packaging design courses. Consequently, students tend to exhibit a fixed mindset rather than fostering a growth mindset in their approach to product innovation and marketing. A prevalent issue in Thai society is the tendency for both children and adults to replicate existing products rather than engage in original design, which consequently hinders the development of creativity essential for the Thailand 4.0 era. As creativity is a crucial skill for fostering innovation, high school curricula should integrate vocational education into general studies. This level of education should focus on individual career development, incorporating diverse learning experiences, personalized career counseling, and practical work planning. The primary objective of such high school programs is to prepare students for future careers (Sukcharoen, 2019; Karunpracha, 2020). Consequently, the researcher developed the Green Packaging Design Club curriculum to enable students to design environmentally conscious packaging, thereby fostering an awareness of environmental conservation. This initiative encourages the use of readily available and biodegradable materials within the school environment, while also equipping students with practical skills that could potentially lead to future vocational opportunities.

Student development activities, as an integral component of the Basic Education Core Curriculum B.E. 2551, play a crucial role in empowering learners to apply their knowledge, acquired skills, and personal experiences. These activities aim to foster self-development, nurturing individuals who are virtuous, ethical, disciplined, and possess strong civic consciousness. Furthermore, they cultivate intellectual wisdom by enhancing life skills, critical thinking, communication, problem-solving, and technological proficiency. Ultimately, these activities contribute to students' well-being, enabling them to lead fulfilling lives with sufficiency and engage constructively with others in society (Ministry of Education, 2010). The overarching aim is to foster holistic student development, enabling them to reach their full potential across physical, intellectual, emotional, and social dimensions, thereby nurturing well-rounded individuals. This includes cultivating morality, ethics, and discipline, instilling a sense of social responsibility, and equipping them with self-management skills to live harmoniously with others. By engaging students in practical activities, the curriculum seeks to build key competencies: communication, critical thinking, problem-solving, life skills, and technological proficiency (Ministry of Education, 2010). Student development activities are paramount in driving the Thai education curriculum toward its goal of holistic learner development. These activities extend beyond merely fostering academic knowledge to encompass the cultivation of life skills, desirable characteristics, and individual potential, aligning with the National Education Act's emphasis on developing well-rounded individuals in body, mind, intellect, knowledge, and morality. Activities such as scouting, club participation, community service, and guidance counseling provide platforms for students to engage in learning by doing, collaboration, and critical thinking—essential 21st-century skills. Involvement in diverse activities allows learners to discover aptitudes and interests, develop leadership, and build responsibility, discipline, and effective coexistence in a multicultural society. Thus, the continuous and high-quality provision of student development activities is crucial for cultivating skilled, well-rounded citizens prepared to face challenges and contribute to a sustainable society.

In educational contexts, the implementation of Design Thinking is highly suitable for fostering innovation, particularly in practical, experiential learning environments like designing green packaging. This iterative process allows students to develop their conceptual and practical design skills through repeated cycles of understanding, creative ideation, and user testing. This approach facilitates continuous learning and error reduction, ultimately promoting the development of refined and innovative solutions. Design thinking, a human-centered approach, emphasizes hands-on, collaborative methods to foster understanding, reframe perspectives, and solve problems. In business contexts, it prioritizes meeting customer needs over aesthetics, often

integrating with strategic planning tools to guide market growth and creative green packaging design. This involves developing packaging appropriate for both products and consumers. Furthermore, design thinking promotes innovative and eye-catching solutions that are environmentally friendly, advocating for the use of reusable, recyclable, and reduced packaging. This approach also encourages the safe disposal of packaging materials. The application of Design Thinking in Thai education is crucial for developing 21st-century learners equipped to face contemporary challenges (Cox, 2016). This human-centered approach emphasizes a cyclical process: Empathize (deeply understanding problems), Define (clearly articulating problems), Ideate (brainstorming diverse solutions), Prototype (creating models), and Test (iteratively refining). This process fosters essential skills such as critical thinking, creative problem-solving, collaboration, and communication. Integrating Design Thinking into the curriculum enables students to effectively apply knowledge to real-world problems, promoting lifelong learning and adaptability in a rapidly changing world. This foundational shift is vital for propelling Thailand towards an innovative and sustainable future.

Initial foundational data for developing a green packaging design club activity curriculum was gathered through focus group discussions with administrators and vocational education teachers. These discussions covered key elements for curriculum development, including its content, learning methodologies, educational media, and assessment strategies. Furthermore, student needs were explored across various dimensions: desire to learn, learning activity organization, assessment methods, evaluators of learning outcomes, and preferred activity formats. By directly soliciting student input, the resulting curriculum effectively addresses their specific needs and preferences.

In the context of increasingly significant social and environmental transformations, sustainability has emerged as a critical national and international agenda. A growing awareness of the environmental impact of packaging has led to a widespread demand for knowledge and skills in designing environmentally friendly packaging, or "green packaging," particularly among youth, who are considered a vital force in driving future society. Stemming from the aforementioned importance and existing challenges, the researcher recognizes the urgent necessity to develop such knowledge and skills for upper secondary school students. This demographic is at an age of exploring their potential and interests, and such development aims to prepare them to become qualified and socially responsible citizens.

Consequently, the researcher has developed the "Development of a green packaging design club activity curriculum for upper secondary students, Rajaprajanugroh 57 School, Phetchabun." This curriculum is specifically designed for students with an interest and aptitude in design, concurrently fostering environmental consciousness. The primary objective of the curriculum is to equip learners with tangible skills in green packaging design, encompassing processes from Design Thinking, selection of environmentally friendly materials, and consideration of product Life Cycle Assessment, to the creation of packaging prototypes that are aesthetically pleasing, functional, and have minimal environmental impact. The development of this curriculum aligns with and responds to national development goals and directions, as outlined in the National Strategy, which emphasizes growth based on an environmentally friendly quality of life. It prioritizes a student-centered learning approach, encouraging active learning through hands-on practice. This curriculum not only promotes specialized skills in green packaging design but also integrates essential 21st-century skills such as critical thinking and problem-solving, collaboration, and communication, all of which are fundamental for life and family.

Furthermore, this curriculum can serve as a model for other educational institutions to adapt its principles and instructional management processes to their specific contexts. The knowledge and processes acquired by students from this club activity can be applied in daily life, promoting a shift towards more environmentally conscious consumption behaviors. Moreover, the profound skills and understanding of green packaging design can inspire and motivate students to explore future career paths related to the packaging design industry, eco-friendly product industries, or even entrepreneurship in creating sustainable packaging innovations. This will ultimately contribute to the sustainable socio-economic development of the nation as a whole.

## 2. Objectives of the Study

The objectives of this paper are as follows:

- 1) To investigate essential data for the development of a green packaging design club activity curriculum for upper secondary students.
- 2) To Construct and evaluate the quality of a green packaging design club activity curriculum for upper secondary students.
- 3) To Compare the green packaging design abilities of upper secondary students.
- 4) To Explore students' opinions regarding a green packaging design club activity curriculum for upper secondary students.

## 3. Methodology

### 3.1. Research Design

This Research and Development (R&D) study adopted a systematic approach to data collection and analysis, based on the Borg and Gall model. Multiple research instruments were used, and the findings were analyzed through both qualitative and quantitative techniques, with results presented using descriptive statistics

### 3.2. Defining the Research Area, Population and Sample

The research area encompasses Rajaprajanugroh 57 School, Phetchabun, Thailand. The research population comprised four distinct groups: 1) Key informants for curriculum development, including school administrators, vocational education teachers,

and high school students; 2) Curriculum evaluators, consisting of university lecturers and teachers; 3) Green packaging design competency evaluators, specifically high school students; and 4) Respondents providing feedback on the green packaging design club curriculum, who were also high school students. The researchers employed a convenience sampling method for data collection, with further details provided below.

The research samples consist of:

- 1) Key Informants for Curriculum Development (n=44): These individuals were selected using snowball sampling.
- 2) Curriculum Evaluators (n=3): Selected via purposive sampling, these evaluators met the following criteria: 2.1) possession of at least a Master's degree in education, 2.2) expertise in curriculum and instruction or packaging design, and 2.3) a minimum of five years of experience working in educational institutions or universities.
- 3) Green Packaging Design Ability Assessment Group (n=17): This group comprised students enrolled in the Green Packaging Design Club during the second semester of the 2024 academic year, selected through purposive sampling.
- 4) Green Packaging Design Club Activity Curriculum Feedback Group for Upper Secondary Students (n=17): Also selected via purposive sampling, this group consisted of students registered for the Green Packaging Design Club activity in the second semester of the 2024 academic year. This refers to the identical group that undertook the assessment of Green Packaging Design Ability.

### 3.3. The Tools Used in the Study

The following tools were developed and validated by experts to ensure reliability and alignment with research objectives:

- 1) A questionnaire designed to ascertain the needs for developing the green packaging design club activity curriculum
- 2) A focus group discussion record sheet for documenting qualitative insights
- 3) An evaluation form to assess the suitability of the green packaging design club activity curriculum
- 4) A green packaging design competency assessment to measure student abilities
- 5) A questionnaire to elicit feedback on the green packaging design club activity curriculum from the target participants

### 3.4. Data Collection

Data collection was conducted in four phases:

1) In-depth data collection was conducted through questionnaires assessing the needs for developing a green packaging design club activity curriculum for upper secondary students and through focus group discussions with key informants. The insights gathered from these methods will be utilized to develop the aforementioned curriculum. The tools employed for this purpose include a questionnaire designed to ascertain the needs for developing the green packaging design club activity curriculum and a focus group discussion record sheet for documenting qualitative insights.

2) The design and development phase involved collecting both quantitative and qualitative data to create a green packaging design club activity curriculum for upper secondary students. Subsequently, the suitability of this curriculum was evaluated by experts, leading to its further development and refinement. The tools employed for this purpose include an evaluation form to assess the suitability of the green packaging design club activity curriculum.

3) The curriculum trial involved quantitative data collection through the implementation of "a green packaging design club activity curriculum for upper secondary students" with students enrolled in the green packaging design club activity. Subsequently, the students' green packaging design abilities were assessed. The tools employed for this purpose include a green packaging design competency assessment to measure student abilities.

4) An investigation was conducted to ascertain students' perceptions of a green packaging design club activity curriculum specifically designed for upper secondary students. This involved surveying the opinions of students who had already completed the aforementioned curriculum. The tools employed for this purpose include a questionnaire to elicit feedback on the green packaging design club activity curriculum from the target participants.

### 3.5. Data Analysis

1) Qualitative data from focus groups and open-ended responses were analyzed using thematic analysis, following an inductive coding process to identify key themes and relationships.

2) Quantitative data were analyzed using a statistical software package, with descriptive statistics such as means, standard deviations, and percentages used to summarize evaluation and feedback results

## 4. Results

This research involved the classification of collected data and the presentation of findings in accordance with the predetermined objectives. The key outcomes of this study are summarized as follows:

The research findings indicate that the informant has provided highly valuable insights for developing a green packaging design club activity curriculum for upper secondary students, which can be summarized as follows: 1) The development of such a curriculum is both necessary and crucial. 2) The curriculum content should encompass design, planning, and marketing, and should foster a hands-on learning process. 3) The pedagogical approach should emphasize practical, experiential activities, enabling students to engage with learning scenarios and comprehend concepts autonomously. This approach will also cultivate problem-solving skills, with a focus on collaborative teamwork, group inquiry-based learning, and peer review of green packaging design outcomes. 4) Learning materials should integrate a blended approach, utilizing both handmade and online resources. 5) Assessment and evaluation should be multifaceted, incorporating authentic performance-based assessments, evaluation of student work and learning outcomes, and self-assessment by students alongside teacher assessment.

The research findings indicate that the researcher designed a green packaging design club activity curriculum for upper secondary students, comprising seven key components: 1) rationale and significance, 2) principles, 3) objectives, 4) curriculum structure, 5) learning activity guidelines, 6) learning materials, and 7) assessment and evaluation guidelines. This curriculum further encompasses six distinct content areas.

**Table 1. The Content and Core Substance of a Green Packaging Design Club Activity Curriculum for Upper Secondary Students**

Subject	Core substance
1 Ansoff Matrix: Needs assessment tool for green packaging	Students gained an understanding of the significance and functions of packaging through an examination of Ansoff Matrix, a marketing tool utilized to investigate issues related to increasing sales of existing products in existing markets (Market Penetration) and introducing existing products to new markets (Market Development). This exploration involved research methodologies such as surveys and interviews to thoroughly comprehend the problems and identify target audience needs.
2 Ansoff Matrix: Defining the problem for green packaging	The process involves analyzing and filtering collected data on target group problems and needs to identify the root issues. These problems are then clearly defined, incorporating principles of eco-friendly green packaging design. This foundational understanding subsequently guides the creation of solutions through product development, introducing new products into existing markets, and diversification, extending these new products into novel markets.
3 Developing alternative approaches to green packaging design.	The collaborative process of generating diverse design alternatives for green packaging fosters idea exchange and critical discourse, leading to problem-solving and group-based artifact creation. This approach encourages the exploration of multifaceted perspectives, yielding a rich dataset from which the most effective methods or concepts for green packaging design can be selected.
4 Green packaging production	The design of green packaging necessitates adherence to the preliminary schematics outlined in Subject 3.
5 Testing green packaging	The green packaging prototype will undergo performance testing through sales and evaluation. Data concerning emergent issues, advantages, and disadvantages will be collected to facilitate iterative improvements before targeting the intended demographic.
6 Marketing	A comprehensive understanding of marketing-oriented thinking and problem formulation is crucial. This includes recognizing and addressing common misconceptions in marketing, as well as mastering the development of robust marketing strategies. Furthermore, it is essential to learn how to effectively blend and manage the various components of the marketing mix to optimally meet the needs of target customer segments.

Subsequently, the researcher evaluated the suitability of the proposed "a green packaging design club activity curriculum for upper secondary students" draft, as assessed by experts. the evaluation results are presented as follows.

**Table 2. The Mean, Standard Deviation, and Suitability Level of the Drafted Green Packaging Design Club Activity Curriculum for Upper Secondary Students (n=3)**

Assessment checklist	M	SD	Suitability level
<b>The significance of curriculum</b>			
1. A thorough and compelling rationale for the development of the curriculum has been articulated.	4.67	0.58	Most appropriate
<b>Average</b>	<b>4.67</b>	<b>0.58</b>	Most appropriate
<b>Principles</b>			
1. It is theoretically grounded in established concepts, principles, and theories.	5.00	0.00	Most appropriate

<b>Assessment checklist</b>	<b>M</b>	<b>SD</b>	<b>Suitability level</b>
2. It offers clear, actionable guidelines for practical application.	4.33	0.58	Very appropriate
<b>Average</b>	<b>4.67</b>	<b>0.29</b>	<b>Most appropriate</b>
<b>Objectives</b>			
1. Specify the dimensions of knowledge (K), skills (S), and desired attitudes/attributes (A).	5.00	0.00	Most appropriate
2. Clarity can lead to assessable outcomes	5.00	0.00	Most appropriate
<b>Average</b>	<b>5.00</b>	<b>0.00</b>	<b>Most appropriate</b>
<b>Structure</b>			
1. Relevance to the curriculum's overarching importance	4.33	0.58	Very appropriate
2. Congruence with the stated goals of the curriculum	4.67	0.58	Most appropriate
3. Curriculum content is appropriately matched to learner characteristics	4.33	0.58	Very appropriate
4. Coherent and progressive sequencing of instructional content	5.00	0.00	Most appropriate
5. Elaboration of content components	4.67	0.58	Most appropriate
6. Optimal duration for planned activities related to each content segment	4.67	0.58	Most appropriate
<b>Average</b>	<b>4.61</b>	<b>0.10</b>	<b>Most appropriate</b>
<b>Activity guidelines</b>			
1. Aligned with the curriculum objectives.	5.00	0.00	Most appropriate
2. The activity guidelines are characterized by a design thinking process.	5.00	0.00	Most appropriate
3. The activity guidelines incorporate clear concepts, principles, or stages.	4.67	0.58	Most appropriate
4. Enhances skills and abilities in designing green packaging.	5.00	0.00	Most appropriate
5. Feasible for practical implementation in teaching.	5.00	0.00	Most appropriate
<b>Average</b>	<b>4.93</b>	<b>0.12</b>	<b>Most appropriate</b>
<b>Guidelines for the utilization of learning materials</b>			
1. Provides explicit details regarding the learning materials.	5.00	0.00	Most appropriate
2. Enhances the capacity for designing green packaging solutions.	4.33	0.58	Very appropriate
<b>Average</b>	<b>4.67</b>	<b>0.29</b>	<b>Most appropriate</b>
<b>Measurement and evaluation of learning outcome</b>			
1. Assessment aligns directly with curricular objectives	4.67	0.58	Most appropriate
2. Diverse assessment methods are employed	5.00	0.00	Most appropriate
3. Evaluation criteria are appropriate	5.00	0.00	Most appropriate
<b>Average</b>	<b>4.89</b>	<b>0.19</b>	<b>Most appropriate</b>
<b>Total average</b>	<b>4.78</b>	<b>0.03</b>	<b>Most appropriate</b>

Based on Table 2, the draft of "a green packaging design club activity curriculum for upper secondary students" demonstrates an overall suitability rating of most appropriate ( $M=4.78$ ,  $SD=0.03$ ). An evaluation of each aspect reveals that all areas were rated as most appropriate, indicating that the proposed curriculum is highly suitable for implementation in teaching and learning.

The research findings indicate that upper secondary school students who participated in activities according to the developed green packaging design club curriculum demonstrated outstanding development. Their average post-activity score in green packaging design ability was 90.02 percent, which is statistically significantly higher than the established target criterion of 80

percent at the .05 level. This clearly reflects the effectiveness of the curriculum in enhancing the aforementioned ability among the target student group and signifies the achievement of the set objectives.

**Table 3. Comparison of Students' Green Packaging Design Ability After Participation in the Club Activity Curriculum Against an 80% Proficiency Benchmark**

Test	n	Full score	M	SD	% of Mean	t	Sig(1-tailed)
Criterion	17	125	100	-	80.00		
Post learning	17	125	112.53	2.10	90.02	24.66*	0.0000

Table 3 indicates that students who participated in the green packaging design club activity curriculum for upper secondary students demonstrated a higher-than-criterion ability in green packaging design. This suggests that the green packaging design club activity curriculum for upper secondary students is effective in developing students' green packaging design capabilities.

The research findings indicate that researchers conducted a survey among students to ascertain their opinions on the teaching and learning within a green packaging design club activity curriculum for upper secondary students, with the following results:

**Table 4. Student Perceptions of Learning Within a Green Packaging Design Club Activity Curriculum for Upper Secondary Students (n=17)**

Assessment checklist	M	SD	Levels of opinion
<b>Part 1: Content Domain</b>			
1.1 The instructional material possesses a high degree of intrinsic interest.	4.76	0.44	Most
1.2 The content demonstrates a strong correspondence with your expressed requirements.	4.65	0.49	Most
1.3 The knowledge acquired through this content is directly transferable to practical application in your professional role.	4.71	0.59	Most
<b>Average</b>	<b>4.71</b>	<b>0.26</b>	<b>Most</b>
<b>Part 2: Teaching and Learning Activities</b>			
2.1 The learning activities foster mindfulness in students.	4.82	0.39	Most
2.2 The learning activities enable students to engage in deep listening to the perspectives of others.	4.76	0.44	Most
2.3 The learning activities facilitate students' self-understanding.	5.00	0.00	Most
2.4 The learning activities promote students' understanding of others.	4.59	0.51	Most
2.5 The learning activities enhance students' familiarity with marketing planning and strategic tools, specifically the Ansoff Matrix.	5.00	0.00	Most
2.6 The learning activities guide students in selecting biodegradable materials.	4.94	0.24	Most
2.7 The learning activities engage students in exploring the demand for green packaging.	4.82	0.39	Most
2.8 The learning activities guide students in defining problems related to green packaging.	4.76	0.44	Most
2.9 The learning activities involve students in the practical application of designing green packaging.	5.00	0.00	Most
2.10 The learning activities encourage students to collaborate with others in problem-solving.	4.88	0.33	Most
2.11 The learning activities culminate in students' production of green packaging.	4.94	0.24	Most
2.12 The learning activities provide students with feedback from others for future development of green packaging.	4.88	0.33	Most
2.13 The learning activities introduce students to and deepen their understanding of marketing mindset.	4.76	0.44	Most
<b>Average</b>	<b>4.86</b>	<b>0.15</b>	<b>Most</b>
<b>Part 3: Learning materials</b>			

Assessment checklist	M	SD	Levels of opinion
3.1 The learning materials were highly engaging, fostering students' creativity and design thinking in the area of sustainable packaging.	4.71	0.47	Most
3.2 The learning materials selected was easily understandable by students and aligned appropriately with the curriculum content.	4.76	0.44	Most
<b>Average</b>	<b>4.74</b>	<b>0.36</b>	<b>Most</b>
<b>Part 4: Measurement and Evaluation</b>			
4.1 Student assessment is conducted through performance-based evaluation.	4.71	0.47	Most
4.2 The evaluation incorporates diverse assessment approaches	4.76	0.44	Most
<b>Average</b>	<b>4.74</b>	<b>0.36</b>	<b>Most</b>
<b>Part 5: Classroom atmosphere</b>			
5.1 Instruction is designed to promote a sense of relaxation and reduce stress among students.	4.82	0.39	Most
5.2 Engagement with this curriculum contributes to students' positive learning experiences.	4.82	0.39	Most
5.3 The teaching staff demonstrates a high level of attentiveness and support towards the students.	4.88	0.33	Most
<b>Average</b>	<b>4.84</b>	<b>0.29</b>	<b>Most</b>
<b>Total average</b>	<b>4.82</b>	<b>0.13</b>	<b>Most</b>

Table 4 indicates that students' opinions on the green packaging design club activity curriculum for upper secondary students were at the highest level ( $M=4.82$ ,  $SD=0.13$ ). A closer examination of individual aspects reveals that students' opinions were consistently at the highest level across all areas. This suggests that students perceive the green packaging design club activity curriculum for upper secondary students as effective in facilitating learning and enhancing green packaging design process skills.

## 5. Discussion

The research findings highlight the significance and necessity of developing a green packaging design club activity curriculum for upper secondary students. This curriculum should be meticulously designed to encompass learning content on design, planning, and marketing. Emphasis should be placed on providing students with ample opportunities for hands-on practice and facilitating learning through diverse online educational resources. Furthermore, the curriculum ought to incorporate a variety of measurement and evaluation methods to holistically assess student progress. This pedagogical approach aligns with Taba's (1962) curriculum design principles, which advocate for starting with a learner needs analysis to develop appropriate content and activities. Furthermore, it resonates with John Dewey's concept of "Learning by Doing," a teaching philosophy positing that hands-on practice enables learners to cultivate diverse skills, foster self-confidence, and consequently, develop a passion for learning. (Regent's International School, 2024) Furthermore, research by Noomee, et al (2023) supports the effective use of online media in promoting students' active learning. Diverse assessment methods, including authentic assessment, behavioral observation, presentations, and group work, alongside self-assessment and teacher evaluation, contribute to comprehensive and equitable outcomes. The study's findings also align with Wiggins' (1993) concept of Authentic Assessment, which emphasizes evaluation within real-world contexts. This resonates with students' desire for hands-on, collaborative, and group-based learning experiences. Therefore, it is concluded that the development of a Green Packaging Design club curriculum should be tailored to student needs, focusing on creative, practical learning and comprehensive assessment that reflects diverse learning outcomes. This approach will ensure the curriculum's suitability and its genuine potential to foster youth development.

The research findings indicate that the developed curriculum comprises seven components, including six learning modules, and exhibits the highest level of appropriateness. This alignment is consistent with Taba's (1962) curriculum development model, which proposes the following stages: Step 1: diagnosis of needs; Step 2: formulation of objectives; Step 3: selection of content; Step 4: organization of content; and Step 5: selection of learning experiences or curriculum drafting. Subsequently, the curriculum underwent quality verification by experts. This aligns with Utranont (1989) comprehensive curriculum development framework, which proposes a systemic approach encompassing curriculum drafting, implementation, and holistic evaluation.

The research findings indicate that upper secondary school students who participated in activities according to the developed green packaging design club curriculum demonstrated outstanding development. Their average post-activity score in green packaging design ability was 90.02 percent, which is statistically significantly higher than the established target criterion of 80

percent at the .05 level. This clearly reflects the effectiveness of the curriculum in enhancing the aforementioned ability among the target student group and signifies the achievement of the set objectives. This outcome aligns with Boonprakob (2022) study, which similarly reported that third-grade secondary students attained a green innovation entrepreneurship competency score of 71.91% after engaging in learning activities, significantly exceeding the 70% criterion at the .05 level. Research by Kanthawong (2024). demonstrated that students' post-test scores in packaging design knowledge, specifically concerning "Art of Design and Buddhist Art in the Community" through a Design Thinking learning activity, were significantly higher than their pre-test scores at a statistical level of .05. This finding aligns with Versino, et al. (2023). study on sustainable and bio-based food packaging, which reviewed past and present design innovations. Versino, et al.'s research emphasized developing packaging solutions to reduce food waste and plastic waste in the food supply chain, focusing on designs that incorporate recyclable and biodegradable materials to minimize environmental impact and promote a circular economy. Key points from Versino, et al.'s study include the necessity of food packaging to maintain food quality, prevent spoilage, and reduce waste, with effective design extending shelf life and mitigating contamination risks during transport and storage. Furthermore, sustainable packaging design necessitates the use of materials that are either recyclable or biodegradable.

The research findings indicate a highly positive perception among students regarding the "Green Packaging Design Club Activity Curriculum for Upper Secondary Students." This favorable reception can likely be attributed to several key factors. The curriculum effectively addresses student needs by incorporating hands-on activities, enabling students to apply learned knowledge directly to their daily lives. This practical relevance stems from the curriculum's focus on content frequently encountered in present and future contexts. Furthermore, the learning environment fosters collaborative exchange of ideas and encourages mutual suggestions, thereby cultivating effective speaking and listening skills and promoting the acceptance of diverse perspectives. The instructional approach prioritizes a relaxed, low-stress atmosphere that emphasizes practical application, leading to increased student engagement and enjoyment. This conducive learning environment cultivates student enthusiasm and overall happiness in the learning process. Finally, the instructors' use of student work for assessment and evaluation further contributes to the positive learning experience. This finding aligns with Kongnisai (2024) research, which investigated vocational certificate students' opinions on instruction that integrates Design Thinking with gamification to foster problem-solving abilities. The study revealed an overall "highest" average level of positive opinion towards this pedagogical approach. A study conducted by Boonprakob (2022) investigated the opinions of 9th-grade students regarding learning activities that incorporated the Design Thinking process. These activities aimed to foster green innovation entrepreneurship competencies among the students. The findings revealed that students felt a sense of belonging in addressing social and environmental issues, exhibited motivation to produce green innovations, and demonstrated a strong sense of social responsibility.

## 6. Conclusion

Contemporary curriculum development must address environmental and sustainability challenges. Therefore, the "Development of a Green Packaging Design Club Activity Curriculum for Upper Secondary Students at Rajaprajanugroh 57 School, Phetchabun" is a crucial initiative. This curriculum focuses on students with a special interest in designing environmentally friendly packaging. This body of knowledge is essential for preparing learners to become responsible citizens and drive a green society. The core of the curriculum is to develop learners' comprehensive skills and capabilities in green packaging design, from conceptualization to tangible products. This development supports long-term national development goals that emphasize environmentally friendly innovation, a circular economy, and instilling a sustainability mindset in youth. The learning process is learner-centered (Learner-Centered Education), providing opportunities for students to explore and fully develop their potential. The curriculum content covers design principles, selection of sustainable materials, environmentally friendly production processes, and life-cycle impact assessment. Beyond technical skills, it also fosters crucial process skills such as critical thinking, creative problem-solving, and teamwork, which are essential for daily life and careers. This curriculum can serve as a model (Model Curriculum) for other educational institutions to adapt and further develop. The knowledge and experience gained by learners can be applied in daily life, reducing environmental impact, and lay a foundation for further education or careers in design, green industries, or entrepreneurship in sustainable innovation. Ultimately, this will contribute positively to the nation's socio-economic development.

## 7. Recommendation

Based on the research findings, the researcher offers the following recommendations:

### 7.1. Research Recommendations

Further research should explore other factors potentially influencing green packaging design, such as the roles of family or online media. This would lead to a more comprehensive understanding of the capacity for green packaging design.

This research exclusively investigated secondary school students at Rajaprajanugroh schools, focusing on vocational skills. Therefore, further studies should include students from schools emphasizing alternative characteristics, such as academic excellence, to facilitate a comparative analysis of their differing packaging design aptitudes.

### 7.2. Recommendations for Future Research

Students who participated in a green packaging design club activity curriculum for upper secondary students demonstrated a statistically significant improvement in their green packaging design abilities after completing the program compared to

before. Therefore, educators can adapt this green packaging design club activity for use in teaching packaging design within agricultural packaging design courses for students at other levels, particularly within the secondary education curriculum.

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