Enhancing design skills for beginners in packaging design education through Kansei engineering

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ABSTRACT

For beginner creators, conceptualizing best-selling packaging designs can serve as efficient design training, yet the practical application remains challenging. To bridge this gap, we considered design education utilizing Kansei Engineering methods. This study aims to enhance beginner creators' packaging design skills through exercises based on Kansei Engineering and to verify the effectiveness of design education. Participants engaged in exercises that involved visualizing Kansei responses to existing ice cream packages, creating original designs, visualizing Kansei responses to their packages, redesigning, and then reading the portfolios. This process showed positive trends in participants' quantitative responses to items such as "I am interested in a job related to design (p = .017, d = –1.24)," "I am confident in designing packages (p = .004, d = –1.7)," and "I find designing something enjoyable (p = .004, d = –1.73)." Our findings suggest that integrating Kansei visualization into the design education process can empower beginners by enhancing their skills and engagement in packaging design.

Keywords: design education, Kansei/affective engineering, packaging, ice cream, STEAM

INTRODUCTION

Food packaging serves not only to maintain the freshness and safety of its contents but also to convey product value and influence consumer behavior, which leads designers to create packaging that effectively communicates the intended message (Schifferstein et al., 2022). Through packaging, companies can communicate their brand values to consumers, making design a critical component of branding strategy (Underwood, 2003; Limon et al., 2009). Some well-designed packages can capture the attention of consumers and enhance product sales. Food packaging elements can elicit consumers' Kansei responses (Liao et al., 2015). For instance, visually and tactilely appealing package designs appeal to consumers' Kansei and serve as factors that enhance their purchasing intent. Previous research has demonstrated the relationship between various design elements in packaging, such as "Color and shape (Mohebbi, 2014; de Sousa et al., 2020)," "typefaces and fonts (Velasco et al., 2018)," "image (Neyens et al., 2015; Fenko et al., 2018)," "logo (Sundar & Noseworthy, 2014)," "inner packaging (van Esch et al., 2019)," "nature design and sustainability (Magnier &

Schoormans, 2015; Magnier et al., 2016; Otto et al., 2021)," and "healthy design (Chrysochou & Grunert, 2014; Fenko et al., 2018)," along with consumers' Kansei responses.

Creators in product planning, development, and design constantly experiment to appeal to consumers' Kansei and aim to create best-selling packages. However, there is no definitive method for achieving high sales through packaging designs. For beginner creators, designing potentially best-selling packages can serve as practical training. The educational opportunities related to design and business have been increasing in Japanese university courses as part of problem-based learning (PBL). However, these exercises typically target university students with some design knowledge or aspirations to become designers. This study explores an effective design education process that enables individuals without professional design education to engage in designing best-selling packages.

In the context of evolving STEAM (Science, Technology, Engineering, Arts, and Mathematics) education, both design thinking and emotional engagement have emerged as essential components for fostering creativity and problem-solving skills. Kansei Engineering contributes to STEAM education by bridging emotional intuition and analytical reasoning. It begins with the identification and quantification of users' Kansei responses to design elements, fostering analytical thinking through the use of empirical methods and data interpretation. These quantified insights are then used to inform design decisions, guiding learners to create products that resonate emotionally with users.

The methodology of Kansei Engineering can support the design process for beginners. Kansei Engineering has been applied to packaging designs for products such as chocolate snacks (Schütte, 2013), chips (Rebollar et al., 2017; Putri et al., 2022), milk cartons (Ishihara et al., 2023), milk desserts (Ares & Deliza, 2010), beverage bottles (Luo et al., 2012; Nasution et al., 2021), gluten-free foods (Yoshida et al., 2021), and saffron (Papantonopoulos et al., 2021). In food and beverage packaging design, ensuring that the design accurately reflects the product's taste/aroma and concept is essential for making it appealing to consumers. If the packaging fails to evoke the product's taste/aroma and concept, there is a risk of missed opportunities for the product to be selected. Furthermore, too flashy packaging might not fit well within consumers' daily environments. Therefore, unless innovation is a specific goal, packaging must not be overly stylish or eye-catching. Consumers tend to prefer "suitable" packaging designs that gain broader acceptance. To verify more appropriate designs, Kansei Engineering attempts a scientific approach.

To measure Kansei responses to a product, Kansei words based on Osgood's semantic differential (SD) method are often used, with principal components analysis (PCA) frequently employed to extract these general factors (Schütte et al., 2024). Furthermore, biplots are particularly useful as they plot the results of PCA on a two-dimensional plane, illustrating the correspondence between samples and Kansei responses (Akiyama et al., 2012; Kawakita & Nishimura, 2023). In this study, we define the utilization of Kansei words in the SD method and their subsequent visualization as effective approaches for design education based on Kansei Engineering. It allows beginner creators to utilize the visualization of Kansei responses as insightful cues for their design.

One of the key challenges in design education for beginner creators is overcoming common negative thoughts and lowering the barriers to active participation in design. Experienced designers often rely on their accumulated expertise, Kansei, and deep insights, guiding their design process (Maekawa, 2014). In contrast, beginners in design encounter fundamental challenges, such as not knowing what to design or how to approach it, when themes are undefined and they are afforded a high degree of creative freedom. This situation frequently heightens their awareness of both lack of design experience and underdeveloped expressive techniques. To alleviate issues, we provided design cues through the Kansei Engineering methodologies. This study aims to enhance beginner creators' packaging design skills through exercises based on Kansei Engineering and to verify the effectiveness of design education.

METHOD

Participants and Materials

Seven female Japanese students (*M* = 19, *SD* = 0.93) participated in the design exercises. None of them had prior professional experience in design. The participants were affiliated with a business-specializing department.

To measure the effects of design education, participants responded to the following quantitative items before and after the design exercises:

- I am interested in a job related to design.
- I am confident in designing packages.
- I can tackle difficult challenges related to design.
- I find designing something enjoyable.
- I want to learn about design.

These were measured on the 5-point Likert scale. Additionally, an item asking participants to describe their feelings regarding design was included to analyze qualitative changes in attitudes toward design.

Design Theme

There are numerous competing products in the food and beverage industry, where differences in packaging designs are not pronounced. For instance, supermarkets are flooded with ice cream of similar designs. In Japan, ice cream has been a familiar product to consumers but has already become commoditized by the 2000s (Morinaga Milk Industry, 2024). In such a competitive market, designing packages for best-selling ice cream requires considerable ingenuity. Additionally, ice cream is a product particularly familiar to most Japanese students. Ice cream expenditure is on an annual rise among confections because it can be easily purchased in supermarkets by consumers of all ages (Ministry of Economy, Trade and Industry, 2023). Therefore, the study focused on designing a package for cups of ice cream, specifically aiming to appeal to teenage female students in Japan.

However, beginner creators often grapple with the fundamental question of "What and how to design," acutely feeling their lack of experience and the immaturity of their expressive techniques. At the outset of the design exercises, it is crucial to understand the Kansei responses to best-selling packages to gain design cues. Therefore, before designing original ice cream packages, participants analyzed and considered cups of ice cream sold in their local supermarkets, which included eight different vanilla-flavored cups (as shown in **Figure 1**). The vanilla flavors are popular products among various manufacturers, making them an accessible reference for packaging design for beginner creators.

Design Support Tools

Canva

Since participants had yet to gain professional experience in design, they utilized Canva (https://www.canva.com/), a software that facilitates intuitive design operations. Design tools such as Adobe Illustrator and Inkscape can be time-consuming for beginners to master and may lead to frustration and abandonment. In contrast, Canva is equipped with copyright-free photos, a variety of fonts, and design editing features, allowing beginners to engage in design activities immediately without the need to learn complex operations or commands. Therefore, Canva was chosen as the design tool for this study. None had prior experience with Canva. They spent one hour practicing with the software before starting the design exercises.

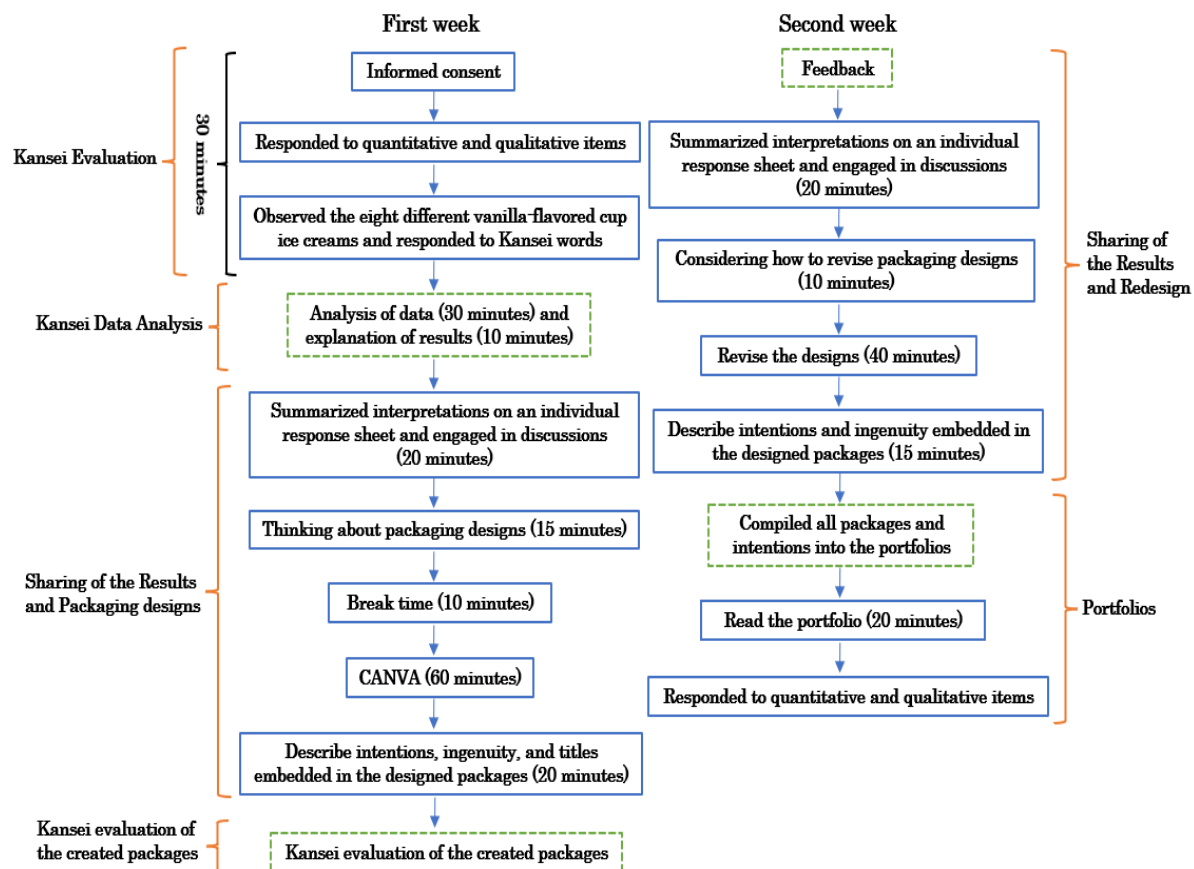**Figure 1.** Eight different vanilla-flavored cups

Figure 2. Design process of the study

Individual response sheets

We utilized individual response sheets as a design support tool to facilitate participants' understanding and review at each stage of the design process, as shown in **Figure 2**. These original sheets served not only to capture the design concepts and intents at each stage but also to guide them in structuring their thought, thereby enabling more effective package design decisions based on Kansei data analysis.

As depicted in **Figure 2**, during the first week, we distributed these sheets for participants to write responses such as, "What can be understood from the analysis of the packages?" and "What kind of packaging design are you considering?". Individual response sheets in the first week encouraged participants to articulate and clarify their design perspectives and preliminary concepts. In the second week, participants were asked to detail their plans for modifications in the sheets with questions such as, "How do you plan to modify the packaging design?" and "Write the thoughts and ingenuity you put into the modified package." Individual response sheets in the second week were crucial for participants to consider how to modify their designs.

Design Education Process

This study followed the design education process illustrated in **Figure 2**. We conducted the exercises over the first and second weeks to keep participants engaged. The green dotted line in **Figure 2** indicates the parts conducted by the author.

First Week: Kansei Evaluation

Participants responded to the items and then carefully observed the vanilla-flavored cups of ice cream (as shown in **Figure 1**). After observing, they completed a questionnaire based on the Semantic Differential (SD) method, utilizing 19 Kansei words through Google Forms. These Kansei words were extracted based on previous studies related to packaging designs and ice cream (Yoshida et al., 2021; Wu & Chen, 2021), with some items being modified or updated after a preliminary survey. **Table 1** presents a list of the Kansei words utilized in this study.

Table 1. Kansei words

1. Warm – Cold	11. Cool – Not cool
2. New – Old	12. Popular – Unpopular
3. Sweet – Not sweet	13. Rich (in flavor) – Not rich (in flavor)
4. Beautiful – Not beautiful	14. Flashy – Plain
5. Stylish – Not stylish	15. Filling – Not Filling
6. Heavy – Light	16. Attractive – Unattractive
7. Cute – Not Cute	17. Kind – Not Kind
8. Healthy – Not healthy	18. Soft – Hard
9. Luxurious – Not luxurious	19. Youthful – Not youthful
10. Elegant – Not elegant	

First Week: Kansei Data Analysis

After all participants completed their responses, the authors calculated descriptive statistics and PCA. Since the participants were not familiar with statistical analysis, the data were visualized using radar charts (visualized SD data) and biplots (visualized PCA data) to facilitate participants' understanding. Radar charts were utilized as a visualization tool to make the data analysis more visually comprehensible (Ishibashi et al., 2016). Biplots allow even beginner creators to easily understand the reactions to samples through the direction and length of the vectors, making biplots an effective tool for visualizing complex multivariate data. **Figure 3** shows the results of the radar charts and biplots.

The PCA of eight different vanilla-flavored cups revealed two main dimensions. PC1 emphasizes attributes such as "filling," "cool," "sweet," "elegant," and "cute," indicating preferences for visually appealing and satisfying products. PC2 emphasizes attributes such as "rich," "heavy," "luxurious," and "attractive," suggesting a trend toward premium products, particularly for special occasions.
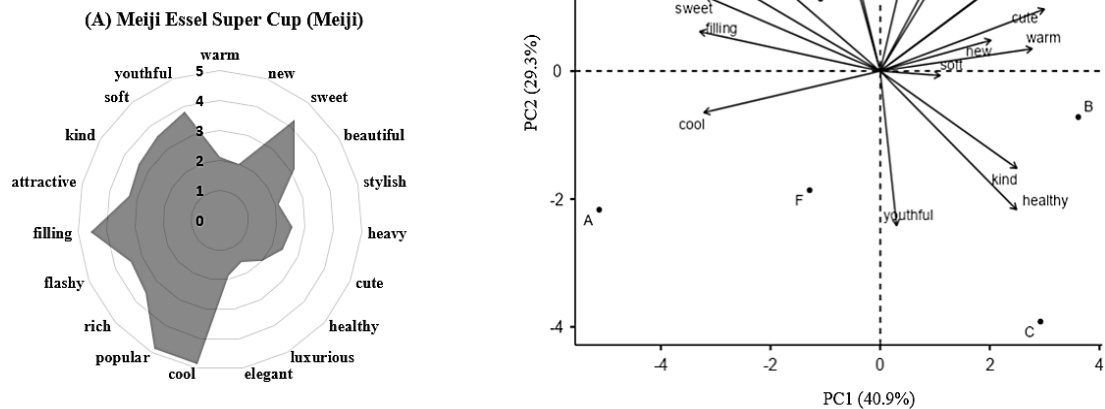
Figure 3. Visualization of Kansei responses for cups of ice cream sold in local supermarkets

First Week: Sharing of the Results and Packaging designs

We explained how to interpret the **Figure 3** to the participants. Each participant summarized their interpretation on an individual response sheet. Participants engaged in discussions based on a sheet and individually considered what packaging designs they wanted to create. For instance, participants considered ideas such as utilizing enlarged images of ice cream to enhance the perception of "filling" and incorporating terms such as "less sugar" and "soy" to emphasize the "healthy."

After a break, they proceeded to create designs utilizing Canva. Participants were asked to describe their intentions, ingenuity, and titles embedded in the designed packages. The packages designed by each participant and their embedded thoughts are shown in **Figure 4**.

In the design process, considering the influence of the product name on evaluators, participants were instructed to name the packages "Shinonome (in Japanese: 東雲/しののめ/シノノメ)" and to label the flavor as "Vanilla (in Japanese: ばにら/バニラ)." The size of the design was standardized at 10cm × 10cm.

First Week: Kansei Evaluation of the Created Packages

Before the second week began, we conducted a collective survey with 26 female evaluators (students) to gather impressions of the packages depicted in **Figure 4**. Seven participants of the study were not included among the 26 evaluators. Each package was printed on paper and presented in a random order. Kansei words were presented randomly through Google Forms. These items were the same as **Table 1**. To filter out inattentive responses, a dummy question, "Please answer 5 (happy) for this item," was included. After removing four participants who answered the dummy question incorrectly, data from 22 evaluators ($M = 18.5$, $SD = 0.58$) were analyzed. The data analysis procedure was the same as the "Sharing of the Results and Packaging designs" in the first week. Parts of the results are shown in **Figure 5**.

Vanilla is the best for ice cream!
I chose a font and color that enhance the volume of ice cream while making the product name Shinonome easily recognizable.

VNLL
I designed the package to convey a sense of style and luxury. It is an ice cream package that makes you want to buy it at least once.

Shinonome specialty vanilla ice cream
I finished the package with a cozy feel by adjusting the font and colors to convey a sense of gentleness, ensuring it is visually comforting.

Milk × Vanilla
I inserted an image of vanilla flowers as the background and used a black, stylish font. It created a package design with a luxurious feel.

Shinonome (Dawn)
This design targets women. It features a background image inspired by the dawn, symbolizing Shinonome (dawn). The sea represents the concept of washing away worries and anxieties. Eating this ice cream helps release any negative feelings. Its light appearance ensures it will not feel heavy, even if eaten in the morning, making it an everyone-friendly ice cream.

Café ice
I created packaging with the image of a stylish and elegant café ice cream in mind. I aimed for a subdued design to convey that it is a low-sugar ice cream with reduced sweetness. I wish I had been more creative with the font choice.

My all-time favorite vanilla ice cream
I designed packaging to convey that it is a healthy ice cream. Although white conveys a healthy impression, it overlaps with the color of the ice cream, so I used a sweet pink color. I incorporated leaf illustrations to add elegance. I believe the negative connotation of "70% less sugar" is alleviated by the sweet colors of the package.

Figure 4. Initial package designs based on participants' creative intentions

By viewing the visualized results presented in **Figure 5**, participants could confirm whether their intended design concepts were accurately manifested in the packages. This understanding enabled them to proceed with redesigning their packages. PC1 highlights attributes such as "elegant," "luxurious," "beautiful," "stylish," and "heavy," indicating a tendency towards premium and sophisticated designs. In contrast, PC2 focuses on "attractive," "youthful," "popular," "cute," and "flashy," reflecting a preference for more vibrant and eye-catching designs.
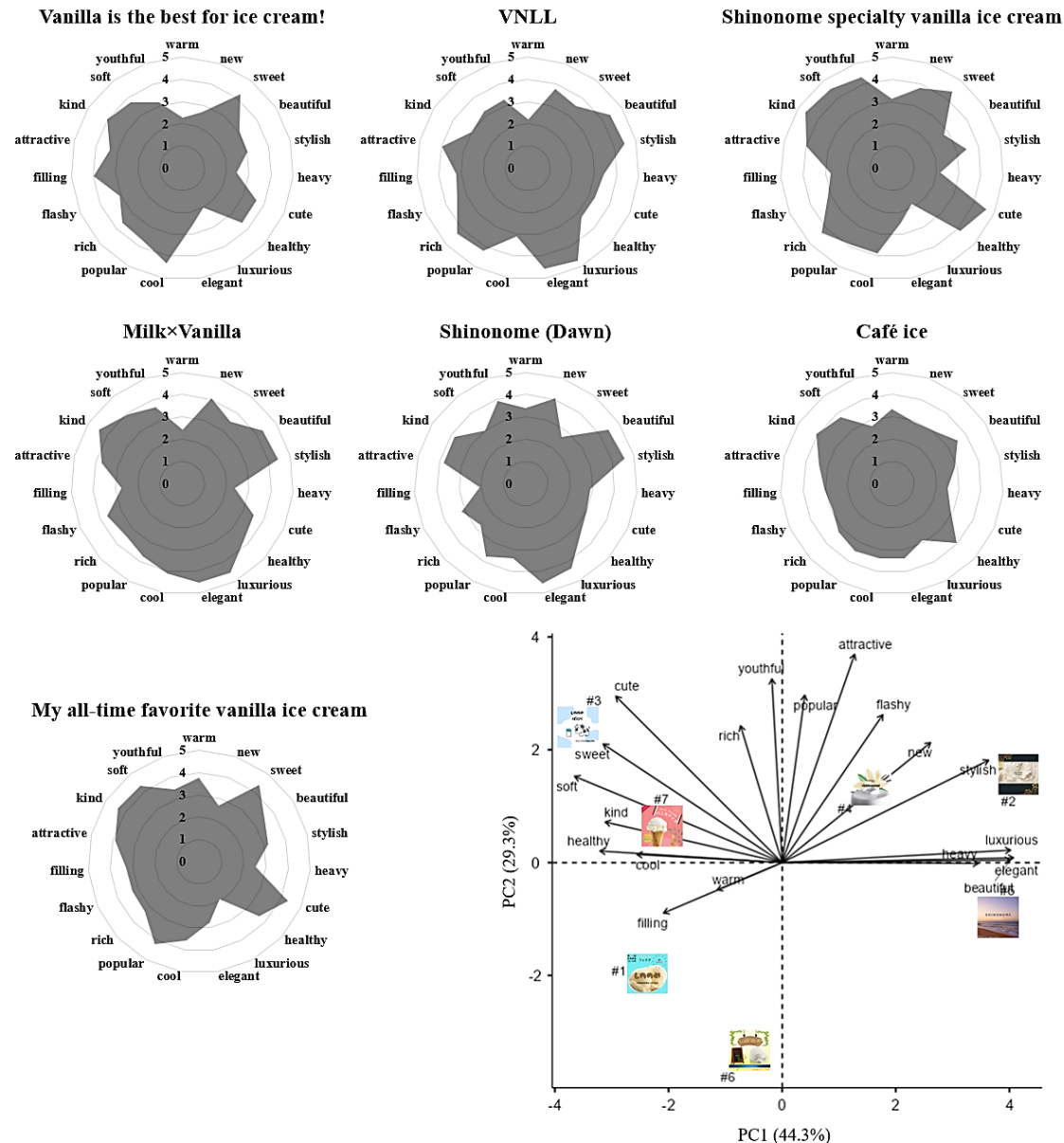
Figure 5. Visualization of Kansei responses for original ice cream packages (Note: The seven radar charts visualize each Kansei response, and the biplot in the lower right visualizes the complex multivariate data through PCA, similar to **Figure 3.**)

Second Week: Sharing of the Results and Redesign

The analysis of packages, as shown in **Figure 5**, was provided to the participants. Following this sharing, participants actively engaged in discussions, collaboratively interpreting the results and exploring how these insights could influence their subsequent design decisions. The process of feedback and discussion not only enhanced their understanding of the Kansei design but also fostered a collaborative learning environment where participants could exchange ideas. They noted "How do you plan to modify the packaging design?" and "Write about the thoughts and ingenuity you put into the modified package" on individual response sheets. During the design revision, participants were instructed not to make significant changes to the design elements they considered symbolic in the original package.

Figure 6. Revised package designs informed by Kansei evaluation results

Second Week: Portfolios

We compiled the completed packages (as shown in **Figure 6**) and the participants' intentions into the portfolios. It allowed participants to review others' packages and reflect on their designs. Each participant read the portfolios and reflected on their packaging design. Finally, they responded to quantitative and qualitative items.

RESULTS

Figure 6 shows the revised designs based on the Kansei analysis in **Figure 5**.

The means and standard deviations (SD) for the quantitative items related to design, both before and after the design education, have been calculated. While paired t-tests were conducted for each item (presented in **Table 2**), the limited sample size (n = 7) restricts the statistical power of these tests.

For the three items, "I am interested in a job related to design," "I am confident in designing packages," and "I find designing something enjoyable," positive trends were observed, as presented in **Figure 7**. The post-mean values were higher, suggesting a potential increase in confidence and enjoyment related to packaging design.

Table 2. Results of the paired t-test for each item

	Pre		Post					
	M	SD	M	SD	df	t	p	d
I am interested in a job related to design.	2.57	1.13	3.43	1.13	6	−3.29	.017	−1.24
I am confident in designing packages.	1.86	1.21	3.14	0.90	6	−4.5	.004	−1.7
I can tackle difficult challenges related to design.	3.14	1.21	3.71	0.95	6	−1.92	.103	−0.73
I find designing something enjoyable.	3.14	1.35	4.14	1.21	6	−4.58	.004	−1.73
I want to learn about design.	3.43	1.51	3.71	1.11	6	−0.68	.522	−0.26
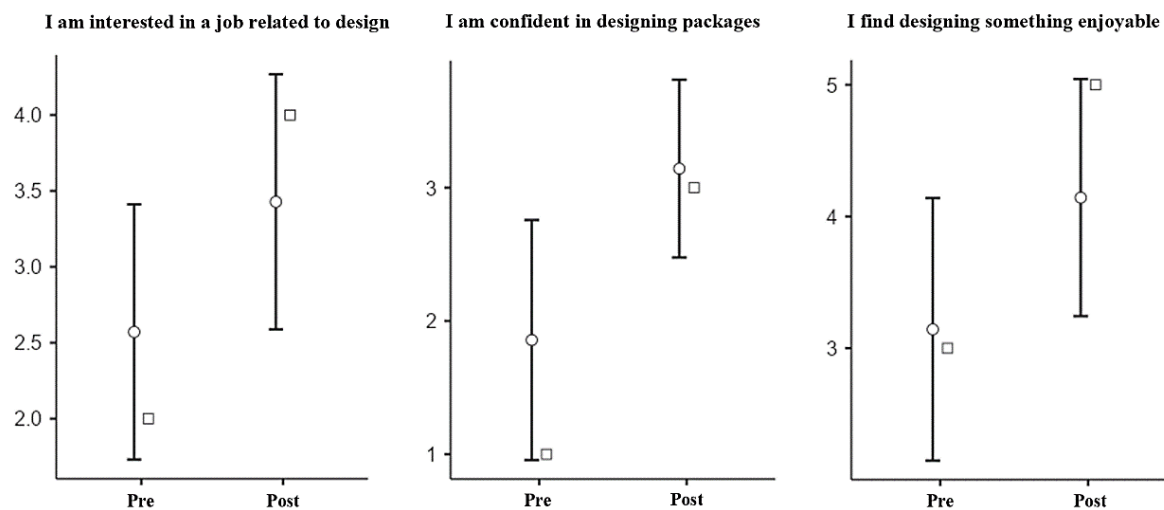
Figure 7. Positive trends in paired t-test

Table 3 presents the shifts in attitudes toward design before and after the exercises. While some participants initially offered negative comments regarding designing, positive feedback increased after the exercises, with remarks such as "It was enjoyable," "I developed an interest in designing," and "I want to learn more about design." Therefore, it is clear that the exercises led to a positive emotional shift towards design.

DISCUSSION

This study aimed to enhance beginner creators' packaging design skills through exercises based on Kansei Engineering and to verify the effectiveness of design education. From **Table 2** and **Figure 7**, positive trends were observed in the three items: "I am interested in a job related to design," "I am confident in designing packages," and "I find designing something enjoyable." The qualitative data indicated predominantly positive descriptions, suggesting participants could create satisfying designs by visualizing Kansei responses. Therefore, it can be inferred that the exercises helped beginners avoid common negative thoughts and lowered the barriers to engaging in design. However, since the exercises focused on packaging design, it did not lead to an overall increase in confidence in design, as represented by the item, "I can tackle difficult challenges related to design." Furthermore, although the qualitative data showed a need to learn more regarding design, no significant difference was observed in "I want to learn about design." Therefore, this exercise is not considered to relate to the motivation to continue studying design professionally. Future efforts should aim to foster sustained interest and motivation in design learning.

Table 3. Qualitative data towards design before and after the work

Pre
I am not good at design, so people with rich imaginations are amazing.
I am not good at drawing, so I lack confidence.
I want to find joy in creating something on my own.
It seems challenging, but I hope to enjoy the design process.
Creativity is essential for design.
I enjoy drawing and editing images, so I look forward to design.
I am not good at coming up with ideas or being creative, so I am worried about whether I can produce a good design. I need help with creativity.

Post
Although I am not particularly good at designing, I found it fun to think about and create something.
It was also interesting to see other designs and analyze various Kansei responses.
I often thought I did not want to design because I am not good at drawing. However, assembling images and illustrations using a computer was fun. Evaluating products and seeing other designs was also refreshing and enjoyable.
I have always been interested in design. It was fun to try packaging design and to improve through feedback.
Although I initially was not interested in designing, the exercises were enjoyable and enabled me to develop an interest in designing.
I had the impression that the packaging design was too difficult. However, through the exercises, I enjoyed thinking about "How to make people like something" and "How to give a sweet atmosphere while keeping elegance."
It was also gratifying to have others appreciate my work.
I have grown to like designing more than before. Seeing the feedback made me happy and inspired me to want to learn more about design.
Initially, I found it challenging, but designing was attractive. I thought that designing might reflect one's personality.
I want to try it again.

In this study, we collected Kansei data toward packages depicted in **Figure 4**, analyzed it, visualized the findings, and sharing the results to participants. As shown in **Figure 6**, participants could redesign the packages while retaining "the design elements they considered symbolic in the original package." Some participants revised visual cues, such as colors and images, because these cues more effectively capture consumers' attention than informational cues. Hallez et al. (2020) found that both children and adults are influenced by visual cues, with the eating behaviors of adults being particularly affected by the packaging color, size, and shape rather than informational cues such as labels. In the case of "vanilla is the best for ice cream!" an image with many vanilla ices overflowing from the container was selected to enhance the perception of "filling." By visualizing the Kansei responses toward packaging design, even beginners can perform more effective redesigns. Therefore, conducting design education through design exercises based on the visualization of Kansei responses is considered adequate for beginners.

From a STEAM education perspective, this study highlights how design education can serve as a bridge between creativity and analytical thinking. By incorporating Kansei Engineering into the design process, both the emotional elements of design and the user-centered functional aspects can be integrated. This approach aligns with the core goals of STEAM education, which seeks to connect the fields of Art, Science, Technology, and Engineering. Through the process of visualizing Kansei responses and using them as a foundation for redesigning, STEAM education empowers students to apply both their creative and analytical abilities to real-world design challenges.

Given that this study employed a within-subjects design, it is possible that the results were influenced by temporal factors. Future research should consider implementing a between-subject design. However, visualizing the Kansei data of a large group and providing feedback to participants presents a challenge. This study focused on beginner creators unfamiliar with design or Kansei Engineering, with Kansei analysis performed by the author (as indicated within the green dotted line in **Figure 2**). While data collection via Google Forms was immediate, visualizing the data for seven participants took 30 minutes. More efficient feedback methods are necessary to conduct design education with a large sample size that allows for between-subjects design.

We employed Canva and Individual response Sheets as design support tools. Canva was essential in allowing beginner creators to reflect their ideas and intentions in their packaging without becoming discouraged. At the same time, Individual Response Sheets were crucial for organizing thoughts and facilitating the design process. In particular, the use of Canva appeared to play a significant role in reducing learning barriers and promoting participant engagement. Its intuitive interface, along with readily available templates and assets, enabled participants to concentrate on the creative aspects of their work without becoming overwhelmed by technical complexities. This accessibility likely contributed to a sense of early success, fostering motivation and reducing anxiety often associated with unfamiliar digital tools. However, the quantitative impact of these tools on the participants has not been examined. In future research, we should not only further evaluate the effectiveness of the Kansei engineering approach but also investigate the influence of the design support tools. It will help clarify the significance of the Kansei engineering approach in enhancing design education.

CONCLUSION

Participants engaged in exercises that involved visualizing Kansei responses to existing ice cream packages, creating original designs, visualizing Kansei responses to their packages, redesigning, and then reading the portfolios. By employing Kansei Engineering methods, even beginners with anxieties can enjoy engaging in packaging designs. Utilizing the visualization of Kansei responses as a guide, they resolved the fundamental question of "What and how to design" and were able to generate design proposals within just an hour. During the redesign phase, the visualization of Kansei responses facilitated better modifications. Quantitative and qualitative analyses indicate that this design education was adequate for beginners. However, the study also highlighted a challenge: as the number of participants increases, the time required for visualizing data and sharing the results, suggests a need to explore more efficient methods.

Limitations

One major limitation of this study is the small sample size (n = 7), which restricts statistical power and limits the robustness of the findings. Additionally, the absence of a control group makes it challenging to determine whether the observed effects are unique to the proposed approach or could be replicated with alternative methods. Together, these limitations constrain the generalizability of the results. While the findings provide valuable insights into the affective responses of female university students, further research with larger and more diverse samples and appropriate comparison groups is needed to validate and extend these observations.

In this study, we implemented Kansei Engineering-based design education by visualizing the results of the SD method and PCA to provide design cues that guided even beginner designers toward superior design. However, as this study does not compare with other design education methods, it cannot demonstrate that this design method is more effective than others. In future research, it will be essential to compare the design education method used in this study with other methods to determine what constitutes the most effective design education approach for beginners.

Ethics Statement

This study received approval from the Ethics Review Committee of the Matsuyama Shinonome College and Matsuyama Shinonome Junior College.

REFERENCES

Akiyama, M., Tatsuzaki, M., Michishita, T., Ichiki, T., Sumi, M., Ikeda, M., Araki, T., & Sagara, Y. (2012). Package design of ready-to-drink coffee beverages based on food kansei model—Effects of straw and cognition terms on consumer's pleasantness. *Food and Bioprocess Technology*, *5*, 1924–1938. https://doi.org/10.1007/s11947-011-0527-5

Ares, G., & Deliza, R. (2010). Studying the influence of package shape and colour on consumer expectations of milk desserts using word association and conjoint analysis. *Food Quality and Preference*, *21*(8), 930–937. https://doi.org/10.1016/j.foodqual.2010.03.006

Chrysochou, P., & Grunert, K. G. (2014). Health-related ad information and health motivation effects on product evaluations. *Journal of Business Research*, *67*(6), 1209–1217. https://doi.org/10.1016/j.jbusres.2013.05.001

de Sousa, M. M., Carvalho, F. M., & Pereira, R. G. (2020). Colour and shape of design elements of the packaging labels influence consumer expectations and hedonic judgments of specialty coffee. *Food Quality and Preference*, *83*, https://doi.org/10.1016/j.foodqual.2020.103902

Fenko, A., de Vries, R., & van Rompay, T. (2018). How strong is your coffee? The influence of visual metaphors and textual claims on consumers' flavor perception and product evaluation. *Frontiers in Psychology*, *9*(53). https://doi.org/10.3389/fpsyg.2018.00053

Fenko, A., Nicolaas, I., & Galetzka, M. (2018). Does attention to health labels predict a healthy food choice? An eye-tracking study. *Food Quality and Preference*, *69*, 57–65. https://doi.org/10.1016/j.foodqual.2018.05.012

Hallez, L., Qutteina, Y., Raedschelders, M., Boen, F., & Smits, T. (2020). That's my cue to eat: A systematic review of the persuasiveness of front-of-pack cues on food packages for children vs. adults. *Nutrients*, *12*, https://doi.org/10.3390/nu12041062

Ishibashi, K., Inada, S., & Miyata, K. (2016). Evaluation of consumers' impressions for chocolate shapes [in Japanese]. *Transactions of Japan Society of Kansei Engineering*, *15*(1), 213–223. https://doi.org/10.5057/jjske.TJSKE-D-15-00022

Ishihara, S., Kuo, R., & Ishihara, K. (2023). AI image generation boosts Kansei engineering design process. *Kansei Engineering*, *101*, 23–33. https://doi.org/10.54941/ahfe1002988

Kawakita, T., & Nishimura, T. (2023). Avatar design focusing on kawaii motions. *Human-Centered Design and User Experience*, *114*, 158–165. https://doi.org/10.54941/ahfe1004232

Liao, L. X., Corsi, A. M., Chrysochou, P., & Lockshin, L. (2015). Emotional responses towards food packaging: A joint application of self-report and physiological measures of emotion. *Food Quality and Preference 42*, 48–55. https://doi.org/10.1016/j.foodqual.2015.01.009

Limon, Y., Kahle, L. R., & Orth, U. R. (2009). Package design as a communications vehicle in cross-cultural values shopping. *Journal of International Marketing*, *17*(1), 30–57. https://doi.org/10.1509/jimk.17.1.30

Luo, S. J., Fu, Y. T., & Korvenmaa, P. (2012). A preliminary study of perceptual matching for the evaluation of beverage bottle design. *International Journal of Industrial Ergonomics*, *42*(2), 219–232. https://doi.org/10.1016/j.ergon.2012.01.007

Maekawa, M. (2014). Models of thinking process on the perspective of external and internal constraints of design objects [in Japanese]. *Bulletin of Japanese Society for the Science of Design*, *61*(6), 9–18. https://doi.org/10.11247/jssdj.61.6_9

Magnier, L., & Schoormans, J. (2015). Consumer reactions to sustainable packaging: The interplay of visual appearance, verbal claim and environmental concern. *Journal of Environmental Psychology*, *44*, 53–62. https://doi.org/10.1016/j.jenvp.2015.09.005

Magnier, L., Schoormans, J., & Mugge, R. (2016). Judging a product by its cover: Packaging sustainability and perceptions of quality in food products. *Food Quality and Preference*, *53*, 132–142. https://doi.org/10.1016/j.foodqual.2016.06.006

Ministry of Economy, Trade and Industry. (2023). *Trends in ice cream, etc.* [in Japanese]. https://www.meti.go.jp/statistics/toppage/report/minikaisetsu/hitokoto_kako/20230309hitokoto.html

Mohebbi, B. (2014). The art of packaging: An investigation into the role of color in packaging, marketing, and branding. *International Journal of Organizational Leadership*, *3*, 92–102. https://doi.org/10.33844/ijol.2014.60248

Morinaga Milk Industry. (2024). *PARM* [in Japanese]. https://www.morinagamilk.co.jp/learn_enjoy/research/story/parmice/

Nasution, S., Hidayati, J., Nissa, N. A., & Agustiara, S. M. (2021). Redesign packaging on Aloe Vera bottle product based on Kansei Engineering. *IOP Conference Series: Materials Science and Engineering*, *1122*(1). https://doi.org/10.1088/1757-899X/1122/1/012117

Neyens, E., Aerts, G., & Smits, T. (2015). The impact of image-size manipulation and sugar content on children's cereal consumption. *Appetite*, *95*, 152–157. https://doi.org/10.1016/j.appet.2015.07.003

Otto, S., Strenger, M., Maier-Nöth, A., & Schmid, M. (2021). Food packaging and sustainability–Consumer perception vs. correlated scientific facts: A review. *Journal of Cleaner Production*, *298*. https://doi.org/10.1016/j.jclepro.2021.126733

Papantonopoulos, S., Bortziou, M., & Karasavova, M. (2021). A Kansei engineering study of Saffron packaging design. *International Journal of Affective Engineering*, *20*(4), 237–245. https://doi.org/10.5057/ijae.IJAE-D-21-00006

Putri, M. V., Iskandar, I., & Andhika. (2022). Redesign Sanjai chips packaging using Kansei engineering method. *International Journal of Information Engineering and Electronic Business*, *14*(6), 37–45. https://doi.org/10.5815/ijieeb.2022.06.04

Rebollar, R., Gil, I., Lidón, I., Martín, J., Fernández, M. J., & Rivera, S. (2017). How material, visual and verbal cues on packaging influence consumer expectations and willingness to buy: The case of crisps (potato chips) in Spain. *Food Research International*, *99*, 239–246. https://doi.org/10.1016/j.foodres.2017.05.024

Schifferstein, H. N., Lemke, M., & de Boer, A. (2022). An exploratory study using graphic design to communicate consumer benefits on food packaging. *Food Quality and Preference*, *97*. https://doi.org/10.1016/j.foodqual.2021.104458

Schütte, S. (2013). Evaluation of the affective coherence of the exterior and interior of chocolate snacks. *Food Quality and Preference*, *29*(1), 16–24. https://doi.org/10.1016/j.foodqual.2013.01.008

Schütte, S., Lokman, A. M., Marco-Almagro, L., Ishihara, S., Yanagisawa, H., Yamanaka, T., Valverde, N., & Coleman, S. (2024). Kansei for the digital era. *International Journal of Affective Engineering*, *23*(1), 1–18. https://doi.org/10.5057/ijae.IJAE-D-23-00003

Sundar, A., & Noseworthy, T. J. (2014). Place the logo high or low? Using conceptual metaphors of power in packaging design. *Journal of Marketing*, *78*(5), 138–151. https://doi.org/10.1509/jm.13.0253

Underwood, R. L. (2003). The communicative power of product packaging: Creating brand identity via lived and mediated experience. *Journal of Marketing Theory and Practice*, *11*(1), 62–76. https://doi.org/10.1080/10696679.2003.11501933

van Esch, P., Heller, J., & Northey, G. (2019). The effects of inner packaging color on the desirability of food. *Journal of Retailing and Consumer Services*, *50*, 94–102. https://doi.org/10.1016/j.jretconser.2019.05.003

Velasco, C., Hyndman, S., & Spence, C. (2018). The role of typeface curvilinearity on taste expectations and perception. *International Journal of Gastronomy and Food Science*, *11*, 63–74. https://doi.org/10.1016/j.ijgfs.2017.11.007

Wu, M. Y., & Chen, Y. H. (2021). Factors affecting consumers' cognition of food photos using Kansei engineering. *Food Science and Technology*, *42*, https://doi.org/10.1590/fst.38921

Yoshida, M., Minato, N., & Sato, M. (2021). Package design of gluten-free foods using semantic differential method [in Japanese]. *Transactions of Japan Society of Kansei Engineering*, *20*(1), 101–110. https://doi.org/10.5057/jjske.TJSKE-D-20-00015