



Research Article

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Creative Procedure of Bin Products for Children

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Abstract

This research had the objective to design children's bins and make a comparison of the new and old bin patterns. The group sampling consisted of 652 participants composed of the students and personnel in a school in Khlong Kum District, Bangkok, Thailand. For this case, multistage random sampling was used with 234 participants, and the research tools were composed of five-point Likert scale questionnaires that were measured with Cronbach's alpha coefficient with a level of 0.91, independent t-test and multiple regression analysis. From the above information, it was found that the influencing factors to the children's bin's design involved the beauty (0.32), specific attributes, (0.24), morale (0.16), ergonomics (0.10), safety (0.07), application (0.07), and the materials (0.05). In addition, when testing the model, it was found that the new bin product patterns had the most satisfaction level ($\bar{X}=4.55$; $S.D.=0.30$), followed by the original bin product patterns that had a moderate satisfaction level ($\bar{X}=3.08$; $S.D.=0.52$). Finally, when comparing the differences of the satisfaction level by using the t-test statistics, it was found that the children's satisfaction to the new bin patterns were at a higher level than the original ones with a statistical significance level of .05.

Keywords: Bin, Children, Creativity, Development, Emotional, Garbage, Influence, Products

1. Introduction

At present, human societies are facing emotional quotient (EQ) problems in learning to control emotions or thinking procedures with reasons. Thus, this is considered as associative thinking that is integrated with intelligence quotient (IQ) because the social conditions during this period of time have developed in a single direction by focusing on the evolution of technology (Lieberman, A. & Pointer Mace, D. 2010). In taking this into consideration, human societies have always neglected the psychological and social fields that have affected humans' current and future ages that would be prone to the lack of controlling emotions and learning skills to live together in society. In addition, they compromise by controlling their expression of emotions until many problems have reached severe levels according to the ratios of the development of technology (Keativipak, K., *et al*, 2020), economics, and lifestyles (Parker, J. D. A., *et al*, 2011).

In enhancing EQ in childhood would be significant for future children's lifestyles, especially for

associative thinking in the social and surrounding environment fields, including the social skills with other people in society for appropriateness (Social of Mental Health Bureau and Development, 2016). Additionally, nowadays, it has been found that environmental problems have originated from a lack of discipline by the people in dumping litter, which has become an increasing problem from the lack of consciousness and realization of the outcome with the non-achievement of good consciousness in their minds. Therefore, the generating of discipline as an appropriate attribution for good consciousness from the dumping of litter by children could create the readiness of good quality in future societies. As a consequence, learning with a strengthened EQ and understanding the social and environmental roles, as well as building stimulation would contribute to the motivation of the correct behavior for children; thus, the rewards would create motivation and self-pride. Significantly, this would involve motivating the children's interests to join in the bin creation by promoting the children's EQ to feel responsible for the environmental and surrounding social fields. Hence, the behavior of dumping in the correct way according to each type of bin's characteristics would enhance the knowledge by increasing happiness by showing one direction for the children to dump litter.

From the evaluation of humans in the current societies, this represents that childhood is a valuable human resource that could have an influence on Thailand's future development. Therefore, this could expand the development of the procedures of essential skills with the children, who are the future leaders of Thailand, or enhancing important subjects, including giving the readiness to the body, emotions, and social and intelligent fields (Darling-Hammond, L. & Bransford, J., 2005).

Learning in the twenty-first century aims at promoting to gain the learning pattern from gathering data and thinking with reasons prior to being expressed as a synthesis and becoming a form of expression (Nadtochiy, Yuliya B., 2020). Finally, this would be capable of developing sustainable knowledge in people with more effectiveness than in the past (D.R. Garrison., 2011).

Initially, in applying the learning pattern combined with the lifestyle and knowledge, this was considered as EQ, as well as was a learning guideline to alter the important lessons of children's lives. Later, this became the skills for children to gain knowledge and use their imagination with suitability according to the National Education Act B.E. 2542 (1999). Similarly, according to Snaddon (Snaddon J. L., *et al*, 2008), this was also concerned with environmental problem-solving for garbage together with consciousness and building learning as a sustainable knowledge procedure for children. Furthermore, this would have a high chance to increasingly enhance future societies with quality development of human resources by emphasizing EQ with reasons that would be representative of the children's behavior. Additionally, this case would contribute to the thinking knowledge for representing the social and surrounding environmental responsibility prior to being one of the significant components for a solution of a sustainable garbage system in a large city of Thailand (Manowong, E., 2012). Thus, this was provided with the necessary attention to solve the origin of the garbage problems that was to improve human feelings with consciousness and the feeling of responsibility for their actions. Likewise, according to the above situation, this would contribute to creating a bin product for children in terms of culturing consciousness to dump the litter with a positive attitude and satisfactory behavior through learning and stimulation inside the children's mind. As a result, this would have an appropriate outcome with regard to human behavior to aid society to be improved though the satisfactory behavior of the children as the future generations of Thailand.

2. Methodology

2.1 Research Objectives

- To study the influencing factors to the designing of children's bins.
- To compare the new pattern of children's bins and the original pattern of children's bins.

2.2 Methodology

Humans have much readiness in various aspects in the twenty-first century; thus, they rely on a special talent that animals do not have that is called goodness. Additionally, this can create new consciousness with basic change in society resulting in happiness and peace, as well as the preparation of the human potential with the rapid developments that would occur in this century consisting of the goodness inside of oneself until resulting in the framework as shown in Figure 1 (Wasi, P., 2012; Griggs, D., *et al*, 2013).

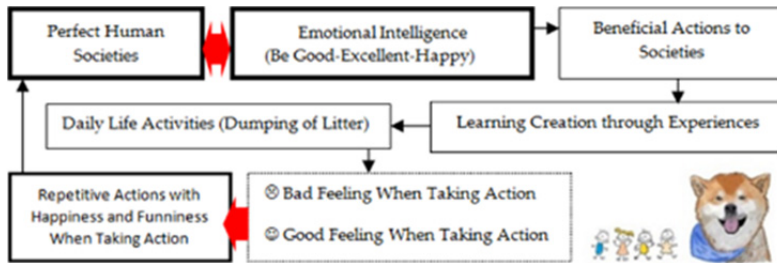


Figure 1: The designing of children's bins for the building of consciousness and emotional intelligence.
Source: Authors

2.3 Scope

- The steps of the study of the children's bin design procedure
 - a. The population comprised 652 primary school students in Khlongkum Subdistrict, Bueng Kum District in Bangkok, Thailand, and the study was conducted in the academic year 2019.
 - b. The students were selected by using multistage random sampling. This had a discrepancy of 5% according to Krejcie and Morgan (Krejcie, R. V. & Morgan, D. W., 1970; Chevalier, M., *et al*, 2020), which had a total of 234 participants.
 - c. The research tool was a structured questionnaire with the content validity in the pattern of a five-point Likert scale that consisted of reliability and Cronbach's alpha coefficient with a level of 0.91 (Cohen, S. M., *et al*, 1989; Kahraman, C., *et al*, 2003). Thus, it was analyzed by using the mean, standard deviation, and analytic hierarchy process (AHP).
- Comparison of the steps of the children's new and old bin products
 - a. The population consisted of 652 primary school students in Khlongkum Subdistrict, Bueng Kum District in Bangkok, Thailand, and the study was conducted in the academic year 2019.
 - b. The group sampling provided information about the behavior for the usage of new and old products by using multistage random sampling. This had a discrepancy of 5% according to Krejcie and Morgan (Krejcie, R. V. & Morgan, D. W. 1970; Chevalier, M., *et al*, 2020), which had a total of 234 participants.
 - c. The research tool was a structured questionnaire with the content validity in the pattern of a five-point Likert scale that consisted of reliability and Cronbach's alpha coefficient with a level of 0.89 by analyzing the data of the mean, standard deviation (S.D), and multiple regression analysis (Cohen, S. M., *et al*, 1989; Kahraman, C., *et al*, 2003; Bayazit, O., 2005).

2.4 Research Framework

2.4.1 Framework 1

There are three fields of the components of EQ that consist of the following: 1. To be a good person

that is to gain the learning ability by living together in society with other people, 2. to be an excellent person that is to have the enthusiasm in joining in activities by displaying appropriate behavior, and 3. to be happy that is to be joyful, amused, and cheerful with others (Rachanukul Institute, 2013; Egwutvongsa, S., *et al*, 2021). Thus, this would enable utilizing EQ with the building of the children's bins in terms of stimulating the children by expressing good, disciplined behavior on dumping litter with the knowledge of each type of bin's story. As a result, this would contribute to the building of learning patterns in a sustainable way for creating happiness by connecting the relationship between good knowledge and the children's behavior (Papert, S., 1993; Ejaredar, M., *et al*, 2017).

2.4.2 Framework 2

This would involve people's stimulation (De Bono, E., 1992; Shanta, S. & Wells, J.G., 2020) and would require a model with creative knowledge in terms of life experiences to become important matters by bringing the internal aspects in their minds to apply with the solutions of future problems effectively. Hence, creative ideas with happiness from their childhood would promote more people to be gentle and relaxed by increasing the esthetics until achieving good emotional intelligence (Jersild, A. T., 1972; Mount, M., *et al*, 2020; Çiftci, S. & Bildiren, A., 2020; Akben, N., 2020).

3. Results

The study of the influencing factors of the children's bin design procedure gave high priority to the environment, which was considered as the main factor contributing to the perfection of quality social conditions. Moreover, nowadays, there are more than 60 million people that dump 14 million tons of litter per year; however, the ability to eliminate all the garbage does not exceed 70%. On the other hand, there still remains a large quantity of garbage that is eliminated on the ground, which is more than that which is buried in an unsanitary way. This would result in causing damage to the environment in the future (Pollution Control Department from Ministry of Natural Resources and Environment, 2004). Furthermore, at present, Thailand has an annual mean increase of garbage of 1.64%, due to urban expansion and the adaption of agricultural societies to city societies as large industrial towns. Thus, from the population increase, there is also a concern with the tourism industry's promotion of the acceleration of the consumption ratio resulting in higher numbers of garbage, as well as the incorrect ways of garbage elimination of approximately 7.36 million tons annually (Pollution Control Department from Ministry of Natural Resources and Environment, 1977; Chiemchaisri, C., *et al*, 2008). As a consequence, the allocation of bins for the types of garbage classification from the government and private organizations has assisted the people to have responsible consciousness toward the environment. Therefore, the people in society are more likely to have knowledge of the bin classification prior to dumping litter, which has become a psychological solution and created satisfactory behavior to resolve the garbage problem at a sustainable level. Significantly, the promotion of people from childhood to gain a positive attitude toward satisfactory behavior for bin classification would enable them to have the morale and essentiality to be cultured from childhood or a learning age by memorizing the concepts and creating good consciousness. As a result, this would contribute to sustainable behavior in people's minds more than with other age groups that rely on the close relationships that are influenced by the family, school, and others. Hence; they would gain knowledge from happiness, and environmental consciousness would be a valuable human resource that could be nurtured into adults; such as, expressing good behavior to the bin classification prior to dumping litter. The conclusions to the problems and solutions are shown in Table 1.

Table 1: Guideline analysis of the solutions of the problems with the determination of the factors for the basic design.

Problem	Solution Guideline / Design Guideline
1. The over high level of the bins for children to dump litter.	➤ Suitable size bins with that of the bodies of the students.
2. The bins with the inconvenience to dump litter or being classified for litter.	➤ Preparation of the equipment that would be suitable for all age groups.
3. The bad behavior of dumping litter in the wrong bins.	➤ Attitude creation with environmental conservation for feeling responsible.
4. The feeling that the bins are dirty and disgusting.	➤ Creation of the feeling of friendliness by stimulating the children's interest.
5. The dumping of litter in the same bins that causes problems of garbage classification.	➤ Classifying the processes with colors or clear holes.
6. The lack of knowledge for the promotion about Garbage.	➤ View creation and new attitudes by stimulating interest.

Source: Authors

From learning about the problems, six fields were found to determine the goals together with the children's happiness for dumping litter by selecting the theoretical framework with the interest stimulation and provocation procedure. This was applied with the design guideline as shown in Table 2 (Serpa, S., *et al*, 2020; Saaty, T. L., 2003).

Table 2: Principle solutions and theory with interest stimulation.


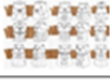



Principle and Theory	Arousing Creation with Stimulation	Design Guideline
1. Theory for the motivation with the cue stimulus as The arousing behavior.	➤ Bringing the things that the children Were interested in for stimulation.	➤ Bringing the animals that children like or Were interested in to be created.
	➤ Creating new or surprising things for Expressing the required behavior.	➤ Applying sensor technology to movement Detection for creating new things.
2. Operant conditioning theory to increase positive reinforcement by expressing the supportive Behavior.	➤ Creating suitable rewards with the Requirements to express behavior.	➤ Using sound and light technology after Dumping the litter.
	➤ Boosting a positive attitude to children's behavior to express when Receiving the rewards.	➤ Using the feedback with songs or admiration; such as, thank you or Excellent.

Source: Authors

The result of the operant conditioning theory contributed to the factor creation from using the waste separation behavior before dumping the litter and gaining the arousing behavior; such as, giving prizes and gifts, admiring and collecting the goodness score, etc. This included placing the bins to classify the types of garbage by using the motivation procedure as the stimulation of the mind with a positive feeling to the children's consciousness (Issock, P. B. I., *et al*, 2020; Pedersen, J. T. S. & Manhice, H., 2020). Thus, this could be the encouragement from showing the behavior to the waste separation prior to dumping the litter in the bins with discipline. This is shown as the creative steps in Table 3.

The SCAMPER technique with the thought development of the design consisted of 1) substituting, 2) combining with similar things, 3) adapting to use different methods, 4) modifying the original parts for improvement, 5) putting to another use or other patterns, 6) eliminating the unnecessary parts, and 7) reversing the working procedure prior to applying the design as the new concept (Poon, J.C.Y., *et al*, 2014; Egwutvongsa, S. & Seviset, S., 2021).

Table 3: Creative design procedure by using the SCAMPER technique.

Creative Step	Operating Procedure of New Product Creation
	1. Data Processing Step: This would be able to create the mood and tone for determining the concept and using the inspiration for the application by removing the sign with an idea sketch. Then, this would enable to create the design concept by using four main words to build the work; such as, childlike, cheerful, sanitary, and sustainable.
	2. Concept Creation: The analysis of the interest stimulation for making happiness and cuteness as childlike would result from the design concept through brainstorming by searching for a guideline (Wu, T. T. & Wu, Y. T., 2020; Chang, Y.S., et al, 2021; De Bono, E., 1992).
	3. Idea Development: This would bring the result from the solving principle of the SCAMPER design by using the diffusion attribution in the most appropriate way. Later, the analysis of the thought details could be separated from the seven components by presenting the product patterns of the guideline methods (Dasgupta, P., 2007).
	4. Applying into the SCAMPER Technique Principle: This would bring the result of the development of the idea for selecting the draft pictures with three children's bin models through brainstorming by applying the design concept and the result of the assessment for the pattern selection of the design principle at the highest level (De Bono, E., 1992).
	5. Applying into the Analytic Hierarchy Process (AHP): From the result of the creative design for the children's bins through the synthesis procedure, this would present the three models of the children's bins and the details of the manufacturing steps consisting of the sizes, colors, mechanisms, materials, etc. After that, these three patterns would be brought for the analytic hierarchy process (AHP) for selecting the most suitable model (Saaty, T. L., 2003).

Source: Authors

Moreover, the result of the factor analysis affected the design of the bin products for the children based on the principle of the analytic hierarchy process (AHP). This resulted in the product development depending on the outcome and the consideration of the standard from the new product's design procedure (Sipahi, S. & Timor, M., 2010). Therefore, this was able to determine the significant analysis standard by examining the hierarchy showing as a procedure (Table 4).

Table 4: Matrix analysis to the weight level value of the influencing factor.

The Standard for the Weight Value Factor	Safety	Applying Role	Ergonomics	Morale	Beauty	Specific Attribution	Material	Eigenvector
Safety	0.06	0.04	0.04	0.04	0.09	0.04	0.16	0.067
Applying Role	0.12	0.07	0.04	0.04	0.07	0.07	0.11	0.074
Ergonomics	0.12	0.14	0.08	0.04	0.09	0.07	0.16	0.100
Morale	0.17	0.21	0.24	0.12	0.12	0.07	0.16	0.157
Beauty	0.23	0.29	0.32	0.36	0.36	0.44	0.21	0.316
Specific Attribution	0.29	0.21	0.24	0.36	0.18	0.22	0.16	0.237
Material	0.02	0.04	0.03	0.04	0.09	0.07	0.05	0.048
Total	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.000

Source: Authors

According to the importance rating scale of the selection of the children's bin product, the value of the eigenvector was utilized to make an analysis with the selection standard of the consistency ratio (CR). In this study, this appeared in the analysis result as D that was equal to 52.42, Max was equal to 7.49, the consistency index (CI) was equal to 0.08, and CR was equal to 0.062.

Then, the random consistency index (RI) was equal to 1.32; thus, a conclusion could be made

that the CR was equal to 0.062 with a less value of 0.1. Therefore, the consistency value of the compared procedure was in the accepted standard with the result of the analysis being classified with the weight in each factor.

From the seven weight standards of significance, it was found that the first rank was beauty that was equal to 0.32, the second rank was specific attribution that was equal to 0.24, the third rank was morale that was equal to 0.16, the fourth rank was ergonomics that was equal to 1.00, the fifth rank was safety that was equal to 0.07, the sixth rank was applying role that was equal to 0.07, and the seventh rank was materials that was equal to 0.05. Additionally, this accounted as the minor standard that the children applied with the decision procedure for selecting the bin products. After that, the important rating scale in each standard was used to check for the validity from the consistency in three new developed bin patterns that were shown as having significance (Table 5).

Table 5: Selection ranking of the three products to the weight consideration for each new developed pattern.

Alternative Standard	Standard							Important Rating Scale
	First	Second	Third	Fourth	Fifth	Sixth	Seventh	
Standard Weight	0.067	0.074	0.100	0.157	0.316	0.238	0.048	
01	0.071	0.065	0.099	0.156	0.323	0.237	0.048	0.2047
02	0.066	0.073	0.099	0.155	0.323	0.236	0.048	0.2046
03	0.072	0.074	0.103	0.135	0.299	0.267	0.049	0.2021

Source: Authors

The testing result of the significant statistical value from the AHP demonstrated a conclusion from the important rating scale with each standard; namely, the first rank or Waste Container 01 as the most suitable model that was equal to 0.2047, the second rank or Waste Container 02 with the second significant value that was equal to 0.2046, and the third rank or Waste Container 03 with the least significant suitability that was equal to 0.2021. Thus, Waste Container 01 was found to be the most appropriate model from using the influencing factor that took into consideration each field prior to using the models' manufacturing steps for the children's real test.

As a result of applying the outcome of the selection by using the product pattern from Waste Container 01, this could create the future image by using the technique of the scenario analysis of the design. Similarly, it could be used for the expectation of the future image of the children's bin model in the real environment and area by preparing the guidelines to the children's group's that could be applied as the satisfactory behavior (Figure 2).



Figure 2: Making a conclusion with the scenario analysis of the design prior to manufacturing the children's bin models.

Source: Authors

The steps of the testing procedure for applying the bins from the children was able to take the satisfaction assessment from the user groups; such as, the primary students, to make the comparison with the usage results between the new and the old product patterns.

Additionally, the selection standard for conducting the satisfaction assessment was based on the analysis and the setting of the children’s behavior assessment standard by the expression of the behavior to use the new developed bins according to the following targets: 1. to promote morale, and 2. to stimulate the behavior of a service mind (Table 6).

Table 6: Analysis of the framework to implement the behavior assessment standard.

Supportive Principle with the Behavior of the Design Principle	Expressing the Standard of Behavior Assessment
1. Promote the behavior of dumping litter in the correct bins.	☺ Children could dump the litter conveniently.
2. Promote children to separate the litter before dumping.	☺ Children could separate the litter with the type of bins.
3. Promote and stimulate children to be interested in dumping litter.	☺ Use the bins to stimulate the children to be interested.
4. Promote the morale of environmental conservation.	☺ Use the bins to support the morale with creating a good environment for the children.
5. Support pride to the children.	☺ Use the bins to make pride for the children by dumping the litter correctly.
6. Continuously support the dumping behavior in the correct way.	☺ Use the bins to make the correct behavior to continuously dump litter.

Source: Authors

The result of the satisfactory assessment that was expressed by the children’s behavior involving the original and new bin usage is shown in Table 7.

Table 7: Result of the satisfactory behavior assessment for the original and new bin usage of children (n=234).

Assessment List	Original Pattern Bin			New Pattern Bin		
	Mean	S.D.	Satisfaction	Mean	S.D.	Satisfaction
1. Children could dump the litter conveniently.	2.87	1.09	Moderate	4.96	0.20	At Most
2. Children could separate the litter into the type of bins.	3.69	0.83	Excellent	4.51	0.77	At Most
3. Use the bins to stimulate and arouse the children’s interest.	3.08	0.82	Moderate	4.30	1.03	Excellent
4. Use the bins to strengthen the morale with the children about environmental conservation.	2.70	1.06	Moderate	4.18	1.17	Excellent
5. Use the bins to generate a positive feeling for the children when dumping the litter.	3.52	0.75	Excellent	4.72	0.62	At Most
6. Use the bins to stimulate continuous correct dumping in the future.	2.62	0.72	Moderate	4.65	0.71	At Most
Total	3.08	0.52	Moderate	4.55	0.30	At Most

Source: Authors

According to the results shown in Table 7, it was found that the new bin pattern had the most level of satisfaction (Mean=4.55; S.D.=0.30). Likewise, it had greater values than the original bin patterns with a moderate level of satisfaction (Mean=3.08; S.D.=0.52). Therefore, a comparison could be made as a basic way to demonstrate that the children’s group had a higher level of satisfaction for the new bin pattern more than the old one. In addition, the satisfaction value had the highest level for all six standards with the ordering from the first to the third ones; thus, the children could conveniently dump the litter (Mean=4.96; S.D.=0.20). As a result, these bins could create pride among the children for dumping the litter correctly (Mean=4.72; S.D.=0.62), as well as making the correct behavior for continuously dumping litter in the future (Mean=4.65; S.D.=0.71).

The creation of predicting the equation of the children’s satisfaction to the new designed bins from the guideline depended on the steps of the factor assessment of the children’s satisfaction for the new developed bins. In addition, applying the real product models to be tested in the targeted area by conducting an assessment from the actual feeling occurred while the children were testing these products. Additionally, this was able to represent the result of the assessment from all seven factor components by selecting four influencing factors according to the Multi-Criteria Decision Analysis (MCDMA). Then, this assisted with the decision procedure to select the suitable answers with the problem conditions by using the AHP (Table 8).

Table 8: The mean, standard deviation, influencing factors to the satisfaction of the newly developed bins for the customer groups (n=234).

Influencing Factor to New Bin Satisfaction	Mean	S.D.	Factor Level
Satisfaction to the New Bins	4.24	0.75	Excellent
X1) Beauty of the bins.	4.50	0.59	Most
X2) Uniqueness of the bins.	4.36	0.64	Excellent
X3) Combination of the morale of dumping litter.	3.54	0.77	Excellent
X4) Consistency of ergonomics.	4.04	0.69	Excellent

Source: Authors

From the result of the assessment of the four input factors, it was found that the testing group had the satisfaction from the most to the least consisting of several factors; namely, beauty of the bin (X1) with the highest level of satisfaction (Mean=4.50; S.D.=0.59), uniqueness of the bin (X2) with an excellent level of satisfaction (Mean=4.36; S.D.=0.64), consistency of ergonomics (X4) with an excellent level of satisfaction (Mean=4.04; S.D.=0.69), and combination of the morale of dumping litter (X3) with an the excellent level of satisfaction (Mean=3.54; S.D.=0.77). This showed the overall satisfaction to the new bins with an excellent level (Mean=4.24; S.D.=0.75) before being concluded for the correlation of the two variables with significance by using a t-test for testing the statistics (Table 9).

Table 9: Conclusion of the correlation between the multiple variables.

Variable	X1	X2	X3	X4	Y
X1) Beauty of the bins.	1.00				
X2) Uniqueness of the bins.	1.10	1.00			
X3) Combination of the morale of dumping litter.	5.49*	0.11	1.00		
X4) Consistency with ergonomics.	1.03	-2.19	0.73	1.00	
Y) Satisfaction of the customer groups.	2.97*	-2.59*	0.69	2.70*	1.00
Mean	4.50	4.36	3.51	4.01	4.21
Standard deviation	0.59	0.64	0.77	0.69	0.75

Source: Authors

Thus, it could be concluded that the factors between the variables of satisfaction for the customer groups consisted of the beauty of the bins (X1), uniqueness of the bins (X2), and consistency of ergonomics (X4). Consequently, all three variables were related to satisfaction when applying the new bins. Later, after conducting an analysis of the influencing relationships, it was found that the beauty of the bins (X1) was involved with the combination of the morale of dumping litter (X3), and the uniqueness of the bins (X2) was involved with the consistency of ergonomics (X4). However, other multiple factors were not involved with each other.

Table 10: Decision coefficient or R₂ of the influencing factors to the satisfaction of the new bin pattern (n=234).

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
Testing	0.3152	0.0994	0.0836	0.719

Source: Authors

Table 10 represented the decision coefficient with the value of 0.994, or the testing of the influencing factors to the bin’s design. Therefore, this could explain the alternation of the level of satisfaction by 9.94% by applying the influencing factors to the satisfaction of the new bin’s design with the regression equation determination that was \hat{y} was equal to $3.518 + (0.292 X_1) + (-0.189 X_2) + (-0.106 X_3) + (0.153 X_4)$.

Table 11: Analysis of the relationships between the design factors and satisfaction.

Testing	SS	df	MS	F	Sig.
Regression Equation	13.078	4	3.270	6.316	0.000
Discrepancy	118.545	229	0.518		
Total	131.624	233			

Source: Authors

According to Table 11, this was based on the predictors; namely, the beauty of the bins (X₁), uniqueness of the bins (X₂), combination of the morale of dumping litter (X₃), and the consistency of ergonomics (X₄) with the dependent variable. In this study, this was included with the satisfaction of the new designed bins, which the analysis result of the F-test was equal to $6.316 > F\text{-table} = 2.430$. Thus, it was found that the independent variable or X of at least one variable was related to the dependent variable or Y.

Table 12: Representation of the multiple linear regression of predicting the satisfaction variables for applying the new bin patterns influenced from the co-designing factors.

Predicting Variables	b	S.E.b	B	t	P
Constant	3.518	0.559		6.290	0.000
X1) Beauty of the bins.	0.292	0.085	0.231	3.455	0.001
X2) Uniqueness of the bins.	-0.189	0.074	-0.164	-2.572	0.011
X3) Combination of the morale of dumping litter.	-0.106	0.065	-0.110	-1.646	0.101
X4) Consistency of ergonomics.	0.153	0.069	0.141	2.220	0.027

Source: Authors

Table 12 presented the multiple linear regressions for predicting the variables of the children’s satisfaction to the newly designed bins. Furthermore, it was found that the beauty of the bins (X₁) had a multiple linear regression equal to 0.29. As such, this could infer that when importance was given to the beauty of the bins as one unit, the children’s satisfaction to the newly designed bins would have an increased chance of 0.29 units.

The uniqueness of the bins (X₂) showed a multiple linear regression equal to -0.18, which could infer when importance was given to the uniqueness of the bins as one unit, the children’s satisfaction to the newly designed bins would have a reduced chance of 0.18 units.

The combination of the morale of dumping litter (X₃) showed a multiple linear regression equal

to 0.10. This could infer that when importance was given to the combination of the morale of dumping litter in one unit, the children’s satisfaction to the newly designed bins would have a reduced chance of 0.10 units.

The consistency of ergonomics (X4) showed a multiple linear regression equal to 0.15. This could infer that when importance was given to the consistency of ergonomics in one unit, the children’s satisfaction to the newly designed bins would have an increased chance of 0.15 units. As a result, it could be concluded that the predicting equation of the design of the bin products could be as follows:

1. According to the above details, the predicting equation as raw scores could be made as follows:
 - i. $\hat{y}=3.518 + [0.292 \text{ (beauty of the bins)}] + [-0.189 \text{ (uniqueness of the bins)}] + [-0.106 \text{ (combination of the morale of dumping litter)}] + [0.153 \text{ (consistency of ergonomics)}]$
 - ii. $\hat{y}=3.518 + (0.292 X_1) + (-0.189 X_2) + (-0.106X_3) + (0.153 X_4)$
2. Furthermore, the predicting equation could be made as the standard score attributions as follows:
 - i. $Z=3.356 + [0.245 \text{ (beauty of the bins)}] + [-0.188 \text{ (uniqueness of the bins)}] + [0.150 \text{ (consistency of ergonomics)}]$
 - ii. $Z=3.356 + (0.245 X_1) + (-0.188 X_2) + (0.150 X_4)$
3. Therefore, in applying the results of the satisfaction assessment, this could classify the assessment details from the children’s expressed behavior of the satisfied designs between the original bins and the new bins (Table 13).

Table 13: Analysis of the mean and standard deviation from the satisfied behavior assessment between the original bin patterns and the new bin patterns of the children (n=234).

Assessment List	Original Bin		New Bin		Comparison	
	Mean	S.D.	Mean	S.D.	t	Sig.
1. Children could conveniently dump litter in the bins.	3.33	0.62	3.98	0.73	-10.258	0.000
2. Children could classify the litter with the types of bins.	3.57	0.73	3.66	0.80	-1.160	0.123
3. Bins could generate arousing behavior and interest for children.	3.20	0.89	4.51	0.55	-19.135	0.000
4. Bins could boost the morale of environmental conservation for children.	2.44	0.90	4.07	0.72	-20.016	0.000
5. Bins could create pride for children to dump litter correctly with positive feelings.	2.75	0.75	3.69	0.76	-13.545	0.000
6. Bins could promote the dumping of litter correctly and continuously in the future.	2.91	0.68	3.87	0.71	-15.026	0.000
Total	3.03	0.41	3.96	0.31	-4.386	0.001

Source: Authors

Table 13 displayed the results of the analysis that found the children’s behavior to dump litter conveniently stimulated and made them interested, as well as generated morale to save the environment. In addition, the bins could create pride for dumping the litter correctly until having a positive feeling, as well as generating the correctness of dumping the litter from now on. Therefore, all five fields that represented the new bin patterns had a higher level of satisfaction than the old ones with significance of .01. As a result, the children were able to separate the litter into the correct types of bins. This did not show the significance level of .01.

The new bin product patterns had a value of satisfaction at an excellent level (Mean=3.96; S.D.=0.31) that was greater than that of the original bin product patterns with a moderate level of satisfaction (Mean=3.03; S.D.=0.41). Therefore, this enabled to make the comparison that the new bin

product patterns applied by the children created more satisfactory behavior than the old ones. Additionally, in applying the new bin patterns, this represented a higher level of satisfaction values in all six standards. Therefore, it could be concluded that the assessment of the satisfactory behavior from applying the new bin patterns had a higher level of satisfaction than the old ones with a significance level of .01.

4. Discussion and Conclusion

The study of the factors influencing the children's bin design procedure brought the scenario of the design to be created with the determination of the factors by using the theory of motivation and the operant conditioning theory. Later, this was brainstormed by using the SCAMPER technique (Egwutvongsa, S., *et al*, 2021; Egwutvongsa, S., 2021). At present, this is able to determine the seven factors with the effects from the children's bin design consisting of safety, applying role, ergonomics, morale, beauty, specific attributions, and material properties and others. All factors were then utilized to be the selected standard of the new developed products based on the analytic hierarchy process (AHP). Then, this enabled the search for the significance of three new developed draft bin models, which it was found that Waste Container 01 had the most suitability. Therefore, this resulted in the creation of the model's image by using the technique of the scenario analysis for the design, and according to the expectation for the future image, it was found that the consistency of the real applying guideline to the customer groups resulted in positive satisfactory behavior. As a consequence, the results of the analysis could be used to manufacture the real models in the industrial field (Ismail, R., *et al*, 2020; Keativipak, K., *et al*, 2019). As a result, this was consistent to the concept as follows:

"The product design for children should result from the studying of the main and the minor factors in terms of making understanding and responding to these factors with going effectiveness (Thangthong, P., et al, 2019; Egwutvongsa, S., et al, 2008)."

According to this concept, this could be applied until finding that the influencing factors to the children's satisfaction had a variety with the different satisfaction factors like other age groups. Therefore, the creation of the seven fields would be essential to plan for making perfect products that could conform with the following concept:

"The creative product design for children must depend on the planning; such as, the interaction between children and things for making understanding to the results from this procedure (Yamada-Rice, D., 2018)."

From the creative procedure in this characteristic, this was considered as the response of the physiology (Aniago, E., *et al*, 2020; Weisberg, R. W., 2004), including creating the co-learning from the new developed environment (Braun, V. & Clark, V., 2006; Anderson, R. C. & Haney, M., 2020; Brooks, R., *et al*, 2020).

In comparing the new and old bins, the result of the satisfaction assessment of the model bin product showed that Waste Container 01 had the highest satisfaction level. It had a greater value than the original bin patterns in the moderate level; moreover, when making the comparison with the result in that subject, it was found that the new products had high satisfaction: 1. the children could dump the litter in the bins conveniently, 2. using the bins created pride among the children when dumping the litter correctly, and 3. using the bins to create continuous correct behavior to dump litter in the future. This conformed to the following concept (Healey, A., *et al*, 2019; Gucyeter, S. & Camci Erdogan, S., 2020).

"The children and juvenile product creation must be stimulated by the development as the best way to be assisted for making understanding of the bodies, social and emotion fields, and it is the important tool for making interaction in the future (Dimuna, K. O. & Olotuah, A. O., 2020; Tonetto, L. M., et al, 2020)."

From the result of the assessment of the comparison, it was found that the new products had a higher satisfaction value among the children groups more than the old products in the market with a significance level of .05. Furthermore, the overall images of the new children's bins could stimulate the children to be interested in applying the bins suitably with the good potential for generating arousing behavior (Wiley, A. N., 2014). Therefore, this assisted in gaining the satisfactory behavior for children by dumping the litter appropriately (Bean, J., 2015; Nikkola, T., et al, 2020; Boltabayevich, B. B. & Shodiévna, B. O., 2020). As a result, this could respond directly to the goals of the children's product design in this digital age in terms of being memorized as being a worthy experience and having a positive result to the users (Roygardner, D., et al, 2020; Trost, S. G., et al, 2010; Hardy, L. L., et al, 2013; Greco, J., 2020; Ameye, H. & De Weerd, J., 2020).

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