

Article

Research on Innovative Self-Made Multifunctional Teaching Toys and Self-Made Picture Books

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Abstract: We developed the “innovative multi-functional teaching toy inside and outside the tent” with situational picture books, which had several game modes for parents and children to play the game together. The result of this research was filed for an invention patent and won the Gold Medal in the International Invention Competition. We analyzed the advantages and disadvantages of commercially available tents and conducted quantitative research to understand the effectiveness of the products. In the quantitative research, a self-written questionnaire was created and tested for reliability and validity. 34 research subjects were invited to use traditional backpacks and innovative “innovative multi-functional teaching toys inside and outside the tent” and fill out a questionnaire. The result was analyzed to understand the new products.

Keywords: Innovative multifunctional teaching toys inside and outside the tent, Picnic mats for large muscle activities, Game tents

1. Introduction

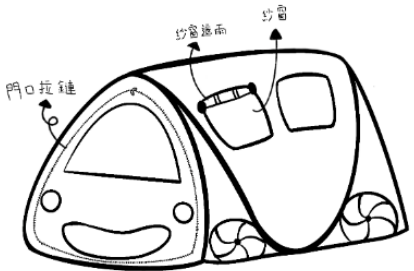
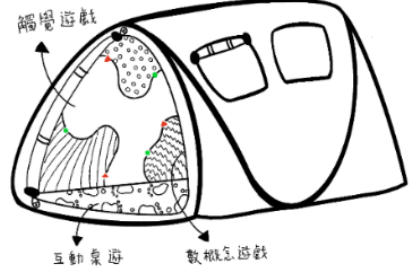

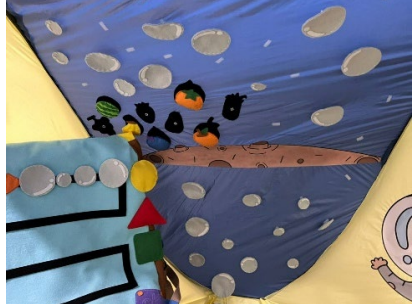


Parents are the most important members of family education and also play an important role in children’s growth and learning. The family structure, parents’ different parenting styles, and parent-child relationship interaction affect children’s personality traits (Lin, 2012). Many parents tend to overuse technological products on their children, causing physical effects on children, such as myopia, emotional disorders, inattention, hyperactivity, and language learning disabilities, and indirectly affecting the interaction between parents and children. In recent years, the types of domestic leisure activities have been constantly changing from resort tours to adventures in mountains and fields, and the accommodation has been changed from hotels and B&Bs to camping (Wu, 2019). Through camping and picnics, people tend to enhance and cultivate the emotional and tacit understanding between parents and children in addition to relaxing the body and mind (He, Hu, and Gao, 2021). The tent designed in this study required muscle activities. Using the game picnic mat and the convenient and detachable hexagonal panels, a variety of games were created. In the light and shadow interactive drama, a slide-like method was used to project the background of the story inside the tent or on any wall, allowing children to operate puppets to perform the drama. The function of drama development activities in language development was to provide children with different situations and environments for practical language use (Fan, 2021) and promote social skills (van Berkel, & Bosman, 2023). Cognitive and operational games guided children to count concepts through situations, making learning more interesting. A tactile board was installed inside the tent combined with a maze game depending on the development stages of all ages. These activities helped children develop in six major areas, covering physical movement and health, cognition, language, society, emotion, and beauty (Ministry of Education, 2023) and allowed them to experience nature during camping and improve their relationship with parents.


In this study, we developed “innovative multifunctional teaching toys and self-made situational picture books inside and outside the tent” based on the design drawings. Then, quantitative research was conducted for 100 research subjects after being tested for reliability and validity. 34 preschool teachers conducted pre-and post-tests to understand the effectiveness of the developed products through the dependent sample t-test.

2. Design

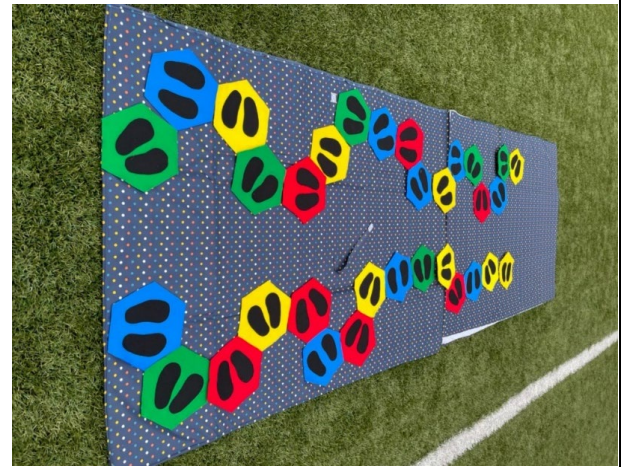
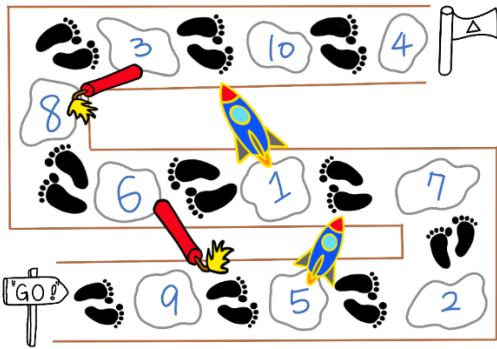
We designed the printing and sewing of the fabric of the tent, the educational toys inside the tent, a picnic mat for gross motor activities, and a self-made situation guidance picture book. The multi-functional teaching toy was to teach to operate alone and combine the tent body and self-made situational guidance picture books in several game modes. Table 1 shows the design and photos of the “Tent Inner and Outer Multifunctional Educational Toy”. The functions are described in Table 1.

Table 1. Design of the developed tent in this research.

	
<p>The appearance of the tent was designed to look like a car, and it also has ventilation windows and curtains to protect from rain.</p>	<p>Four main axes were designed, including tactile games, interactive board games, digital concept games, and light and shadow games. All games were operated alone or by four to five people.</p>
	
<p>The layout design of the number concept game. There was the appearance on the right side of the tent. The layout included five operations of the number concept game.</p>	<p>Bubbles lined up (1) Observe the order of bubbles on the oxygen bottle. (2) Arrange the bubbles in space on the oxygen bottle.</p>
	
<p>Fruit shadow fun (1) Fruits were food for aliens.</p>	<p>Very hungry alien</p>

<p>(2) Correspond the fruit to the relative shadow.</p>	<p>(1) Aliens came in five different colors: red, orange, green, purple, and yellow.</p> <p>(2) Classified the colors of all fruits for the aliens to eat, such as red aliens eating apples and strawberries, and orange aliens eating oranges and persimmons.</p>
	
<p>Planets collide</p> <p>(1) There were five planets and five aliens respectively.</p> <p>(2) Pair the alien with the planet. Then, the alien went home smoothly.</p>	<p>Tangram puzzle puzzle</p> <p>(1) Designed the meteorites in space as block puzzles.</p> <p>(2) Put the meteorite into the shape in the picture card.</p>
	
<p>Rescue A Chou was touching</p> <p>Tactile layouts were designed with sponges, sandpaper, plastic, scouring pads, and beans. A tactile experience where the white lines were the maze.</p>	<p>A master at looking at pictures and making sentences</p> <p>(1) People, things, time, places, and object cards were placed at the entrance and exit of each tactile body.</p> <p>(2) After experiencing each touch, you need to draw a card. After experiencing the five touches, you have one person, thing, time, place, and object card in your hand.</p> <p>(3) Created a short story based on the patterns on the cards.</p>

	
<p>Weight-to-weight ratio</p> <p>(1) Hang up the radish and observe it. (2) Compare the quantities on both sides.</p>	<p>Expressions messed up</p> <p>(1) Stand behind the carton with your hands sticking out from the two round holes. (2) Emotions were spelled out according to the emotion chart.</p>
	
<p>Color was gone</p> <p>(1) Used the characteristics of cellophane to observe the same picture. (2) Checked what was missing, for example, look with red cellophane, and the red butterfly disappeared.</p>	<p>Magic flashlight</p> <p>(1) Put the flashlight paper card into the mezzanine. (2) Look at what appears on the picture card.</p>
	
<p>Junior Painter</p> <p>(1) The ziplock bag contains sand made from rice. (2) Used fingers to imitate drawing cards.</p>	<p>Hand in hand</p> <p>Play a hand shadow game using the properties of light.</p>



Step by step

- (1) Throw a dice to determine the number of steps forward. For example, if a player rolls 5, the player will move forward five steps, starting from the third footprint of go.
- (2) The player who reaches the end first wins.
- (3) If you encounter a rocket, you can move forward to the footprints or stones pointed by the rocket. For example, if the player walks to stone No. 5, then it can move forward five steps.
- (4) If you encounter a bomb, you will retreat to the footprints or stones pointed by the bomb. For example, if the player reaches stone No. 6, he will retreat nine steps.

Conquer the Plate Army

- (1) The player starts from the starting point.
- (2) Two players guess the game and the winning player can jump forward one space in sequence according to the direction of the footprints in the hexagon.
- (3) The player who reaches the finish line first wins.



The self-made picture book "Magic Tent" with computer graphics tells the story of aliens. The content of the story was combined with the operation of teaching aids. It was lively and interesting and satisfied children's imagination of outer space.

The tent body, big muscle game mats, and color plates were stored in this self-made tent round storage bag. The teaching toys related to the tent group were stored in this self-made multifunctional teaching toy operation backpack.

3. Results and Discussions

3.1. Questionnaire Survey

Since there were currently no relevant children’s play tents, we referred to the characteristics that children’s toys must have. We invited three experts to provide revision opinions as a reference based on the structure and content of the questionnaire. There were 11 questions in the questionnaire on a five-point scale. 100 childcare staff were invited to conduct a pre-test. 6% of them were in their 20s, 43% in 21 to 30 years old, 24% in 31 to 40 years old, 21% in 41 to 50 years old, and 6% in 50 and above. 27% worked for vocational public kindergartens, 56% for private kindergartens, 11% for public childcare centers, and 6% for private childcare centers. After the pre-test, the project analysis was conducted first, and Pearson correlation analysis was performed. The correlation coefficient was 0.3 at a significance level of 0.05. Questions with a correlation coefficient of lower than 0.3 were deleted. 27% of the questions were selected by the research subjects and grouped into high and low groups. An independent sample t-test was conducted. We conducted the KMO sampling suitability test. If the value was close to 1, the correlation of the variables was higher and more suitable for factor analysis (Wang, 1999). The KMO value of the survey was 0.88, which met the decision-making standard. The Bartlett’s sphericity test result indicated that there were common factors among the parent group correlation matrices suitable for factor analysis (Wang, 1999). Then, factor analysis was carried out with principal component analysis. The factor loading greater than 0.30 and the eigenvalue greater than 1 were used as the selection criteria (Wu, 2013). The summary of the factor analysis results with the rotation axis is shown in Table 2. The eigenvalue of factor 1 was 5.75, which was explained by 52.24% of the variation. The loading value of factor one was between 0.75 and 0.91, and was named “the function of the tent with teaching aids”. The eigenvalue of factor two was 2.12, which explained 19.26% of the variation. The loading value of the second factor was between 0.73–0.86 and named “the characteristics of the matching teaching aids of situational picture books”. The total variance explained by the two factors accounted for 71.50% (Table 2).

Table 2. Summary of the factor analysis result of the survey for the developed toddler play tent.

Question Number	Content	Factor 1	Factor 2
9	The tent is paired with teaching aids to improve children’s fine motor development	0.91	
8	The tent is paired with teaching aids to enhance children’s cognitive abilities	0.91	
7	Pairing the tent with teaching aids can enhance the development of young children’s number concepts	0.87	
4	The tent is equipped with teaching aids, which can improve children’s language expression ability during the operation	0.85	
6	Paired with teaching aids, the tent can enhance children’s imagination and creativity.	0.83	
11	The tent is paired with teaching aids to help children understand the types of emotions	0.81	
5	Pairing the tent with a play mat can enhance the development of children’s gross motor movements.	0.80	
10	Paired with teaching aids, the tent can improve children’s spatial abilities	0.75	
2	Picture books paired with teaching aids can enhance children’s interest in learning		0.86
3	Picture books provide tasks and increase children’s motivation for active operations		0.77
1	The theme of the picture book is novel, lively, and interesting, which can attract children’s attention		0.73
	Eigenvalues	5.75	2.12
	Explained variance (%)	52.24	19.26
	Cumulative explained variance (%)	52.24	71.50

For testing the internal consistency, Cronbach α coefficient was used to examine the reliability of the full scale and subscales. The reliability of “the function of matching teaching aids with tents” was 0.95, and that of “Features of matching teaching aids with situational picture books” was 0.71. The reliability of the full scale was 0.92.

We invited 34 educators. 65% of them work for kindergarten education and 35% work at nursery centers. For the current traditional play tent and the developed tent, we explained and demonstrated how to use them to the personnel for them to evaluate. Tables 3 and 4 present the average scores and standard deviations of “the Function of Tents with Teaching Aids” and “the characteristics of the matching teaching aids of situational picture books” for the traditional and the developed play tents.

Table 3. The average scores and standard deviations of the functional subscales of the research objects using two ways of tents with teaching aids.

the function of the tent with teaching aids				
Group	Traditional game tent		Parent-child multifunctional tent group	
Topic	Average	Standard Deviation	Average	Standard Deviation
4. The tent is matched with teaching aids, which can improve children’s language expression ability during operation	3.00	0.92	4.65	0.65
5. The tent is matched with the game mat, which can strengthen the development of children’s large muscle movements	3.21	0.98	4.82	0.39
6. Tents with teaching aids can enhance children’s imagination and creativity	3.12	1.07	4.71	0.52
7. Tents with teaching aids can enhance the development of children’s number concept	3.03	1.09	4.74	0.51
8. Tents with teaching aids can strengthen children’s cognitive ability	3.18	0.97	4.79	0.41
9. Tents with teaching aids can improve children’s fine motor development	3.03	0.97	4.71	0.58
10. Tents with teaching aids can improve children’s spatial ability	3.21	1.01	4.79	0.41
11. Tents with teaching aids can help children recognize the types of emotions	2.97	0.94	4.68	0.59

Table 4. The average score and standard deviation of the characteristic subscale of the research subjects using two methods of situational picture books and teaching aids.

the characteristics of the matching teaching aids of situational picture books				
Group	Traditional game tent		Parent-child multifunctional tent group	
Topic	Average	Standard Deviation	Average	Standard Deviation
1. The theme of the picture book is novel, lively, and interesting, which can attract children’s attention	3.24	0.78	4.65	0.60
2. Picture books paired with teaching aids can enhance children’s interest in learning	3.24	0.85	4.68	0.64
3. Picture books provide tasks and increase children’s motivation to take initiative	3.18	0.94	4.76	0.50

The above results were tested by dependent sample T, and the results are shown in Table 5. The *p*-values reached the significant level of 0.05, showing that the developed tent was evaluated to have better functions as educational toys, large muscle game picnic mats, and floor mats for board games. The result of “the total average of the subscale “Characteristics of situational picture books with teaching aids” showed that the *p* values reached a significant level of 0.05, indicating the developed tent had the uniqueness, fun, functionality, and diversification.

Table 5. Dependent sample T-test for subscales.

Subscale	The average number of traditional toddler tents	The average number of multifunctional teaching aid tents	The standard deviation of traditional toddler tent	The standard deviation of multifunctional teaching aid tent	T Value	p Value
The function of the tent with teaching aids	3.10	4.74	0.91	0.47	10.065	0.000
Features of situational picture books with teaching aids	3.22	4.70	0.80	0.53	9.364	0.000

4. Conclusion

The innovative multifunctional teaching toys inside and outside the tent developed in this study help parents interact with children. They can play indoors which is sufficient, and the interior design is exquisite and special with rich and diverse game content. There are different mini-games. The tent is windproof, waterproof, breathable, and convenient for families to use in camping. In addition to operation, it can be used as an outdoor sunshade tent to arouse children's interest, provide children with situational exploration, and allow them to install easily. Children can create self-made situational picture books and explain to their parents about them. The story can be creative as paintings of the tent are interesting for parents to effectively guide children to operate educational toys. The picture book function helps children absorbed in the game and enhances their imagination and creativity.

5. Patents

The self-made multi-functional emotion-teaching aids were patented for invention and were awarded the Gold medal in the Green Concept International Invention Competition. (Patent application country/type/certificate number/patent start and end date: Republic of China/Invention No. I795342/2023.3.1–2042.11.21).

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References

- Wu, J. (2019). Luke is coming, and I will briefly talk about the profile of camping consumers. *Carat Media Weekly*, May 8, 2019.
- Fan, M. R. (2021). Research on Creative Drama Curriculum and Children's Language Development. Master's Thesis, Department of Cultural and Creative Industry Management, National Taipei University of Education, Taipei.
- Ministry of Education. (2023). *Curriculum Outline for Kindergarten Education and Care Activities*; Taipei, Taiwan: National and Preschool Education Department, Ministry of Education.
- van Berkel, A. J. M., & Bosman, A. M. T. (2023). Sociable in someone else's shoes: A review of drama as social skills training for elementary school children. *International Journal of Research in Education and Science (IJRES)*, 9(1), 165-187. <https://doi.org/10.46328/ijres.3037>
- Wang, B.J. (1999). *SPSS for Windows and Behavioral Science Research*; Taipei, Taiwan: Psychology.
- Wu, M. L. (2013). *SPSS Statistical Applied Learning Practice: Questionnaire Analysis and Applied Statistics*; New Taipei City, Taiwan: Easy to Learn.
- He, Y. M., Hu, Y. W., & Gao, Y. X. (2021). Research on leisure motivation and leisure benefits of parent-child camping activities. *Journal of Leisure and Health Care*, 26, 77–93.
- Lin, Y. S. (2012). A study on the influence of parents' participation in parent-child activities on parent-child interaction and children's cognitive learning and growth. Master's Thesis, Department of Education, National Taitung University, Taitung, Taiwan.

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