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Research Article

Upcycling perceptions of gifted students

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Abstract

One of today's most important environmental problems is waste. Separating and recycling waste from garbage is an important part of waste management. One of the concepts within waste management is the concept of upcycling. Upcycling is the reuse of used or unused products for a different purpose. Gifted children, who are important for the growth and development of countries, will undoubtedly take on a social leadership role in the future and their waste management behavior will have an impact on the people around them and on the development of waste management technologies in the future. For this reason, it is necessary to determine the perceptions of gifted students regarding the concept of upcycling within the subject of waste management. In line with this justification, the aim of the study is to reveal the perceptions of gifted primary school students on the concept of upcycling through metaphor. The study was conducted with 92 primary school students studying at a science and art center in the Eastern Mediterranean Region of Turkey in the 2023-2024 academic year. In the study, phenomenology pattern, one of the qualitative research methods, was used. The data obtained from gifted primary school students completing the sentence "Upcycling is like ..." was analyzed according to content analysis. According to the findings of the study, 17 types of metaphors were produced by the students and it was determined that the most recurring metaphors were design, invention and recycling metaphors. The metaphors produced were categorized according to similar characteristics and 3 categories were created. The most metaphors were produced in the "upcycling in terms of re-creation" category, and direct quotations were made from the metaphors created by the students in order to support the findings. In line with the results of the findings obtained in the study, it can be said that the perception of gifted primary school students regarding the concept of upcycling is to design a new product and re-create it and ensure useful use again. In order for students to have a more accurate perception of the concept of upcycling, it can be suggested that students should be given training on this subject.

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Introduction

One of the most important problems of our world in the century we live in is the environmental problems that arise as a result of rapid and incorrect consumption of natural resources. Waste is one of the most important environmental problems affecting all humanity on a global scale (Jekria and Daud, 2016). In order to reduce waste materials, waste is evaluated through recycling, reuse and upcycling. Recycling is "the process of converting wastes that can be reused into raw materials or by-products and re-introducing them into production" (Çimen and Yılmaz, 2012). Reuse is the re-use of a product for the same or different purposes after the consumer's use, without being subjected to any chemical or biological processing (Elibol, Bezci, Dündar Türkkan and Varol, 2018). Upcycling is turning old or unwanted products into new and useful items to serve a different purpose (Ersan, 2021).

In the upcycling method, it is possible to recover the waste in a more valuable way than before the natural energy was consumed, and this can only be done through design. The upcycling method, which is more advantageous than recycling

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in this respect, makes it possible for everyone to evaluate their own waste on-site, thanks to various templates created by designers. Upcycled products also have a certain lifespan and eventually turn into waste again. It is very important to recycle the upcycled material that has completed its useful life at this point. The useful life of waste should be extended by first upcycling and then recycling. Although recycling is necessary for nature and humans, the priority should be not to create waste (Demir, 2022).When the studies on students in the literature on zero waste and recycling in Turkey are examined, in the study conducted by Ural Keleş and Keleş (2018), the perceptions of 3rd and 4th grade primary school students about the concept of recycling; In the study conducted by Bulut and Çavuldur (2017), behavioral development of 6th grade secondary school students regarding recycling; In the study conducted by Volunteer and Çelik (2015), the knowledge levels of 3rd and 4th grade primary school students about the recycling of packaging waste; In the study conducted by Mutlu (2013), 8th grade students' perceptions of recycling; In the study conducted by Çimen and Yılmaz (2012), secondary school students' behaviors regarding recycling; In the study conducted by Mrema (2008), recycling knowledge levels of 8th and 11th grade students; In the study conducted by Önal, Kaya and Çalışkan (2019), zero waste policy in environmental education and its appearance in the current textbooks of the 2nd grade life sciences course; In the study conducted by Sönmez (2020), drawings of first grade primary school students regarding the concept of zero waste; In the study conducted by Kara and Dönel Akgül (2021), the metaphors created by 8th grade students for recycling; In the study conducted by Egüz and Gökalp (2023), it was seen that they examined the metaphorical perceptions and awareness of secondary school students towards recycling .

The literature review, in the field of fashion and textiles (Ateş, 2023; Azakoğlu 2021; Erben, 2023; Güner, 2019; Ünlü, 2021), in the field of fine arts for the design of packaging waste (Demir, 2023; Ersoy Yılan 2023), in the field of architecture (Haberal, 2023) includes studies on upcycling. However, no study has been found on the concept of upcycling in the field of education and training. As a matter of fact, it is seen that the concept of upcycling is expressed as the concept of recycling in studies on recycling and zero waste in the field of education and training. For this reason, the concept of upcycling is not known by students. The use of metaphor was used in this study so that students can learn and distinguish the concept of upcycling more easily.

It can be said that metaphors are a tool that teaches unknown concepts more easily, makes them stick in the mind, and has proven validity in this regard (Arslan and Bayrakçı, 2006). Although metaphors can be used in every field, it is seen that studies on metaphor have increased in recent years. Although metaphors are widely used in the field of social sciences, they are generally used in the sense of analogy in the field of educational sciences (Zeren and Yapıcı, 2014). Metaphors are frequently used in education and training processes and play an important role in classroom activities (Akyol, 2017).

Importance must be given to the education of special talents who have strategic importance for the development and development of the country. Gifted child; They are students who are determined by experts to have a high level of performance compared to their peers in intelligence, creativity, artistic capacity or special academic fields or leadership, and who need special education in these areas (Ministry of National Education, 2013). Gifted students will be able to take on a social leadership role in the future and influence other individuals with their behavior, especially regarding waste management (Renzulli, 2007). For this reason, it is necessary to determine the perceptions of gifted students regarding the concept of upcycling within the subject of waste management. Therefore, metaphor was used to reveal the thoughts of gifted primary school students about the concept of upcycling.

Problem of the Study

This research aims to reveal the metaphorical perceptions of gifted primary school students about concept of upcycling. Within the scope of this purpose, answers to the following questions will be sough:

- What are the metaphors that gifted primary school students have about concept of upcycling?
- On which conceptual categories are metaphors collected?

Method

Research Model

The phenomenological pattern, one of the qualitative research methods, was used. The phenomenology pattern, which is one of the patterns of qualitative research , focuses on the underlying meanings of the phenomena that we are aware of but do not have a deep understanding of, and discovers and reveals them (Creswell, 2013; Yıldırım and Şimşek, 2018). In this study, the phenomenological pattern was chosen to reveal the mental schemas of gifted primary school students regarding the concept of upcycling.

Participants

The study group of this study consisted of 92 primary school students studying at a science and art center in the Eastern Mediterranean Region of Turkey in the 2023-2024 academic year. "Easily accessible sampling" method was used when creating the study group, and the study was planned with primary school students studying at the science and art center where the researcher worked and studied. The easily accessible sampling method is a type of sample determination in which individuals from whom data can be obtained most easily are selected in the study (Yıldırım and Şimşek, 2018). Thus, the practitioners and the researcher were given the opportunity to make explanations during the data collection process. Demographic characteristics of the gifted primary school students in the study group are listed in Table 1.

Table 1. Demographic characteristics of participants

Demographic features		f	%
Gender	female	52	56.5
	male	40	43.5
Grade Level	2nd	20	21.7
	3rd	50	54.3
	4th	22	24
Total		**92**	**100**

When Table 1 is examined; 56.5% of the students included in the study were female (f: 52) and 43.5% were male (f: 40); It is seen that 21.7% of them are 2nd grade (f: 20), 54.3% are 3rd grade (f: 50) and 24% are 4th grade (f:22) students. First grade students were not included in the research because they were not defined as gifted students and were still at the first reading and writing stage.

Data collection tool

A interview as prepared as a tool to collect data from the study group. The interview was created in three parts. In the first part, the purpose of the study, the definition of upcycling, the definition of metaphor and its example were given to the students. In the second part, questions were asked about the demographic characteristics of the students regarding gender and grade level. The third part is where the actual data is collected. In this section, students were asked to fill in the blanks. To students; "Upcycling is like ... . Because..." the sentence was directed. In this sentence, students were asked to compare the concept of upcycling to something and to give the reason for this analogy under the because sentence. In this way, students were enabled to provide a justification and logical basis for the metaphors they produced (Saban, 2008).

Data Collection Process

The students were briefly told about the study and their preliminary knowledge about the concept of upcycling was checked. In order to make the study results more accurate, information about what the concept of metaphor is is given. Not only was a definition made, but examples of the concept of metaphor were given from our daily lives, students were asked to produce different examples, and as a result, students were enabled to master the subject. Before the interview was distributed to the students, it was shared with the students that they should not be influenced by metaphors that hurt each other and that each metaphor written was valuable, and then the form was distributed. Approximately 20 minutes was sufficient for all students. The forms filled out completely and without errors by primary school students were organized to be included in the study data set.

Analysis of Data

Content analysis was used to analyze the data. The aim of content analysis is to reach concepts and connections that can make sense of the data. The data obtained in the content analysis are examined in detail (Krippendorff, 2004). The number of repetitions of the metaphors obtained from the students was determined and they were ranked from the most repeated metaphor to the least repeated metaphor. As a result of the examinations, some students were eliminated by consulting expert opinion because they could not create metaphors, and these metaphors were not included in the study. A total of 17 types of metaphors produced by the students were categorized according to their similar features. Within this framework, three categories were created. The number of metaphors under the created categories was determined and presented in tables. Direct quotations are included to support the findings. In direct quotations, taking into account the principle of confidentiality, the students who participated in the research were coded starting from S-1 to S-84.

Validity and Reliability

In order to ensure validity and reliability, all control was provided by the researchers during the application phase, and the researchers were with the students at every stage of the application. While ensuring the reliability of the study, expert opinion was also consulted, and the metaphor list and conceptual categories created and the matches made by the expert were compared. The reliability of the study was calculated using Miles and Huberman's (2021) formula (Reliability: Consensus/Agreement +Disagreement x 100), and it was revealed that the agreement obtained was 78/78+6x100=92%. If the agreement between expert and researcher is 90% or above, sufficient reliability is achieved (Saban, 2008).

Results

The metaphors created by gifted primary school students for the concept of "Upcycling" and the findings of the categories created from the metaphors are included. 92 students participated in the study voluntarily, and the forms of 8 students were not evaluated because they could not produce metaphors or could not justify the metaphors they produced. Findings and frequency values were calculated on 84 student forms.

Metaphors produced by gifted primary school students about concept of upcycling

"What are the metaphors that gifted primary school students have about concept of upcycling?" the answer to the question has been sought. The metaphors developed by gifted primary school students regarding the concept of upcycling are listed in Table 2.

Table 2. Metaphors, frequency and percentage values developed by specially gifted primary school students regarding the concept of upcycling

Metaphor	Frequency (f)	Percentage (%)
Design	24	28.2
Invention	16	19.2
Recycle	15	18
renew	5	6
Useful use	5	6
reboot	3	3.5
not to waste	3	3.5
Science	2	2.4
meet the need	2	2.4
be thrifty	2	2.4
A new world	1	1.2
new product	1	1.2
Raindrops	1	1.2
Innovation	1	1.2
Wash	1	1.2
A new life	1	1.2
a new planet	1	1.2
Total	**84**	**100**

İt is seen that gifted primary school students produced a total of 17 different metaphors for the concept of "upcycling". It was determined that the metaphors focused on design (f: 24, 28.2 %), invention (f:16, 19.2%) and recycling (f:15, 18%) metaphors. It was determined that they produced one metaphor each with the metaphors of a new world, new product, raindrops, innovation, washing, a new life, and a new planet. It has been determined that the majority of metaphors are metaphors aimed at explaining the different and new intended use of upcycling.

Findings regarding the second sub-problem

On which conceptual categories are the metaphors of gifted primary school students regarding the concept of upcycling collected?" The answer to the question has been sought. The distribution of metaphors of gifted primary school students regarding the concept of "Upcycling" according to categories is shown in Table 3.

Table 3. Distribution and Percentage Values of Metaphors Developed by Gifted Primary School Students by Category

Categories	Number of metaphors	Percentage
Upcycling for regeneration	Design (24), Invention (16), A new planet (1), A new world (1), A new life (1), New product (1), Innovation (1)	53.6
Upcycling for reuse	Recycle (15), Renew (5), Restart (3), Raindrops (1), Wash (1)	29.8
Upcycling for benefit	Beneficial use (5), Not wasting (3), Science (2), Meeting needs (2), Being economical (2)	16.6
Total	**84**	**100**

When Table 3 is examined, metaphors of gifted primary school students regarding the concept of "Upcycling"; It is seen that it creates 3 categories: in terms of regeneration (f: 45, 53.6 %), in terms of re-use (f: 25, 29.8%) and in terms of benefit (f: 14, 16.6%). When the metaphors were examined, it was determined that positive metaphors were generally produced. The resulting categories and sample expressions are as follows;

Category 1. Upcycling in terms of regeneration

Sample expressions obtained in this category are as follows;

S-33: "Upcycling is like designing, because I take a plastic water bottle, decorate it and make a bird feeder."

S-46: "Upcycling is like invention, because I make something new from items I do not use."

Category 2. Upcycling for reuse

Sample expressions obtained in this category are as follows;

S-27: "Upcycling is like recycling because we recycle and reuse the items we use."

S-31: "Upcycling is like raindrops, because raindrops evaporate and fall back to the earth."

Category 3. Upcycling in terms of utility

Sample expressions obtained in this category are as follows;

S-76: "Upcycling is like beneficial use, because we reuse the items that are useful to us."

S-19: "Upcycling is like science because it is useful for us."

Conclusion

Metaphors are frequently used to explain complex and similar concepts by associating them with previously learned concepts in the mind. In this study, the metaphors used by gifted primary school students when explaining the concept of upcycling are also an indicator of the impact of their previous learning and their individual perspectives on waste and how they approach the concepts. The metaphors students use enable them to express the concepts they have difficulty in explaining with concepts they already have in their minds and structure the newly learned concepts in this way (Perry & Cooper, 2001).

Metaphors are included in educational environments to reveal what students already know about subjects and concepts, to change this information if there is any previous incorrect or incomplete learning, and to structure what individuals have learned in their minds and make it permanent (Sadıkoğlu, Mumcu, & Hastürk, 2022). In this study, the results obtained from the study coincide with the findings of the study conducted by Sadıkoğlu, Mumcu and Hastürk (2022), as it changes the missing and incorrect learning about the concept of upcycling and structures new knowledge.

It was concluded that the gifted primary school students, expressed in the first sub-problem of the study, created 17 different metaphors based on the metaphors related to the concept of upcycling , and the most recurring metaphor was the design metaphor. According to this result, it can be said that the perception of gifted primary school students regarding the concept of upcycling is to design a new product. Gifted primary school students also produced a recycling metaphor regarding the concept of upcycling. It can be said that this situation arises from the fact that the concept of upcycling is considered as the concept of recycling in school and daily life. The use of metaphors such as invention and innovation by gifted primary school students draws attention in terms of awareness of invention and innovation.

The metaphors related to the concept of upcycling, expressed in the second sub-problem of the study, the gifted primary school students were grouped under 3 different categories: "Upcycling in terms of re-creation", "Upcycling in terms of re-use" and "Upcycling in terms of benefit", and the most metaphors were collected. It was concluded that the category was "Upcycling in terms of re-creation" category. According to this result, it can be said that gifted primary school students re-created the concept of upcycling and expressed it as beneficial use.

General conclusions that can be drawn from the study can be listed as follows;

- Not many metaphors were produced regarding the concept, which may be an indication that students structure concepts in similar ways in their minds.
- It has been observed that students can easily define the concept of upcycling that they have just learned, thanks to the metaphors they created in their minds by comparing it to the concept of recycling in their previous learning.
- When the metaphors produced and their justifications are examined, it is seen that the students have the basic knowledge they need to know about the concept.
- It can be said that the reason why the recycling metaphor is repeated too much is an indicator of the effect of previous learning at school and in daily life.

Recommendations

In this section, based on the results of the study, suggestions can be listed as follows to guide those who will conduct similar studies;

- Interviews can be held to examine students' mental schemas regarding the concept of upcycling in depth.
- In order for students to have a more accurate perception of the concept of upcycling, it can be suggested that students should be given training on this subject.
- In this study, the sentences and metaphors made by the students were determined. In cases where concepts cannot be expressed in sentences or in younger age groups such as pre-school and 1st grade students, studies can be planned by having students draw drawings related to the concepts and interpreting the drawings.
- This study was conducted only with gifted primary school students. Similar studies can be conducted with students at different levels. In addition. Since metaphors are linked to individuals' own lives and sociocultural environments, similar studies can be conducted with different student groups in different residential areas.

Limitations of Study

This study;

- With the 2023-2024 academic year,

- With primary school students studying at Osmangazi Science and Art Center in Onikişubat district of Kahramanmaraş province,
- It is limited to one metaphor for each student in the "Upcycling Metaphor Form".

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