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A quantitative investigation on recycling attitudes of gifted/talented students
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Uncontrolled industrialization process since nineteenth century and the trend towards consumer society have resulted in an enormous amount of waste materials. As a result of this problem, management and safe removal of urban waste has become one of the most important environmental issues of today. Recycling projects that have been developed to solve this problem will reduce waste materials, recycle discarded materials and save energy, money and time. Therefore, recycling applications and related researches are significantly growing due to their enormous potential to solve many environmental problems of society. In this perspective, the aim of this study was to determine the recycling attitude levels of gifted/talented students. Also, gifted/talented students’ recycling attitude levels was compared according to some independent variables, such as age, gender and grade. For these purposes, single scan model was performed in the present research. As a means of data collection, Recycling Attitude Scale (RAS) and the personal information form were used. The RAS was applied to 122 gifted students enrolling in Science and Art Center in Manisa Province of Turkey in 2012–2013 academic years. Gifted/talented students’ ages ranged from 10 to 13 and, also, the 11-year-old candidates, who participated in the study, were majority. Statistical package for the social sciences (SPSS 17.00) programme was utilized to analyse the obtained data. The analysis results showed that gifted and talented students had fairly well recycling attitude level and there were no significant difference between gifted and talented students in terms of gender, age and class.

Keywords: gifted students; recycling; attitude; environmental education

Introduction
Consumption and damage to the nature is accelerating and runs parallel to the increasing world population. Uncontrolled industrialization process since nineteenth century and the trend towards consumer society have resulted in an enormous amount of waste materials.[1–12] As a result of this problem, management and safe removal of urban waste has become one of the most important environmental issues of today. Recycling projects that have been developed to solve this problem will reduce waste materials, recycle discarded materials and save energy, money and time. As is known, natural resources are not limitless and the reuse of these resources is vital in terms of leaving a habitable world for the future generations.[2]

Recycling applications and related researches are significantly growing due to its enormous potential to solve many environmental problems of society.[13] At the end of the literature search, it was seen that recycling attitudes researches tended to concentrate on attitudes of public, households and students. Public and households were evaluated as study groups in most of these researches and the majority of existing instruments in the literature were developed by researchers to measure public and households’ attitude toward recycling.[14–24] Also, many of the researches were conducted by science and environmental educators in order to determine students’ attitudes toward various applications of recycling.[25–29]

Attitude toward recycling was also evaluated in a survey of university students in Sweden.[30] The researchers studied the attitude of Thai students, who are studying in Sweden, toward recycling and container deposit system, by comparing the level of attitude before and after they came to Sweden, in order to understand the changing attitude. The survey prepared by Lorgunpai and Lertchaiworakul [30] contained 47 likert-type items and was divided in four parts, which were ‘General information’, ‘Attitude toward recycling system before they came to Sweden’, ‘Attitude toward recycling system after they came to Sweden, in order to understand the changing attitude’. The results of this study showed that the differences in age have no bearing on recycling attitudes and container deposit system. However, providing knowledge and education in point of recycling is one of the factors that influences attitude in a positive way. Another study with Canadian high school students investigated students’ behaviour and attitudes toward recycling programmes through the use of observations, semi-structured interviews and a questionnaire containing 15 items, which dealt with recycling applications, recyclable materials and

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recycling attitudes.[31] The results of the study showed that knowledge about recycling and knowing what materials are recyclable was found to be the main factor that influences recycling participation, as well as location of and instructions on the recycling bins.

Student attitudes affect individual behaviour, particularly the choice of action and persistence to make a decision. For example, students with high scientific literacy tend to make more appropriate decisions and seem more knowledgeable.[32] Researches have also confirmed the relationship between socio-scientific issues and scientific literacy.[32] From this point of view, it is important to examine student attitudes in the evaluation of science curriculum.[33]

**Research significance**

Studies on the subject showed that the attitudes of the students have an impact on their individual behaviours, determinations for decision-making processes and preferences about the related issues. For example, students who have higher levels of scientific background and literacy have been found to be more accomplished in terms of the decisions they make.[32] This finding shows the significance of the efficiency of the individuals, who receive education in addition to the competence of the curriculum implemented in an effective environmental education. From this viewpoint, ensuring active participation of the individuals of superior intelligence and/or gifted individuals defined as the most significant human resources of a country in environmental issues included amongst the most crucial items of the agenda today, as well as in the future, is of great importance.[34] As a consequence, education and employment of the individuals of superior intelligence and/or gifted individuals in terms of environmental issues as in other spheres of social issues would significantly contribute to the development and progression of our country.

**Materials and methods**

**Research model**

The aim of this study was to determine recycling attitude levels of gifted students. Also, gifted students’ recycling attitude levels were compared according to some independent variables, such as age, gender and grade. For this purposes, single-scan model was performed in the present research.

**Subjects**

The subjects of this study included 122 gifted students studying at Manisa Science and Arts Center in the 2012–2013 academic year, spring semester (61 female, 61 male). Gifted students’ ages ranged from 10 to 13 and, also, the 11-year-old candidates, who participated in the study, were the majority (Table 1). Gifted students that constituted working group were 58 of the fifth, 46 of the sixth and 18 of the seventh grade (Table 2).

| Age | 10 | 11 | 12 | 13 |
|-----|----|----|----|----|
| Gender | G | f | % | f | % | f | % | f | % |
| B | 4  | 100 | 26 | 51.0 | 19 | 45.2 | 12 | 48.8 |
| Total | 4  | 100 | 51 | 100 | 42 | 100 | 25 | 100.0 |

Table 1. Distribution of students, according to gender and age levels.

| Class | 5 | 6 | 7 | Total |
|-------|---|---|---|-------|
| f     | 58 | 46 | 18 | 122   |
| %     | 47.5 | 37.7 | 14.8 | 100   |

Table 2. Distribution of students according to class levels.

Recycling Attitude Scale (RAS) developed by researcher was used to assess students’ attitudes toward recycling. The RAS consisted of three subscales and 21 items with responses recorded on a 4-point Likert scale, options ranging from strongly agree to strongly disagree. Cronbach’s alpha reliability coefficient (α) of first factor with six items (attitudes toward recycle) was found to be 0.82, reliability (α) of second factor with nine items (attitudes toward reduce and reuse) was found to be 0.77, reliability (α) of third factor with six items (General recycling attitude) was found to be 0.70 and reliability (α) of the whole scale with 21 items was found to be 0.83 for this study (Table 3). In addition, questions about independent variables of the study such as the participants’ name, surname, age, gender and class take part in the scale.

| Subscale                        | Item number | Cronbach alpha value |
|---------------------------------|-------------|----------------------|
| Attitudes toward recycle        | 6           | 0.82                 |
| Attitudes toward reduce and reuse | 9           | 0.77                 |
| General recycling attitude      | 6           | 0.70                 |
| Whole scale                     | 21          | 0.83                 |

Table 3. Cronbach alpha values of recycling attitude scale.
Data analysis

The data obtained from RAS were transferred to computer and were analysed with the SPSS 17.00 package program. Gifted students’ recycling attitude levels were investigated significantly by regards to personal characteristics, whether differed or not. Likert-type items of the RAS covers four points including ‘strongly agree’, ‘agree’, ‘disagree’ and ‘strongly disagree’. Scoring of each Likert-type item was done in the order above, as 4,3,2,1. Some items were reverse-scored and analysed as they consisted of negative opinions. Points of each item were collected and the point average of gifted students was separately determined for all grades and ages according to the each factor included in the scale.

Results and discussion

The determination of the attitudes of the individuals of superior intelligence and/or gifted individuals towards recycling and the variables having an impact on such attitudes is of great importance to ensure active participation of such individuals in the resolution of environmental issues, by means of providing an environmental and recycling education for them. Within this scope, average scores of the individuals of superior intelligence and/or gifted individuals obtained from the RAS and its subscales as well as the comparisons of these scores to independent variables are presented in this chapter in the respective tables.

Findings on the students’ attitudes toward environmental issues

The results obtained from the students included in the research sample for the RAS were evaluated and the general average score for these students was found to be 70.88 out of a total score of 84, determined for the respective scale. As the average scores for the environmental attitudes of the students associated with the subscales were examined, average scores of 19.84 for the subscale of the ‘attitudes toward recycle’, 32.02 for the subscale of the ‘Attitudes toward reduce and reuse’ and 19.01 for the subscale of the ‘general recycling attitude’ have been obtained. The average scores of the students’ attitudes obtained for RAS and its subscales are presented in Table 4.

As the average scores for the environmental attitudes of the gifted/talented students were examined based on class levels, the following results were obtained: 71.23 for the 5th grade students, 71.45 for the 6th grade students and 68.33 for the 7th grade students. An analysis of the average scores for the environmental attitudes of the students associated with RAS in general and its subscales in particular suggested that there were not any direct correlations between class levels of the students and their attitudes toward recycling. The average scores for the students’ attitudes toward recycling based on class level for the subscales of the RAS are presented in Table 5.

As the average scores for the environmental attitudes of the gifted/talented students were examined based on gender, average scores were found to be 71.42 for female students and 70.34 for male students. An analysis of the average scores associated with the RAS suggests that female students have a higher average score than male students for the RAS in general and all of its respective subscales. The average scores toward recycling based on the gender of the students associated with the subscales of the RAS are presented in Table 6.

Table 4. Recycling attitudes of gifted/talented students.

| Subscale                        | N   | Items | Mean | ss  | Maximum | Minimum |
|---------------------------------|-----|-------|------|-----|---------|---------|
| Attitudes toward recycle (ATR)  | 122 | 6     | 19.84| 3.01| 24      | 11      |
| Attitudes toward reduce and reuse (ATRR) | 122 | 9     | 32.02| 3.14| 36      | 24      |
| General recycling attitude (GRA)| 122 | 6     | 19.01| 2.91| 24      | 11      |
| Total (RAS)                     | 122 | 21    | 70.88| 7.20| 84      | 51      |

Table 5. Recycling attitude levels according to class levels.

| Scale          | Class | N   | Mean | Std. deviation | Maximum | Minimum |
|----------------|-------|-----|------|----------------|---------|---------|
| ATR            | 5     | 58  | 19.90| 2.81563        | 11.00   | 24.00   |
|                | 6     | 46  | 20.01| 3.33858        | 12.00   | 24.00   |
|                | 7     | 18  | 19.23| 2.88464        | 14.00   | 24.00   |
| Total          |       | 122 | 19.84| 3.01923        | 11.00   | 24.00   |
| ATRR           | 5     | 58  | 32.06| 3.09903        | 24.00   | 36.00   |
|                | 6     | 46  | 32.26| 3.03276        | 25.00   | 36.00   |
|                | 7     | 18  | 31.31| 3.61341        | 24.00   | 36.00   |
| Total          |       | 122 | 32.02| 3.14268        | 24.00   | 36.00   |
| GRA            | 5     | 58  | 19.27| 2.96174        | 11.00   | 24.00   |
|                | 6     | 46  | 19.18| 2.44850        | 14.00   | 24.00   |
|                | 7     | 18  | 17.78| 3.66126        | 11.00   | 23.00   |
| Total          |       | 122 | 19.02| 2.91772        | 11.00   | 24.00   |
| RAS            | 5     | 58  | 71.23| 6.33381        | 60.00   | 84.00   |
|                | 6     | 46  | 71.45| 7.26357        | 56.00   | 81.00   |
|                | 7     | 18  | 68.33| 9.31561        | 51.00   | 80.00   |
| Total          |       | 122 | 70.89| 7.20144        | 51.00   | 84.00   |
As the average scores for the attitudes of the students included in the research sample toward recycling are examined based on the variable of age, the average scores for the attitudes of the students except for those of 10-year-old students were found to be approximate to the general average. The general average score for the attitudes of 10-year-old students was found to be 75.00 and of 12-year-old students was found to be 71.88, both of which were above the general average scores. On the other hand, the average score of 11-year-old students was determined to be 70.62 which was almost equal to the general average, whereas the average score of 13-year-old students was found to be 69.08 that represented a value below the average score. Table 7 shows the average scores for the attitudes of the students toward recycling based on the variable of age.

A statistical comparison of the students’ attitudes toward recycling based on independent variables

In this section, the findings are presented about whether the differences amongst the average scores based on such independent variables as gender, age and class level determined for the average scores for the attitudes of the gifted/talented students toward recycling obtained from the RAS were statistically significant.

An independent t-test analysis was carried out to determine whether the average scores for the attitudes of the students toward recycling based on gender represented a significant difference. The results of the analysis showed that the differences amongst the average scores of the students based on gender were not statistically significant ($p > 0.05$). The statistical analysis of the differences amongst the average scores for the attitudes of the students based on the variable of gender is presented in Table 8.

ANOVA analysis was conducted to determine whether the average scores for the attitudes of the gifted students represented a significant difference based on the independent variables of class level and age. The general average scores for the attitudes of the students included in the research sample were found to represent no statistically significant difference based on both independent variables ($p > 0.05$). The statistical analysis of the differences amongst the average scores for the attitudes of the students based on the variables of class level and age is presented in Tables 9 and 10, respectively.

Educational implications

The objective of this study was to determine the attitudes of the gifted/talented students, who are considered to contribute significantly to the environmental education and the resolution of environmental issues toward recycling, which is one of the most crucial strategies for the
conservation of natural resources and to compare these attitudes based on such independent variables as class level, gender and age. For this purpose, RAS of 4-point Likert-type composed of 21 items and developed by the researcher was used as a data collection tool. Based on the results of the study, an analysis of the average scores of the students’ attitudes toward recycling based on class level showed that the average scores of the 5th and 6th grade students were higher compared to those of the 7th grade students. On the other hand, an analysis of the average scores for the attitudes of the students toward recycling based on the variable of age suggested that 12-year-old students had the highest average scores and 13-year-old students had the lowest average scores for the attitudes toward recycling. Based on the research results on gender, it was concluded that female students achieved a higher average score than male students for the attitudes toward recycling.

As a result of the statistical comparison amongst the RAS average scores of the attitudes of the students participated in the study and the independent variables determined for the study, it was concluded that the differences in the average scores are not significant in terms of the variables of gender, class level and age \( (p > 0.05) \). In other words, it can be said that the education provided for the students of superior intelligence and/or gifted students during secondary school is not effective in the development of the students’ attitudes toward recycling. Based on the results of their study, conducted on university students studying in Sweden, Lorgunpai and Lertchaiworakul [30] concluded that the attitudes of the students toward recycling and decomposition of the solid wastes did not differ significantly in terms of gender. The results of the aforementioned study are consistent with the findings of this study.

Ugulu et al. [35] applied a scale composed of four subscales including the subscale of the ‘attitude toward recycling’ in their study on the environmental attitudes of the students of superior intelligence and/or gifted students. The students included in the research sample were found to achieve an average score of 28.55 for the aforementioned subscale composed of eight items included in the RAS scale of 4-point Likert-type. This value showed that the students of superior intelligence and/or gifted students achieved 89.2% positive attitude score for the subscale of ‘attitudes toward recycling’. A similar analysis carried out in line with this study showed that the students achieved 84.4% positive attitude score based on the RAS results.

Recycling has often become one of the most popular strategies considered by both individuals and organizations whenever a positive attitude toward the environment is intended; however, the application of recycling in real life has failed to maintain sufficient consistence and stability, except for a small number of examples. With the exception of the activities of a few private institutions and foundations, hardly any comprehensive example can be found within the scope of any curriculum implemented in educational institutions subordinated to the Ministry of National Education or those instructed in universities. [2]

A review of international activities carried out for recycling education shows a comprehensive development in parallel with the development of environmental education. International practices consist of sophisticated curriculum adopted in preschool education and further extended to secondary and higher education, whereas the majority of the efforts in Turkey are still limited to a small number of definitions about recycling education. In addition, demographic and sociological factors associated with recycling and recycling education in parallel with the development process of environmental education have been examined for years in a number of studies. [36—40] Within this framework, the attitudes of gifted/talented students toward recycling have been examined in this study, carried out as a consequence of an awareness about the absence of a comprehensive recycling education in Turkey and considering the fact that the education and employment of the individuals of superior intelligence and/or gifted individuals within the scope of environmental issues in addition to other spheres of social issues could contribute significantly to the development and progression of our country.

### Conclusions

In conclusion, the results of the study showed that gifted/talented individuals, having achieved aforementioned average scores for environmental attitudes, have a significant potential to improve environmental education in Turkey to a desired level. This is important in order to ensure the development and performance of the projects, associated with the protection and sustainability of the environment.

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**Table 9. ANOVA analysis of recycling attitude scores according to class levels.**

|                      | Sum of squares | df | Mean square | F     | Sig. |
|----------------------|----------------|----|-------------|-------|------|
| Between groups       | 139.039        | 2  | 69.519      | 1.348 | 0.264|
| Within groups        | 6136.116       | 119| 51.564      |       |      |
| Total                | 6275.155       | 121|             |       |      |

Note: degree of freedom (df), F value (F), significance (Sig), \( p > 0.05 \).

**Table 10. ANOVA analysis of recycling attitude scores according to ages.**

|                      | Sum of squares | df | Mean square | F       | Sig. |
|----------------------|----------------|----|-------------|---------|------|
| Between groups       | 193.439        | 3  | 64.480      | 1.251   | 0.294|
| Within groups        | 6081.716       | 119| 51.540      |         |      |
| Total                | 6275.155       | 121|             |         |      |

Note: degree of freedom (df), F value (F), significance (Sig), \( p > 0.05 \).
Disclosure statement
No potential conflict of interest was reported by the author.

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