

Plant Awareness Profile of Junior High School Students by Grade Level and Gender

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ABSTRACT Lack of plant awareness is a phenomenon that can have a lasting negative impact on plants and the surrounding environment. Plants can seem unimportant when people are unaware of them. This phenomenon relates to science learning at the junior high school level because it involves discussions about plants. In addition, science subjects can increase students' Plant Awareness. Grade level and gender factors can affect students' Plant Awareness, so this study aims to determine the profile of Plant Awareness among junior high school students by grade level and gender. The study population comprised one junior high school in Malang City, with a sample of 300 students. The data collection technique involved distributing questionnaires via Google Forms to students. The data were analyzed using IBM SPSS Statistics 27, including normality tests, Kruskal-Wallis tests, and Dunn Post Hoc tests. The Post Hoc Dunn test aims to determine the location of significant differences in the sample. The results of this study indicate that junior high school students in the city have a relatively high level of Plant Awareness, except that the attention-to-plants indicator remains low. Class 7 males have significant differences in interest and attitudes towards plants compared to other groups, so efforts are needed to increase students' attention to plants and increase interest and positive attitudes towards class 7 males.

Keywords: Attention, Average value, Attitude, Interest, Knowledge, Plant awareness

1. INTRODUCTION

Awareness of biodiversity is currently still very low (Dünser et al., 2024). This phenomenon has a lasting negative impact on the surrounding environment, especially on plants. Most people prefer animals to plants because the human visual system is more drawn to moving objects (Brownlee et al., 2023). In learning, explanations about plants are lower than those about animals (Parsley, 2020). Stagg & Dillon (2022) Stated that students show more interest and attitudes towards animals, while interest in plants is still low, and students tend to have negative attitudes towards plants. As much as 65% of the learning about plants will be obtained when entering college, so it can be concluded that junior high school students will receive less learning about plants (Peter Batke et al., 2020). In the school environment, this phenomenon is caused by an imbalance in knowledge between plant science lessons and animal science lessons (Wulandari et al., 2023). Low interest in learning can make it difficult for students to identify plants in their immediate environment (Fatimah &

Santiana, 2017). This phenomenon can lead to a lack of understanding of biodiversity and the role of plants in maintaining ecosystem balance, leading to the idea that plants are not important (Jose et al., 2019). In the sustainability of human life, plants have a vital role, as a form of natural wealth that has not been utilized. Biodiversity must always be maintained and preserved based on its function as a source of food, a source of industrial materials, a source of medicine, and so on (Kacprzyk et al., 2023). In fact, awareness of plants, or Plant Awareness, is an important indicator in education and environmental sustainability (Putriani et al., 2023).

Plant Awareness Profile is a description of a person in understanding, viewing, and behaving towards plants. The term profile in Plant Awareness refers to a person's characteristics, knowledge, interests, and attitudes towards plants (Wulandari et al., 2023). Plant Awareness can be

Received: 18 June 2025

Revised: 21 July 2025

Published: 30 September 2025

interpreted as a person's ability to realize and appreciate the role of plants in the environment (Parsley et al., 2022). A person's level of awareness and concern about plants can be analyzed using four Plant Awareness indicators: attention, knowledge, relative interest, and attitude (Fiel'ardh et al., 2023).

Attention to plants is the ability to recognize plant characteristics through detailed visual inspection. Attention to a person is selective; stimuli in the form of movements, such as animals, are captured more readily than those that do not, so plants receive less attention because they do not produce visible movement (Stagg et al., 2024). This does not mean that plants are not visible at all; instead, they are placed in the background of a specific visual field to serve other organisms, such as animals (Parsley, 2020).

Knowledge of the importance of plants provides insight into their various roles and functions in maintaining ecosystem balance, supporting the economy, and providing medicine, unlike botanical literacy, which is general knowledge about plants. The Plant Awareness indicator explicitly examines the importance of plants to humans and to the surrounding ecosystem (Parsley et al., 2022).

Relative interest in plants is a person's tendency to be more interested in plants than in animals. A person's relative interest can change; for example, they may become interested in certain types of plants, such as medicinal and ornamental plants. A person's interest in plants can be an important factor in increasing plant awareness. Developing strategies for learning and appreciating plants can be one way to increase students' interest in plants (Fiel'ardh et al., 2023). Knowledge alone is not enough to change students' habits and attitudes towards understanding the role of plants (von Kotzebue, 2023). According to Dünser et al. (2024) A person's interests are divided into two types: individual and situational. Individual interests are more closely tied to a person's characteristics, while situational interests can change in response to stimuli that attract a person's attention (Renninger & Hidi, 2022). Individual interests and situational interests can influence each other (Hidi & Ann Renninger, 2006; Dünser et al., 2024). Situational interest is temporary, but it can evolve into individual interest, and vice versa: individual interest can evolve into situational interest (Barimbing et al., 2022). Throughout adolescence and puberty, a person's interests can change; interactions with peers are one factor that can shape those interests (Suwanto et al., 2021). This change in interest can change a person's learning experience and motivation towards certain things. Efforts to increase students' desire to be actively involved with plants and their awareness of plants can be done through activities that involve interesting plant study objects in their learning; in addition, this can also increase students' emotions towards plants (Sanders et al., 2022).

Attitude towards plants is a psychological tendency expressed through liking or disliking plants. Attitude

indicators are also related to a person's emotions towards plants (Albarracin & Shavitt, 2018). Activities that introduce students to the beauty of plants can help change students' emotional perceptions and cognitive understanding of plants (Dünser et al., 2024). In fact, high school students have less positive attitudes towards plants (Parsley et al., 2022).

Junior high school students enter adolescence and puberty. This phase can be interpreted as a transition period towards adulthood. Related to plant awareness, in this phase, many students begin to experience development both in sexual maturity and in determining self-identity (Mudhar, 2017). Therefore, at this time, many students are beginning to change as they find their identity, especially regarding their interests. As they get older and their class level increases, students will experience greater cognitive development, more learning materials, and more practical experiences. The higher the level, the more in-depth science material students will receive and the more practical experience they will gain; in addition, students will have a greater sense of responsibility. In addition to class level, gender can also affect students' plant awareness. In general, male students tend to have lower plant awareness than female students. The differences between the two sexes are significant, especially in attitudes, behavior, and participation (Siskawati et al., 2023). Women are more sensitive, enthusiastic, and active in practicing sustainability awareness. Similarly, caring for plants and maintaining the surrounding environment is more often carried out by women, as female students show a more positive attitude towards environmental preservation (Siskawati et al., 2023).

Research on Plant Awareness has been widely conducted, especially regarding the development of instruments for Plant Awareness by Parsley et al. (2022), which were tested with biology students. Research by Dünser et al. (2024) on Plant Awareness was conducted with 179 students aged 9-19 years, who completed a questionnaire that focused solely on attitudes towards and interest in plants. Based on this study, students showed a stronger positive attitude towards plants, while their interest in plants was lower. Furthermore, in the research by Sanders et al. (2024), which examined only one indicator of Plant Awareness — attention or vision of plants — as the only element, while the others focused on 47% of 95 students. Another study compares the level of Plant Blindness among junior high school students with that among high school students. The results of the study showed that plant could mention one plant-related more on animal elements. blindness in junior high school students was higher than in high school students, with a range of values ≥ 70 , with 76.20% of high school students getting a score of ≥ 70 , while junior high school students only got 37.77% (Wulandari et al., 2023). Research by Pany et al. (2022) presents two indicators of Plant Awareness— plants as living organisms and knowledge about plants—

using a sample of 345 middle school students. The study found that students considered plants less alive than animals. Several of these studies were used as references for norms in this study. The reference criteria for Plant Awareness based on age and gender cannot be detailed regarding the level of plant awareness, but several previous studies can serve as a reference.

Based on several previous studies examining Plant Awareness, only a few of the four leading indicators are listed; in addition, the study's samples remain general. Research on Plant Awareness that covers all the leading indicators among junior high school students, differentiated by class and gender, has not yet been found. Class and gender are factors that can influence Plant Awareness among students, so this study aims to determine differences in Plant Awareness profiles among junior high school students at the class and gender levels.

2. METHOD

The method used in this study is a quantitative descriptive method. This method is often described as a research method that explains phenomena using numerical data without testing any hypotheses (Wahyudi, 2022). The population in this study was junior high school students in Malang City. The school is located in an urban area, surrounded by local community activities, including markets. The study included 300 students: 67 male 8th-grade students, 78 female 8th-grade students, 76 male 7th-grade students, and 79 female 7th-grade students. The sample was selected purposively to align with the objectives of this study. This study presents a diverse set of characteristics, including students' grade level and gender, so a large sample size is required. Thus, the results obtained can describe students' plant awareness profile and provide a minimum threshold for drawing research conclusions. In this study, the samples will be grouped to compare levels and determine the Plant Awareness profile for each group. A description of the implementation of this study is shown in Figure 1.

The implementation of this research involves providing a Plant Awareness instrument accessible via Google Forms. This instrument contains six questions covering four Plant Awareness indicators: attention, knowledge, attitude, and interest. The attention indicator question was adopted from research. Sanders et al. (2024) By providing several images of plants, animals, and local ecosystems. The scoring in this question follows the assessment of the research by Sanders et al. (2024) With slight modifications in determining the score. This modification is made in the assessment category. In questions related to plant attention, students are expected to identify plant types and describe plant condition in detail, earning a perfect score of 4. The following is a picture of the scoring determination for the attention indicator question for plants (Figure 2).

Furthermore, the questions on the knowledge indicator about the importance of plants are adjusted to the research of Pany et al. (2019), with several questions in the form of plant identification based on their grouping, and several other statements, using a correct-scoring technique: 1 if wrong and zero if correct. Furthermore, the questions on the interest and attitude indicators were adopted from the research of Dünser et al. (2024), which contains 10 statements each with answer choices, namely SD (Strongly Disagree), LA (Less Agree), QA (Quite Agree), and SA (Strongly Agree). Overall, the instruments used in this study have been adjusted to suit junior high school students through expert lecturers' testing, so that junior high school students will easily understand the question commands.

The development of the Plant Awareness instrument has involved a theoretical study to examine the indicators. Furthermore, the questions on this instrument have undergone expert review, validity testing, and statistical reliability testing. Based on testing by expert lecturers, an average value of 89.5 was obtained, indicating that the instrument is very suitable for use. The results of the validity test using IBM SPSS Statistics 27 software showed that each item in the instrument had a r count $>$ r table (0.306), indicating that the instrument is valid (Anggraini et al., 2022). Based on testing using IBM SPSS Statistics 27, a

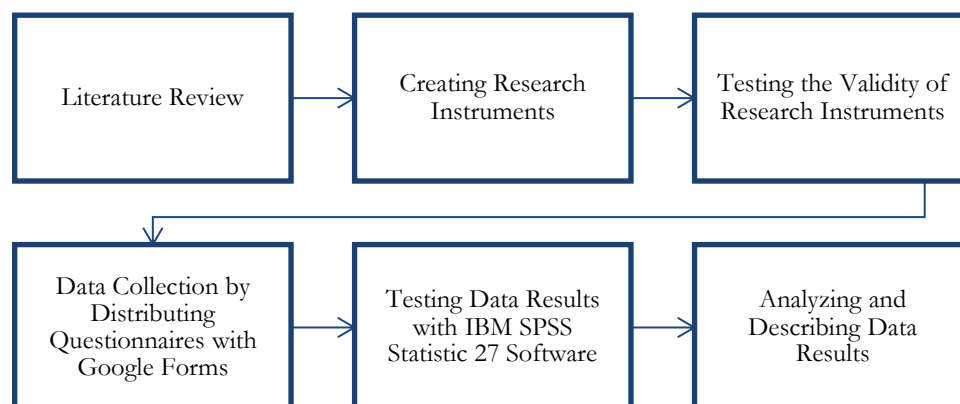


Figure 1 Plant awareness research flow

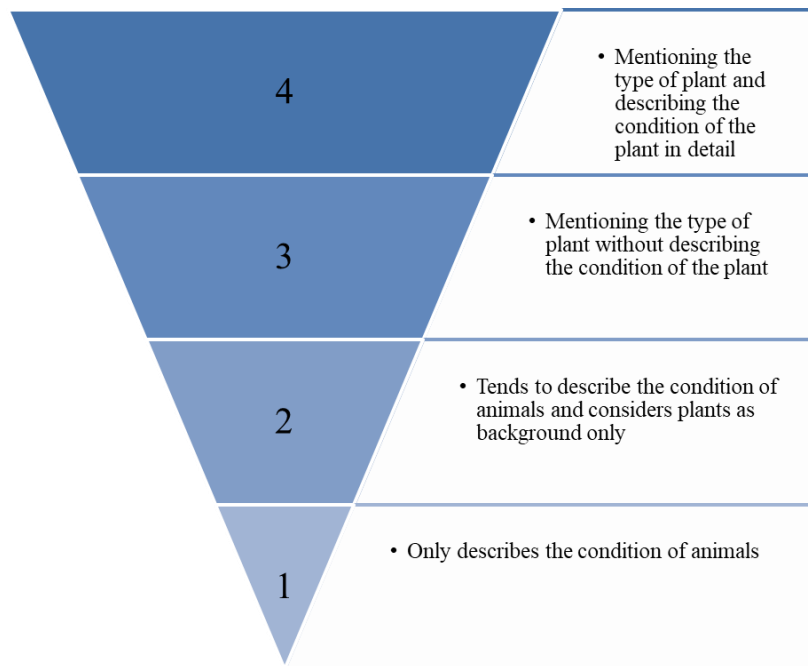


Figure 2 Attention assessment model for plants

Cronbach's Alpha value of > 0.6 was obtained, indicating that this instrument is reliable (Taherdoost, 2018).

To determine the level of Plant Awareness among students in each group, comparisons of the maximum question score with the average score for each Plant Awareness indicator are used, along with statistical testing. Normality testing using IBM SPSS Statistics 27 software shows that a p -value < 0.05 indicates the data are not normally distributed (Pasaribu et al., 2024). Therefore, the next step is to use the non-parametric Kruskal-Wallis test and the Dunn Post Hoc Test to determine the differences between groups.

The standard for this assessment result is based on comparing the average value in each group with the maximum value for each Plant Awareness indicator. Each group will be compared, and the lowest and highest values will be identified. Additionally, the results of statistical analyses using IBM SPSS Statistics 27 serve as a reference for determining groups that exhibit significant differences. The Plant Awareness profile standard for junior high school students and the community cannot be explained in detail yet because this phenomenon is still new. However, there is research that can be used as a reference for how the results of the Plant Awareness level are in junior high school students, for example, in research by Dünser et al. (2024), who studied students aged 9-19 years, where this age range is from elementary school to high school. This study shows that students have a more positive attitude towards plants, while their interest in plants is lower (Dünser et al., 2024). Based on the results of this study, all samples were found to be homogeneous, indicating that junior high school students have a positive attitude; however, their interest in plants remains low. Further

research by Wulandari et al. (2023) compared Plant Blindness levels among junior high school and high school students. Plant Blindness and Plant Awareness are almost the same phenomena. Plant Blindness is a negative phenomenon in which someone experiences blindness to plants, while Plant Awareness is a positive phenomenon in which someone has awareness of plants. However, if connected, these two phenomena are actually still related. In this study, results showed that junior high school students who experienced Plant Blindness scored higher than high school students. This is undoubtedly related to their class level, as high school students have a higher level of education and have received more material about plants, as well as more experience with them. Research by Pany et al. (2022) examined middle school students and found that, based on the results, students considered plants less alive than animals. Based on the results of this study, it can be concluded that middle school students are more inclined towards plants, yet they still have a relatively low level of awareness of them. Based on several studies, it can be concluded that junior high school students still have a low Plant Awareness profile, as most previous studies have shown that they tend to consider animals rather than plants. However, across several studies, it has not been possible to explain in detail how the Plant Awareness profile of students varies by class level and gender. It can yield only general results, so later this study will use them to determine how the Plant Awareness profile of students differs by gender and class level.

3. RESULTS AND DISCUSSION

The results of this study are in the form of values from the results of the Plant Awareness instrument that students

have worked on. The value is calculated based on each Plant Awareness indicator, including attention to plants, knowledge of the importance of plants, interest in plants, and attitudes towards plants. Each value on this indicator is further tested in IBM SPSS Statistics 27 to determine which indicators exhibit significant differences. The following table presents the results of the Kruskal-Wallis nonparametric test for each indicator (Table 1).

Table 1 Results of the Kruskal Wallis non-parametric advanced test

Indicator	Significance
Attention to Plants	.388
Knowledge of the Importance of Plants	.408
Interest in Plants	<.001
Attitudes to Plants	.002

Based on the results obtained, the data on attention to plants and knowledge about the importance of plants showed a p value > 0.05 , it was stated that there was no significant difference between the groups, while the results of the data on interest in plants and attitudes towards plants showed a p value < 0.05 , it was stated that there was a significant difference between the groups. The data with differences were tested using the Post Hoc Dunn test to determine the location of the differences in detail within each group, including class 8 male, class 8 female, class 7 male, and class 7 female. The test results in the Pairwise Comparisons table showed that the group that had differences was class 7 males, both in terms of interest in plants and attitudes towards plants. Based on the average value obtained in this study, the grades of class 7 males tended to be lower than those in other groups. The class 8 male and class 8 female groups tended to have higher values, but even so, class 7 female students also had excellent values. In several Plant Awareness indicators, the class 7 female students' grades were slightly higher than those of the other groups. The following results are based on the average student scores and the location of significant differences between sample groups (Table 2).

3.1 Attention to Plants

Based on the Plant Awareness profile graphic (Figure 3) and the average value, the highest and lowest values are within the sample groups. In the first result, namely the

average value for students on the indicator of attention to plants, is relatively low compared to the highest value of 12. The values obtained in each group are: class 8 male: 3.46; class 8 female: 3.38; class 7 male: 3.53; and class 7 female: 3.39. The average value in each group is almost the same. However, male students in both classes 8 and 7 have slightly higher averages, indicating that male students' attention to plants is slightly superior to that of female students. The low attention students pay to plants aligns with the findings of Sanders et al. (2024), who found that of 95 students, only 47% could name one plant-related element, while the others focused more on animal elements. Research by Pany et al. (2022) Shows that students consider plants to be less alive than animals. The low average score is because most students discuss animals more than plants in the provided images. Students' attention tends to be on animals; however, attention to plants is not entirely ignored, though plants are placed in the background of the visual field to serve other organisms (Parsley, 2020). Attention to a person is selective; stimuli in the form of movements, such as animals, are captured more than others, so plants receive less attention because they do not produce visible movements (Stagg et al., 2024). This study shows that students' attention, both male and female 8th-grade students, and male and female 7th-grade students, remains low. Efforts to increase students' attention to plants can continue by encouraging them to observe plants in their surroundings, thereby strengthening their memory of plants (Wyner & Doherty, 2022). The practice of remembering affects increased attention to plants (Stagg et al., 2024).

3.2 Knowledge About the Importance of Plants

The average score on the indicator of knowledge about the importance of plants is relatively high — 39 — compared to the maximum value. The values obtained in each group include class 8 male 28.4, class 8 female 28.94, class 7 male 27.19, and class 7 female 27.98. Based on the average value obtained, the profile of knowledge about the importance of plants in class 8 shows that both male and female students have high values, indicating that class 8 students, both male and female, are superior in their knowledge of plants. The values in class 7 are almost the same, but female students have higher values than male students. The plant-related material in this study has been

Table 2 Results of Average Student Scores and Differences between Groups

Plant Awareness Indicators	Average Student Score				Maximum Score
	Grade 8 male	Grade 8 female	Grade 7 male	Grade 7 female	
Attention to Plants	3.46 ± 0.63	3.38 ± 0.70	3.53 ± 0.80	3.39 ± 0.58	12
Knowledge of the Importance of Plants	28.40 ± 4.91	28.94 ± 4.37	27.19 ± 5.89	27.98 ± 4.63	39
Interest in Plants	29.62 ± 6.58 ^a	29.61 ± 4.92 ^a	26.35 ± 6.35 ^b	30.24 ± 5.10 ^a	40
Attitudes to Plants	32.82 ± 4.84 ^a	32.85 ± 5.19 ^a	30.55 ± 5.48 ^b	33.49 ± 5.39 ^a	40

Lower case letters indicate the results of the Dunn Post Hoc test, different letters mean there is a significant difference.

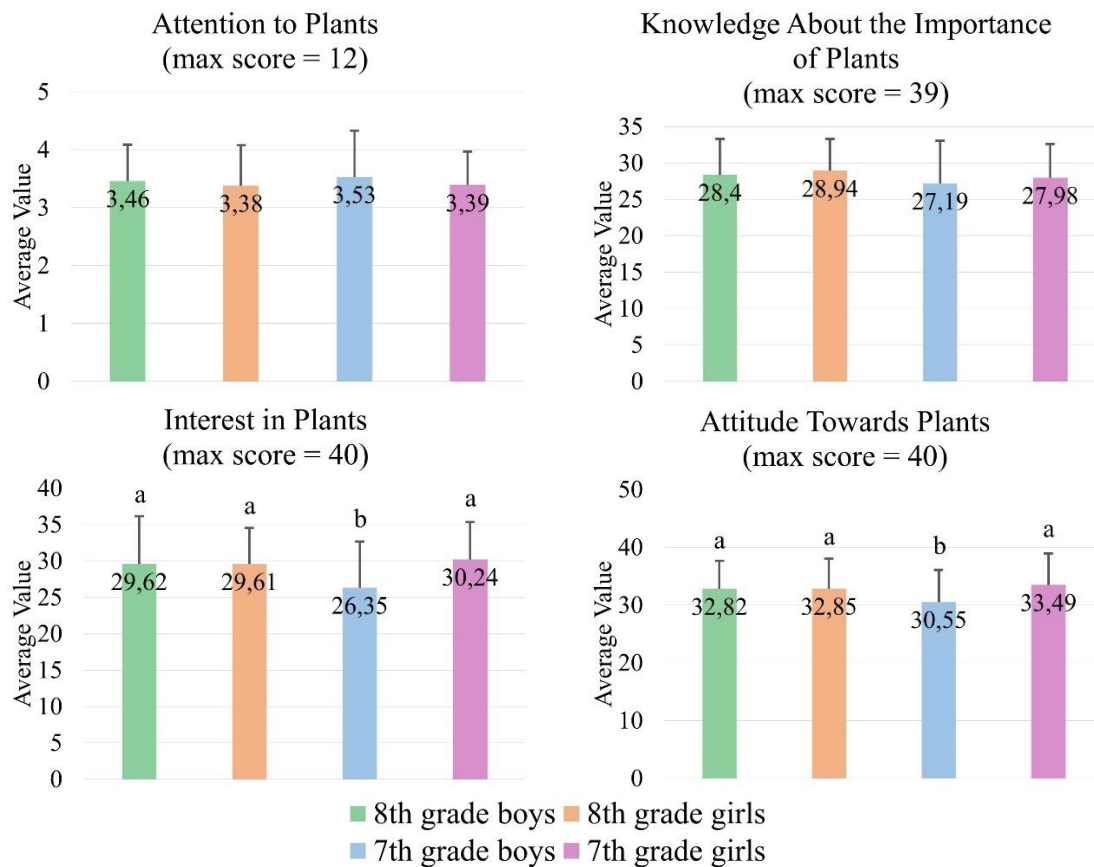


Figure 3 Comparison chart of students' Plant Awareness profiles based on average scores
The lowercase letters indicate the results of the Dunn Post Hoc test; different letters indicate a significant difference.

included in all samples, namely in class 7 odd semester, so that the average student value is higher than the maximum value. The difference in average scores between grade 8 males and grade 8 females tends to be higher than in grade 7. This occurs because the higher the class level, the more cognitive development, learning materials, and practical experience students will experience (Mudhar, 2017). In accordance with the independent curriculum, grade 7 students cover only the classification of living things and the ecology and biodiversity of Indonesia. In contrast, grade 8 students have received more material and experience related to plants. In the sample school environment, when students are in grade 8, they must be more active in activities beyond learning, for example, in organizations. Several sample school organizations can provide additional knowledge on plants, for example, Adiwiyata activities. This activity can increase students' knowledge and awareness of environmental preservation efforts, particularly in the school environment (Akbar et al., 2022). The average scores of female students are higher than those of male students; this is related to the cognitive level of female students, which tends to be higher than that of male students (Barnas & Ridwan, 2019). The profile reference for the knowledge indicator on the importance of plants still uses a comparison of the average value with

the maximum value for this indicator, because no previous research has discussed the level of knowledge among junior high school students.

3.3 Interest in Plants

The average interest indicator in plants is relatively high —40— compared to the maximum value. The average values obtained in each group are: 8th-grade males, 29.62; 8th-grade females, 29.61; 7th-grade males, 26.35; and 7th-grade females, 30.24. In the data results, 7th-grade males receive lower scores than other groups. Post Hoc Dunn testing also shows that 7th-grade males differ significantly from other groups. The average value shows that 8th-grade males and 8th-grade females have almost the same value, which is higher than that of 7th-grade males, while 7th-grade females have the highest score in this indicator, suggesting that 7th-grade females have a high interest in plants. Differences across groups can result from the influence of class and gender. The results for grade 8 interest are almost identical, and there is no difference between the two because, at this time, students have a broader view of plants. In contrast, in grade 7, females have a high interest in plants. In general, female students are more interested in plants because, based on their attitudes, behavior, and participation, they are more enthusiastic about caring for and maintaining the surrounding

environment, especially at school (Siskawati et al., 2023). In contrast to male grade 7 students, whose scores are lower and different from those of other groups. Peer interaction can influence students' interests; they tend to choose interests they consider cool (Suwanto et al., 2021). The learning environment can influence students' interest in plants (Stagg et al., 2024). Plants with distinct characteristics, such as shape, aroma, and color, can increase students' interest in learning about them (Stagg et al., 2024). The reference to the profile of interest in plants in this study is evident from the results of comparing the average value of this indicator with its maximum value. In addition, research conducted by Dünser et al. (2024) found that students aged 9-19 years had low interest. In contrast, in a study focused on students in grades 7 and 8, their interest in plants was relatively high, despite significant differences.

3.4 Attitudes Towards Plants

The average attitude indicator score towards plants is also relatively high, with a maximum value of 40. The average scores for each group are: male 8th-grade students (32.82), female 8th-grade students (32.85), male 7th-grade students (30.55), and female 7th-grade students (33.49). Based on the average scores of male and female 8th-grade students, the scores are almost the same and tend to be higher than those of class 7. In contrast, female 7th-grade students achieve the highest scores on the attitude indicator towards plants, indicating a stronger positive attitude than other student groups. In this study, male 7th-grade students have the lowest scores among the groups. Based on the Post Hoc Dunn test, male 7th-grade students have a significant difference when compared to other groups. The average grade for male and female students is the same. In addition to having broader insight and experience, grade 8 students also have a higher sense of responsibility than grade 7 students, so both male and female grade 8 students have relatively high values. Likewise, the value produced by grade 7 female students is almost the same as that of grade 8 students; this is related to the emotions of female students who prefer plants (Albarracin & Shavitt, 2018). Female students show higher empathy and are generally more concerned and sensitive to their surroundings, especially plants. The majority of women like plants. In grade 7, male students have a negative attitude towards plants, specifically a dislike of them. Students' low attitude towards plants may stem from a lack of direct interaction with them, which can affect their emotions. Direct activities with plants, such as planting small plants and caring for them until they grow, can increase students' emotions (Krosnick et al., 2018). According to Ju & Kim (2011), plants are more interesting when planted when they are still small (seeds). Activities that introduce students to the beauty of plants can help change students' emotional perceptions and cognitive understanding of plants (Dünser et al., 2024). The profile reference for the attitude indicator

towards plants is seen from the comparison of the average value in each group with the maximum value on this indicator, in addition there is research that can be used as a reference for the attitude indicator towards plants, namely research by Dünser et al. (2024) which studied students aged 9-19 years; in this study, it was found that students have a positive attitude towards plants, but it was not explained in detail at what age they have a higher positive attitude towards plants. Research by Siskawati et al. (2023) indicates that female students have a more positive attitude towards preserving their environment, for example, caring for plants and protecting the surrounding environment. The differences between the two sexes are significant, especially in attitudes, behavior, and participation in activities (Siskawati et al., 2023). Women are more sensitive, enthusiastic, and active in practicing sustainability awareness.

In this phenomenon, previous studies stated that gender does not fully influence a person's Plant Awareness profile. According to Bruschi et al. (2019) In their research, they found that female participants better mastered plant knowledge than male participants. Women are better able to remember and identify more plant types (Kaasinen, 2019). In the study Bruschi et al. (2019) Found that females are better at making lists of plants and lists of plant roles than males, but in the study Linderwell et al. (2024) Stated that male participants identified more types of plants than female participants. Based on a literature review from Stagg & Dillon (2022) On biology education and ethnobiology literature linking gender relations to traditional knowledge, it explains that in 15 studies, no differences were found between genders, 18 studies found differences that women know more about plants, and 13 studies found that men know more about plants, so that from several previous studies, the findings regarding gender differences and knowledge about plants are still ambiguous.

Based on this study, it was found that female students have more advantages in indicators of knowledge about the importance of plants, interest in plants, and attitudes towards plants. In contrast, male students are superior in indicators of plant attention. Male students in this study pay more attention to plants. The study found that male participants tend to have a more confident attitude toward their abilities than female participants, which affects their performance. (McMurrin et al., 2023). However, female students also have advantages in indicators of knowledge, interest, and attitudes towards plants. Female students are interested in studying plant science, especially medicinal plants (Bruschi et al., 2019).

Based on the study's results, 8th-grade students tend to have higher grades than 7th-grade students. This is in line with research. Bruschi et al. (2019) This shows that children's knowledge will continue to increase with age. It can be concluded that knowledge and skills will increase with age and experience.

4. CONCLUSION

Based on this study, it is concluded that the Plant Awareness profile in students is relatively high based on the comparison of the average value results for each Plant Awareness indicator, but in the Plant Awareness indicator, the student profile in attention to plants is still very low based on the comparison of the maximum value. The results of the student profile on the indicators of knowledge about the importance of plants, interest in plants, and attitudes towards plants are relatively high, relative to the maximum value. The results of the study show that 7th-grade males exhibit significant differences in their interest in and attitudes towards plants. The results of the study on 8th-grade male and female students tend to be higher and more stable than those of 7th-grade students, suggesting that higher grade levels are associated with greater plant awareness. Based on studies of gender differences, seventh- and 8th-grade females achieve higher, more stable scores than their male peers, suggesting that female students have greater awareness of plants than males. The low profile of attention to plants among students needs to be improved through learning activities that directly involve plants. Junior high school students are still in a phase where their interests and attitudes are subject to change. Therefore, their interest and attitudes toward plants can be enhanced through appropriate activities or learning. Students' plant awareness profiles must be assessed in detail so that teachers can improve them through targeted, efficient learning strategies, leading to greater student attention, knowledge, interest, and positive attitudes toward plants.

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