

Are different responses related to the different affective features? CHAID analysis study

Neslihan Tugce Ozyeter^{1,*}

¹Kocaeli University, Faculty of Education, Department of Educational Sciences, Kocaeli Türkiye

ARTICLE HISTORY

Received: June 18, 2022

Revised: Aug. 13, 2022

Accepted: Aug. 17, 2022

Keywords:

CHAID analysis,
Rubric,
Affective features,
Student answer.

Abstract: In education, examining students' learning in detail, determining their strengths and weaknesses and giving effective feedback have gained importance over time. The aim of this study is to determine the distribution of students' answers to the reading comprehension achievement test items which were written at different cognitive levels and to investigate the affective variables that are effective in classifying students based on their incorrect, blank, and unrelated answers identified via rubric. For this purpose, a reading comprehension achievement test, a student information form, the perceived academic self-efficacy scale and the learned helplessness tendency scale were used to collect data. The student information form included perseverance, achievement motivation, exposure to bullying and test anxiety subscales. A rubric was used to determine the students' response categories. According to the findings of the study, the rate of blank and incorrect answers increases as the cognitive level of the items become more complex. While the most correct response rates are decreasing, partially-correct answers are increasing relatively. While students' learned helplessness tendencies were effective in classifying their blank and unrelated answers at the most basic reading comprehension level, as the cognitive process became more complex, the affective characteristics classifying the student responses increased in number. It was concluded that these variables are important in improving the students' answers and in leading them to the partially correct and the most correct answer. It can be suggested to create trainings and classroom environments that will equip and improve students' features about these variables.

1. INTRODUCTION

Many discrete test item structures are used to measure various psychological features in education and psychology. The preferred item structure depends on the psychological feature to be measured. The use of multiple-choice items, frequently administered throughout the 20th century, is quite common in national and international high-stakes tests and in-class measurements. Although multiple-choice items offer various advantages, their limitations have been debated today, and there seems to be a consensus on the existence of more valid and reliable methods to measure certain skills.

*Corresponding Author: Neslihan Tugce OZYETER ✉ simsekneslihuntugce@gmail.com 📍 Kocaeli University, Faculty of Education, Department of Educational Sciences, Kocaeli, Türkiye

One major disadvantage of multiple-choice items is that they do not inform any of the education stakeholders about how students transfer what they have learned and how they structure their answers. With the effect of chance success, simply marking the correct answer in multiple-choice items provides very limited information about students' learning and disregards their partial learning. Additionally, the feedback to students with the same score is quite similar and limited particularly in terms of students' individual learning characteristics and shortcomings.

Many weaknesses of multiple-choice items, changes in the features to be measured, and advances in learning and teaching theories have brought about a more in-depth examination and measurement of student performance. Therefore, educators meet open-ended item use. An open-ended item requires students to construct and write their own answers (Badger & Thomas, 1991). Although it requires expertise to prepare an open-ended item, it is much easier than writing a multiple-choice item, which offers a great advantage. The fact that students create their own answers is very informative about their learning progress. Whether and to what degree the student has achieved the targeted outcome measured by the item, and how much s/he is able to answer correctly can be reliably analyzed thanks to the zero-chance success regarding the item. A rubric must be used to carry out this process and to eliminate errors arising from subjective scoring of the item.

A rubric (Kutlu *et al.*, 2017; Popham, 1999) is a tool for scoring the performance of students in general or by dividing the performance into sub-dimensions, in line with certain indicators. The use of the rubric is very important to explain which performance indicator the student will match with how many points, or which performance indicator the student's score on the item corresponds to. Thus, any doubts about the subjective context of scoring open-ended items are eliminated. Effective feedback is the most important benefit that the rubric adds to the teaching and learning process. Whether the student's performance is measured in general or divided into sub-dimensions, it shows the performance level of the student's response to the item. It also provides information on how to perform to reach higher performance levels, which not only increases the validity of the scores, by providing objective scoring of the answers given to the item but also provides feedback to the student about his/her own performance.

Rubrics are of two types: holistic and analytical (Kutlu *et al.*, 2017). Whereas in analytical rubrics, performance is defined by its sub-dimensions with ratings corresponding to the individual's performance for each sub-dimension, the holistic rubric contains an overall assessment of student performance. A holistic rubric prepared for an achievement test consisting of open-ended items includes possible answers that a student can give. Hence, the most correct answer, partially-correct answers, blank answers, incorrect answers, and unrelated answers are the answer categories for the achievement test. These response categories can be summarized as follows:

The most correct answer: It is the answer that accurately and completely describes the construct and scope measured by the item. When creating the rubric, this response category is written first.

Partially correct answer(s): Responses in this category include answers that accurately but incompletely describe the measured construct and scope.

Incorrect answer: An incorrect answer is the answer that is correct in itself but not true to the scope asked by the item.

Blank Answer: It is the absence of any response regarding the scope and construct of interest in the item.

Unrelated answers: These are the answers that are not related to the scope or construct measured by the item or reflect the cases where the student's writing is illegible.

The response categories described above reveal student performance. The high performance of students in an achievement test is related to their answers being close to the most correct answer. In other words, the first step to be taken to have more successful students is to teach students who give blank, incorrect and unrelated answers in a way that they will give partially correct and the most correct answers. To increase student performance in this way, students should be informed about their performance at the first place. Later, the performance indicators at the target performance level should be examined, and the thinking and learning strategies of the students should be reviewed in light of the feedback.

The answer to the question of why some of the students who receive education in the same class under similar conditions can give the most correct answer, while others leave the item unanswered or give wrong answers is thought to be related to the students' affective features. Reviewing the related research literature, it is clear that self-efficacy comes first among the affective characteristics associated with the academic performance of students (Manzano-Sanchez *et al.*, 2018; Nasir & Iqbal, 2017; Olivier *et al.*, 2019). High self-efficacy, defined as the individual's belief in his or her own capacity (Bandura, 1982), is a factor that increases student success, while low self-efficacy means that students have low self-esteem and low performance. Learned helplessness is a variable that affects both the academic success and emotional wellbeing of the student. Learned helplessness occurs when the individual cannot achieve the expected result despite her/his repeated efforts and weakens the relationship between her/his behavior and the result expected. This situation results in the individual not doing what s/he needs to do to achieve his/her goal. The literature states that students with learned helplessness have low school achievement (Ghasemi, 2021; Walling & Martinek, 1995). Perseverance, on the other hand, is the continuation of the goal-oriented behavior of the individual despite the obstacles (Dweck, 1986). It is closely related to motivation, and both perseverance and motivation are variables that affect student success. Test anxiety is another factor that affects an individual's performance. While low-level anxiety increases the performance of the individual (Parvez & Shakir, 2014), the increase in anxiety makes it difficult for the individual to start work and leads to cognitive and emotional harm (Zahrakar, 2008). Test anxiety also describes the individual's fear of mental failure (Hembree, 1988). This anxiety, which arises when the student takes the test or being evaluated, affects his/her performance. Another variable within the scope of this study that is thought to affect the academic performance of students is exposure to bullying. The child who is bullied by her/his friends at school or in the educational environment suffers from some emotional consequences, and thus her/his academic performance becomes poorer. Studies in the literature confirm the negative relationship between exposure to bullying and academic performance (Roman & Morilla, 2011; van der Werf, 2014).

One of the prerequisites for increasing student performance, getting higher-quality students' answers, and enabling students to perform better in national and international assessments is to identify students who give incorrect, blank and unrelated answers. By doing so, it is thought that necessary measures can be taken to ensure that these students are paid attention to give partially correct and the most correct answers. Identifying the affective characteristics that can be used in classifying student responses is important, especially in determining the characteristics of students who give incorrect, blank, and unrelated answers, and in taking precautions for this student group. Therefore, with this study, it is aimed to determine the affective characteristics that are effective in classifying the distribution of the answers given by the students to the items written at different cognitive levels in the reading comprehension achievement test.

1.2. Research Questions

Questions to be answered within the context of this study are as follows:

- 1- What is the distribution of the answers, given by the fifth-grade students, to the open-ended items written at different cognitive levels based on the response categories?
- 2- What role do achievement motivation, perseverance, test anxiety, perceived academic self-efficacy, exposure to bullying, and learned helplessness of fifth-grade students play in classifying their responses to open ended items at different cognitive levels in the reading comprehension test?
- 3- How do the students' affective characteristics, which play a role in classifying the response categories of the answers given to the reading comprehension test, differ according to the cognitive level of the item?

2. METHOD

2.1. Research Design

This research is designed as a correlational study, which aims to reveal the relationships between students' affective features and their responses to the reading comprehension achievement test. To decide which variables are discriminators, the relationships between independent variables and the dependent variables were examined.

2.2. Study Group

The Study group consisted of 944 fifth grade students from Ankara and Kocaeli provinces in Turkey. The students were chosen from different districts of the cities in order to minimize the effects of socioeconomic variables. The gender and the location distribution of the study group is presented in [Table 1](#).

Table 1. *Gender and the Location Distribution of Study Group.*

	<i>f</i>	%
Gender		
Female	436	46.2
Male	508	53.8
Province		
Ankara	313	33.2
Kocaeli	631	66.8

[Table 1](#) shows that the gender distribution of the study group is quite even. The percentages of female and male students are close to each other. The study group mainly composed of students from Kocaeli province.

2.3. Data Collection Tools

To collect data, a reading comprehension test, a scoring rubric and student information form were used. All data collections tools were constructed by the researcher. To collect data, ethical permission from Ankara University was approved on 30/03/2020 and the decision number is 64. Additionally, data collection permissions were received from provincial directorates of national education of Ankara and Kocaeli.

2.3.1. Reading comprehension test

The reading comprehension achievement test was composed of 4 open-ended items. These items were generated based on the reading comprehension processes suggested by Progress in International Reading Literacy Study (PIRLS). PIRLS defines reading comprehension processes with four cognitive processes. These processes are focusing on and retrieving

explicitly stated information, making straightforward inferences, interpreting and integrating ideas and information and evaluating and critiquing content and textual elements. These processes are hierarchical which means that they are constructed from the simplest to the most complicated. While focusing on and retrieving explicitly stated information process requires students to use the explicitly stated information as it is in the text, evaluating and critiquing content and textual elements, which is the most complex comprehension process, allows students to benefit from their own experiences and learning and present an evaluation or produce a critique (Mullis *et al.*, 2016).

In order to receive an expert opinion for the items developed, PIRLS reading comprehension processes document, the text and the items were sent to an expert group of measurement and evaluation in education and a Turkish language teacher with 5-year experience. Experts were asked to provide feedback regarding the validity of the items, technical features of the items and the instructions while Turkish teacher was requested to provide feedback about the suitability of the text and the items with the age of the students. All the feedback was carefully studied and necessary editing and corrections were made in line with the feedback. The reading comprehension achievement test was finalized.

Upon finalizing the reading comprehension achievement test, it was piloted with a small group which is similar to the target group. This small session was used to predict the necessary time for students to read the text and write their answers. Additionally, students' questions during the session were noted down to be used to have more reliable and valid data collection process.

2.3.2. Rubric

Rubric was constructed to objectively score the open-ended items in the reading comprehension achievement test, and to identify the students' response categories. To prepare a valid rubric, the answers of the students collected from the pre-test application provided an insight.

The rubric included response categories that can be used to give feedback to the students. The response categories were the most correct answer, partially correct answers, blank answers, incorrect and unrelated answers. For each item, the most correct answer was written first. Partially correct answers were defined according to their distance to the most correct answer. Blank answers were those in which the student did not write anything. Incorrect answer was the correct answer of another item, while unrelated answer referred to the student's answers unrelated from the text.

2.3.3. Student information form

The student information form measured the student's affective and demographic characteristics. The affective characteristics of the student measured within the scope of the study were achievement motivation, test anxiety, perceived academic self-efficacy, exposure to bullying, perseverance and learned helplessness tendency.

2.3.3.1. Achievement Motivation. A 5-item subscale used in the PISA 2015 application was used to measure students' achievement motivation (OECD, 2017). The reliability coefficient calculated for the study group was 0.77. The Confirmatory Factor Analysis (CFA) results for the study group showed that the subscale was validated for the study group (RMSEA=0.035; CFI=0.99; TLI=0.99; SRMR=0.014).

2.3.3.2. Test Anxiety. Test anxiety was measured through the 5-item-subscale used in the PISA 2015 application. The CFA results for the study group constituted the validity evidence of the scale (RMSEA=0.053; CFI=0.99; TLI=0.97; SRMR=0.023). The internal consistency coefficient calculated for the group of this study was 0.74.

2.3.3.3. Perceived Academic Self-Efficacy. Students' academic self-efficacy was measured with the Perceived Academic Self-Efficacy scale adapted by Özyeter and Kutlu

(2022). There were 30 items under 3 dimensions in the scale. The CFA results of the scale for the study group showed that the construct was confirmed for the study group (RMSEA=0.066; CFI=0.91; TLI=0.90; SRMR=0.063). The Cronbach Alpha internal consistency coefficient was 0.68.

2.3.3.4. Exposure to Bullying. Exposure to bullying subscale was used in PISA 2018 application (OECD, 2019). According to the CFA results, the scores obtained from the scale were valid for the study group (RMSEA=0.054; CFI=0.98; TLI=0.96; SRMR=0.033). The Cronbach Alpha reliability coefficient was calculated as 0.81.

2.3.3.5. Perseverance. Another subscale used in the study was perseverance subscale (OECD, 2014). When the CFA results for the study group (RMSEA=0.034; CFI=0.99; TLI=0.99; SRMR=0.017) and the internal consistency coefficient (0.77) were examined, it can be concluded that the subscale produced valid and reliable results.

2.3.3.6. Learned Helplessness Tendency Scale. The learned helplessness tendency scale developed by Kutlu and Özyeter (in press) produced valid (RMSEA=0.037; CFI=0.92; TLI=0.90; SRMR=0.036) and reliable (0.68) results for the study group.

The fact that the sub-scales and scales in the student information form generally had lower reliability than the original forms was thought to be related to their application to a single grade level. Data collected from the fifth grade students may have become more homogeneous in terms of the feature of interest. Therefore, the reliability was lower than the original forms. Still, they are above the acceptable lower limit of 0.60.

2.4. Data Analysis

Before proceeding to the analysis of the data, descriptive statistics of the scores obtained from the subscales and scales measuring affective characteristics were presented in order to explain the situation of the study group in terms of the variables measured in the study.

To answer the first research question of the study, frequencies and percentages were used and graphs were created to examine the distribution of the answers given by the fifth-grade students to the items written at different cognitive levels in the reading comprehension achievement test. CHAID analysis was used to answer the second research question, which is "What role does fifth grade students' achievement motivation, perseverance, test anxiety, perceived academic self-efficacy, exposure to bullying, and learned helplessness play in classifying their responses to items written at different cognitive levels in the reading comprehension achievement test?". CHAID analysis is one of the oldest and best-known tree classification methods developed by Kass in 1980 and uses the chi-square test for categorical dependent variables (Nisbet *et al.*, 2009). CHAID classifies the analyzed data set on the condition that the change in the dependent variable is minimum (homogeneous) within groups and maximum (heterogeneous) between groups, and repeats this process until there is no statistically significant differentiation for the subgroups formed after each node (Kass, 1980). Within the scope of the study, the correct answer category was created by combining the most correct answer and partially correct answers of the students together. The dependent variable of the CHAID analysis is the students' response categories (correct answer, incorrect answer, blank answer and unrelated answer). The independent variables are learned helplessness, perceived academic self-efficacy, achievement motivation, perseverance, test anxiety and exposure to bullying. In order to answer the last research question, the similarities or differences of the affective characteristics, which were effective in classifying the answers given to the items in the reading comprehension achievement test which are written at different cognitive levels, were examined. CHAID analysis demands no assumptions regarding the distribution of the relationships of variables. However, defining the correct scale levels of both dependent and independent variables is of the most importance (IBM, 2012). In order to answer the last research question, the similarities

or differences of the affective characteristics, which are effective in classifying the answers given to the items written at different cognitive levels in the reading comprehension achievement test, were examined.

3. FINDINGS

Before answering the research questions, the descriptive statistics of the scales and subscales and the factors of the achievement test used in the study were calculated. These statistics are presented in [Table 2](#).

Table 2. *Descriptive Statistics of Data Collection Tools.*

	\bar{x}	<i>Sd</i>	Minimum Score	Maximum Score
Reading comprehension achievement test total score	21.82	6.78	0.00	37.00
First item (first cognitive process)	8.12	3.13	0.00	10.00
Second item (second cognitive process)	4.78	2.88	0.00	10.00
Third item (third cognitive process)	5.29	2.83	0.00	10.00
Forth item (forth cognitive process)	3.62	2.11	0.00	10.00
Achievement motivation	16.57	3.04	5.00	20.00
Perseverance	16.08	2.78	6.00	20.00
Text anxiety	12.32	3.66	5.00	20.00
Perceived academic self-efficacy	92.35	11.21	51.00	120.00
Exposure to bullying	9.16	4.03	6.00	24.00
Learned helplessness tendency	4.12	2.43	0.00	13.00

When the descriptive statistics presented in [Table 2](#) are examined, the scores corresponding to the answers given by the students to the achievement test items are observed to be the highest at the level of focusing and retrieving explicitly stated information, and the lowest at the level of examination and evaluation and critiquing the context and the textual elements, which is the most complex level of reading comprehension. The scores decrease as the students proceed through the complex reading processes. When the student affective characteristics are examined in general, it can be seen that the students get the highest scores on the achievement motivation and perseverance subscales.

3.1. Findings Regarding the First Research Question

The first research question sought to be answered is how the students' responses to the items at different cognitive levels in the reading comprehension test are distributed in response categories. The distribution of the answers given to the first item of the reading comprehension achievement test, which measures the cognitive process of focusing on and retrieving the clearly stated information, is given in [Table 3](#).

Table 3. *Distribution of the answer to the first item (cognitive process: focusing on and retrieving explicitly stated information).*

Cognitive process	Response Category	<i>f</i>	%
Focusing on and retrieving explicitly stated information	The most correct answer	640	68.3
	Partially correct answers	116	12.4
	Blank answers	65	6.9
	Incorrect answers	69	7.4
	Unrelated answers	47	5.0

According to Table 3, most of the students gave the most correct answer in the process of focusing on and retrieving the explicitly stated information, which is the first cognitive level in the measurement of reading comprehension. Including the partially correct answers, more than 80.7% of the group gave the correct answer, while 19.3% failed to do so. Table 4 shows the distribution of the responses given to the second item, which measures the process of making straightforward inferences.

Table 4. Distribution of the answer to the second item (cognitive process: making straightforward inferences).

Cognitive process	Response Category	<i>f</i>	%
Making straightforward inferences	The most correct answer	92	9.8
	Partially correct answers	323	34.5
	Blank answers	200	21.3
	Incorrect answers	251	26.8
	Unrelated answers	71	7.6

Looking at the given response categories in Table 4, only 9.8% of the group had the most correct answer in the cognitive process of making straightforward inferences. Students who gave correct answers together with those who gave partially correct answers constitute only 44.3% of the whole group. The number of students who gave blank, incorrect and unrelated answers in the process of making simple inferences is remarkable, more than half of the group. Table 5 shows the distribution of the answers given to the third item, which measures the process of interpreting and integrating ideas and information.

Table 5. Distribution of the answer to the third item (cognitive process: interpreting and integrating ideas and information).

Cognitive process	Response Category	<i>f</i>	%
Interpreting and integrating ideas and information	The most correct answer	103	11.0
	Partially correct answers	392	41.8
	Blank answers	235	25.1
	Incorrect answers	123	13.1
	Unrelated answers	84	9.0

Examining Table 5, it can be observed that only 11% of the answers to the item that measures the cognitive process of interpreting and integrating ideas and information are the most correct answer. Those who answered this item correctly constitute only half of the group. Similar to the case in the cognitive process of making straightforward inferences, students have quite a lot of blank, incorrect, and unrelated answers for this item. The number of students who gave the most correct answers were outweighed by the number of students who left the items blank or made it wrong. Table 6 shows the distribution of the responses given to the fourth item in the reading comprehension achievement test, which measures evaluating and critiquing the content and the textual elements.

Table 6. Distribution of the answer to the fourth item (cognitive process: evaluating and critiquing content and textual elements)

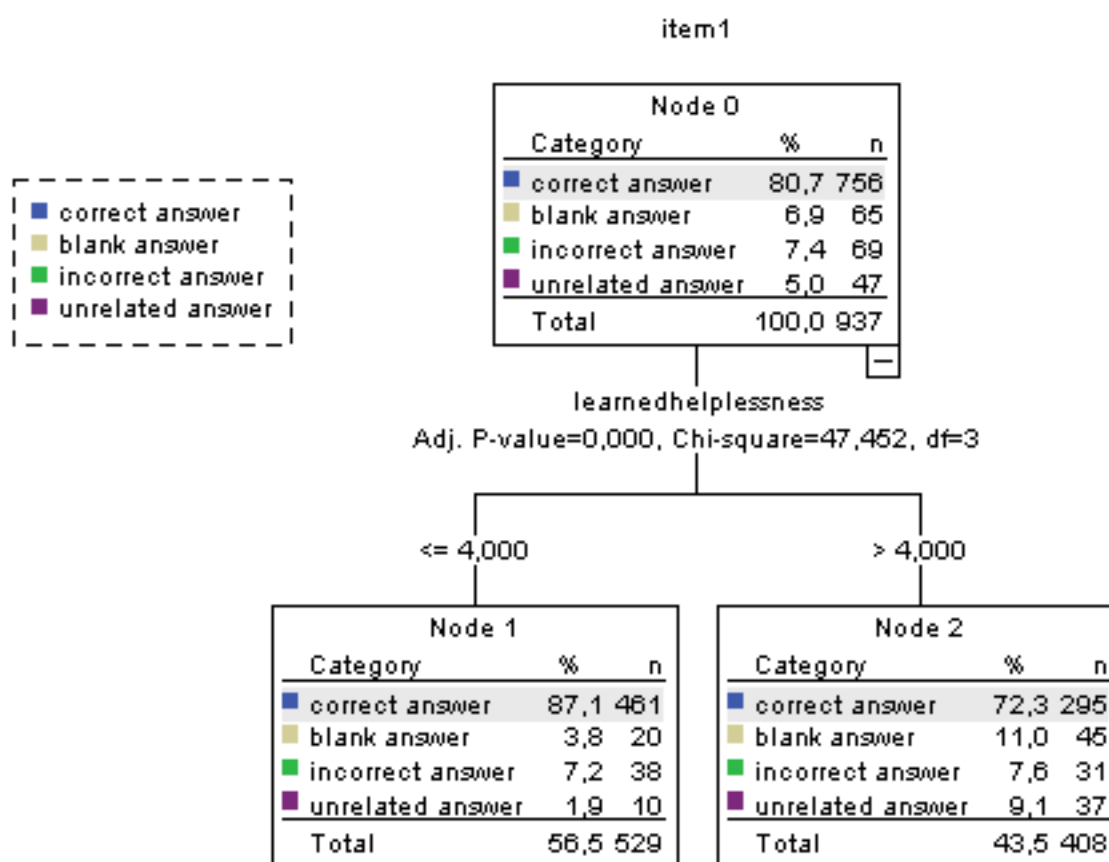
Cognitive process	Response Category	<i>f</i>	%
evaluating and critiquing content and textual elements	The most correct answer	22	2.3
	Partially correct answers	135	14.4
	Blank answers	393	41.9
	Incorrect answers	326	34.8
	Unrelated answers	61	6.5

The distribution of the responses given to the item focusing on evaluating and critiquing the content and elements of the text, which is the most complex level of reading comprehension, is given in Table 6. Accordingly, the rate of students who gave the most correct answer is only 2.3% of the group. Notably, almost half of the group (41.9%) left this item unanswered. The rate of those who gave incorrect answer to the item is one third of the group (34.8%).

3.2. Findings Regarding the Second Research Question

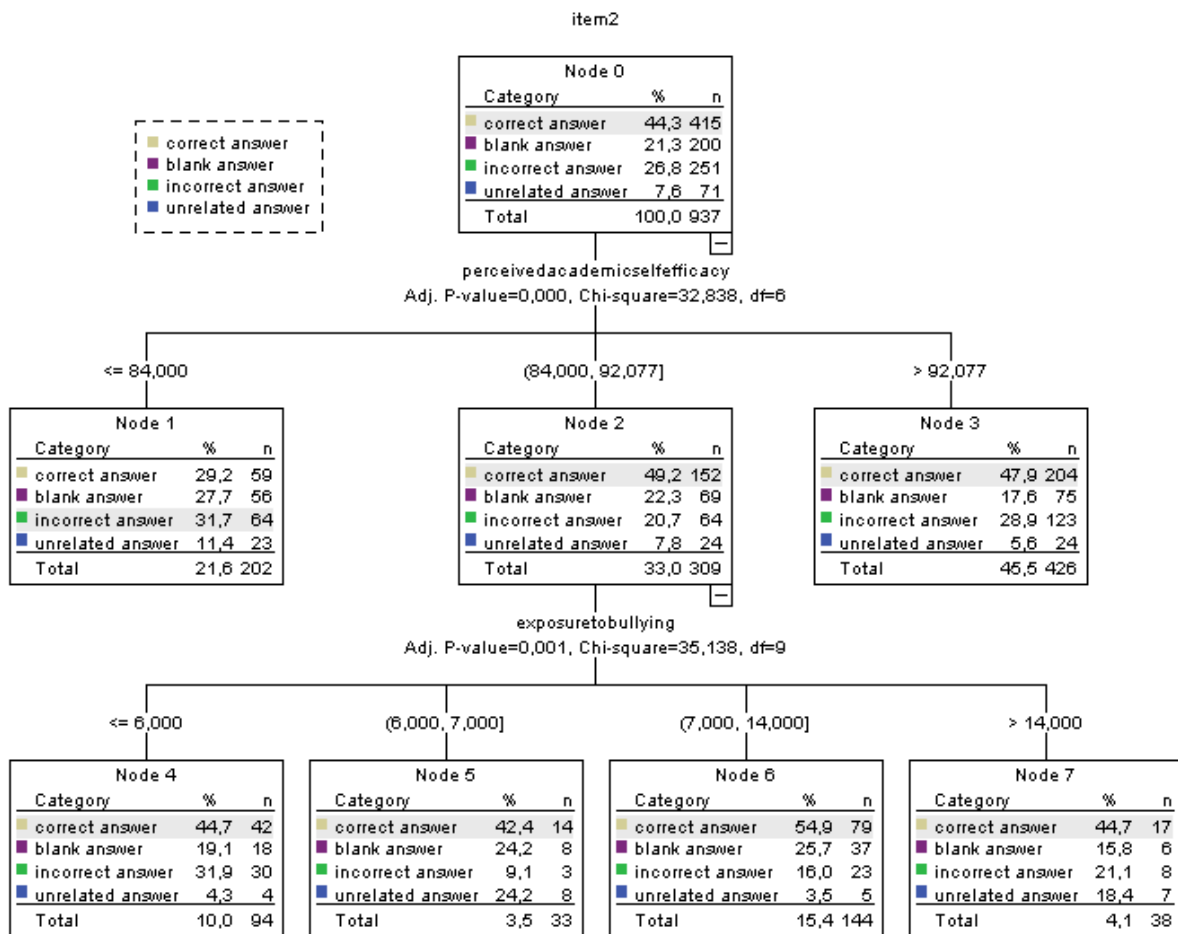
Figure 1 shows the tree graph created through the CHAID analysis to examine the role of achievement motivation, perseverance, test anxiety, perceived academic self-efficacy, exposure to bullying, and learned helplessness tendency on classification of the students based on their response categories.

Figure 1. Decision Tree for the first item.



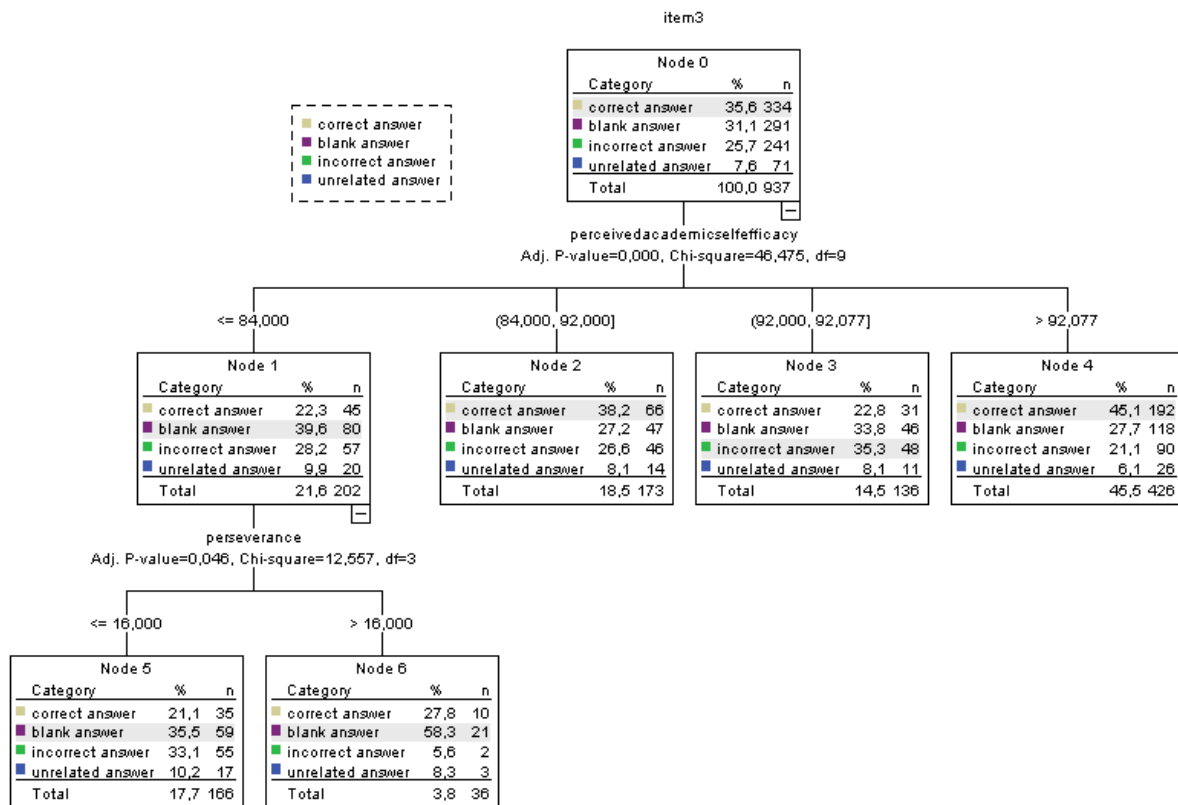
Looking closely at the decision tree given in Figure 1, one variable is noted as affecting the students' incorrect, blank, and unrelated answers at the cognitive level of focusing and retrieving explicitly stated information. This variable is the learned helplessness tendency. Accordingly, 7.4% of the students in the first branch answered incorrectly; 6.9% gave blank, and 5.0% gave unrelated answers. Learned helplessness tendency has a strong impact on students' incorrect, blank and unrelated answers ($\chi^2=47.452$; $df=3$; $p<0.01$). While 12.9% of the students with a learned helplessness tendency score of 4 and below gave incorrect, blank or unrelated answers, 27.7% of the group with a learned helplessness tendency score above 4 gave incorrect, blank or unrelated answers. The decision tree was created to identify the variables that play a role in the incorrect, blank and unrelated answers given at the cognitive level of making straightforward inferences was presented in Figure 2.

Figure 2. Decision Tree for the second item.



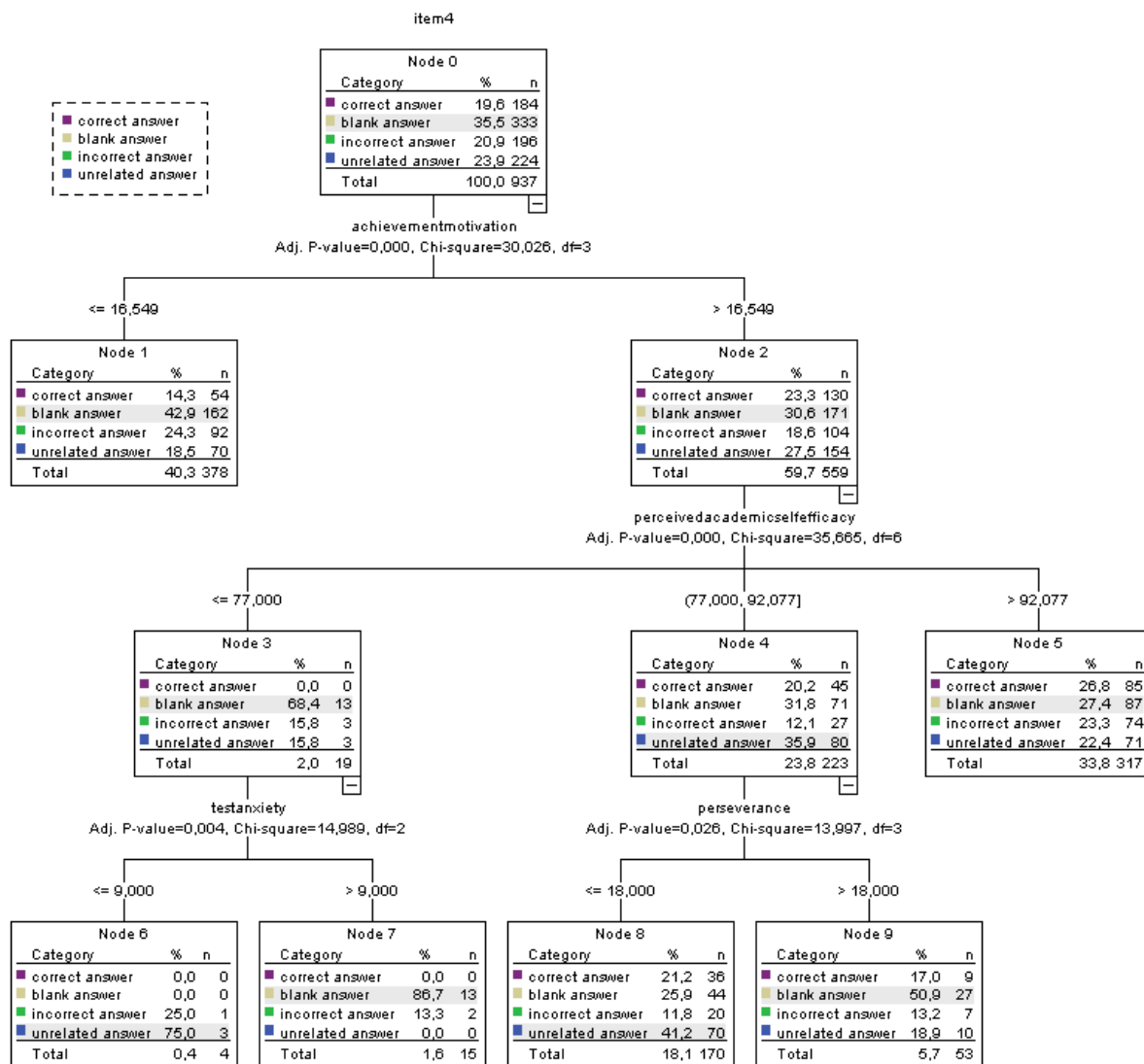
As shown in Figure 2, the strongest variable in classifying the students' responses at the cognitive level of making straightforward inferences was perceived academic self-efficacy ($\chi^2=32.838$; $df=6$; $p<0.01$). Accordingly, students with a perceived academic self-efficacy of 84 points or less constituted 21.6% of the group; those between 84 and 92 constituted 33.0% of the group, and those with more than 92 points constituted 45.5% of the group. When the response distributions of the students were examined according to their perceived academic self-efficacy, 70.8% of the group with the lowest perceived academic self-efficacy gave incorrect, blank or unrelated answers. 50.8% of the students in the middle group and 52.1% in the top group gave incorrect, blank or unrelated answers. In terms of perceived academic self-efficacy, the branch in the middle group, where half of the group answered incorrectly or gave blank or unrelated answer, formed a knot again. In other words, the variable that classifies the answers given by students whose perceived academic self-efficacy score was between 84 and 92 points was the variable of being bullied ($\chi^2=35.138$; $df=9$; $p<0.01$). The percentages of incorrect, blank and unrelated answers in the leaves prepared according to the scores obtained from the bullying scale were very similar (between 45.2% and 57.5%). When the leaves were examined in more detail, the differences in the response categories of the students according to the scores of being exposed to bullying are striking. Accordingly, as the scores obtained from the students' exposure to bullying subscale increase, the unrelated response rates increase as well. The decrease in the scores of being exposed to bullying can be seen in the leaves with a higher number of wrong answers. Figure 3 shows the tree created to examine the variables that have an effect on the answers at the level of interpreting and integrating ideas and information, which is the third cognitive level of reading comprehension.

Figure 3. Decision Tree for the third item.



When the decision tree given in Figure 3 is examined, it can be pointed out that the most important affective factor in the students' responses at the level of interpreting and integrating ideas and information was their perceived academic self-efficacy ($\chi^2=46.475$; $df=9$; $p<0.001$). Accordingly, the rate of incorrect, blank and unrelated answers in the group with the highest perceived academic self-efficacy was 54.9%, while in the other levels of perceived academic self-efficacy, this rate ranged between 61.8% and 77.7%. The perseverance variable affected the answers of the students with the lowest perceived academic self-efficacy, who constituted 21.5% of the whole group and had the highest rate in terms of incorrect, blank and unrelated answers ($\chi^2=12.557$; $df=3$; $p<0.05$). Accordingly, while 78.9% of the students with a perseverance score of 16 or less gave incorrect, blank or unrelated answers, the rate of incorrect, blank and answers was 72.2% for the students who scored higher than 19 points. What is noteworthy here is the distribution of these percentages to the answers. While students with low perceived academic self-efficacy and low perseverance had the same rate of blank and incorrect answers, 35.5% and 33.1% respectively, the rate of incorrect answers was only 5.6% for those with low perceived academic self-efficacy and high perseverance. The blank answers were 58.3%. The decision tree formed for the answers given for the evaluating and critiquing the content and textual elements, which was the final level of reading comprehension was presented in Figure 4.

Figure 4. Decision Tree for the fourth item.



When the decision tree presented in Figure 4 is examined, the first thing that stands out regarding the process of evaluating and critiquing the content and the textual elements is that the variables that classifies the answers of the students are achievement motivation ($\chi^2=30.026$; $df=3$; $p<0.01$), perceived academic self-efficacy ($\chi^2=35.665$; $df=6$; $p<0.01$), test anxiety ($\chi^2=14.989$; $df=2$; $p<0.01$) and perseverance ($\chi^2=13.997$; $df=3$; $p<0.05$). Accordingly, while 85.7% of students with achievement motivation scores below 16.5 points gave incorrect, blank or unrelated answers, this rate was 76.7% for the students scoring above 16.5 points. While the blank answers given by students with low achievement motivation (42.9%) were quite high, the same rate was 30.6% for the highly-motivated students (>16.5). In the incorrect and unrelated response categories, the percentage in the group with low motivation (42.8%) was lower than that in the high-motivation group (46.0%). The variable that affected the responses of the group with a high score on the achievement motivation scale was observed as perceived academic self-efficacy. Students who scored more than 16.5 points from the achievement motivation scale and had low perceived academic self-efficacy (<77) mostly gave blank answer, and they had no correct answer at all. While the rate of blank and unrelated answers was high for students with perceived academic self-efficacy scores between 77 and 92, a more balanced distribution was observed in the incorrect answers of students who scored more than 92 points. The test

anxiety was the one of the variables that affected classifying the answers given in the cognitive process of examining and evaluating content and textual elements. As such, among the students with low perceived academic self-efficacy, incorrect and unrelated answers were observed by the students with low test anxiety (<9), while no blank answers were observed. Unrelated response behavior was never observed in students with high-test anxiety (>9). The students in this group mostly gave blank answers. The variable that classifies the distribution of students with moderate perceived academic self-efficacy (<77-92<) into response categories is the variable of perseverance. Accordingly, the answers of the students with a perseverance score of 18 points and below were mostly unrelated answers, while the students with a perseverance score of more than 18 points generally left the questions unanswered.

3.3. Findings Regarding the Third Research Question

The third problem of the study focuses on how the students' affective characteristics that has a role on classifying the responses differ according to the cognitive level of the item. Accordingly, the learned helplessness tendency variable was found to play a significant role in classifying student responses in the cognitive process of focusing on and retrieving explicitly stated information. Perceived academic self-efficacy and being exposed to bullying were found to have a significant role in classifying responses in the cognitive process of making straightforward inferences. Perceived academic self-efficacy and perseverance were found to play a significant part in classifying the responses in the cognitive process of interpreting and integrating ideas and information. Finally, perceived academic self-efficacy, achievement motivation, test anxiety, and perseverance variables were found to be significant in classifying the responses given to the cognitive level of evaluating and critiquing content and textual elements.

4. DISCUSSION and CONCLUSION

In this study, the answers of the fifth-grade students to the open-ended reading comprehension items were examined. The main point in this examination was to determine the affective characteristics that play a key role in classifying the incorrect, blank and unrelated answers indicating student failure. Thus, the aim was to outline a profile based on the affective characteristics of the students in these response categories, which is an indication of failure to understand what they read. In addition, based on the processes of measuring reading comprehension it was expected that the affective profiles of students may change. In other words, it was thought that the affective variables classifying the blank, incorrect and unrelated answers given to the most complex reading comprehension level, which is evaluating and critiquing content and textual elements, would not be the same with the variables classifying the blank, incorrect and unrelated answers given at the most basic reading comprehension level, namely focusing on and retrieving explicitly stated information. The change in affective characteristics that play a role in the classification of students' responses to items at different cognitive levels was also examined. The first conclusion can be drawn from the finding of the study is that as the reading comprehension cognitive processes became more complex, the correct response rates of the students decreased, and the rates of incorrect and blank answers increased. The unrelated response rates were close across all cognitive processes.

The reason why incorrect and blank response rates increase as cognitive processes become more complex is that students need to perform better and make deeper connections in the complex reading comprehension process (Mullis *et al.*, 2016). PISA 2018 assessment results also support this finding (OECD, 2019). Accordingly, students who perform at the highest proficiency levels (5 and 6) in reading literacy constitute only 3% of the whole group. Based on this finding, it can be suggested that in order to raise students with adequate and improved reading comprehension performance, students' blank and incorrect answers should be reduced

Another finding of the study is related to the affective characteristics of students who gave blank, incorrect or unrelated answers. As such, the most influential variable in classifying students in terms of blank, incorrect and unrelated answers at the level of focusing on and retrieving explicitly stated information is the learned helplessness tendency. When the answers at the level of making straightforward inferences were examined, it was seen that perceived academic self-efficacy was the most effective variable in classifying the answers given in this process. Students, who are at the group of lowest academic self-efficacy score, had the lowest rate of correct answers, and the highest rate in giving blank or unrelated answers. The students who are in the group of the higher academic self-efficacy group had the highest correct response rate, and the lowest rate of blank and unrelated responses. The variable that classifies the responses of students who are in the middle group on the perceived academic self-efficacy scale is exposure to bullying. The strongest variable in classifying student responses for the third cognitive process is perceived academic self-efficacy. For students in the group of lowest perceived academic self-efficacy, the strongest variable was perseverance. Thus, the number of blank and incorrect answers are high among students with low perceived academic self-efficacy and low perseverance whereas the group with low perceived academic self-efficacy and high perseverance had high blank response rates. The blank and incorrect response rates of students with moderate perceived academic self-efficacy were observed to be high while those with high perceived academic self-efficacy had the highest correct response rates. The distribution of blank and incorrect answers was similar. In the process of evaluating and critiquing content and textual elements, which is the most complex reading comprehension process, achievement motivation is the most effective variable in classifying student responses. It can be observed that the group with high achievement motivation, low perceived academic self-efficacy and low test anxiety gave mostly unrelated answers, while those with high test anxiety gave generally blank answers; the group with high achievement motivation, middle perceived academic self-efficacy and low perseverance were observed to give unrelated answers while those with higher perseverance were mainly watched to leave the items unanswered. The response distribution of students with high achievement motivation scores and high perceived academic self-efficacy were similar. In the group with low achievement motivation, the most common response was the blank response.

Considering the findings, the variables that shape the variations in thinking processes (and thus the categories) at different cognitive levels and the responses resulting from the thinking processes are diverse. Overall, the strongest variable in shaping the classification of the non-correct answers (incorrect, blank and unrelated answers) given in the simplest reading comprehension process is the learned helplessness tendency. In their longitudinal study, Fincham *et al.* (1989) concluded that learned helplessness plays a role in students' current reading comprehension success and their success two years later. Valås (2001) proved that helplessness is associated with academic performance. According to the result of this study, students with less learned helplessness tendency have low unrelated and blank answer rates, while the percentage of correct answers is high. Perceived academic self-efficacy is a meaningful classifier in all reading comprehension processes except from the first one. In general, students with low perceived academic self-efficacy gave blank and unrelated answers mostly, while the students with higher perceived academic self-efficacy scores mostly gave incorrect answers. Academic self-efficacy is often associated with student performance in the literature (Honicke & Broadbent, 2016; Nasir & Iqbal, 2019; Zysberg & Schwabsky, 2021). Komarraju and Nadler (2013) state that individuals with high self-efficacy have higher belief in what they can do. This finding explains why individuals with low academic self-efficacy have mostly blank and unrelated answers, while those with high academic self-efficacy have a high percentage of incorrect answers. The student with low academic self-efficacy may show the behavior of not responding to the item due to low belief in his/her own actions or writes

unrelated things because he/she thinks the answer will be incorrect no matter what. The reason why students with high academic self-efficacy gave the highest number of incorrect answers may be because of their belief in the answer they will write. Their belief that the answer they give would be correct may have led them to respond to the item and to think while creating the answer. The variable of exposure to bullying is a significant classifier only for the process of making straightforward inferences. The literature reports that the social, personal and academic lives of students who are exposed to bullying are affected from those experiences (Strøm *et al.*, 2013). Within the scope of the current study, the rate of giving non-correct answers by the children who were bullied was quite high. This finding is in parallel with the literature. Considering why being bullied is only effective on cognitively basic reading comprehension processes, the very first thing to come into one's mind is its possible relation to students' backgrounds. Though bullying can take place regardless of the schools' and students' socio economic and cultural background, it is a fact that it is much more common in economically disadvantaged schools (Bowes, 2009; Lumeng *et al.*, 2010). Students attending those schools are poor performers (are able to write answers to cognitively simple items such as making straightforward inferences; however, fail to properly perform for complex cognitive processes). This situation is thought to be the reason behind this finding.

The affective features that affect students' answers in the second or third degrees in classification are perseverance and test anxiety. The relationship between perseverance, test anxiety and academic performance has been given a substantial focus in the literature (Cassady & Johnson, 2002; Chapel *et al.*, 2005; Culler & Holahan, 1980; Kutlu *et al.*, 2017). It is very particular to note that students with low anxiety gave largely unrelated answers and those with high anxiety left the items mostly unanswered. High anxiety has both psychological and physical consequences that prevent students' cognition from working properly, due to which the student may avoid answering items. Low anxiety, on the other hand, shows that the student does not care about the academic task at all. The behavior of not caring can also lead the student to write the answers s/he wants and writes meaningless words instead of the answers required by the item. Regarding perseverance, there are mostly incorrect answers when low perseverance is coupled with low self-efficacy, and many blank answers when while when perseverance is high with low self-efficacy. There are unrelated answers when moderate self-efficacy is coupled with low perseverance, and blank answers in case of high perseverance with moderate self-efficacy.

The final variable that is influential in classification is achievement motivation. While students with low achievement motivation have more blank and incorrect answers, students with high achievement motivation have more unrelated answers. This finding is inconsistent with the researcher's expectations. What was expected that students with high achievement motivation would have more incorrect answers than unrelated ones. This finding can be interpreted as the fact that the Turkish education system may not adequately prepare students for higher order thinking processes. The fact that achievement motivation, which is the strongest classifier at the most complex level of reading comprehension, plays a role in students' unrelated response can be interpreted in two ways. First, students were so focused on answering the item and being successful that they answered the item even if it was not meaningful. The second interpretation may be related to the failure of students to show the expected performance in the process of evaluating and critiquing the content and textual elements. This may have affected the algorithm of the analysis method used.

When the classifiers of the answers examined, it becomes clear that learned helplessness tendency is important at the level of focusing on and retrieving explicitly stated information; perceived academic self-efficacy and exposure to bullying in making straightforward inferences; perceived academic self-efficacy and perseverance in interpreting and integrating

ideas and information, and finally, achievement motivation, perceived academic self-efficacy, test anxiety, and perseverance in evaluating and critiquing the content and elements of the text. As can be seen, as cognitive levels become more complex, more variables are involved in classifying students' cognitive performance.

5. LIMITATIONS OF THE STUDY and SUGGESTIONS

The most important limitation of the study is that the answers given to the items written at different cognitive levels were measured with a single item at each level. The reason for this limitation is the poor performance of students' reading and reading comprehension skills probably due to the pandemic process. In 40 minutes (one class hour), the students had difficulty in reading the text and answering the test items. For that reason, the number of items was limited to four, and each cognitive level could only be measured through one item. Thus, further research may include more items for each comprehension level.

Based on the findings of this study, it can be suggested that efforts must be made to help students who give incorrect, blank or unrelated answers in classroom activities. They should be encouraged to overcome their past failures, increase their self-confidence and self-efficacy. Teachers are advised to organize their classroom settings in a way that does not allow peer bullying, guides students to continue their goal-oriented behavior despite the difficulties that may arise, and increases their motivation for success.

As for in-classroom practices, it can be suggested that teachers should include open-ended items in the classroom assessment and evaluation processes and use rubrics to show students the content and category of their answers and the correct answer performance expected from them. In this way, students can understand where they are at and how they can improve themselves. By doing so, the number of students who give incorrect or unrelated answers can be reduced. Another suggestion that can be made based on the findings is the planning of curriculum and taking precautions that will activate the appropriate affective processes of the students and prepare them to learn better. By observing the helplessness experiences of socially disadvantaged students more closely, the teacher can implement proper psychoeducational practices that can prevent this experience of the student. Finally, the teacher, who discusses sample response categories with the help of rubrics in the classroom, can increase his/her students' motivation for success by raising their perception of what they are doing, and the student, who knows about the expected performance, can take a more objective stance regarding his/her own self-efficacy, and have a chance to improve it.

Declaration of Conflicting Interests and Ethics

The author declares no conflict of interest. This research study complies with research publishing ethics. The scientific and legal responsibility for manuscripts published in IJATE belongs to the author. **Ethics Committee Number:** Ankara University, Social Sciences Sub-Ethics Committee, 30/03/2020-3-54.

Orcid

Neslihan Tugce OZYETER  <https://orcid.org/0000-0003-1558-1293>

REFERENCES

- Badger, E. & Thomas, B. (1991) Open-Ended questions in reading. *Practical Assessment, Research, and Evaluation*, 3(4). <https://doi.org/10.7275/fryf-z044>
- Bandura, A. (1982). Self-efficacy mechanism in human agency. *American psychologist*, 37(2), 122. <https://doi.org/10.1037/0003-066X.37.2.122>
- Bowes, L., Arseneault, L., Maughan, B., Taylor, A., Caspi, A., & Moffitt, T.E. (2009). School, neighborhood, and family factors are associated with children's bullying involvement: A nationally representative longitudinal study. *Journal of the American Academy of Child*

- & *Adolescent Psychiatry*, 48(5), 545-553. <https://doi.org/10.1097/CHI.0b013e31819cb017>
- Cassady, J.C., & Johnson, R.E. (2002). Cognitive test anxiety and academic performance. *Contemporary Educational Psychology*, 27(2), 270-295. <https://doi.org/10.1006/ceps.2001.1094>
- Chapell, M.S., Blanding, Z.B., Silverstein, M.E., Takahashi, M., Newman, B., Gubi, A., & McCann, N. (2005). Test anxiety and academic performance in undergraduate and graduate students. *Journal of Educational Psychology*, 97(2), 268–274. <https://doi.org/10.1037/0022-0663.97.2.268>
- Culler, R.E., & Holahan, C.J. (1980). Test anxiety and academic performance: The effects of study-related behaviors. *Journal of Educational Psychology*, 72(1), 16–20. <https://doi.org/10.1037/0022-0663.72.1.16>
- Dweck, C.S. (1986). Motivational processes affecting learning. *American Psychologist*, 41(10), 1040–1048. <https://doi.org/10.1037/0003-066X.41.10.1040>
- Fincham, F.D., Hokoda, A., & Sanders Jr, R. (1989). Learned helplessness, test anxiety, and academic achievement: A longitudinal analysis. *Child development*, 60(1), 138-145. <https://www.jstor.org/stable/1131079>
- Ghasemi, F. (2021). A motivational response to the inefficiency of teachers' practices towards students with learned helplessness. *Learning and Motivation*, 73(1), 101705. <https://doi.org/10.1016/j.lmot.2020.101705>
- Hembree, R. (1988). Correlates, causes, effects, and treatment of test anxiety. *Review of educational research*, 58(1), 47-77. <https://doi.org/10.3102/00346543058001047>
- Honicke, T., & Broadbent, J. (2016). The influence of academic self-efficacy on academic performance: A systematic review. *Educational Research Review*, 17(1), 63-84. <https://doi.org/10.1016/j.edurev.2015.11.002>
- IBM SPSS. Decision trees 21. IBM Cooperation.
- Kass, V.G. (1980). An exploratory technique for investigating large quantities of categorical data. *Applied Statistics*, 29(2), 119-127. <https://www.jstor.org/stable/2986296>
- Komarraju, M., & Nadler, D. (2013). Self-efficacy and academic achievement: Why do implicit beliefs, goals, and effort regulation matter? *Learning and Individual Differences*, 25(1), 67-72. <https://doi.org/10.1016/j.lindif.2013.01.005>
- Kutlu, Ö., & Özyeter, N.T. (in press). Development of the learned helplessness tendency scale for children: Validity and reliability studies. *Studies in Psychology*.
- Kutlu, Ö., Doğan, C.D., & Karakaya, İ. (2017). *Ölçme ve değerlendirme performansına ve portfolyoya dayalı durum belirleme [Measurement and evaluation, assessment based on performance and portfolio]*. Pegem Akademi.
- Lumeng, J.C., Forrest, P., Appugliese, D.P., Kaciroti, N., Corwyn, R.F., & Bradley, R.H. (2010). Weight status as a predictor of being bullied in third through sixth grades. *Pediatrics*, 125(6), 1301-1307. <https://doi.org/10.1542/peds.2009-0774>
- Manzano-Sanchez, H., Outley, C., Gonzalez, J.E., & Matarrita-Cascante, D. (2018). The influence of self-efficacy beliefs in the academic performance of Latina Students in the United States: A systematic literature review. *Hispanic Journal of Behavioral Sciences*, 40(2), 176–209. <https://doi.org/10.1177/0739986318761323>
- Mullis, I.V., Martin, M.O., & Sainsbury, M. (2016). *PIRLS 2016 reading framework*. PIRLS, Chapter-1, 11-29. https://timss.bc.edu/pirls2016/downloads/P16_FW_Chap1.pdf
- Nasir, M., & Iqbal, S. (2019). Academic self-efficacy as a predictor of academic achievement of students in pre-service teacher training programs. *Bulletin of Education and Research*, 41(1), 33-42. <https://files.eric.ed.gov/fulltext/EJ1217900.pdf>
- Nisbet, R., Elder, J., & Miner, G. (2009). *Handbook of statistical analysis and data mining applications*. Elsevier.

- Olivier, E., Archambault, I., De Clercq, M., & Galand, B. (2019). Student self-efficacy, classroom engagement, and academic achievement: Comparing three theoretical frameworks. *Journal of Youth and Adolescence*, 48(2), 326-340. <https://doi.org/10.1007/s10964-018-0952-0>
- Organisation for Economic Co-Operation and Development. (2014). *PISA 2012 technical report*. OECD Publishing. <https://www.oecd.org/pisa/pisaproducts/PISA-2012-technical-report-final.pdf>
- Organisation for Economic Co-Operation and Development. (2017). *PISA 2015 technical report*. OECD Publishing. <https://www.oecd.org/pisa/data/2015-technical-report/>
- Organisation for Economic Co-Operation and Development (2019). *PISA 2018 results (Volume II): Where all students can succeed*, PISA, OECD Publishing, <https://doi.org/10.1787/b5fd1b8f-en>
- Özyeter, N.T., & Kutlu, Ö. (2022). Adaptation of the children's perceived academic self-efficacy scale: Validity and reliability study. *International Journal of Assessment Tools in Education*, 9(2), 430-450. <https://doi.org/10.21449/ijate.958871>
- Parvez, M., & Shakir, M. (2014). Academic achievement of adolescents in relation to academic anxiety, gender, and choice of academic stream. *Research on Humanities and Social Sciences*, 4(1), 107-115. ISSN (Paper) 2224-5766, ISSN (Online) 2225-0484 (Online)
- Popham, W.J. (1999). *Classroom assessment: What teachers need to know*. Allyn & Bacon. <http://www.abacon.com>
- Román, M., & Murillo, J. (2011). *Latin America: School bullying and academic achievement*. *Cepal Review*. https://repositorio.cepal.org/bitstream/handle/11362/11502/104037053I_en.pdf?sequence=1&isAllowed=y
- Strøm, I.F., Thoresen, S., Wentzel-Larsen, T., & Dyb, G. (2013). Violence, bullying and academic achievement: A study of 15-year-old adolescents and their school environment. *Child Abuse & Neglect*, 37(4), 243-251. <https://doi.org/10.1016/j.chiabu.2012.10.010>
- Valås, H. (2001). Learned helplessness and psychological adjustment II: Effects of learning disabilities and low achievement. *Scandinavian Journal of Educational Research*, 45(2), 101-114. <https://doi.org/10.1080/00313830120052705>
- van der Werf, C. (2014). The effects of bullying on academic achievement. *Revista Desarrollo y Sociedad*, 74, 275-308. <https://doi.org/10.13043/dys.74.6>
- Walling, M.D., & Martinek, T.J. (1995). Learned helplessness: A case study of a middle school student. *Journal of Teaching in Physical Education*, 14(1), 454-466. <https://core.ac.uk/reader/213401840>
- Zahrakar, K. (2008). The relationship between parents' child rearing practice and young adults' mental health in Islamshahr. *Innovation in Management Education (Journal of Modern Thoughts in Education)*, 3(2), 71-90. <https://www.sid.ir/en/Journal/ViewPaper.aspx?ID=181803>
- Zysberg, L., & Schwabsky, N. (2021). School climate, academic self-efficacy and student achievement. *Educational Psychology*, 41(4), 467-482. <https://doi.org/10.1080/01443410.2020.1813690>