Cognitive bias among university students

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ABSTRACT
The current research aims to identify the cognitive bias of university students, And to identify the statistically significant differences in the cognitive bias among university students according to the gender variable (males, females), stage (first, fourth), specialization (scientific, human). The research sample consisted of (400) male and female students from Dhi Qar University for the academic year (2020-2021) for the morning study. They were chosen randomly, The researcher prepared the cognitive bias scale and the number of its (36) items in its final form Divided into three areas (inaccurate decisions, illogical interpretations, perceptual distortion), The validity and reliability of the scale items were also calculated, and the researcher used the statistical methods that were calculated by the computer program (SPSS). They are: (K2) chi-square test, one-sample t-test, two independent samples T-test, Pearson correlation coefficient, alpha-Cronbach internal consistency equation, simple regression analysis, The most prominent results were as follows: that the research sample had no cognitive bias, There are no statistically significant differences between males and females in cognitive bias, There are no statistically significant differences between the scientific and humanitarian specializations in cognitive bias, and the presence of statistically significant differences between the two stages in cognitive bias in favor of the first stage.

Keywords: Cognitive bias, university students

The problem of the research:

bias is one of the general problems that individuals suffer from, and almost no society is devoid of them, but it differs in varying degrees in terms of its relationship to the nature of people's social life and their psychological formations. The task of providing students with different knowledge, which contributes to the formation of the personalities of its members (Al Jamili, 2018: 87). The study of Gormon, et.al, 2008) indicated that there is a relationship between cognitive bias and social standards. Two groups were tested, the first has social standards, that is, based on normative and specific information to obtain it, and the second group does not have specific standards. The study proved that the group has a cognitive bias when processing information or New information (Gormon, et.al, 2008:71 78). The human mind faces many obstacles that affect thinking, including cognitive bias. When it affects individuals, the problem escalates, but cognitive bias in behavior, education, economics, and politics has a greater impact than other areas as it produces ideas that individuals and groups take and their decisions appear poorly. It is another obstacle in the decision-making process when a person chooses an alternative that matches or matches his beliefs and opinions, and often irrational decisions and may be bad or wrong and characterized by their amazing prevalence an important role in our view of the behavior of different individuals, bias is an unequivocal flaw if a person grows up to solve problems and make useful decisions (Al-Ani, 2015:4). Based on the foregoing, the research problem can be determined by answering the following question: Do university students have a cognitive bias?

Research importance:
Cognitive bias is anything that expresses the inclination of the human mind towards a particular aspect without convincing reasons or without preferring information over the other in a subjective manner under the influence of emotional and psychological reasons, which makes human thought deviate from it from the goal of rationality and integrity and falling into the mud of subjectivity, lack and superficiality in their analysis and evaluation for different life issues (Bohayek, 2018:188).
importance of studying cognitive bias lies in revealing the mental design of individuals because it is a kind of challenge in behavior and can also appear in more than one complex situation and is incompatible with the human mind (Comides & Toob, 1994:329). Based on what was presented about the concept of cognitive bias, which was a general framework framing the subject of cognitive bias and its role in influencing university students, cognitive bias can affect many people and the social and psychological variables of personality.

Based on the above, the importance of the current research can be summarized as follows:
1- This research deals with an important segment of society represented by university students who are considered the pillar of society and the basis of its progress and prosperity, as they bear the responsibility of developing the future of the educational process in society.
2- This research is a modest contribution to enriching the educational and psychological library to serve researchers in this field in the future.

Research Objectives: The current research aims to identify:
2. The statistically significant differences in the cognitive bias among university students according to the gender variable (males, females) stage (first, fourth) - specialization (scientific, human).

Research limits: which include:
- Objective limits: Cognitive bias among university students.
- Spatial boundaries: Dhi Qar University (College of Engineering, College of Education for Human Sciences, College of Arts, College of Science).
- Human limits: includes a sample of students from the University of Dhi Qar (initial studies) and of both sexes.
- Time limits: includes the morning preliminary studies for the academic year (2020-2021).

Define terms: (Kahneman, 1974):
“It is a judgment when making wrong decisions that occur in certain situations and lead to distortion of sensory perception, or to give inaccurate decisions or illogical interpretations” (Kahneman, et.al, 1974: 430).

Theoretical framework and previous studies Cognitive Bias
The concept of cognitive bias
The word bias in English derives from the Latin word for prejudice, so bias is the tendency to prejudge rather than wait and judge a situation based on its aspects. Unfortunately, because many of the usual stimuli that activate bias have become ingrained in our thought patterns over time, it is difficult to undo their power and influence (Grant, 2015:96). Cognitive bias is a general term used to describe many of the observed effects on the performance of the human mind, which lead to distortion of sensory perception, inaccurate decisions, and illogical interpretations. It often occurs because of an attempt to simplify information processing in light of the experiences and information that the individual possesses. The thoughts and decisions made by the individual, which may seem rational and logical, but are often incorrect (Al-Yasiri 15: 2017,).

Types of cognitive bias:
1. Confirmation Bias: It shows the tendency of individuals to listen to information that confirms their ideas, hypotheses, and convictions only, regardless of whether they are true information or not, as they collect evidence and recall information from memory selectively, to confirm the validity of their ideas in a way biased, and they ignore research behind information that might undermine or contradict those ideas (Lewicka, 1998:233)

2. HindSight Bias: It is the failure of the individual to anticipate and predict past situations before they happen and occur, which results in distortion in the memory, which leads to making wrong decisions,
such as when someone says I have known this all the time, he tends to see past events as if they It was foreseen when it happened (wilke A. & mata R, 2012:532)

**Reasons for cognitive bias:**

Buster Benson classified the reasons for bias into four reasons:

1. Excess of information: There is a large number of information that we receive, and we may often have to filter it and try to choose the most important and useful, but this selection is rarely free of lapses and biases, such as a preference for what is in agreement with what is in the memory, as well as a preference for funny, joyful and strange things.

2. Insufficient amount of meaning: When we observe the various appearances and phenomena, we find a lot of ambiguity and little meaning and harmony. The mind often searches for relationships and patterns that give a clearer meaning to various things so that it can keep them in its memory, which creates many biases related to the illusion of perfection, simplification and projections. The missing links are depicted.

3. Limited time: Our world is governed by precise time limits, and we find ourselves in many situations limited by a narrow time during which we need to act quickly and take a lot of decisions. Here, our minds use a lot of tricks and methods to avoid wasting time in what is not important, but the problem is that this is not without mistakes. And biases, which are sometimes expensive.

4. Limited memory: Human memory has a limited capacity, which the mind desires to categorize what passes through and classify it according to certain priorities in order to preserve the priorities of higher importance, which are often the things that it deems most used and useful for it in the future, as well as things that are frequently repeated in addition to general matters and general laws instead from small details and this also leads to a large number of biases related to memory (Bohayek, 2018: 188).

**Among the factors that affect cognitive bias are:**

1- Carefully illusion: It is the subject of giving great weight to an unimportant but noticeable feature where there are different reactions due to the way it is presented and described.

2-Pessimism factor: It is the influence of decisions and judgments on information that is not strongly related to knowledge (Jensen, AR, 1966:60).

3- Effect of aura: The other effects in evaluating others and others is the effect of aura, as it refers to the process in which a person’s influence, negatively or positively, in one sector affects his evaluation of him in other areas (Al-Obaidi, 2009: 165).

**The bias has an impact on many aspects, including:**

1- Financial level: Sometimes the bias causes investors to feel exaggerated confidence, in light of the omission of evidence indicating that their plans will cause them to lose, or studies of the political betting stock exchange, as the people who have taken neutrality as an approach have more profits than others who tend to be biased (David, 2000:195).

2- Mental and psychological health: The results of studies, including the study (Mathews & Macleod, 2005) and Reid, Salmon & Lovibond, (2006) have proven that there is a causal link between cognitive biases on the one hand and some psychological disorders such as anxiety, depression, aggression, addiction and obsessive-compulsive disorder on the other (Al-Hamouri, 2017: 2).

3- The field of science: Scientists in scientific research selectively interpret or ignore unwanted data, and it has been proven that scientists do experiments that correspond to their beliefs better than those that do not, and to combat this tendency, scientific exercise is based on teaching methods of cognitive unbiased, but even in scientific circles meets Individuals who produce results contrary to popular belief with harsh criticism from peers (Al-Wardi, 1994: (135-134).

**Theories that explain cognitive bias: Expectancy Theory(1974):**

The expectation theory is one of the most accepted theories, as there are many evidences that support and support this theory. The behaviors of individuals and this theory of the world, Victor Vroom, (1964) is well-known and famous in psychology and behavioral sciences, as Fromm showed that the theory of expectation is to help understand the psychological processes that cause motivation, perceptions, beliefs, thinking, possibilities and other processes (Shilpi, 2014: 4). Kahneman (1974) has developed the theory of expectation as a more realistic and acceptable alternative to the theory of rational choice, and the expectation theory believes that individuals evaluate their choices on the principle of profit, gain or loss through a reference point as they rise and fall with their eyes on this point and calculate the outcome of
gain and loss together. From it and with reference to it, the theory considers that the mental framework through which we perceive the situation greatly affects the attractiveness of the various alternatives that decision-makers take, as we consider ourselves working in the position of the loser or we see ourselves if we realize the position of the winner, and this awareness of the situation determines the degree of our willingness to risk. We are in the position of a loser that we are more willing to risk than we are in a winning position and will be risk averse (Kahneman & Tversky, 1979: 12). Expectation theory emphasizes mental (cognitive) processes with regard to choice, and it is one of the motivation theories that push the individual to make decisions, and the content of the theory is the motive that makes the individual choose the behavior that suits him in order to determine the outcome. (Oliver, 1974: 243-253).
The theory interprets how to motivate to activate and choose a behavioral attitude over another behavioral situation and choose the decisions that will bring them the expected results. The theory typically consists of three elements: Expectancy, Value, and Benefit (Karaü, et.al, 1993: 684). The theory of the value of expectation was considered one of the theories that explained the formation of human behavior, its direction, its movement, its continuity and its cessation. Doing something or not doing it depends on how the tests are directed between the various alternatives, and the individual gets a state of psychological helplessness when his motivation and performance are low because of that. The value of expectation is low and the probability of the outcome occurring through behavior, and expectation describes the individual's knowledge and awareness of the strength or weakness of the performance of a particular thing and the expectation that it will happen. In the cognitive aspect of the individual (Al-Qayrouti, 2009:98).

The researcher has adopted this theory (Expectancy Theory 1964, which was developed by Kahneman (1974), for the following justifications:

1. The theory is more objective and acceptable in explaining the cognitive bias.
2. Kahneman relied clearly in his interpretation of the cognitive bias according to the theory of expectation.
3. Many studies and research that dealt with decision-making, problem solving and cognitive bias - according to the researcher's knowledge - relied on the theory of expectation.

Previous Literature Review:

1. Al-Adly study (2017): (Cognitive bias and its relationship to the cognitive style (macro-abstract) among university students) The study aimed to identify the cognitive bias among university students. And the fourth for the morning study only, and the two researchers prepared a measure of cognitive bias, and the most important results that were reached is that the cognitive bias among Al-Qadisiyah University students is not statistically significant, there are no statistically significant differences at the level (0.05) in cognitive bias according to gender variables (male - female). And specialization (scientific - human) and grade (second - fourth) among university students, university students prefer to use the abstract cognitive method over the macrocognitive method, there are no statistically significant differences in the cognitive method (abstract - macroscopic) according to the variables of gender (male - female) specialization (Scientific - Human) grade (second - fourth) among university students, that there is a negative correlation between cognitive bias and cognitive style (abstract - macroscopic), meaning an increase in cognitive bias accompanied by a decrease in cognitive style (abstract) and an increase in The cognitive style (macroscopic), the cognitive style (abstract - macroscopic) contributed to predicting the degrees of cognitive bias (Al-Adly, 2017, 14-15).

First: Research Methodology:
The two researchers relied on the descriptive correlative approach in describing the relationship to achieve the results of its research by studying the relationship between the variables. The description method is one of the indispensable research methods and is one of the most used research methods. For any phenomenon in this research, the researcher must have a description and value The phenomenon to be studied, and when he wants to know the degree of correlation between two or more variables, he turns to the research related to it. (Daoud and Abd al-Rahman, 1990:159).

Second: The research community: The current research community is determined by the students of Dhi Qar University (morning study) for the academic year (2020-2021) for all its scientific and humanities faculties and for the morning study only, and their number reached (16104) students, distributed by gender to (6106) students, at a rate of 38% And by (9998) female students (62%), distributed by...
specialization to (9415) scientific and (58%) and (6689) humanitarian, and (42%) distributed among the (20) colleges.

Third: The research sample:

The research sample was chosen randomly, which is one of the important steps of the research, and to achieve the objectives of the research, four colleges were randomly selected, two colleges in the scientific specialization (College of Science, College of Engineering) and two colleges in the humanities specialization, namely (College of Education for Humanities, College of Arts) and on the basis of So, (400) male and female students were selected from the selected faculties at the University of Dhi Qar, distributed by gender, including (201) males and (199) females, and according to specialization (two scientific faculties), the number of students in the scientific specialization (208) male and female students, and two humanities faculties. Students in the humanitarian specialty are 192 male and female students. As for the stage, the number of students in the first stage is 195, and students in the fourth stage are (205). Table 1 illustrates this.

<table>
<thead>
<tr>
<th>specialty type</th>
<th>College Name</th>
<th>stage</th>
<th>The grand total of the stage</th>
<th>number of students</th>
<th>total summation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scientific specialization</td>
<td>Sciences</td>
<td>S1</td>
<td>57</td>
<td>53</td>
<td>208</td>
</tr>
<tr>
<td></td>
<td>Engineering</td>
<td>S4</td>
<td>51</td>
<td>55</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td></td>
<td>101</td>
<td>109</td>
<td>208</td>
</tr>
<tr>
<td>humanitarian specialization</td>
<td>humanitarian specialization</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Literature</td>
<td></td>
<td>49</td>
<td>48</td>
<td>208</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td></td>
<td>94</td>
<td>100</td>
<td>205</td>
</tr>
<tr>
<td>total summation</td>
<td></td>
<td></td>
<td>195</td>
<td>199</td>
<td>400</td>
</tr>
</tbody>
</table>

Fourth: Research Tool: Cognitive Bias Scale: To achieve the goals, the two researchers reviewed the available research and studies and related standards, as they were unable to obtain a suitable local, foreign or Arab scale to measure cognitive bias for university students, as the research required a necessity Preparing a scale (cognitive bias) through which the cognitive bias of university students can be measured. Therefore, the tool will be prepared according to the following basic steps:

A. Define the concept of cognitive bias:

According to the theory of expectation, the two researchers adopted the theoretical definition of cognitive bias, which is (as a judgment in making incorrect decisions that occurs in certain cases and leads to distortion of sensory perception, or giving inaccurate decisions or illogical interpretations).

B. Define scale areas:

Based on the definition based on openness to experience, the two researchers identified three areas of the cognitive bias scale: (inaccurate decisions - illogical interpretations - distortion of perception). Each of these fields has been defined according to Kahneman’s definition, and these definitions have been fixed with the special paragraphs for each field.

C. Formulating the paragraphs of the scale in their initial form:

One of the most important steps for building and preparing standards is the formulation of paragraphs, as the two researchers were able to formulate paragraphs of each of the fields according to these following steps:

1. Behavioral attitudes should be clear.
2. Avoiding the negation method in formulating behavioral attitudes.
3. The paragraph should measure only one goal. (Samara, 1989:81).

The two researchers were able to formulate (36) paragraphs in their initial form to measure cognitive bias, distributed over (3) domains, with (12) for the first domain, (12) for the second domain, and (12) for the third domain.

Prepare Scale Instructions:
In order to meet the requirements of the research, the two researchers are keen to include a description of the scale, so that the respondent is not affected when answering, as there is no right or wrong answer, and the answer time ranged between (10 minutes-20 minutes) at an average of 15 minutes.

**Verifying the validity of the paragraphs (apparent honesty):**

In order to identify the validity of the paragraphs, the two researchers presented the scale in its initial form of (36) paragraphs to (20) arbitrators from specialized professors with experience in the field of educational psychology, measurement and evaluation to express their opinions and observations, and in light of what the experts decided, all paragraphs were accepted, and adopted. The two researchers accounted for (80%) or more of the arbitrators’ opinions to indicate the apparent validity of the scale. Thus, the scale became composed of (36) items that will be statistically analyzed.

**Survey application:**

The two researchers applied the scale to the exploratory samples to understand and prove the sample’s understanding of the scale items and descriptions. The researcher applied (42) items to (40) male and female students from the research sample from the University of Dhi Qar, from two variables: males (20) and female (20) respectively, in order to verify the clarity of the paragraphs, descriptions and methods of answering. As shown in the previous table No. (6), it is clear that the paragraphs and descriptions of the scale are understandable, clear and accurate for students, so no student asked any questions or inquiries about the scale.

**Table (2) The first survey application**

<table>
<thead>
<tr>
<th>colleges</th>
<th>stage</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>S1</td>
<td>S4</td>
</tr>
<tr>
<td>Sciences</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Engineering</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Education for the humanities</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Literature</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Total</td>
<td>20</td>
<td>20</td>
</tr>
</tbody>
</table>

G- Correcting the scale and finding the total score:

The paragraphs of the scale were formulated in both positive and negative forms, as the number of paragraphs with positive content was (8) paragraphs, and the number of paragraphs with negative content was (28) paragraphs. As for the answer alternatives towards the content of the paragraphs, where the researcher used Likert’s five-way method (it applies to me completely, applies to me often, applies to me sometimes, applies to me rarely, never applies to me (corresponds to the scale of degrees 1,2,3,4,5)) This is with regard to the paragraphs with positive content, as for the paragraphs with negative content, it corresponds to the scale of degrees (1, 2, 3, 4, etc.) 5) In this way, the total score for each respondent on the scale was calculated by summing the scores of her response on all paragraphs. Therefore, the highest score that can be obtained is (180) and the lowest score is (36). This has reached the hypothetical mean of the scale (108) to judge the research sample if she had a cognitive bias or not.

**Statistical analysis of the cognitive bias scale items:**

For the purpose of conducting a statistical analysis of the items of the cognitive bias scale, the scale consisting of (36) items was applied to a sample of (400) male and female students.

**Calculation of the psychometric properties of vertebrae:**

The two researchers calculated the psychometric properties of the items represented by the discriminatory strength and internal consistency (paragraph validity).

1. **Discrimination Power of Items:**

After applying the scale to the sample members of (400) male and female students, correcting the answer form and extracting the discrimination intensity for the scale segment, the scores of the sample members are arranged from the highest total to the lowest total score, two extreme groups of percentages were identified, each with a percentage of (27%), and it consists of the number of students in each group consisted of (108) male and female students in the upper group, and (108) male and female students in the lower group. The researcher used the t-test for two independent samples in calculating the significance of the differences between the averages of the two groups in the scores of each item of the scale. On the basis that the calculated T-value represents the discriminatory power of the paragraph,
and it became clear that all the paragraphs are distinguished for being a statistical function, because the calculated T-value is greater than the tabular T-value of (1.96) with a degree of freedom (214) and at a significance level (0.05).

Internal consistency (paragraphs validity): Paragraph validity was calculated as follows:

A- The relationship of the paragraph’s degree to the total degree:

In calculating the validity of the paragraph, the two researchers relied on the Person correlation coefficient between the grades of each paragraph and the total degree, because the paragraph grades are related and gradual, noting that the paragraph validity sample consists of (400) students in the current research, and it became clear that all the correlation coefficients Statistically significant, as the values of their correlation coefficients with the total score were greater than the tabular value of (0.098) with a degree of freedom (398) and with a significance level of (0.05)

2. Relationship of the degree of the paragraph with the degree of the field to which it belongs:

The two researchers used this method to find the correlation coefficient between the score of each paragraph and the total score for the domain to which it belongs to verify the validity of the item and the total score for the cognitive bias scale for each domain, using the value of this domain as an internal test, and after using the Pearson correlation coefficient, it is clear that all correlation coefficients are a function A statistic compared to the critical value. The amount of (0.098) at the level of significance (0.05) and the degree of freedom (398), and through this indicator it became clear that the paragraphs of the scale express its domains.

C. The matrix of internal links:

To this end, we conducted a statistical analysis of (400) male and female students, and the results showed that all correlation coefficients and the total score for each domain with other domains are statistically significant, which indicates that the three domains measure cognitive bias, and all the calculated correlation coefficients are higher than the critical value of (0.098). ) at a significance level of (0.05) with a degree of freedom (398), and this is a good indicator of the validity of the scale construction.

Psyrometric characteristics of the scale: First: Validity of the scale:

A- Apparent honesty:

The researchers verify the apparent validity of the cognitive bias scale by defining the definition of the scale and its behavior domain and writing items based on the scale behavior domain, after education and psychological science experts reached a consensus about the validity of domain behavior and items that measure cognitive bias.

B- Constrcut Validity:

The sincerity of the construct means the psychological features that are reflected or appear in the marks of a test or a measure, and the construct represents a psychological feature, a trait or a characteristic that cannot be directly observed, but is inferred through a set of behaviors associated with it (Melhem, 2002: 269)

Second: Scales Reliability:

A- Test-Retest Method: To extract stability in this way, the scale was re-applied to a stability sample consisting of (60) male and female students, starting from the first application with an interval of (14) days, then Pearson correlation and the degree of the first and second applications, and the scale correlation coefficient (0.85) indicates that if the coefficient of The correlation between the first application and the second application (0.70) or more, this is a good indicator of the reliability of the test in the fields of education and psychology (Al-Esawy, 1985: 58).

b- Cronbach's Alpha equation:

In this way, reliability is extracted from the scores of the basic sample questionnaire with a total of (400) samples, and using Cronbach's equation, the alpha coefficient is (0.82), which is a good stability coefficient.

Description of the scale in its final form:

The cognitive bias scale in the current research in its final form consists of (36) items distributed over three areas: (inaccurate decisions, illogical interpretations, distortion of sensory perception) and each item has five alternatives: (always apply to me, applies to me often, applies (sometimes, applies to me rarely, never applies to me), and gave them the weights (1, 2, 3, 4, 5) respectively. A total score for the
scale is calculated by adding the scores obtained by the respondent for each alternative he chooses from each of the paragraphs. The scale, therefore, the highest score a respondent can get is (180) degrees, which represents the highest score, and the lowest score he gets is (36) degrees, which represents the lowest total score for the scale, and thus the theoretical average of the scale is (108) degrees.

**Statistical Indicators of the Cognitive Bias Scale:**
The researcher used the statistical bag for social sciences (SPSS) (Statistical Package for Social Science) in extracting those statistical indicators.

**Presentation, discussion and interpretation of results:**
The first objective: to identify the cognitive bias of university students
To achieve this goal, the researcher applied the cognitive bias scale consisting of (36) items to the research sample consisting of (400) male and female students. The results of the research showed that the arithmetic mean of the scores of this sample on the scale amounted to (103,702) degrees, with a standard deviation of (19,604) degrees. The difference is statistically significant and in favor of the hypothetical mean, as the calculated t-value amounted to (4,384) which is greater than the tabular t-value of (1.96), at a significance level (0.05) and a degree of freedom (399), which means that the research sample has no cognitive bias. Table (3) and Figure (1) illustrate this.

Table (3) Arithmetic mean, standard deviation, and T-value of the cognitive bias scale

<table>
<thead>
<tr>
<th>Variable</th>
<th>Sample</th>
<th>SMA</th>
<th>Standard Deviation</th>
<th>Hypothetical Mean</th>
<th>t Value</th>
<th>t *</th>
<th>Signify</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cognitive bias</td>
<td>400</td>
<td>103,702</td>
<td>19,604</td>
<td>108</td>
<td>4,384</td>
<td>1.96</td>
<td>A function in favor of the hypothesis</td>
</tr>
</tbody>
</table>

The second objective: to identify the statistically significant differences in the cognitive bias among university students according to the variables of gender, specialization stage.
For the purpose of verifying this goal, the researcher took the responses of the research sample amounting to (400) male and female students on the cognitive bias scale, and the stage (first, fourth), and the results were as shown in Table (4).

Table (4) Arithmetic averages and standard deviations of the cognitive bias scale according to gender, specialization, and stage

<table>
<thead>
<tr>
<th>Type</th>
<th>SMA</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>104,274</td>
<td>18,112</td>
</tr>
<tr>
<td>Male</td>
<td>103,126</td>
<td>21,034</td>
</tr>
<tr>
<td>Specialization</td>
<td>SMA</td>
<td>Standard Deviation</td>
</tr>
<tr>
<td>Scientific</td>
<td>102,293</td>
<td>16,460</td>
</tr>
<tr>
<td>Humanitarian</td>
<td>105,229</td>
<td>22,466</td>
</tr>
<tr>
<td>Stage</td>
<td>SMA</td>
<td>Standard Deviation</td>
</tr>
<tr>
<td>First</td>
<td>105,869</td>
<td>20,772</td>
</tr>
<tr>
<td>Fourth</td>
<td>101,528</td>
<td>18,224</td>
</tr>
</tbody>
</table>

In order to present the verification of the differences between the averages of cognitive bias according to gender, specialization and stage, the researcher used the triple analysis of variance test with interaction, and the results were as shown in Table (5).

Table (5) Three-way analysis of variance according to the variables (gender, specialization, stage).

<table>
<thead>
<tr>
<th>Indication level</th>
<th>F Value</th>
<th>Sum of Squares</th>
<th>Degrees of Freedom</th>
<th>Significance Level T Value</th>
<th>Contrast Source Source</th>
</tr>
</thead>
</table>
The results of the three-way analysis of variance showed the following data:

### a. Type
- It was found that the value of the calculated percentage (0.831) is smaller than the value of the tabular percentage of (3.84) at the level of significance (0.05) and two degrees of freedom (1,392), which indicates that there are no statistically significant differences in bias Cognitive according to gender.

### B. Specialization
- It was found that the calculated percentage value (3,269) is smaller than the tabular percentage value of (3,84) at the significance level (0.05) and two degrees of freedom (1,392), which indicates that there are no statistically significant differences in Cognitive bias by specialization.

### C. Stage
- It was found that the value of the calculated percentage percentage (4,216) is greater than the value of the tabulated percentage of (3,84) at the level of significance (0.05) and two degrees of freedom (1,392). The first stage reached (105,869) and the average grades for the fourth stage reached (101,528), which indicates that there are statistically significant differences according to the stage variable and in favor of the first stage.

### D. Gender* Specialization
- It was found that the value of the computed tertiary ratio (2,987) for the interaction between (sex * specialization) is smaller than the value of the tabulated quotient ratio of (3.84) at a significance level of (0.05) and two degrees of freedom (1,392), which indicates that there is no Statistically significant differences in cognitive bias according to the interaction between gender and specialization.

### E. gender*stage
- It was found that the calculated t-ratio value (2,750) for the interaction variable between (sex * stage) is smaller than the tabular t-ratio value of (3.84) at a significance level of (0.05) and two degrees of freedom (1,392), which indicates that it is not There are statistically significant differences in cognitive bias depending on the interaction between gender and stage.

### F. Specialization* Stage
- It was found that the value of the calculated percentage percentage (3,364) for the interaction between (specialization * stage) is smaller than the value of the tabular percentage of (3.84) at the significance level (0.05) and two degrees of freedom (1,392), which indicates that there is no Statistically significant differences in cognitive bias according to the interaction between specialization and stage.

### G . Gender * Specialization * Stage
- It was found that the value of the computed tertiary ratio (3,679) for the interaction between (sex * specialization * stage) is smaller than the value of the tabular quotient of (3.84) at the significance level (0.05) and two degrees of freedom (1,392), which indicates that There are no statistically significant differences in cognitive bias according to the interaction between gender, specialization and stage.

#### Recommendations:
1. Education specialists should urge students to make accurate decisions stemming from scientific knowledge, maturity in cognitive processes, mental activity, and flexibility in dealing with circumstances and problems to reach positive and sound decisions to avoid falling into cognitive bias when making decisions.
2. It is necessary to work on developing students’ thinking that contributes to the peaceful decision-making process, through school curricula and the work of cultural seminars within universities.
References

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