Characteristics of bidikmisi’s scholarship awardee in FMIPA UNP using chi-squared automatic interaction detection

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Abstract. Bidikmisi’s Scholarships is a funding assistance from government to help students in the university who lack economically but good in academic. Number of awardee in FMIPA UNP increases yearly. So, we have to know classification of awardee to make sure that scholarship is received by the right one. We use CHAID-Chi-Squared Automatic Interaction Detection analysis. Result of the research, there are five groups awardee. Characteristics of awardee is father’s jobs (farmers, motor driver, jobless) and area of their house approximately 50 m2.

1. Introduction
Studying in college is desire of all high school students. But this is not easy, because studying at college requires substantial costs both for tuition and college needs. However, the government has prepared scholarships for students who have high abilities, but are economically weak. One of the scholarships is the Bidikmisi scholarship. This scholarship provides tuition and also provides pocket money every month.

The number of students receiving Bidikmisi scholarships at Universitas Negeri Padang (UNP) increases every year. Nevertheless, there are still many students at FMIPA who have a weak economy and have good achievements who do not receive this scholarship. This is due to the limited number of scholarship recipients provided by the government. For this reason, it is necessary to look at the characteristics of the recipients of the scholarship at FMIPA.

The analysis used to see the characteristics of the bidikmisi scholarship recipient groups is CHAID (Chi-Square Automatic Interaction Detection) analysis. CHAID analysis uses the Chi-Square test to determine the best separator at each step. The CHAID method is used if the dependent variable is a nominal or ordinal scale with the Chi-Square test statistical criteria at each separation. The essence of this method is to divide the data into smaller groups based on the relationship between variables depend to independent variables

The dependent variable (Y) used in this study is the status of bidikmisi scholarship recipients, while the independent variable (X) is an indicator that is a prerequisite for receiving bidikmisi scholarships, parents’ income, parent’s job, home ownership, number of dependents and building area. The variables this problem are nominal scale.

CHAID is a method for classifying category data where the purpose of the procedure is to divide the data set into subgroups based on the dependent variable (Lehmann and Eherler, 2001: 1). The results of classifying CHAID will be displayed in the tree diagram.
Kass (1980:121) telah mendeskripsikan metode CHAID dalam lima tahap, yaitu:

- for each explanatory variable, cross-tabulate categories of explanatory variables with the response variable category.
- look for pairs of categories from explanatory variables with sub-tables 2 x d (d are the number of categories of response variables) that are not significant (the smallest chi-square). If a significant value does not reach a critical value, combine these two categories into one combined category and repeat this stage with the combined category.
- for each combined category containing three or more origin categories, look for the most significant binary separator (the largest chi-square). If it significantly exceeds the critical value, do the separation and return to stage 2.
- calculate the significance of the explanatory variable that has been merged, then identify the most significant. If the significant value is greater than the critical value, divide the data according to the categories of the explanatory variables chosen.
- if there is a separation in step 4, then return to step 1 for each part of the data resulting from the separation.

The Chi-square test for checking freedom is used to decide which two variables in a population are mutually independent or not mutually independent. This test has the following assumptions

- Data consists of a simple random sample size n of a population observed.
- The results of observations in the sample can be classified cross-classified according to the observed variables.

In decision making, the rejection of the null hypothesis states dependence on level signifikan α, that is if the value of the test statistic results of calculations is greater than the table with free degrees (r-1) (c-1).

CHAID will produce a classification tree diagram that describes the formation of segments. The CHAID tree diagram consists of tree trunks by dividing into smaller branches (branches). This tree diagram follows rules from top to bottom, where diagrams are arranged starting from the parent group continues under successive subgroups from the results of the division of parent groups, based on certain criteria (Mayers, 2006: 67). Each node of this tree diagram describes the subgroup of the sample studied and contains the entire sample and this absolute frequency. for each Y category arranged. In the CHAID classification tree there is the term depth, which means the number of levels of sub-group nodes to the bottom of the last subgroup node. At the first depth, the sample is divided by X1 as the best independent variable for the independent variable, while the three child nodes represent several categories of X1. Each child node contains information on the Y variable frequency, as the dependent variable, which is part of the subgroup generated based on the categories mentioned (X1). The second depth is the result of the division of X1, in the same way the sample is divided by variables X2 and X3 (Lehmann and Eherler, 2001). Each node displayed the percentage of respondents for each category of the dependent variable, and also indicated the total number of respondents for each node. The node at the end of the tree that is no longer branching is called the terminal node.

2. Result and Discussion
The number of bidikmisi recipient students in FMIPA 2016 is 180, with details as follows as the following table:

| Program Studi  | Gender | Total |
|----------------|--------|-------|
|                | Man    | Woman |
| Biology        | 6      | 11    | 17   |
| Physics        | 8      | 11    | 19   |
| Chemistry      | 4      | 13    | 17   |
| Mathematics    | 4      | 15    | 19   |
| Biology Education | 1      | 26    | 27   |
Based on the table above, it can be seen that the highest number of Bidikmisi recipient students is Mathematics Education and Biology Education study program students with 58.89%. While the least number of students receiving bidikmisi scholarships is the Statistics study program as many as 3 people.

Variables in CHAID Analysis can be seen in the following table:

| Type of Variabels | Variabels | Note | Categorical |
|-------------------|-----------|------|-------------|
| Dependen Y        | Status of receiving Bidikmisi | 1 : receive | Categorical |
| Independen X₁     | Father’s Occupation | 1 : Sivil servant | 2 : Private employee |
|                   |                       | 3 : Enterpreneur | 4 : Farmer |
|                   |                       | 5 : Fisherman | 0 : Else |
| X₂                | Mother’s Occupation | 1 : Sivil servant | 2 : Private employee |
|                   |                       | 3 : Enterpreneur | 4 : Farmer |
|                   |                       | 5 : Fisherman | 0 : Else |
| X₃                | Number of burden | 1 : 3 people or more | 0 : less than 3 people |
| X₄                | House’s Owner | 1: Themselves | 0: Rent or belonging |
| X₅                | House area | 1: more than 50 m² | 0: less than or equal 50 m² |
| X₆                | Father’s salary | 2: more than 2 million rupiahs | 1: between 1 and 2 million rupiahs |
|                   |                       | 0: less than or equal to 1 million |
| X₇                | Mother’s salary | 2: more than 2 million rupiahs | 1: between 1 and 2 million rupiahs |
|                   |                       | 0: less than or equal to 1 million |

The analysis of this research data was used by IBM SPSS 20. The steps for analyzing CHAID used were:
1. Categorize the dependent variable and the independent variable.
2. Creating a two-way contingency table for each independent variable with the dependent variable.
3. Calculate the chi-square statistics to check significance (has the largest chi-square value and p-value <α) of each independent variable on the dependent variable.

| Independen Variabel | Chi-Square | P-Value |
|---------------------|------------|---------|
| Father’s salary     | 22,451     | 0.000   |
| Mother’s salary     | 16,725     | 0.002   |
| Number of burden    | 1,609      | 0.205   |
Based on table 3, the father's work variable is the variable that has the largest chi-square value and the smallest p-value value means that the father's work variable is significant among the other variables. That means the first branch on the CHAID diagram is the father's work variable. Furthermore, merging or separation is carried out for each variable, so that the tree is obtained as follows.

![Bidikmisi scholarship tree diagram](image-url)

**Figure 1.** Bidikmisi scholarship tree diagram
The CHAID diagram above can be seen that the variables that significantly influence the acceptance status of Bidikmisi are Father's Work, Building Size, Father's salary and home ownership status.

Based on the diagram, 5 groups were obtained, namely:

- **Groups I**
  Status of Acceptance of Student Bidikmisi is influenced by Father's Work where the types of work are farmers and others (Not Working, Ojek, etc.) which have a building area of less than or equal to 50 m².

- **Group II**
  The Status of Acceptance of Student Bidikmisi is influenced by Father's Work where the types of work are farmers and others (Not Working, Motorcycle Ojek, etc.) which have a building area of more than 50 m² with father's income of less than or equal to 1 million.

- **Group III**
  The Status of Acceptance of Student Bidikmisi is influenced by Father's Work where the types of work are farmers and others (Not Working, Motorcycle Ojek, etc.) which have a building area of more than 50 m² with father's income 1 or more than 2 million rupiahs.

- **Kelompok IV**
  The Status of Acceptance of Student Bidikmisi is influenced by the work of the father where his job is Entrepreneur, Private Employee, Fisherman and Civil Servants (PNS).

The following table is the percentage of groups of students who receive bidikmisi scholarship proposers.

| Tabel 4. Percentage of each Bidikmisi Applicant College Student Group |
|----------------|----------------|--------------------------|--------------------------|
| Node | Scholarship Proponent | Percent | Receive Bidikmisi | Not Receive Bidikmisi | Response |
| 3 | 140 | 50.9 | 107 | 33 | 76.4% |
| 5 | 68 | 24.7 | 48 | 20 | 70.6% |
| 7 | 15 | 5.5 | 9 | 6 | 60.0% |
| 2 | 38 | 13.8 | 13 | 25 | 34.2% |
| 8 | 14 | 5.1 | 3 | 9 | 21.4% |

Based on table 4, it can be seen that the largest percentage value of 76.4% is students who receive bidikmisi scholarships based on the work of fathers where the work is farmers and others (not working, motorcycle taxi drivers etc.) who have houses with a building area of less or equal to 50 m². This is the character of the 2016 Bidikmisi recipient students of FMIPA UNP. So that students who do not accept Bidikmisi who have criteria like this have the opportunity to get a Bidikmisi scholarship.

Furthermore, the classification of bidikmisi scholarship student proposals can be seen in the following table:
### Tabel 5. Classification of College Students Proposing Bidikmisi Scholarships

| Classification          | Observed | Predicted |
|-------------------------|----------|-----------|
|                         | Not Receive Bidikmisi | Receive Bidikmisi | Percent Correct |
| Not Receive Bidikmisi   | 36       | 59        | 37.9%          |
| Receive Bidikmisi       | 16       | 164       | 91.1%          |
| Overall Percentage      | 18.9%    | 81.1%     | 72.7%          |

Based on table 5 criteria the recipient of Bidikmisi students results from the CHAID analysis shows that there are 59 students who are predicted / have criteria for receiving Bidikmisi scholarships but in reality, this student does not accept Bidikmisi. While there were 16 people who were predicted not to receive bidikmisi but in reality, this student received bidikmisi.

### 3. Conclusion

The characteristics of the 2016 Bidikmisi scholarship recipient students of FMIPA UNP are students who receive bidikmisi scholarships based on the work of fathers where the work is farmers and others who have houses with a building area of less than or equal to 50 m². The characteristics of bidikmisi recipients consisted of 5 groups.

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