



## ***Backward Chaining Model for Identifying Learning Difficulties Factors Experienced by Children with Disabilities***

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### **Abstract**

**Purpose:** Identifying learning difficulties is the most crucial process because it determines the next step in conducting an assessment, especially for students with disabilities. The first step to determining children's learning difficulties with special needs is through identification, where each student has a different character. This study was conducted to identify learning difficulties faced by children with disabilities by using the backward chaining model and give solutions to learning difficulties.

**Methods:** This present study used a qualitative research design. The participants of this study were 30 (thirty) junior special school students (7<sup>th</sup> grade – 9<sup>th</sup> grade) at the special school in Kudus regency, central java province. The data were collected through interviews and observation of the students in a special school. The results of interviews and observation became the rule base used as the variable for identifying learning difficulties factors.

**Findings:** This study indicates that the main factor causing learning challenges for children with special needs is an internal component coming from the students themselves, namely their motivation (75%). The second component is an external factor that has to do with how parents educate their special needs children (25%). To solve the problems, students should have high motivation to study and parents should change the way they educate their children. It is suggested that parents give more attention to students' academic progress.

**Novelty:** The current study's findings contribute to developing a new theory of backward chaining implementation to discover factors causing learning difficulties in children with disabilities which is rarely investigated before.

**Keywords:** Backward Chaining, Children with Disabilities, Learning Difficulties

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### **INTRODUCTION**

Learning difficulties are difficulties in processing information, especially in various disorders that can be seen from the difficulties in mastering and using listening, speaking, reading, writing, reasoning, or mathematical abilities. Learning difficulties are divided into 2 (two) categories, they are general learning difficulties and specific learning difficulties. General learning difficulties are indicated by low learning achievement in all subjects. While the indicator of specific learning difficulties focuses on students' low achievement in certain academic aspects such as reading, writing, and arithmetic. This condition is caused by impaired perception (perceptual handicaps), brain injury (brain dysfunction), dyslexia, or developmental aphasia. Several ways can be done to identify the factors which cause the children's learning difficulties. One of them is by using backward chaining expert system. Backward chaining is a decision-making strategy based on hypotheses or assumptions obtained from existing information.

Numerous previous studies have been conducted dealing with children with disabilities, learning difficulties, and the use of backward chaining. [1] mentions the rights of persons with disabilities who need special attention to obtain an education. It is also stated that the effectiveness of education for children with disabilities requires extra services and education [2]. Moreover, research on the influence of intelligence, creativity, and cognitive control on people with disabilities found direct support that explains the relationship between intelligence and creativity that impacts specific learning disabilities [3]. Researching the impact of changes in inclusive education on students with disabilities at the international level has brought major changes, namely, the education policy of disabled groups is equal to normal

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students in obtaining learning rights [1]. Finally, as a technology-enhanced platform, MAS improved intellectual disabilities students' education processes [4]. Some scholars have also conducted studies on learning difficulties identification. One them mentions that visual stimulation can improve reading skills in dyslexic children which can be seen in the difference before and after being given visual stimulation in children with disabilities [5].

Furthermore, [6] revealed in her research that identification is the first step teachers take in providing services to children with special needs, more specifically, identifying children with learning difficulties with dyslexia. In addition [7] investigated regular elementary school students to determine their difficulties in reading. The next study relates to analyzing learning difficulties in deaf and intellectually disabled children at the high school level. The analysis results revealed that SRN subjects tended to have low learning outcomes, be slow in doing learning tasks, be unable to capture explanations, never collected and completed assignments, and had difficulty adapting to the learning process at school. However, SC subjects were shown to have below-average intelligence abilities and lacked confidence. Moreover, learning difficulties experienced by SC subjects in all learning subjects were related to practice and theory [8].

Studies on the effectiveness of the backward chaining method for children with disabilities have also been done. For example, [9] found that the percentage overlaps between the baseline-1 condition and the intervention condition, as much as 0%. The calculation indicated an effect of the effectiveness of backward chaining as an intervention on improving eating skills as a target behavior. Another previous study was investigated by [10] who discussed the application of expert diagnosis of kindergarten with disabilities using the backward chaining method. The results showed that the diagnostic accuracy rate was 72% through special handling methods [10]. The authors also did preliminary research by analyzing the detection of learning difficulties in children with disabilities by measuring the certainty factor model. This study was conducted on children aged 6-12 years. The method used by the certainty factor was by combining trust and distrust in a symptom of a disease. The certainty factor detection rule results obtained the fact that special learning difficulties for children with special needs are a behavioral barrier factor [11]. Another research that the authors conducted relates to implementing picture mnemonic strategies in English learning for intellectually disabled students. The results showed that students' English learning achievement was better after being taught using the picture mnemonic strategy than before they were taught using the picture mnemonic strategy. It can be concluded that picture mnemonics effectively teach basic English for students with intellectual disabilities [12]. Furthermore, the authors also investigated the intellectually disabled behavior during English learning using mnemonics [13].

Based on the background of the study, this present study examined the use of the backward chaining model to identify learning difficulties factors experienced by children with disabilities. This study is different from other previous studies since it integrates the backward chaining model and learning difficulties factors on children with disabilities. Although numerous studies have been done by scholars, the one which investigates the use of backward chaining to identify learning difficulties factors especially experienced by students with disabilities is rarely conducted.

## **METHODS**

The method used in this study was a qualitative research design. The research was conducted to identify learning difficulties faced by the students with special needs by using backward chaining. The study participants were 30 (thirty) junior special school students (7<sup>th</sup> grade – 9<sup>th</sup> grade) at the special school in Kudus regency, central java province. To collect the data, the authors interviewed the students and did observations. The interview and observation results became the rule base used as the variable for identifying the factors causing learning difficulties. Figure 1 is the research flow in this research.

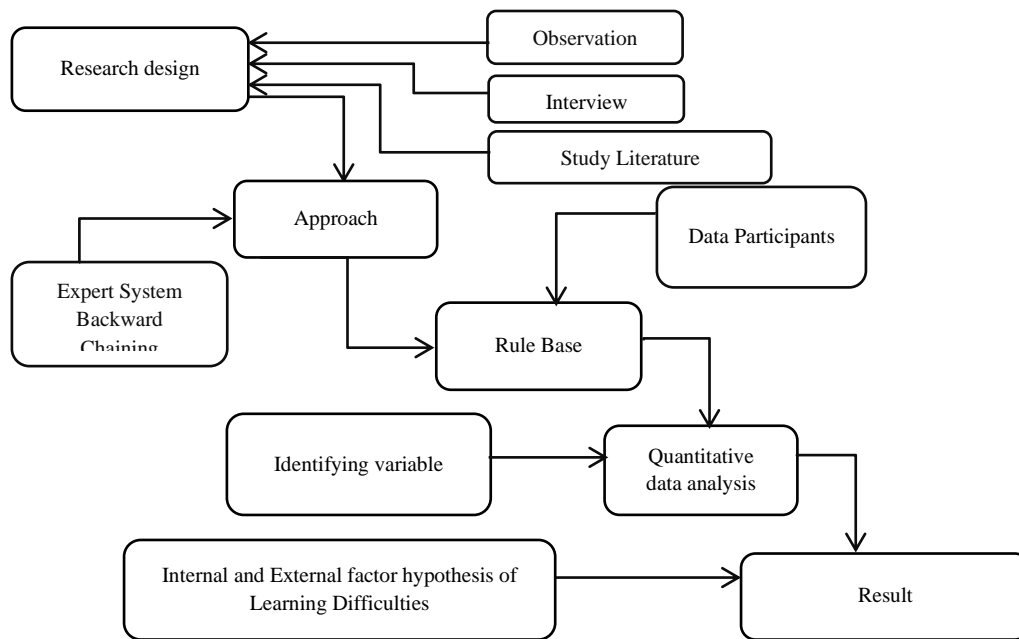


Figure 1. Research Flow

The results of the interview and observation were then analyzed by referring to the data analysis proposed by [14], which consists of three steps: data condensation, data display, and conclusion drawing/verification. Data condensation is selecting, concentrating, simplifying, abstracting, and transforming information from observation, field notes, or interviews to make them more manageable and understandable. The data of this study had been selected, limited, simplified, and transformed by summarizing or paraphrasing the results of observation and interview. The next step is data display. It was a structured and condensed piece of data that allowed for conclusions and actions to be drawn. The display could be an extended form of text, charts, graphs, pictograms, tables, or matrices that provide a new way to organize and think about the embedded textual data. In this study, the data were displayed in a table. The final step is conclusion drawing, which refers to the stepping back to consider what the analyzed data implies and how they relate to the questions.

Meanwhile, the procedures for implementing the backward chaining models were as follows: (1) determining the Knowledge Base (2) determining the Rule or Interference Engine to start reasoning to get conclusions (goals) from hypotheses for achieving the facts, (3) producing output (results) in the form of solution from the reasoning results. Figure 2 is the step backward chaining model.

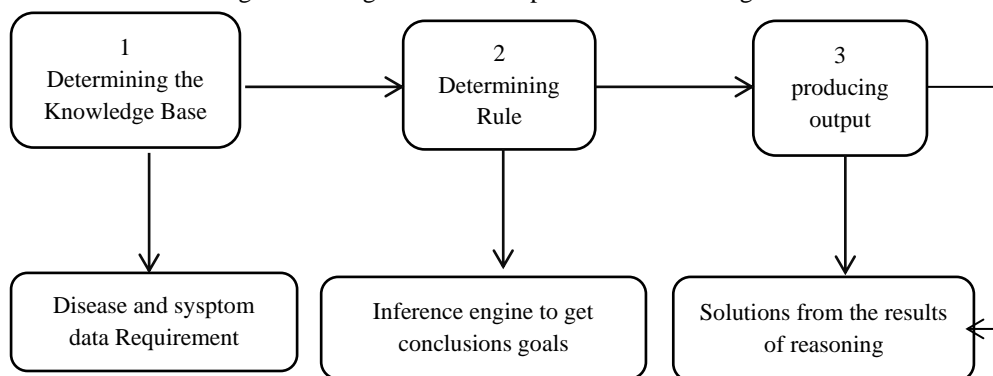


Figure 2. Step Backward Chaining

The stages of the backward chaining in Figure 2 can be explained as follows: (1) Determining the knowledge base containing knowledge that can be used to comprehend, formulate, and solve problems. The analysis of this needed data has obtained the factors that cause learning difficulties in children with

disabilities obtained from an expert. (2) Determining the Rule (rules) or Inference Engine to begin reasoning to obtain conclusions (goals) from hypotheses (objects) to get facts. In this case study, the factors are divided into internal factors (physical, psychological, and fatigue) and external factors such as family and society. (3) Generating output (results) in the form of solutions from reasoning results. The process begins with the goal (which is in the THEN section of the IF-THEN rule), and then the search engine begins to see if the facts match the premises in the IF section. If it matches, the rule is executed. The hypothesis in the THEN section is saved as a new fact in the database. If they don't match, save the premise in the IF section as a SubGoal to the stack. The process ends when the goal is found or when no rule can prove the truth of the SubGoal or Goal as an output.

## RESULT AND DISCUSSION

Children with disabilities are defined as individuals with different characteristics from other individuals considered normal by society in general. Moreover, they are also indicated by having mental, emotional or physical disabilities. The results of the data analysis of internal factors indicate the facts and hypothesis of the learning difficulties of students with disabilities, as presented in Table 1. Furthermore, the results of data analysis of external factors show the facts and hypothesis of the learning difficulties of students with disabilities in Table 2. Internal factors are those that exist within the learners or individuals. Meanwhile, external factors are issues outside the individual or pupils. The internal factor in this study was the motivation factor. The detail of the study results is presented in Table 1 and Table 2.

Table 1. Internal factor and Hypothesis of Learning Difficulties

Factor	Factor Code	Hypothesis	Hy
Health Factor	F01	Blood deficit	D01
		Senses function disorder/Body function disorder	D02
Impairment Factor	F02	Vision impairment	D03
		Half vision impairment	D04
		Hearing impairment	D05
		Half hearing impairment	D06
		Broken leg	D07
		Broken arm	D08
		Paralyzed	D09
Intellectual Factor	F03	Below average cognitive functioning	D10
		Can't adapt easily	D11
Attention Factor	F04	Having less attention on the learned materials	D12
		Often daydreaming during the learning process	D13
		Playing by him/herself during the learning process	D14
Interest Factor	F05	No interest to study	D15
		There is no enjoyment in learning	D16
Talent Factor	F06	Having no talent in a subject	D17
		Having no talent in learning materials	D18
Motivation Factor	F07	Having no aim to get a good score	D19
		Having no motivation to go to a higher class	D20
		Having no motivation to graduate with a good achievement	D21
		Having no motivation to continue to higher education	D22
Maturity Factor	F08	Learning Subjects exceed the SMP students' ability	D23
		Inappropriate curriculum	D24
Readiness Factor	F09	No preparation before examination	D25
		Never study	D26
		No preparation for learning tools	D27
		Cheating during examination	D28
Fatigued Factor	F10	Lack of sleep/stay up late	D29
		Playing too much	D30

There are 10 facts and 34 hypotheses on learning difficulties faced by special needs children in the external factors. The existing assumptions will later be used to find out the factors causing learning difficulties for children with disabilities.

Table 2. External Factors and Hypothesis of Learning Difficulties of Children with Disabilities

Factor	Factor Code	Hypothesis	Hypothesis Code
The Way Parents Educate Children Factor	F11	Parents don't pay attention to their students' learning	D31
		There is no attention at all from parents on students' interests and needs in learning	D32
		Parents don't schedule the time for studying	D33
		Incomplete learning tools	D34
		No attention on students' academic progress	D35
Family Members Relationship Factor	F12	Children and parents relationship is not good	D36
		Parents are too forceful with their children	D37
		The relationship between parents and their children are indifferent	D38
		The relationship between relatives and children is not good	D39
		The relationship between relatives and children doesn't run smoothly	D40
House Condition Factor	F13	The relationship between relatives and children is indifferent	D41
		The house is noisy	D42
		there are often fights between family members	D43
		there are often fights between family members and of the family members	D44
		There is a dispute in the family	D45
Economic Factor	F14	No learning room	D46
		No table for studying	D47
		Inadequate electricity	D48
		Insufficient learning materials (pencils, books)	D49
Parents Factor	F15	Many home assignments should be done by children	D50
		Insufficient time for studying	D51
		There is no learning assistance from parents/mentors	D52
Cultural Background Factor	F16	There are family habits that disturb children' learning	D53
		There are school habits that can disturb children' learning	D54
Students' Activities in Society Factor	F17	Joining too many activities in society	D55
		Lack of time to study due to too busy with social activities	D56
Mass Media Factor	F18	Children often watch TV with a negative effect, such as promiscuity, obscenity, etc.	D57
Friends Factor	F19	Children have idols on TV or in comics who have negative roles	D58
		Children often stay up late with their friends	D59
		Children often hang out with their friend	D60
		Children often smoke	D61
		Children often hang out with friends who have negative effects such as drunkards, gamblers, adulterers	D62
Society Life Factor	F20	Children are often gathered with society who have bad habits	D63
		Living environment that has a lot of negative influences	D64

These factors and assumptions (hypotheses) will later produce an expected knowledge base. Meanwhile, four assumptions of learning difficulties factors, among others, are: having no goal of getting good grades, having no goal to go to a higher class, and having no goal to graduate with good achievements, which are mentioned in rule (R07 with three indicators), and parents don't give attention on their children learning which is stated in rule (R11) with one indicator. The way to find the facts of the learning difficulty factor is to match the assumptions into the database rule that contains the rule of learning difficulties and formulate the percentage of completion by using the following formula: hypothesis/number of hypotheses\* 100%.

$$(R07): *100\% = 75\%$$

$$(R11): *100\% = 25\%$$

Then it resulted in the fact that the main factor that caused learning difficulties was an internal factor from the students themselves. Then, that was a motivation factor, such as no motivation to go to a higher class, no motivation to graduate with good achievement, and no motivation to continue to a higher level of education. The main external factor also caused the learning difficulties. That was the way parents educate their children. Parents ignore their students' learning, and children and parents do not have a good relationship and others.

Table 3. Difficulties Learning Factors Experienced by Children with Disabilities

Code	Learning Difficulties Factors Experienced by Junior High School Students with disabilities
F01	Health Factor
F02	Physical disability Factor
F03	Intellectual Factor
F04	Attentional Factor
F05	Interest Factor
<b>F06</b>	Talented Factor
F07	Motivational Factor
F08	Maturity Factor
F09	Readiness Factor
F10	Fatigued Factor
F11	The Way Parents Educate Children Factor
F12	Family Members Relationship Factor
F13	House Condition Factor
F14	Economic Situation Factor
F15	Parents' Understanding Factor
F16	Cultural Background Factor
F17	Students' Activities in Society Factor
F18	Mass Media Factor
F19	Friends Factor
F20	Society Life Factor

This research found out the facts related to the factors causing learning difficulties experienced by students with disabilities as mentioned above from f1 – f20.

The results of this study support previous studies done by some scholars [15], [16], [17], [18]. [15] who investigated the students in an International Based school in learning physic found that factors causing learning difficulties were students' interest, students' talent, motivation, intelligence, teachers, facilities or infrastructure, and parents' support. Moreover, the most influential element which leads to the student's learning challenges is internal factors driven by learning habits and interests and external factors such as family and school environment [16]. Furthermore, [17] discovered some factors causing fifth-grade elementary school students to learn about human and body organs, such as low attention and motivation, inappropriate teaching method, and parental attention. Similarly, [18] found out that the factors that caused students learning disabilities at elementary school Tangerang region were gadget influence, and the lack of parents' attention. Meanwhile, the results of this study are different from the study conducted by [19], who found that the main internal factor causing students' learning difficulties in elementary schools in the Sayegan Subdistrict was the health level of the hearing and seeing senses.

The results of this present study then lead to the development of a new theory of the use of backward chaining to identify factors causing learning difficulties experienced by children with disabilities which has never been explored previously.

## CONCLUSION

The main factor that causes learning difficulties for children with disabilities is the internal factor coming from the students themselves: their motivation. The second factor is the external factor which relates to the way parents educate their special needs children. Therefore, the solution to these learning difficulties is mainly focusing on students' internal factors, that is students' motivation. Children with disabilities should have high motivation to drive themselves to study. In this case, parents can help their children to have high motivation. Concerning the external factor, parents should change their way of educating their children. Parents should give more attention to their children's academic progress and make them willing to study actively.

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