COUNSELING MODEL BASED ON BACKWARD CHAINING OF STUDENT BEHAVIOR AT SMK 10 MUHAMMADIYAH KISARAN

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Abstract: The diversity of student behaviors can serve as impediments to the learning process and students' personal development. This research aims to develop a counseling model that can address students' behavioral issues and enhance the role of homeroom teachers in guiding students. The research commences with problem analysis, goal setting, literature review, data collection, system design, implementation, and result analysis. Subsequently, the focus shifts to the development and implementation of the counseling model within the school environment. To comprehend the underlying reasons, data on children's misbehavior are analyzed using a backward chaining methodology. The constructed counseling model, which encompasses 14 behaviors, 67 phenomena/symptoms, and 14 rules, is centered on the objectives and methods for modifying student behavior. Three students subsequently undergo system testing based on the predetermined counseling goals. The results of this research reveal the presence of behaviors such as "Smoking," "Emotional Issues," and "Fighting" among the students. With this Backward Chaining-based counseling model, homeroom teachers can more easily gather information about students' behavior and provide solutions based on their professional expertise, without having to wait for guidance procedures from counselors.

Keywords: backward chaining; student behavior; counseling; expert system; artificial intelligence

Abstrak: Ragam perilaku siswa dapat menjadi penghambat dalam proses pembelajaran serta perkembangan pribadi siswa. Penelitian ini bertujuan untuk mengembangkan model konseling yang dapat membantu mengatasi masalah perilaku siswa dan meningkatkan peran guru wali kelas dalam membimbing siswa, dimulai dengan analisis masalah, penetapan tujuan, studi pustaka, pengumpulan data, perancangan, dan implementasi sistem, serta analisis hasilnya. Selanjutnya, fokus dialihkan ke pengembangan dan implementasi model konseling di lingkungan sekolah. Untuk memahami alasannya, data perilaku nakal anak-anak dianalisis menggunakan metodologi backward chaining. Model konseling yang dibuat, yang mencakup 14 perilaku, 67 fenomena/gejala, dan 14 aturan, difokuskan pada tujuan dan metode untuk memodifikasi perilaku siswa. Tiga siswa kemudian menjalani pengujian sistem berdasarkan tujuan konseling yang telah ditetapkan sebelumnya. Hasil penelitian ini mengungkapkan adanya perilaku seperti "Merokok," "Masalah Emosional," dan "Berkelahi" di antara perilaku siswa. Dengan model konseling berbasis Backward Chaining ini, guru wali kelas dapat lebih mudah mengumpulkan informasi tentang perilaku siswa dari mereka dan memberikan solusi berdasarkan pengetahuan profesional, tanpa perlu menunggu prosedur bimbingan dari konselor.

Kata kunci: backward chaining; perilaku mahasiswa; konseling; sistem pakar; kecerdasan buatan

INTRODUCTION

According to Law No. 20 of 2003, education refers to a deliberate and planned effort to create a learning environment and learning process so that students actively develop their potential to have the religious spiritual strength, self-control, personality, intelligence, noble morals, and skills needed by themselves, society, the nation, and the state [1]. One of the most important aspects of a student's development is their behavior. It is required of students to conduct consistently well and in accordance with the laws in force. The fact that this clause provides the students themselves a meaning with positive worth is, of course, what lies behind all of that. The social system naturally judges how people behave in daily life. starting with the social environment, the family environment, and the learning environment at school [2].

Student behavior plays a very significant role in determining their success in various aspects of life, including in academic, social, and adaptability in society. One of the educational institutes dedicated to creating top-notch graduates in a range of specializations is Vocational High School (SMK) 10 Muhammadiyah Kisaran. To accomplish this goal, attention must be paid to specific aspects of student conduct. This will help them grow personally and prepare them to give back to society. This means that creating models for student behavior counseling is essential. Activities designed to fulfill these responsibilities in guidance and counseling help individuals enhance, internalize, modernize, and incorporate value systems into autonomous conduct. [3].

The objective of this research is to design a counseling model to mitigate student behavioral issues and reinforce the role of homeroom teachers in guiding students. Furthermore, this research seeks to develop a backward chaining-based counseling model, particularly for addressing student behavioral problems at SMK 10 Muhammadiyah Kisaran. With the existence of this model, it is expected that counselors can provide a more structured and effective approach to help students develop positive behavior and address existing issues.

One method that can be used in the development of student behavior counseling models is the Backward Chaining approach. In the beginning, the Backward Chaining method begins with a goal or hypothesis to be achieved. Then, the system reasoning backwards, following predetermined rules or rule-bases, to find facts or information that meet the criteria or conditions needed to achieve these goals [4]. This approach is a method that focuses on developing students' skills or behaviors by starting at the desired end goal and then identifying the steps back needed to achieve that goal. Backward Chaining is a search method whose direction is reversed compared to forward chaining, the search process starts from the goal, which is the conclusion that becomes the solution to the problem at hand [5].

The results of previous research entitled "Intelligent System for Diagnosing Internet Addiction Using a Backward Tracking Expert System" resulted in the conclusion that by using a series of tracking steps that start from a goal or hypothesis and then try to match with the initial state or existing facts. In this expert system, every answer given will lead to a conclusion, namely the result of a diagnosis. With this system, users in this case adolescents will be able to see directly their tendency towards

internet addiction so that they can control themselves in their use so as not to experience more severe disorders [6]. The opposite of backward chaining is titled "Expert System for Early Screening of PTSD (Post Traumatic Stress Disorder) Using Website-Based Forward Chaining Method" where the method of tracking forward with a search technique that starts with known fact information, then matches a fact information by combining to produce a conclusion. Forward Chaining method using IF-THEN rules. If there are facts that match the IF section, then the rule is executed. The reason researchers use the Forward Chaining method is that this method is very suitable for creating expert system websites, because the Forward Chaining method uses forward tracking by looking for facts to make it a conclusion [7].

The next study in 2023 entitled "Backward Chaining Method Expert System for Optimizing Drug Information Delivery Services" with the conclusion that the Drug Information Delivery Expert System using the Backward Chaining method can be applied to provide and optimize drug information delivery services with 100% accuracy. The Drug Information Delivery Expert System application can assist pharmaceutical officers in completing drug information delivery services at the Agam Regency Lasi Health Center without having to wait for a Pharmacist [8].

This expert system can be used as a final decision in diagnosing pests and diseases experienced by porang plants. Reasoning gained from user experience and consultation with experts remains a major factor in detecting and diagnosing pests and diseases in porang plants [9].

The next research on the use of the backward chaining method in lectures entitled "Backward Chaining Method for Receiving Dipa Scholarships at the State Islamic University of North Sumatra" with the results of making a decision tree to recognize scholarship receipts from the Faculty of Economics and Islamic Religion UIN North Sumatra.

In this system, it is stated that there are 2 results, namely receiving (P1) and Not Receiving (P2). Each has 4 criteria consisting of an Active Information Letter studying 100% (A1), GPA (A2), TOEFL Score (A3) and Certificate of Achievement (A4). In P2, it is explained that they cannot receive DIPA scholarships if their GPA and TOEFL scores are not met [10].

Research in the field of medicine uses a backward chaining method entitled "Expert System to Determine the Danger Level of Paresthesia Disease in an Individual Using Backward Chaining" with the conclusion that patients with Paresthesia disease do not need to visit the doctor concerned to know to what extent the paresthesia disease experienced [11].

METHOD

Backward chaining is a method typically used in problem-solving and action planning. The search process begins with the goal, which is the conclusion that becomes the solution to the problem at hand.
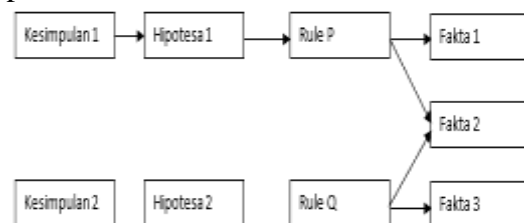

Image 1. Backward Chaining

Backward chaining encompasses the following steps:

Identification of the Ultimate Goal

Which involves recognizing the desired end result. In the context of research on student behavior counseling, this ultimate goal may manifest as the achievement of positive behavioral changes in students.

Reverse the Steps

Initiate from the ultimate goal and then work backward to identify the necessary steps to achieve that goal.

Identify Phenomena/Symptoms

Identify phenomena or symptoms that may be related to the behavior of the students that needs modification. This can aid in determining the influencing factors of that behavior.

Causation Analysis

Working backward, scrutinize the causes or triggers of the identified phenomena/symptoms. What triggers the student's behavior? What influences this change in behavior?

Development of Counseling Model

After causation analysis, one can develop or select a suitable counseling model to achieve the goal of changing student behavior.

RESULT AND DISCUSSION

Data Analysis

The behavioral data used in this study was taken from the expertise of Mr. Kurniawan Syahputra, S.Pd majoring in Guidance and Counseling S1 UMSU Medan who currently works as a Guida-nce and Counseling Teacher at SMK 10 Muhammadiyah Kisaran. Each behavior and behavioral phenomenon is assigned an alphanumberic code as shown in the table 1. Based on the data obtained at the time of data collection, it can be concluded that the number of behaviors obtained is 14 behaviors. In addition to behavioral data, phenomenon data are also given alphanumeric codes which can be seen in table 2 of 67 phenomena.

Table 1. Behavioral Data

No.	Code	Behavioral
1	P001	Group/Fortified Conflict
2	P002	Academic Procrastination
3	P003	Conformity
4	P004	Late
5	P005	Lazy to Study
6	P006	Miss
7	P007	Fight
8	P008	Disrespecting Teachers
9	P009	Broken Home
10	P010	Learning Difficulties in Certain Areas
11	P011	Smoke
12	P012	Lie
13	P013	Criminal Acts
14	P014	Emotional problems

From these various behaviors and phenomena, rules or rules are made to connect them. From previous behavioral and phenomenon data, rules were obtained using a backward sequence of 14 rules. These rules can be seen in table 3.

Table 2. Behavioral Phenomenon Data

No.	Code	Phenomenon
1	G001	Having personal/group fights
2	G002	Inciting friends
3	G003	Feeling demeaned or ignored by friends
4	G004	Irritability
5	G005	Throwing taunts at each other with friends
6	G006	Don't want to help friends
7	G007	Implementing an overnight speeding system
8	G008	Work on assignments at the end of deadlines
9	G009	Delaying tasks
10	G010	Decreased learning achievement
11	G011	Never do assignments
12	G012	Fight to defend friends
13	G013	Sign in a specific gang member
…	…	…
60	G060	Drunkenness
61	G061	Positive involvement in drugs
62	G062	Involved in phone sex cases
63	G063	Caught participating in a brawl
64	G064	Caught on video performing indecent acts
65	G065	Tired of Working
66	G066	Oversleeping due to exhaustion
67	G067	Low Emotional Control

Table 3. Rules

No.	IF	THEN
1.	IF (G001) AND (G002) OR (G003) AND (G004) AND (G006)	P001
2	IF (G007) AND (G008) AND (G009) AND (G010) AND (G011)	P002
3	IF (G012) AND (G013) AND (G014) AND (G015) AND (G016)	P003
4	IF (G017) AND (G018) AND (G019) AND (G020) AND (G021)	P004
5	IF (G022) AND (G023) AND (G024) AND (G025) AND (G026)	P005
6	IF (G027) AND (G028) AND (G029) AND (G030) AND (G031)	P006
7	IF (G032) AND (G033) AND (G034) AND (G035) AND (G036)	P007
8	IF (G037) AND (G038) AND (G039) AND (G040) AND (G041)	P008
9	IF (G042) AND (G043) AND (G044) AND (G045) AND (G046) AND (G047)	P009
10	IF (G048) AND (G049) AND (G050) AND (G051)	P010
11	IF (G052) AND (G053) AND (G054) AND (G055)	P011
12	IF (G056) AND (G057) AND (G058) AND (G059)	P012
13	IF (G060) AND (G061) AND (G062) AND (G063) AND (G064)	P013
14	IF (G065) AND (G066) AND (G067)	P014

In software development, the user interface plays a very important role in ensuring the usability, dependability, and attractiveness of a program or application. A good display can make users feel comfortable, easily access features, and clearly understand how the program interacts with users.
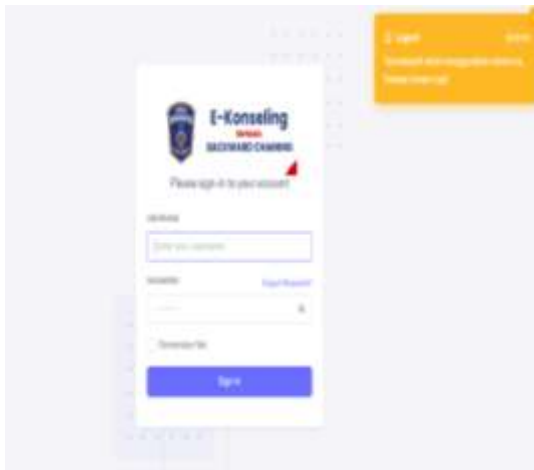

Image 2. Login Page

The login page consists of several users, namely Dashboard Teacher, and BK Teacher. This Login Form is the starting point for logging into the system which has functionality tailored to each user's access level.
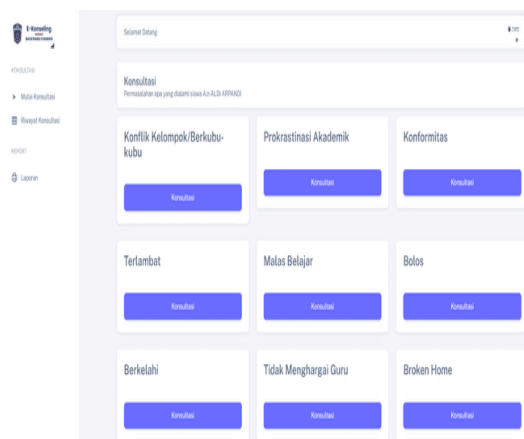

Image 3. Consultation Page

On the consultation page, the homeroom teacher selects the data of the students who have to be consulted, then the system displays a list of behaviors that have been entered by experts. After that, the homeroom teacher will be shown some facts experienced by students. If it matches the rules, the system will display a solution.

Testing Results

In the testing phase of research results regarding the backward chaining-based counseling model for student behavior at SMK 10 Muhammadiyah Kisaran, evaluation and analysis steps were carried out to measure the effectiveness of the model in overcoming student behavior problems.
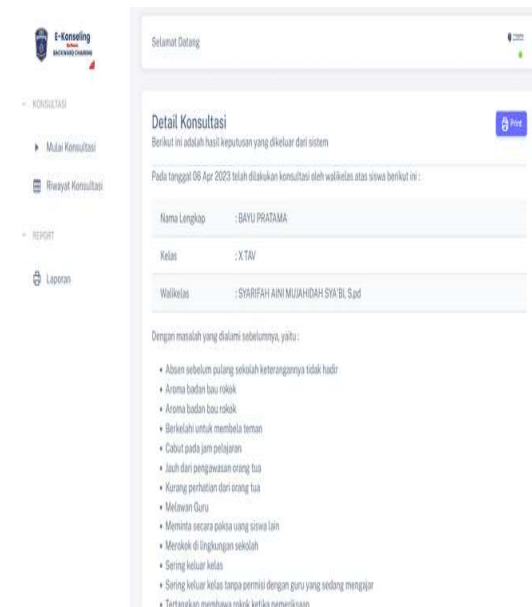

Image 4. Testing Result

Testing was carried out on a student, based on previous counseling history, the goal was obtained that "Smoking (P0011)" facts with several phenomena "Body smell smells of cigarettes (G052)", "Forcibly asking other students for money (G053)",

"Smoking in the school environment (G054)", "Caught carrying cigarettes during the examination (G055)", because all conditions are met with the conditions in rules P0011 it can be concluded that the results of reports from student 1 are true of experiencing negative behavior "Smoking".

CONCLUSION

Based on the implementation carried out, the process of transferring knowledge from experts into the system obtained the counseling process carried out by the homeroom teacher for children who have negative behavior can be recognized by entering the facts experienced and the system provides solution recommendations.

The Student Behavior Expert System application using Backward Chaining helps the homeroom teacher of SMK Muhammadiyah 10 Kisaran in providing student behavior resolution services without having to wait for the Counseling Guidance Teacher.

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