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Application Of Certainty Factor In Detecting Learning Concentration Disorders In Children At School

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Abstract—Learning concentration disorders are a fairly common problem in elementary schools and can have a significant impact on students' academic performance. At UPTD SDN 015861 Bunut Seberang, initial observations indicate that around 20–25% of students experience symptoms such as distractibility, difficulty focusing, hyperactivity, and decreased motivation to learn. Current interventions are limited, lack a structured system, and rely on teachers' subjective assessments. This study aims to develop an expert system based on the Certainty Factor method to detect learning concentration disorders more objectively and accurately. The research method uses a quantitative approach with stages of problem identification, data collection through observation and interviews, analysis, system design using UML, and implementation based on PHP and MySQL. The system processes student symptom data, calculates the confidence level of the diagnosis, and provides follow-up recommendations for teachers and parents. The implementation results show that the system can efficiently identify potential learning concentration disorders, assist teachers in decision-making, and serve as a model that can be adapted by other schools facing similar issues.

Keywords— Expert System, Certainty Factor, Detection, Learning Disorders, Children

I. INTRODUCTION

Children's ability to concentrate during the learning process is a crucial factor that significantly influences academic performance and cognitive development. Concentration disorders in school-aged children often manifest as difficulties in maintaining focus, frequent distractions, hyperactive behavior, and inability to complete tasks effectively [1]. If such conditions remain undetected and unmanaged, they may hinder knowledge acquisition, lower self-confidence, and negatively impact long-term educational outcomes [2]. Therefore, early detection of concentration-related learning disorders is essential to provide timely interventions, including specialized learning strategies, psychological support, or medical consultation [3].

At UPTD SDN 015861 Bunut Seberang, initial observations indicate that approximately 20–25% of students experience symptoms of concentration difficulties [4]. These include daydreaming during lessons, being easily distracted by the surrounding environment, and showing reduced motivation to learn. Teachers have attempted to address these challenges through additional assignments and informal counseling sessions. However, such efforts are limited, largely subjective, and not supported by a structured system, which often leads to inconsistencies in identifying students who genuinely require intervention [5].

In recent years, expert system approaches have been widely applied in both education and healthcare to support decision-making processes [6] [7]. Among these, the Certainty Factor (CF) method has proven effective in handling uncertainty and ambiguity in human reasoning [8] [9]. The CF approach enables experts to assign confidence levels to symptoms or behavioral indicators [10], making it particularly suitable for diagnosing conditions that do not always present with clear or absolute signs [11] [12]. Applying this method to detect learning concentration disorders provides a systematic framework for integrating teacher observations, student performance data, and parental input while accounting for uncertainty in interpretation [13].

This study aims to develop and implement an expert system using the Certainty Factor method to detect learning concentration disorders among students at UPTD SDN 015861 Bunut Seberang. By combining expert knowledge with computational reasoning, the system is expected to assist teachers, parents, and educational psychologists in identifying concentration-related issues at an early stage [14]. The proposed system not only enhances diagnostic accuracy but also serves as a practical decision-support tool that contributes to improving students' learning experiences and educational outcomes [15].

II. METHODOLOGY

This study used several stages, as shown in Figure 1 below.

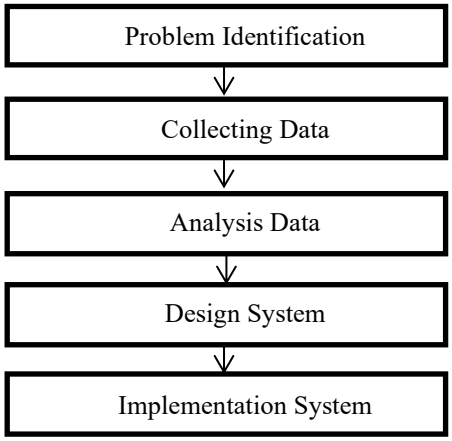

Figure 1. Research Method

A. Problem Identification

The problem identification stage in this study was carried out through direct observations and interviews with teachers at UPTD SDN 015861 Bunut Seberang. From this process, it was found that approximately 20–25% of students exhibited symptoms of concentration difficulties, such as being easily distracted, daydreaming, and showing reduced motivation in learning. These findings established the foundation for developing a detection system based on the Certainty Factor method. UPTD SDN 015861 Bunut Seberang is one of the public elementary schools located in the Bunut Seberang area. The school has a significant number of students, with the latest data showing that there are approximately 150 students enrolled from grades 1 to 6. The school has 10 teachers responsible for the daily learning process. Although the school has made efforts to provide quality education, there are several challenges faced, one of which is the issue of learning concentration difficulties among students.

B. Collecting Data

Data were collected using teacher interviews, classroom observations, and student academic performance records. Teachers provided information about common behavioral indicators, such as hyperactivity and difficulty completing assignments, while classroom observations validated the frequency and intensity of these symptoms. This data became the knowledge base of symptoms and disorders used in the system [16].

C. Analysis Data

The data collected were analyzed to identify patterns of symptoms that correlate with learning concentration disorders. Each symptom was categorized (e.g., concentration, hyperactivity, memory, motivation) and mapped into a diagnostic framework. These structured data inputs served as the main parameters for the Certainty Factor calculation in the expert system [17].

D. Design System

The system design stage employed Unified Modeling Language (UML) diagrams, including use case and class diagrams, to model the interaction between users (administrators and teachers) and the system [18]. The design specifically emphasized how symptom data would be entered, processed using the Certainty Factor algorithm, and outputted as diagnostic results with confidence levels.

E. Implementation

The designed system was implemented using PHP as the programming language and MySQL as the database [19], with Visual Studio Code as the development environment. In practice, the system allowed administrators to manage symptom data, run diagnosis processes, and generate printable reports. This implementation ensured that teachers could use the system as a decision-support tool for detecting concentration disorders in students.

III. RESULT AND DIISCUSSION

A. Analisys Data

Data analysis consists of input data that will be processed using the Certainty Factor (CF) method . The data used as input in this study is as follows;

Table 1. Code Symptom Data

No	Code	Decription Symptom	Categori
1	G01	Easily distracted while studying	Concentration
2	G02	Does not complete tasks without a clear reason	Task Focus
3	G03	Often daydreams in class during teaching and learning activities	Concentration
4	G04	Difficulty following instructions or commands given by the teacher in sequence	Instruction Processing
5	G05	Appears restless, frequently moves without purpose (cannot stay still)	Hyperactivity
6	G06	Often talks to oneself or disrupts peers during learning	Social Behavior
7	G07	Easily forgets things that were just explained	Short-Term Memory
8	G08	Shows no interest in lessons, even those they enjoy	Learning Motivation
9	G09	Difficulty starting tasks without help from the teacher or peers	Task Initiative

10	G10	Rapid mood changes during learning (e.g., suddenly angry/sad)	Emotional

Table 1 presents a list of codes and descriptions of symptoms used as indicators for identifying learning concentration disorders in students. Each symptom is grouped into specific categories such as concentration, task focus, instruction processing, hyperactivity, social behavior, short-term memory, learning motivation, task initiative, and emotional aspects.

Table 2. Data Interference

Interference	Symptom									
	G1	G2	G3	G4	G5	G6	G7	G8	G9	G10
P1	✓	✓			✓	✓			✓	
P2	✓	✓					✓			
P3		✓		✓			✓	✓		
P4	✓		✓					✓		✓
P5			✓					✓		✓
P6		✓		✓				✓	✓	
P7	✓				✓	✓				
P8					✓	✓				✓

Table 2 contains a mapping between types of learning concentration disorders and their accompanying symptoms in each student who was the subject of the study. This data was used as the basis for diagnosis by an expert system based on the Certainty Factor method, so that the relationship between the disorder and its symptoms could be analyzed systematically and measurably.

Table 3. Rule

Interference	Symptom									
	G1	G2	G3	G4	G5	G6	G7	G8	G9	G10
P1	✓	✓			✓	✓			✓	
P2	✓	✓					✓			
P3		✓		✓			✓	✓		
P4	✓		✓					✓		✓
P5			✓					✓		✓
P6		✓		✓				✓	✓	
P7	✓				✓	✓				
P8					✓	✓				✓

Table 3 contains rules that link each type of learning concentration disorder with relevant symptoms based on predetermined knowledge bases. These rules serve as the main reference for the Certainty Factor-based expert system to calculate the level of diagnostic confidence, enabling the identification process to be carried out consistently and accurately.

B. Design System

System design using use case diagrams with the help of MS Visio tools. The purpose of system design using use case diagrams is to clearly describe the functional requirements of the system through interactions between actors and the system [20]. System design using use case diagrams is shown in Figure 2 below.

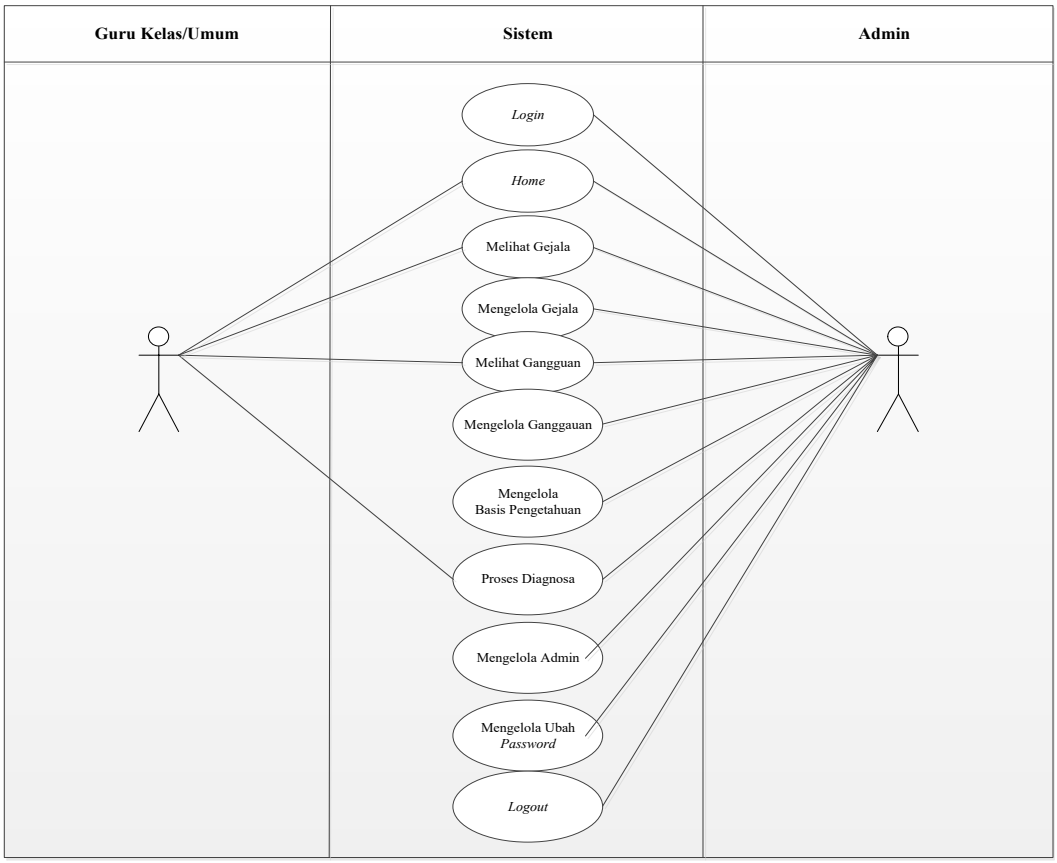

Figure 2. Use Case Diagram

Figure 2 shows a use case diagram that illustrates the interaction between system users, namely administrators and teachers, with the main functions available. This diagram shows that administrators have the right to manage symptom data, knowledge bases, and perform diagnosis processes. This visualization helps to understand the general functional requirements of the system as well as the workflow from data input to diagnosis output.

C. Implementation

This forecasting system was created using the PHP, with Microsoft Visual Studio Code as the text editor and mysql as the database.

1. Symptoms Page

The symptoms page displays data on students' symptoms, and administrators can add, view, edit, and delete symptom data. The following are several examples of diseases that are input into the system, which are presented in Table 4.

Table 4. Example of Symptom Data In the Application

No	Symptom Code	Symptom Description	Category	Action (CRUD)
1	G01	Easily distracted while studying	Concentration	Add / Edit / Delete
2	G05	Appears restless, frequently moves without purpose	Hyperactivity	Add / Edit / Delete

Table 4 only displays two symptom examples as a representation of the application page and the Action column indicates whether the admin can add, edit, or delete data.

2. Knowledge Base Page

The knowledge base page displays data on symptoms and disorders, which students and administrators can add to, edit, and delete. Following are some examples of knowledge entered into the system, which are presented in Table 5.

Table 5. Knowledge Base Page

No	Disorder Type	Related Symptom Code	Symptom Description	CF Value
1	Concentration Disorder	G01	Easily distracted while studying	0.7
2	Hyperactivity Disorder	G05	Appears restless, frequently moves without purpose	0.8

Table 5 shows just two examples of the relationship between disorders and symptoms and the CF value indicates the level of confidence (certainty factor) determined by the expert.

3. Diagnosis Page
This page displays diagnostic data on students and shows the results of the diagnosis, which can be printed out.

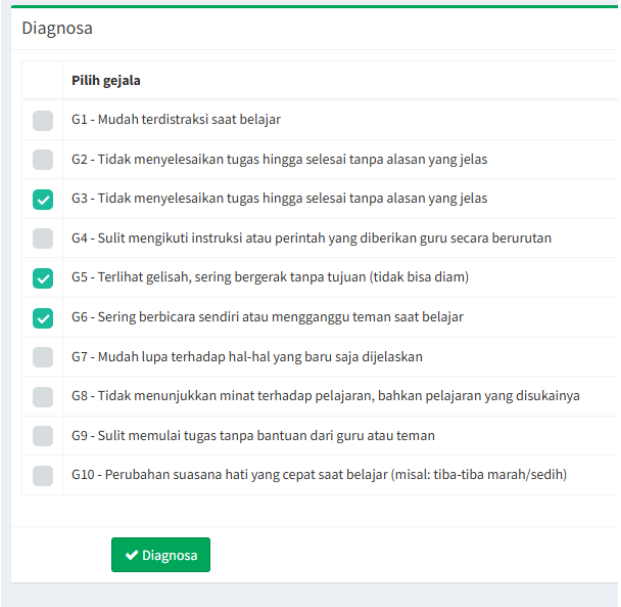

Figure 3. Diagnosis Page

4. Diagnose Report
This page is a report of the diagnosis results, and it displays the assessment results and provides solutions based on the diagnosis results. The following are some examples of diagnostic reports generated by the expert system, which are presented in Table 6.

Table 6. Diagnose Report

Student ID	Student Name	Detected Disorder	Confidence Level (CF)	Recommendation
S01	Ahmad	Concentration Disorder	0.82 (82%)	Counseling with teacher and psychologist
S02	Bunga	Hyperactivity Disorder	0.76 (76%)	Classroom management and parental support

Table 6 only shown two student examples are shown. The Confidence Level column shows the results of the Certainty Factor calculation and the Recommendation column contains the follow-up actions taken by the system.

IV. CONCLUSION

Based on the results of this study entitled "Application of the Certainty Factor Method for Analyzing Learning Concentration Disorders in Children", it can be concluded that the development of an expert system using the Certainty Factor method is effective in identifying symptoms of learning concentration disorders among students. The system is able to process symptom data, calculate the certainty level of diagnosis, and provide recommendations for appropriate follow-up actions. This approach supports teachers, schools, and parents in detecting concentration-related problems more accurately and efficiently, thereby facilitating timely interventions such as counseling, adjustments in teaching methods, or parental involvement. Overall, the implementation of the Certainty Factor-based system contributes to improving the quality of learning and student well-being, while also demonstrating the potential of expert systems to be applied in broader educational contexts.

REFERENCES

[1] S. N. Luthfiyana and G. P. Utama, "Penerapan Metode Certainty Factor Untuk Sistem Pakar Diagnosis Penyakit Anak Berbasis Website," *Semin. Nas. Mhs. Fakulltas Teknol. Inf.*, vol. 2, no. September, pp. 909–918, 2023.

[2] Odilia Yulyana Dani, A. Sellyana, and M. Pratiwi, "Sistem Pakar Untuk Mendiagnosa Gangguan Pencernaan Pada Balita Dengan Menggunakan Metode Certainty Factor," *JUTEKINF (Jurnal Teknol. Komput. dan Informasi)*, vol. 11, no. 1, pp. 80–88, 2023, doi: 10.52072/jutekinf.v11i1.457.

[3] I. P. D. Suarnatha and I. M. A. O. Gunawan, "Implementasi Metode Certainty Factor dalam Sistem Pakar Deteksi Penyakit Pencernaan pada Manusia," *J. CoSciTech (Computer Sci. Inf. Technol.*, vol. 3, no. 2, pp. 73–80, 2022, doi: 10.37859/coscitech.v3i2.3872.

[4] D. E. Br.Purba and R. M. Simanjorang, "Sistem Pakar Diagnosa Gangguan Pencernaan Pada Manusia Menggunakan Metode Certainty Factor," *J. Sains Dan Teknol.*, vol. 3, no. 2, pp. 36–42, 2022, doi: 10.55338/saintek.v3i2.208.

[5] M. Z. A. Putra and M. Ary, "Sistem Pakar Diagnosis Penyakit Gangguan Saluran Pencernaan Menggunakan Metode Certainty Factor," *eProsiding Sist. Inf.*, vol. 2, no. 1, pp. 147–152, 2021, [Online]. Available: http://eprosiding.ars.ac.id/index.php/psi

[6] D. Dani and S. Karmadi, "Sistem Pakar Diagnosa Penyakit Pencernaan Pada Manusia Dengan Menggunakan Metode Certainty Factor Berbasis Web," *Sainstech J. Penelit. Dan Pengkaj. Sains Dan Teknol.*, vol. 33, no. 2, pp. 72–80, 2023, doi: 10.37277/stch.v33i2.1589.

[7] R. A. Lubis and M. D. Irawan, "Sistem Pakar menggunakan Metode Certainty Factor Mendiagnosa Gizi Buruk Balita berbasis Android," *Edumatic J. Pendidik. Inform.*, vol. 7, no. 2, pp. 505–514, 2023, doi: 10.29408/edumatic.v7i2.24340.

[8] A. Suprika, "Sistem Pakar Diagnosa Penyakit Infeksi Saluran Pencernaan Menggunakan Metode Certainty Factor," *Teknologipintar.org*, vol. 3, no. 3, pp. 1–19, 2023.

[9] B. Betrisandi, "Penerapan Metode Certainty Factor Untuk Mendiagnosa Penyakit Diare," *J. Nas. Komputasi dan Teknol. Inf.*, vol. 5, no. 3, pp. 46–50, 2022, doi: 10.53842/juki.v1i2.16.

[10] A. Maulana, A. F. Boy, and A. Calam, "Aplikasi Sistem Pakar Untuk Mendiagnosa Penyakit Dalam Tropic Infeksi Dengan Menggunakan Certainty Factor," *J. CyberTech*, vol. 1, no. 1, pp. 1–10, 2020, doi: 10.132020/cbt.v1i1.2562

[11] D. Maulina and A. M. Wulanningsih, "Metode Certainty Factor Dalam Penerapan Sistem Pakar Diagnosa Penyakit Anak," *J. Inf. Syst. Manag.*, vol. 1, no. 2, pp. 23–32, 2020, doi: 10.24076/joism.2020v2i1.171.

[12] E. M. Sari Rochman, "Penerapan Metode Certainty Factor Untuk Diagnosis Penyakit Pada Anak," *Netw. Eng. Res. Oper.*, vol. 5, no. 1, p. 36, 2020, doi: 10.21107/nero.v5i1.157.

[13] S. N. I. Windaputri and A. A. S. Widowati, "Sistem Pakar Diagnosa Penyakit Mata Menggunakan Metode Forward Chaining dan Certainty Factor," *J. Teknol. Terap. Sains*, vol. 1, no. 3, pp. 107–119, 2020, doi: 10.11110/jtts.v1i3.2324

[14] A. Wijianto, "Sistem Pakar Mendiagnosa Penyakit Pencernaan Pada Manusia Menggunakan Metode Forward Chaining dan Certainty Factor," *J. Tek. Juara Aktif Glob. Optimis*, vol. 1, no. 2, pp. 1–10, 2021, doi: 10.53620/jtg.v1i2.26.

[15] R. Wakhidah, P. Y. Saputra, and M. I. K. Firismanda, "Diagnosis Penyakit Saluran Pernafasan Manusia Menggunakan Metode Forward Chaining," *J. Minfo Polgan*, vol. 12, no. 1, pp. 128–134, 2023, doi: 10.33395/jmp.v12i1.12327.

[16] A. N. Utomo, "Sistem Pakar Diagnosa Penyakit Pencernaan Pada Manusia Menggunakan Metode Certainty Factor Berbasis Web," *Incometech*, vol. 10, no. 2, pp. 44–49, 2021, doi: 10.302010/ict.v10i2.2232

[17] A. Noviantara, L. A. Budiman, W. Apriyanti, and P. Rosyani, "Analisa Sistem Pakar Diagnosa Penyakit Influenza (Flu) Pada Orang Dewasa Dengan Metode Forward Chaining," *J. Ilmu Komput. , Tek. dan Multimed.*, vol. 1, no. 2, pp. 208–218, 2023, doi: 10.121010/jitem.v1i2.1332

[18] Agustinus Zalukhu, Swingly Purba, and Dedi Darma, "Perangkat Lunak Aplikasi Pembelajaran Flowchart," *J. Teknol. Inf. dan Ind.*, vol. 4, no. 1, pp. 61–70, 2023.

[19] Lufti Puspitasari, Joni Maulindar, and Vihi Atina, "Penggunaan Metode SAW dalam Sistem Pendukung Keputusan Pemilihan Pegawai Terbaik," *Infotek J. Inform. dan Teknol.*, vol. 8, no. 1, pp. 104–115, 2025, doi: 10.29408/jit.v8i1.28298.

[20] A. K. Barus, Y. A. Dalimunthe, S. Informasi, and U. H. Medan, "Sistem Pendukung Keputusan Dalam Menentukan Peringkat Universitas Swasta Di Sumatera Utara Menggunakan Metode Topsis," *J. Kecerdasan Buatan dan Teknol. Inf.*, vol. 4, no. 2, pp. 189–197, 2025, doi: doi.org/10.69916/jkbti.v4i2.319.