Strengthening character education with the implementation of machine learning in the millennial era industrial revolution 4.0

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Abstract. Education is a part that cannot be separated from human life. There is a relationship between education and prosperity and patterns of human life. In the context of human life, education has a significant role in aspects of social, economic, environmental, political and security safeguards. In terms of welfare, education has a large influence. One education actor who plays a very important role is the teacher, who will teach and become an example for his students. And things that should not be eroded by the development of the age are the cultivation of good character in educating students, including those that must be prevented are acts of violence against students maybe it can happen in the world of education, either by the teacher or fellow students. In this study a web-based Expert System will be designed using the Forward Chaining method. Forward Chaining is a search method or a forward tracking technique with information and merging rules to produce conclusions. With this system the teachers can conduct online consultations that will be applied in machine learning in the learning process, so that the teachers can find out whether their actions in the teaching and learning process are in accordance with the ethics of an educator.

1. Introduction

Education is an inseparable part of human life. There is a close relationship between education and prosperity and patterns of human life. In relation to human life, education has a significant role in aspects of social, economic, environmental, political and defense security aspects. In the aspect of welfare, education has a big influence. Even the data shows that one of the obstacles faced in achieving prosperity is education. One education actor who plays a very important role is the teacher, who will teach and become an example for his students. And the thing that must be maintained is about character education for students who might begin to erode because of the development of technology and information in the world of education, whether by teachers or fellow students. One of the learning methods that is increasingly prevalent today is the application of machine learning based learning, which will certainly have an impact on the interaction between educators and students which will be reduced, because of the use of media in the learning process. Expert system technology is the most potential solution to solve the problem of prevention of violence and the development of teacher character in the learning process. This system will be a medium of consultation and provide advice by computers about teacher violence prevention measures in the teaching and learning process. The method used by Forward Chaining.
Forward Chaining is a strategy for predicting or finding solutions to a problem that starts with a known set of experts, then decreases new facts based on rules whose premises match the known facts (Wibowo, 2009). This process continues until it reaches a goal or there are no rules whose premise matches the known facts. Among the application of the Forward Chaining method that has been implemented is in diagnosing shallots and chilli pests and diseases (Sasmito, et al. 2011). Then also applied to diagnose edamame soybean pests and diseases based on symptoms of damage (Desratiano, et al. 2013). In the automotive field, the Forward Chaining method has also been implemented to detect car damage (Mustofa, et al. 2012). In the world of expert system education has also been applied to consulting students with problems with the Forward Chaining method (Kurniawan, et al. 2009). Expert systems with the Forward Chaining method are also used for recursive development in the ternary grid (Erdani, et al. 2011). The chicken roll Forward Chaining game has also been used (Putra, et al. 2013). In the field of psychology among the application of Forward Chaining is the diagnosis of children with autism (Tutik, et al. 2009).

2. Research Method
Expert systems are a set of programs that manipulate encoded knowledge to solve problems in domain-specific areas that usually require human expertise. Expert System as a program that is used to imitate human experts must be able to do things that can be done by an expert. To build a system like that, the components that must be owned are as follows (Verma, 2010):

a. User Interface
b. Knowledge Base
c. Inference Engine (Inference Engine)
d. Knowledge Acquisition

Whereas to make the expert system more like an expert who interacts with the user, it is equipped with the following facilities:

a. Facility Explanation (Explanation Facility)

b. Knowledge Acquisition Facility

Figure 1. Expert System Component
2.1 Search Method

The important thing in determining the success of a system based on intelligence is success in search and matching, basically there are 2 search and tracking techniques used, namely blind search and guided search.

2.1.1 Blind Search

2.2 Forward Chaining

Forward Chaining is thought that starts from facts to conclusions from facts (Giarranto Andriy, 2005).

You want to get conclusions from the list of conclusions based on the premises in the rules and facts given by the user. The following is a list of rules:
Rule 1:

If premis 1
And premis 2
And premis 3
Then Conclusion 1

Rule 2:

If premis 1
And premis 3
And premis 4
Then Conclusion 2

Rule 3:

If premis 2
And premis 3
And premis 5
Then konklusi 3

2.3 Violence in Education

In its development, violent behavior widened into the education area known as bullying. The term bullying is inspired by the word bull (English) which means bull, whose connotation likes to gore. The perpetrators of bullying are called bullies. The meaning of bullying according to the Oxford English Dictionary, is an action that causes pain or hurts others for their own sake.

In addition, in terms of terminology, violence can be seen from the actions it does. The action is among others:

a. Can be done actively or passively (not doing)
b. Desired / approached by the perpetrator
c. There are consequences or possible consequences for the victim (physical / psychological) that is not desired by the victim
2.4 Need Analysis

Needs analysis is a step to determine what kind of system will be produced, the software used. In the expert system, prevention of bullying action and character building begins with the creation of a knowledge base. Knowledge from experts is presented in the form of units of knowledge.

2.5 Knowledge Base

How to represent knowledge with an IF-THEN statement where the THEN part will be true if one or more sets of facts or relationships between facts are known to correctly fulfill the IF section. In general, in the form of IF production rules the premise is THEN conclusion; then for the premise more than one can be connected with the operator and or or. While the conclusions section can be in the form of a single sentence, several sentences associated with and, and possible to be developed with else.
Figure 7. Reasoning for Character Strengthening Decisions

The stages in analyzing this process are carried out using the Forward Chaining method. Forward Chaining is carried out starting from the facts in the knowledge base and getting conclusions.

The forward chaining method is a method which in determining its goal must start from the first step to the last step. These steps will be represented by using existing rules. Which is obtained from the system database.

In making the rules in this study is based on the data in the table below:

Table 2. Facts Data Symptoms of Violence and Solutions

| No | Problem          | Symptom                                                                 | Solution                                                                 |
|----|------------------|--------------------------------------------------------------------------|--------------------------------------------------------------------------|
| 1  | Physical abuse   | - Slap students who don't obey                                           | - Teacher should understand, that students who make mistakes must not be ignored, but also should not be punished physically and morally that can cause pain to students. |
|    |                  | - Step on the feet of students who don't wear black shoes                |                                                                         |
|    |                  | - Throw with student erasers who don't pay attention to the teacher in explaining |                                                                         |
|    |                  | - Pull the ears of students who don't listen to the teacher's explanation |                                                                         |
| 2  | Psychic Violence | - Shaming students in front of other students by saying slackers          | - Teachers need to increase activity with students. Learning activities, especially outside school hours, are a means of getting along between teachers and students. |
|    |                  | - terrorizing students through cellphones on e-mail                      |                                                                         |
|    |                  | - Looking cynically at students who are rich and ignore the poor         |                                                                         |
|    |                  | - Give the threat of not going up to class                               |                                                                         |
|    |                  | - rebuke with harsh words                                                |                                                                         |
| 3 | Verbal Violence |
|---|----------------|
| - Reprimand with a high tone and done repeatedly |
| - Vent anger by tearing off student answer sheets |
| - Gives inappropriate sensual touches to students |
| - Accuse students of cheating |
| - Refuse forgiveness from students |
| - Dubbing students with strange names |
| - Justing students until the student feels embarrassed |
| - Like to curse with harsh words |
| - Insulting students who have less learning ability |
| - Labeling students to make them feel stressed |

- Guru should think positively towards students and see students behave well, obey, and understand students have different behaviors. The teacher requires an open attitude and accepts and acknowledges the existence of students as they are.

- Guru must be able to give an example to students, both about how to dress, how to get along with each other, and how the relationship between the teacher and the social environment, as well as the right way of worship according to the teachings of religion.

- It needs to be an effort to increase teacher awareness of moral considerations and a sense of responsibility, because educating students is a mandate for a teacher.

| 4 | Physical abuse |
|---|----------------|
| - Sentencing students running around the field |
| - Punish students late by asking for push ups to get tired |
| - Hit the ruler |
| - Drying students who are late for the ceremony |

- Teachers can provide decisive action that educates in the form of reprimand and greeting or warning, and advice that can make students aware of their mistakes, and do not repeat mistakes in the future.

- Teachers must be able to provide actions that can improve the behavior of students in a positive direction, such as manners and manners.

| 5 | Violence Regarding Professionalism |
- Choose love in treating students
- Inhibiting student progress
- Provide unfair judgments in student assessment
- Does not raise students if there is one subject that does not pass
- Discipline students late by cleaning the toilet
- Implementing graduation standards that are unnatural or too high

- Guru must provide opportunities for students to communicate with teachers and friends in the social process
- It is necessary to increase the quality of teachers, for example through training and education, especially training themselves to respect students and avoid bullying, not discriminatory, and attend upgrading, seminars and other scientific meetings.
Table 2. Fact Data Symptoms of Violence and Solutions (Continued)

( Rule )

| Rule | Description |
|------|-------------|
| 1 | IF Slapping an obedient student is True AND Step on the foot of a student who isn't wearing black shoes True AND Throwing an eraser is True AND Pulling students' ears is True AND Tells students to push up until they are tired is True AND Hit with a ruler is True AND Drying students until noon is True THEN Violence is Physical |
| 2 | IF Shames students in front of other students True AND terrorize students through HPis True AND Looking cynically at students True AND Pay attention to students who are rich and ignorant who are poor True AND Giving the threat of not going up to base True AND rebuke with harsh words True AND reprimanding with high notes repeatedly is True AND Examination of anger by tearing off student paperwork is True AND An inappropriate sensual touch on students is True THEN Violence is Psychic |
| 3 | IF Accusing students of cheating is True AND Refuse student forgiveness is True AND Dubbing students with strange names is True AND Shouts students until the student feels embarrassed is True AND Like cursing with harsh words is True AND Insulting students who have less ability is True AND Labels students so that they feel depressed is True AND Insulting students who lack in economic terms is True AND Public humiliation is true AND Spreading gossip about students’ secrets is True AND Spreading slander about students who are not liked is True THEN Violence is Verbal |
| 4 | IF Choose love in treating students is True AND Inhibiting student progress is True AND Provides an unfair assessment of student grades True AND Does not raise students if there is one value that fails is True AND Discipline students late by cleaning WC is True AND Applying a high standard of graduation is True THEN Violence is about professionalism |
From the pictures above, it can be seen that every fact that influences the diagnosis results of prevention of bullying action and character building has several criteria, for example Physical Violence (F00), can be mixed with students (T01), stepping on a student's foot (T02), throwing with an eraser (T03), pulling the ears of students (T04), telling students to run around the field (T05), telling students to push up to tired (T06), hitting with a ruler (T07), drying students who are late for the ceremony until noon (T08), if found 5 symptoms of these 8 criteria, then the problem with the
teacher can be found, namely physical violence, if the statement shown is true or (Y) then it will continue until the symptoms of physical violence (F00) run out, but if the choice is not correct (T) then the system will automatically jump on the question about the next type of violence, psychological violence (F01).
3. Implementation And Analysis

Figure 10. Inference Engine

Figure 11. Home View
4. CONCLUSION AND SUGGESTION

4.1 Conclusion

Based on the analysis and discussion conducted, it can be concluded several things as follows:
1. Forward Chaining reasoning can be used to trace factors and symptoms to get results in determining teacher violence actions in the learning process.
2. The output of this system is in the form of information that provides solutions or corrects the problems of acts of violence found.
4.2 Suggestions
As the end of this study, the authors would like to submit suggestions that might be useful and helpful for those who are interested in using this system:
1. It is expected that by developing this expert system, the number of rules that are used so that more so that the results of the diagnosis can get better results.
2. Increasingly developing computer technology, it is expected that all forms of public services can be applied in the form of systems (Computer Systems) that can be easily used by the public.
3. Draft Expert System to prevent teacher violence in the learning process, the author feels that it is still far from perfection, so the authors hope that there are other researchers who want to develop and continue this research.

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