A Research Paper on Rule Based System for Teaching and Learning Process for Higher Education

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ABSTRACT
The Rule based System for Teaching and Learning is the important area in which the teaching and learning quality can be measured. The teaching methods involve three types of methods like lecturing method, Computer based teaching method and mixed teaching methods. The researcher have studied the methods used by teachers and method preferred by the students they have also returned the rules to find out the quality of the teaching and learning. The results are found by Chi. Square test for the teaching and learning methods. The respondents taken for the study were 100 teachers and 100 students. The final results are very surprising and it suggests to use both Computer based and Lecturing method of teaching learning process. This is a decent contribution to the academics in the form of quality improvement. The authors propose to develop simulation model for the above system in future.

Keywords: Rule based System, Quality, higher education, expert system, Chi Square Test, Teaching Methods

Abbreviations: TQM-Total Quality Management, QA-Quality Assurance

Introduction
The motive of the research is to enhance the quality of teaching learning process in higher educational institutes. The researcher propose the rule based system for Teaching and learning process in higher education. Variation in educational techniques and materials promotes better understanding of a subject. Simply applying theory is ineffective. Examples can influence learning process much more than the presentation of concepts and even rule. An increasing concern with improving the teaching quality has led to the adoption of quality improvement approaches in colleges. These include “total quality management” (TQM), approach that employs process control measures to ensure quality standards, and “continuous quality improvement” (CQI), and services. Continuous quality improvement was originally based on the quality assurance (QA) paradigm. Teaching experiences in colleges have shown that Quality Assurance programs are based on knowledge base system technology.

A Rule based system is the part of the program in which the rules are stored. Using some method of representation, such as IF ELSE rules. These rules are constructed by codifying the experience and knowledge of a group of experts. The proposed rule based system is intended to supplement, but not replace, traditional teaching and learning techniques such as lectures and laboratory sessions. This rule based system will present an analysis of teaching and learning quality improvement.

1.1 Objective of the Research study
In present research endeavor entitled above, the objectives have been considered as follows.
1. To study the various types of teaching methodology used in higher education.
2. To develop the Rule based system and software for teaching and learning process.
3. To report findings of the study.
1.2 Methodology of the study
The present study has been completed using field survey method. In the field survey method the researcher has approached institutes of Kolhapur and collected method of teaching from teachers and students.

1.3 Data collection method
Selection of method of data collection is based upon the nature, Scope, availability of money and time, precision factor etc. Data is collected by using primary and secondary data collection method.

Primary data- For developing of knowledge base system primary data has been collected by 60 students of post graduate degree and 70 teachers from undergraduate and postgraduate classes from Kolhapur city has been selected using convenient random sampling method. Teachers and Students provided the information related to teaching and learning by interview schedule method.

Secondary data- The secondary data has been collected by educational website and brochures.

Rule based system for teaching and learning
6.1 Introduction:
The basic idea of using rule is to codify tacit knowledge of teaching and learning in the form of premise-action pairs. The basic idea is to present knowledge in the form of premise-action pairs. IF-THEN structure of the rule is represented by premise and action clauses. The action clauses consist of a statement or a series statement separated by AND or commas and is executed if the premise is true. The main aim of preparation of rule is to calculate the score and find the grade of teaching methods. Rule based systems are generally composed of an inferential engine, a knowledge-base and a user interface. The items are classified on the basis of the values of some parameters calculated on test outcomes. A rule based system is a system whose knowledge base is expressed under the form of production rules. Rule-based system has been employed in many applications for decision making. Such systems can also be used for classification. In general, the rules are in the following form:

IF <antecedent conditions>
THEN <consequent conditions>

The antecedent conditions define the values or the value intervals for one or more input attributes. The consequent conditions define the values or the value intervals for one or more output attributes. In the case of classification, the consequent conditions determine if a given entity belongs to a class. In rule based system it is often necessary to deal with uncertainty by using decision making.

Conditions are connected using AND logical operator.
All the conditions given the default weight (1.0) Except for the first two conditions (0.5) the weight will be calculated on the basis of entered conditions and the marks will be obtained. The obtained marks will produce the result of teaching and learning process.

Weight for each condition is being given on the basis of expert [1] advice collected at the time of data collection. Some decision for giving the weight for each condition is given on the basis of secondary data available in various books and websites [2].

Rule based system will be defined on the basis of IF, AND, THEN conditions and also the score will be calculated. The conditions will be entered in the form of “0” and “1” by the user and score will be calculated depending on the entered value, which will represent the result of teaching and learning process.

[1] Experts are the experienced academicians having more than 10 years of experience and well known for their practices.
[2] List of books and websites is given in Bibliography.
6.2 Rule based system for producing “O” grade and Excellent teaching and learning process

IF Experience > 10years (weight=0.5)
AND the teacher uses new illustration (weight=0.5)
AND the communication skill of teacher is good (weight=1)
AND the teacher interacts with the students (weight=1)
AND the teacher maintains proper level of knowledge (weight=1)
AND the teacher motivates students to learn (weight=1)
AND the students are actively involved in learning (weight=1)
AND the teacher uses information technology for teaching (weight=1)
AND the feedback of teacher by students is good (weight=1)
AND proper time is managed for lecture (weight=1)
AND curriculum is taught well by the teacher (weight=1)
THEN “O” grade is given (Score=10)

That is the teacher performance is excellent.

(Note: the Score between 8.5 to 10 is producing “O” grade)

Fig.No.1:- For producing “O” grade and Excellent teaching and learning process

Output is
6.3 Rule based system for producing “A” grade and Very good teaching and learning process

IF Experience > 10years (weight=0.5)
AND the teacher using new illustration (weight=0.5)
AND the communication skill of teacher is good (weight=1)
AND the teacher not interacts with the students (weight=0)
AND the teacher not maintain proper level of knowledge (weight=0)
AND the teacher motivates students to learn (weight=1)
AND the students actively involved in learning (weight=1)
AND the teacher using information technology for teaching (weight=1)
AND the feedback of teacher by students is good (weight=1)
AND time is not managed properly by the teacher for teaching (weight=1)
AND curriculum taught well by the teacher (weight=1)
THEN “A” grade is given (Score=8)
That is the teacher performance is “VERY GOOD”.

(Note: the Score between 6.5 to 8 is producing “A” grade)

Fig. No.2:- For producing “A” grade and Very good teaching and learning process

6.4 Rule based system for producing “B” grade and good teaching and learning process
IF Experience > 10years (weight=0.5)
AND the teacher not uses illustration (weight=0)
AND the communication skill of teacher is good (weight=1)
AND the teacher not interacts with the students (weight=0)
AND the teacher not maintain knowledge of students in teaching (weight=0)
AND the teacher not motivates students to learn (weight=0)
AND the students actively involved in learning (weight=1)
AND teacher not using information technology for teaching (weight=0)
AND the feedback of teacher by student is good (weight=1)
AND proper time is not managed for lecture (weight=0)
AND curriculum is taught well by teacher (weight=1)
THEN “B” grade is given (Score=4.5)
That is the teacher performance is “GOOD”.

(Note: the Score between 4.5 to 6 is producing “B” grade)

Fig. No.3: For producing “B” grade and good teaching and learning process

Output is

6.5 Rule based system for producing “C” grade and Satisfactory teaching and learning process
IF Experience < 10years (weight=0)
AND the teacher not using illustration (weight=0)
AND the communication skill of teacher is good (weight=1)
AND the teacher not interacts with the students (weight=0)
AND the teacher not maintain level of knowledge of student (weight=0)
AND the teacher not motivates students to learn (weight=0)
AND the students actively involved in learning (weight=1)
AND the teacher is not using information technology for Teaching (Weight=0)
AND the feedback of teacher by student is not good (weight=0)
AND time is not managed for teaching (weight=0)
AND curriculum is taught well by the teacher (weight=1)
THEN “C” grade is given (Score=3)
That is the teacher performance is “Satisfactory”.

(Note: the Score between 2.5 to 4 is producing “C” grade)

Fig. No.4: For producing “C” grade and Satisfactory teaching and learning process
Output is

6.5 Rule based system for producing “D” grade and Unsatisfactory teaching and learning process

IF Experience < 10 years (weight=0) AND the teacher not uses new illustration (weight=0) AND the communication skill of teacher is good (weight=1) AND the teacher not interacting with the students (weight=0) AND the teacher not maintains knowledge level of students (weight=0) AND the teacher not motivates students to learn (weight=0) AND the students not actively involved in learning (weight=0) AND the teacher not using information technology for learning (weight=0) AND the feedback of teacher by students is not good (weight=0) AND time is not managed for teaching (weight=0) AND curriculum is not taught well by teacher (weight=0) THEN “D” grade is given (Score=1) THAT is the teacher performance is “Unsatisfactory”.

(Note: the Score between 0 to 2 is producing “D” grade) Fig. No.5:- For producing “D” grade and unsatisfactory teaching and learning process
Output is

**Table No.5.10: Grade of teachers for teaching and learning by students**

<table>
<thead>
<tr>
<th>Rate your opinion about your teachers for teaching and learning process</th>
<th>Excellent</th>
<th>Very Good</th>
<th>Good</th>
<th>Medium</th>
<th>Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of students</td>
<td>14</td>
<td>23</td>
<td>13</td>
<td>8</td>
<td>2</td>
</tr>
</tbody>
</table>

23.34% students rate their opinion about their teachers for teaching and learning process is Excellent and 38.33% students rate their opinion about their teachers for teaching and learning process is very good and 21.67% students rate their opinion about their teachers for teaching and learning process is good and 13.33% students rate their opinion about their teachers for teaching and learning process is medium and 3.33% students rate their opinion about their teachers for teaching and learning process is unsatisfactory.

<table>
<thead>
<tr>
<th>Sr.No.</th>
<th>Random Numbers from Excel (observed)</th>
<th>Teaching Method used</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>87</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>68</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>50</td>
<td>2</td>
</tr>
<tr>
<td>5</td>
<td>8</td>
<td>1</td>
</tr>
</tbody>
</table>
The pie chart is clearly showing that majority of the student (38.33%) say that their teachers are very good While only a few (3.33%) are unsatisfied with their teachers.

Monte-Carlo Simulation model for teaching methodology.

Frequency table for methods used by teachers

<table>
<thead>
<tr>
<th>Sr. No</th>
<th>Methods for Teaching</th>
<th>frequency (f)</th>
<th>Probability( p) P= f/N</th>
<th>Cumulative Probability(cp)</th>
<th>Random No. Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Lecturing Method</td>
<td>22</td>
<td>0.31</td>
<td>0.31</td>
<td>00-30</td>
</tr>
<tr>
<td>2</td>
<td>computer Based</td>
<td>19</td>
<td>0.27</td>
<td>0.59</td>
<td>31-58</td>
</tr>
<tr>
<td>3</td>
<td>Both Method</td>
<td>29</td>
<td>0.41</td>
<td>1.00</td>
<td>59-99</td>
</tr>
<tr>
<td>Total</td>
<td>N= 70</td>
<td></td>
<td>1.00</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Observation No.1: Monte-Carlo simulation model Verification result for 10 teachers teaching methods
Figure. No.1: Monte-Carlo simulation model Verification result for 10 teachers teaching methods

Fig 1 represents that majority (40%) of the teachers use computer and lecturing both methods for teaching.

Observation No.2: Monte-Carlo simulation model Verification result for 10 teachers teaching methods

<table>
<thead>
<tr>
<th>Sr.No.</th>
<th>Random Numbers from Excel (observed)</th>
<th>Teaching Method used</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>74</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>65</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>17</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>14</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>43</td>
<td>2</td>
</tr>
<tr>
<td>6</td>
<td>97</td>
<td>3</td>
</tr>
<tr>
<td>7</td>
<td>84</td>
<td>3</td>
</tr>
<tr>
<td>8</td>
<td>31</td>
<td>2</td>
</tr>
<tr>
<td>9</td>
<td>37</td>
<td>2</td>
</tr>
<tr>
<td>10</td>
<td>24</td>
<td>1</td>
</tr>
</tbody>
</table>

Figure. No.2: Verification result for 10 teachers teaching methods

Fig 2 also tells that the majority (40%) of the teachers used computer based and lecturing both methods for teaching.

Conclusion

As per the research findings about the teaching methods highlighted in the research study (Computer based teaching method, lecturing method and using combination of these methods. All the methods have equal importance and respondents did not show any variations in the teaching methods. In brief we cannot conclude by selecting any one method as best or preferred by the teachers.

As per the students learning process the research findings are that more than 60 percent students prefer the mixed method of teaching. 20% students prefer only Computer based teaching methods for learning and renaming students prefer only lecturing methods.

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