

Analysis Of Different Examination Patterns Having Question Answer Formulation, Evaluation Techniques And Comparison Of MCQ Type With One Word Answer For Automated Online Examination

Dr. Vimal P.Parmar^{*}, Dr. CK Kumbharana^{**}

^{*} Research Scholar, Dept. of Comp. Sci., Saurashtra University, Rajkot, Gujarat, INDIA

^{**} Head, Guide, Department of Computer Science, Saurashtra University Rajkot., Gujarat, INDIA

Abstract- Today for conducting an examination and declaring the result in a limited time period is a challenging task for any educational school, college, institute, department and Universities. This paper is about different examination patterns employed today. The process of examination, assessment, result preparation and formulation of question paper to judge different level of knowledge is an integrated approach entirely. Use of advanced technology has been initiated by many organizations in the field of education from teaching, learning, evaluation and performance measures. The use of computers in this process has evolved the way of conducting examination. The research paper is organized as starting with different types of examinations patterns in form of online, offline and manual examination, question paper formulation and evaluation of such questions with merits and demerits, analysis and comparison of different techniques for better evaluation. Question formulation involves drawing of question paper with different level of complexity to judge different level of knowledge. Use of computers is mandatory in each different online technique and there must require a way of evaluating the students. Two types of question multiple choice questions (MCQs) and one word answer question is at the centre of this research paper. At last the paper is concluded with future scope.

Index Terms- Online, offline, Examination, Question, Answer,, MCQ, One word answer, Subjective, Objective, Evaluation, Assessment, Automation, Computerized exam,

I. INTRODUCTION

Online examination system has changed the way of traditional examination patterns which has been performed manually. Initially examination has been started with oral question answer communication to assess the student knowledge and by using written examination. In written examination student is assigned a question paper and student is required to attempt written answer in same question paper or using separate answer book. In both of the cases answers are evaluated manually to gain understanding knowledge. This type of examination pattern is traditional examination pattern and still it is being performed widely. Some of the Universities and organizations have started the digital evaluation of the answer sheets using the help of computers and LAN or internet in which scanned copy of answer

sheets are used with appropriate interface to assign the marks for each question. By using such software, evaluation process can be made from anywhere anytime, which requires specific software running on a computer connected through LAN or internet. This solution is good enough but still this process of evaluating the answer books is similar to manually assessment of answer books but by using computer so the task of adding marks of each question is reduced as it is being performed by computer not by an examiner. So, this is the same process of evaluation as manual process of assessment of answer books but it uses computer as a tool to facilitate the evaluation process.

Another solution of online examinations is to conduct examination through Multiple Choice Question (MCQ) [4] and students will answer by marking the correct answer in Optical Mark Reader (OMR) sheet by selecting the correct answer from four multiple options. OMR sheet then is scanned through scanner and the OMR software reads the dark marks on OMR sheet and determines the result by comparing marked answer with correct answer. OMR has proved the quick and efficient solution which saves time and result can be declared within few days. Same type of technique is used by OCR which recognizes written characters of alphabet generally A, B, C and D. OCR requires more efforts than to OMR.

The further improvement to the above solution is by use of online computerised test in which instead of dark circle marking in OMR or character writing in OCR, it uses directly entering the answer by selecting appropriate radio button. This will reduces the process of scanning and result can be generated on the same day of after completion of examination. Computer software is used to prepare and set questions of objective type.

All the above the solutions require some or manual process of assessment or it can not be useful for subjective type examination. Objective MCQ type of examination is used to determine the concept, logic and knowledge but for subjective knowledge some alternate solutions are required. Subjective type of knowledge is also utmost important. So other solutions are required that includes fill in the blanks, match the pair, true or false type questions, one word answer, definition type question, one sentence answer and at last full descriptive type of questions [1]. It is difficult to design such software system what is known

as expert system having expertise in specific subjects with large subjective knowledge base. Such systems requires concept of artificial intelligence. Subsequent sections discuss level of complexity in question paper design and the comparison between objective and subjective type of questions.

II. EXAMINATION PATTERN AND ASSESSMENT PATTERN OF ANSWER BOOKS

Examination pattern includes mode of examination that is online or offline and what kind of questions are included in the examination that is MCQs or descriptive type of questions [3]. These processes can be classified as follows.

- A. Offline examination is the traditional written examination in which examinee has to write answer in answer book and examiner has to evaluate the answer. Such type of test includes both kinds of questions of objective as well as descriptive subjective. Evaluation process is also manual process.
- B. Online examination is the computerized test having most of the time objective types of MCQs like question [1]. Student requires to select any answer from available options by just using a mouse click. As it is online computerized test the evaluation is being performed automatically without human intervention. On line examination can also be attended by students may be location independent. [6] For organizing such online examination security must be enforced [8]. Online examination may involve directly entering subjective answers and assessed by examiner [10] [12]. Such type of online examination can be implemented by web based solution [14].
- C. Offline examination is the traditional written examination in which examinee has to write answer in answer book and examiner has to evaluate the answer using computerized software. Assessment of answer book is made by scanning the answer book to produce the soft copy of it and by using computer with software to assess the answer book. Software provides user interface to enter marks according to question paper. This type of evaluation process requires network LAN or internet that facilitates to evaluate answer book anytime any where if it uses internet. It requires time to download the answer book depending on the bandwidth of internet.
- D. Online examination is the computerized test having objective types of MCQs like questions [1], one word answer type question, define terms [9], match the pair, true or false type questions, fill in the blanks like question and descriptive type of question. User requires to enter an answer using mouse to select MCQ answer and keyboard to enter text. To evaluate objective type of MCQ questions, it is somehow easier, but to evaluate one word answer, definition or descriptive type of questions it requires more efforts. To evaluate automatically such answer books customized complex software is required with large knowledge base. Using such system for evaluating hand written answer books having descriptive types of questions, it does not only require to evaluate but it also requires to recognize hand

written, grammatical mistakes and recognizing figures and diagrams in answer books.

In this paper two types of questions MCQs and one word answers are compared and analyzed.

III. FORMULATION OF QUESTION ANSWER

Formulation and drawing of question papers should be designed according to keep mind all types of students and all types of question categories from simple to complex by assigning suitable weight to each type of categories. To draw a structured and balanced question paper, Bloom's taxonomy is quite useful. Bloom's technology consists of a layered approach.

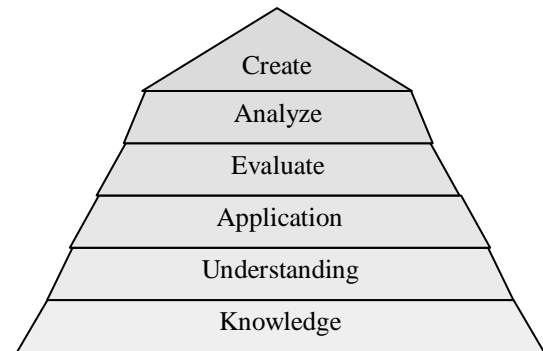


Figure 1. Bloom's Taxonomy Triangle

Each of the layer describes different level of complexity from bottom to top in increasing order from basic to expertise level. Each of the level is described below.

1. Knowledge : It is associated with core basic knowledge and concepts. Questions related with define, duplicate, list, memorize, repeat and state fall in this category.
2. Understanding : It is associated with ideas or working concepts. Questions related with classify, describe, discuss, explain, identify, locate, recognize, report, select and translate fall in this category.
3. Application : It is associated with the applicability of ideas and information learnt from knowledge and understanding in different situations. Questions related with execute, implement, solve, use, demonstrate, interpret, operate, schedule and sketch fall in this category.
4. Analyze : It is associated with connections among ideas. Questions related with differentiate, organize, relate, compare, contrast, distinguish, examine, experiment, question and test fall in this category.
5. Evaluate : It is associated with justification and decision. Questions related with appraise, argue, defend, judge, select, support, value, critique and weigh fall in this category.
6. Create : It is associated with production of new or original research work. Questions related with design, assemble, construct, conjecture, develop, formulate, author and investigate fall in this category.

Question paper should be designed with keeping Bloom's taxonomy in mind. Weight of each level should be maintained to evaluate different levels of knowledge. For any kind of question to answer, basic knowledge must be required which is at the base level and to create some new ideas, model or product requires creativity which is at the highest level. Each level depends on its predecessor lower levels. The same triangle is applied to solve real life working problem but in reverse order. As to create some real research work it must be followed from top to bottom level and to reach at the core knowledge which helps to solve the problem in hand. Thus Bloom's taxonomy is useful to determine the complexity of question papers. The algorithm has been designed for generating a question paper [2]. Quality of paper has measure impact on the correct evaluation of the student [3], by using such techniques it is possible to produce qualitative question papers.

IV. MCQ TYPE EXAMINATION

Multiple Choice Questions are widely used for many competitive examinations. Following are the characteristics of MCQ type examination.

- A. MCQ type examination is useful to assess the objective type of knowledge of understanding.
- B. It can be online through computer or may be offline.
- C. In online MCQ type examination result can be produced faster compare to offline examination [5].
- D. In offline MCQ type examination scanned copy of OMR or OCR sheet is used for assessment.
- E. This type of test lacks to test subjective type of knowledge. Although mathematical calculation type problems with four options can be included.
- F. Some MCQ examination also involves negative marking system for incorrect answers.
- G. This type of examination is easy to conduct and requires to prepare predetermined number of questions with answer.
- H. MCQ type system reduces the ability of writing and vocabulary of the students.
- I. At first glance it seems as easy to attend as no writing efforts are required but in reality it may be difficult.
- J. Attempting an incorrect answer all the marks related to that question will be lost. Oppose to it with same marks, in writing an descriptive answer has chance to gain some marks.
- K. So MCQ type examination has advantages with some disadvantages so it is suggested that some weight of entire examination should be assigned to achieve desired evaluation.

V. AUTOMATIC COMPUTERIZED TEST AND EVALUATION PROCESS INVOLVING ONE WORD ANSWER

The automatic computerized techniques for one word answer implemented through software helps the teachers by saving time and include user response by entering one word answer. An

Automatic evaluation process reduces the human efforts and behaves intelligently having following characteristics.

- A. Automatic evaluation process is subjective at some extent and equally applied for all the examinees. This makes bias free evaluation.
- B. Result generation will be fast enough with no chances of error if implemented very carefully.
- C. Demonstrate the intelligent behavior as natural evaluation process.
- D. It requires to prepare question set with one word answer for different subjects.
- E. The system provided with functions to identify similar pronunciation words called homophones helps users to select an appropriate answer from system generated set of similar pronunciation words.
- F. The test can be applied for one word answer or fill in the blanks like questions.
- G. Allows users to enter answer during online examination and viewing result after completion of examination similar to MCQ examination.
- H. It requires to prepare a model to generate internal representation of the words to identify homophones of given attempted answer word.
- I. Use of such proposed system may be an alternative to manual examination or may be an alternative to the MCQ examination. This may be first step towards the research of subjective examination.
- J. Behavior of the system mimic human-like behavior of computer and examination will be interactive, interesting and realistic.
- K. The concepts can be incorporated into speech recognition system to solve the problems of recognizing homophones.
- L. Helpful to the students who know correct pronunciation but not the actual spelling of the answer word by obtaining the suggestions from the system.
- M. The solution might be helpful for further research of sentence evaluation [9] as well as paragraphs in answer at some extent which also requires an equivalent expert system to be built.

VI. IMPLEMENTING THE EVALUATION PROCESS FOR ONE WORD ANSWER EXAMINATION

Evaluation of one word answer examination uses the concept of "Text Pattern recognition". Text pattern recognition applied for such system involves recognition of similar pronunciation English words for helping the students who knows the correct pronunciation of the answer word but not the correct spelling of that answer word. The software system designed for conducting such examination should have interactive user input interface with text box like control to obtain the answer from the user. This user interface interacts with the system knowledge base to quickly find out homophones of the entered wrong word. The entered word is error free then it should be accepted directly but in case if any typographical mistake exists in input then such input must not be accepted and propagating alternative

suggestions words which have the similar pronunciation. Student must require selecting one word from the list of generated words. Proper care should be taken if entered answer is name of something. Any name in the input should be accepted as valid word.

To achieve the desired performance of searching homophone for the given incorrect word, internal representation must be required as efficient as possible for fast retrieval of such words because English language is rich in its vocabulary. Each entered word is compared with the stored English word database and matching pronunciation words are returned as correct spelling. Although implementation involves many processes but it supports better assessment process. Many algorithms with different techniques have been developed for recognizing English as well as other languages homophones which are also implemented in many software.

VII. ANALYSIS AND COMPARISON OF TECHNIQUES

Both MCQs and One word answer examinations have their own advantages and limitations. Following analysis compares both of these techniques.

- A. MCQs type is easy to implement where one word answer examination requires more efforts to design, develop and implementation.
- B. MCQs are only useful for objective type of questions where as one word answer is useful to assess subjective type of knowledge as some extent.
- C. Directly user's response is compared with actual answer so it involves character comparison. While one word answer requires comparison of string of characters, so more processing is involved.
- D. MCQs do not require any further algorithms but one word answer involving homophone requires special homophone identification algorithms.
- E. In MCQs no need of preparing and maintain database of English words is required but in one word answering it requires to prepare and maintain large database of English words
- F. MCQ type examination is interactive compared to one word answering system.
- G. MCQs do not require any artificial intelligence behavior and core computation is performed while implementation of such one word Examination require artificial intelligence and knowledge base construction for natural behavior.
- H. Attempting wrong answer in MCQ results in loss of marks where as in one word answer examination attempting wrong answer results in set of alternatives of entered answer. Which will just help user towards the correcting the answer.
- I. Both type of computerized examination are automatically evaluated so fast retrieval of result.
- J. Both type of computerized examination are required to prepare question answer sets for different subjects.

- K. Both type of computerized examination are useful for equal evaluation of examination for every student.
- L. Both type of computerized examination provides error free automated evaluation. Care must be taken when implemented otherwise effects to the entire result.
- M. MCQs type offline examination can be automatically evaluated using OMR or OCR systems but one word answer examination if not implemented online then suggestions to misspelled word be lost or hand written recognition techniques are required to recognize different user answers with different handwriting for automatic evaluation.
- N. One word answering solution technique can be extended for sentence, paragraph and descriptive answering schemes compared to MCQs solution technique.

VIII. ADVANCED TECHNOLOGY

By use of advanced technology and artificial intelligence like neural network, fuzzy logic, expert system it is possible to achieve desired level of accuracy for fully computerized examination having objective and descriptive type of questions. Knowledge base for many numbers of subjects must be constructed in specific form to maintain and retrieval of it which is necessary for subjective assessment. Learning and experiments are performed at the initial stages of the system. Although to achieve the accepted level of accuracy is a topic of research area as it does not only require to apply the knowledge but to assess hand written answer book it requires technique of hand written recognition technique. Again it is difficult task as different users have different hand writing and to recognize them successfully more processing are needed. Although due to amount of processing required, the systems can be implemented at some possible extent. The technological power, high processing computers and available ideas and skills the possibility of such full-fledged system can be overlooked. It is also possible to answer the question by voice and automatically evaluating the answer. Base theme will be the same to assess subjective answers by use of various interfaces of input answers.

IX. CONCLUSION

Technology enhancement in computer hardware and software technologies, examination pattern has dramatically be changed from class based examination to online examination. Online computerized examination does not only implement as computerized examination and evaluation process but also provides quick and reliable evaluation with flexibility for automation of entire examination process. In this research paper different techniques of examination process are discussed with formulation of the question paper which follows the Bloom's taxonomy that will determine the complexity of the paper. Characteristics of MCQs and one word answer examination are discussed and later are compared with each other. Both these

techniques have their own advantages and disadvantages. So both types of examination are important. Instead of applying only MCQ type examination or only one word examination, if both are used together then the effect of implementation for assessment of student knowledge will be more useful. Other types of questions like true or false, match the pair or write definition can also be included to increase the different types of questions. At last the paper is concluded with latest technology involvement for better implementation of online examination process. Use of computers has dramatically increased in teaching learning process in almost every field of education and also widely used for conducting, evaluating and displaying result of such examination. Improvement and efficiency can be obtained over time to meet the latest needs.

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AUTHORS

First Author – Vimal P.Parmar, Research Scholar, Dept. of Comp. Sci., Saurashtra University, Rajkot. Gujarat, INDIA parmarvimal1976@yahoo.co.in

Second Author – Dr. CK Kumbharana, Head, Guide Department of Computer Science, Saurashtra University Rajkot. Gujarat, INDIA, ckkumbharana@yahoo.com