

# On Selection of Assessment Methods in Outcome Based Education (OBE)

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**Abstract:** Quality Teaching Learning practices play a fundamental role in developing human capital and knowledge workers. Student's assessment is the integral part of teaching and learning. To ensure proper learning appropriate assessment techniques are applied. With the emergence of Outcome Based Education (OBE) one has to ensure listed course outcomes and subsequent program outcomes have been attained. To evaluate different course outcomes different assessment techniques exists. This paper discusses a variety of innovative methods for the assessment of students. As a case study Computer Networks course outcome assessment techniques are considered. We have shown that combination of traditional along with project based assessment has helped in Course outcome attainment. The advantages and disadvantages of traditional assessment techniques and the new approaches are also discussed. A survey on the different methods is carried out and the results of the same are also presented.

**Keywords:** Project Based Assessment, Traditional Assessment Methods, Outcome based education

## 1. Introduction

Traditional education system often involves delivering as much information as rapidly as possible. As compare to traditional methods today's education is nearly changed from traditional chalk and board to video projector. Traditional teaching learning practices leads to low quality of learning by students. Lot of innovations in modern teaching has taken place (Fui-Theng 2004), (Yahya et. al., 2011), (Shabnam Bidariana et. al., 2011). But less work has been carried out which suggest innovations in modern assessment methods (Oriah Akir et. al., 2012) (Vijayalakshmi et. al., 2013). To overcome this Outcome Based Education (OBE) has been proposed. OBE requires proposing course outcome and program outcome. The entire teaching learning mechanism has to be implemented in a way to prove that outcomes have been attained. Assessment of the students is the important aspect to assess the attainment of listed outcomes. In OBE proper assessment techniques are required to show attainment of appropriate outcomes. It is difficult to select appropriate assessment tools and techniques. Lots of improvements are also proposed to improve the assessment process. Traditionally examiners prefer the traditional written exams for the assessment of knowledge gained by the students. In traditional assessment system, there is a midterm exams of about 50 marks are conducted in between the semester and at the end of semester 80 or 100 marks exam for the full syllabus is conducted. In all the exams students are assumed to write the answers of the questions asked by the paper setter. Moreover,

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students are not allowed to carry any learning material or any electronic gadgets with them inside the exam hall. The exam timings are also fixed and are decided by those who will not be taking that exam.

This paper discusses and compares traditional and new assessment techniques to calculate the attainment of listed course outcomes. As a case study Computer Network course has been selected to demonstrate the proper selection of assessment technique to evaluate learning outcomes of the course. We have shown that combination of traditional along with project based assessment has helped in Course outcome attainment.

## 2. Overview Of Assessment Techniques

Why to assess?

If questioned lecturers would say that we assess for the following reasons:

- a) To show that the learning outcomes of the course are being achieved
- b) To provide feedback to students on their learning, enabling them to improve their performance
- c) To motivate students to undertake appropriate work
- d) To guide learning
- e) To evaluate the effectiveness of teaching

What to assess?

Designing assessment techniques for a Unit of Study is important to designing what and how students will learn. What is being assessed, therefore, should be closely aligned with the stated learning outcomes for the unit. A properly designed set of learning outcomes will make the design of assessment tasks a great deal easier.

Types of Assessment:

Summative assessment:

It is assessment that is used to signify competence level attained by students in his/her grade or marks in a course, module or degree level.

Formative assessment:

It is assessment which is used to provide feedback

to the student on their learning. It provides the student with status on their progress and how to improve their progress, but should not form part of their summative grade or mark.

Continuous assessment:

It involves a series of tasks that are individually assessed, and sometimes it is appropriate to add a final assessment to continuous assessment.

### 2.1 Blooms Taxonomy and Learning Outcomes

What students will learn is conveyed by stating learning outcomes. Learning outcomes are those which are assessed in measurable ways.

The taxonomy presented in Table 1 identifies six levels of complexity of thinking of students. In the table, Bloom's objectives (expressed here as unit aims) are linked to what students will be able to do, at each of the levels.

**Table 1. Blooms Taxonomy**

Aims	Learning Outcomes
Remember	Recognise, recall, identify, retrieve, name
Understand	Interpret, paraphrase, translate, represent, clarify Exemplify, instantiate, illustrate Classify, categorize, subsume Summarize, abstract, generalize Infer, extrapolate, interpolate, predict, conclude Compare, contrast, match, map Explain, construct models
Apply	Execute, carry out Implement, use
Analyze	Differentiate, discriminate, select, distinguish, focus Organize, outline, structure, integrate, find coherence, parse Attribute, deconstruct
Evaluate	Check, test, detect, monitor, coordinate Critique, judge
Create	Generate, hypothesize Plan, design Produce, construct

## 2.2 Assessment Method Design Principles

a) Assessment design should check for following learning abilities.

- Higher order thinking: interpreting, translating, problem solving, critical reasoning
- Connection to the real world: application of theory to practical "real life" situations
- Capacity for team work, negotiation and collaboration: ability to work and converse with other students, teachers and discipline experts
- Attitude towards lifelong learning: highly motivated to be active learners and an interest towards further education

b) Assessment design should be inclusive, making sure that the design of assessment does not favor one group of students at the expense of another and to make sure that with appropriate effort all students have the equal opportunity to be successful. Here are some strategies that support an inclusive approach to assessment design:

- Allow students to plan ahead. Knowing how they will be assessed in advance enables them to access support in time.
- Provide choice. If choices can be provided in the types of assessments a student might undertake, as long as they align with the stated learning outcomes, students can select from the choices to prove their acquired skills.

c) Assessment design should be efficient and it should not overload students for example, laboratory reports should not be 'marked' every week. Students should get feedback in the lab over two weeks regarding their performance and then be assigned grades on the third week on their progress, improvement and take advice from teachers and peers.

d) Assessment design needs to comply with the Blooms Taxonomy levels and course outcomes

## 2.3 Analysis of Assessment Methods:

Diverse assessment methods exists each having its own benefits and limitations so assessment design for a course should take into account both and should measure level of learning outcome attained. Table 2 shows benefits and limitations of various assessment methods

**Table 2. types of Assessment**

Type of Assessment	Benefits	Limitations
Regular practical work	<ul style="list-style-type: none"> <li>• Early encouragement of students</li> <li>• Formative in nature as this give opportunities for students and teachers to make adjustments</li> <li>• To encourage application of learnt concepts</li> </ul>	<ul style="list-style-type: none"> <li>• Can be time consuming for teachers</li> </ul>
Final written Exams	<ul style="list-style-type: none"> <li>• Assurance that students have attained the knowledge, skills tested in the exam</li> <li>• Less time-consuming to mark and relatively economical</li> </ul>	<ul style="list-style-type: none"> <li>• Only summative in nature</li> <li>• It checks capacity to recall information under stress</li> <li>• Lack of Feedback</li> </ul>
Writing assignments	<ul style="list-style-type: none"> <li>• Encourages out of box thinking</li> <li>• Encourages deep learning</li> <li>• It gives an opportunity to develop capacity to interpret, translate, apply, and evaluate</li> </ul>	<ul style="list-style-type: none"> <li>• Time consuming to assess</li> <li>• It is Subjective in nature</li> </ul>
Research article review	<ul style="list-style-type: none"> <li>• Requires interpretation and evaluation</li> <li>• Opportunity to understand how experts proceed</li> </ul>	<ul style="list-style-type: none"> <li>• Students need to be taught how to review research papers</li> </ul>
Project Based	<ul style="list-style-type: none"> <li>• Encourages collaboration, co-operation and communication among students</li> <li>• It encourages to correlate theory to real-time problems and its solution.</li> <li>• It assesses most of the course learning outcomes</li> </ul>	<ul style="list-style-type: none"> <li>• Difficult to assess individual students</li> <li>• Can disadvantage students if group work is not well supported</li> </ul>
Class presentations	<ul style="list-style-type: none"> <li>• Students are motivated to perform well</li> <li>• Can encourage group cohesion and collaboration</li> <li>• Can enable peer feedback</li> </ul>	<ul style="list-style-type: none"> <li>• Time consuming for all students to present individually</li> <li>• Can be traumatic for some students</li> <li>• Evidence for assessment can be transient unless recorded</li> <li>• Difficult to avoid subjective bias in assessment</li> </ul>

### 3. Case Study: Assessment Methods Used For Course Computer Networks

Course outcomes of Computer Networks

Table 3 shows Course Outcomes of Computer Network course on completion of the course:

**Table 3. Course Outcomes Of Computer Network**

Course Outcome	Description	Suitable Assessment Method
CO1	Describe the basis and structure of layered protocol model	Final written Exams
CO2	Describe and analyze data link, network, and transport layer protocols	Final written Exams , Regular practical work, Orals
CO3	Design and implement data link or network layer protocols with simulation in networking environment	Project Based, Regular practical work, Orals, Writing assignments
CO4	Describe and analyze various technological aspects, and social aspects of specific computer network protocols	Research article review, Project Based, Class presentations
CO5	Identify and apply basic principles and formulae for the information-theory required for communication and the performance of physical, data link and network protocols	Cases and open problems, Research article review , Project Based, Class presentations

### 4. Details Of Assessment Methods Used For Assessing Computer Networks Course Outcomes

#### Final written Traditional Assessment

This is one of the popular methods for Assessment. Students always give preference to written exam as compared with oral exam. Numbers of written exams are conducted on computer networks for continuous evaluation. In this exam typical type of questions are

asked like "Explain different Routing algorithms" and these questions also have precise answers. The advantage of this method is that a teacher can cover exactly those areas of knowledge which he wants to check. From students points view advantage of written exam is that they get a better chance to do their best. Written examinations measure not only content knowledge, but also give yet another opportunity to practice and get reviewed on writing. All students have same task to do in the same way. Most of the course outcomes can be achieved through written exam such as "Students must be able to understand working of Routers". Purpose of written exam is only for measurement not for feedback and because of lack of feedback students loose learning opportunities. Written exam can be applicable to test theoretical knowledge but not for practical knowledge of subject. Student's application of the course to the given practical problem cannot be tested through traditional written exams.

#### Viva or Oral Assessment

Generally, written examination is best suited for knowledge, comprehension assessment where viva or oral is best suited for analysis, synthesis and evaluation. For the questions like "In what ways are the layer three switches and routers similar and different?" they have to analyze interconnecting devices in different perspective. Another main aspect of Oral examination is its flexibility and adaptability which makes it possible to test the student's level of knowledge for each topic, for example by starting the oral with a hard question such as "How to configure Domain Name System Server" and then give the clue until the student can answer it sufficiently. Oral exam gives feedback from the students on how they relative importance of different topics.

Main drawback of oral exam is inadequate coverage of syllabus topics. Since oral examinations are generally limited to very few questions i.e. Students will not be tested on all important concepts. This type of exam helps to attain course outcomes like "Describe and analyze data link, network, and transport layer protocols".

#### Cases and open problems Assessment

In this exam students are allowed to use their readings, reference materials or textbooks, notes, other material related to subject. An open book exam requires an exact understanding of the subject and be

able to interpret, think critically, and present an organized and well written answer. These are often quite difficult exams. Even though students are having their text books and notes, This method always help to test the skills of problem solving and critical thinking. For example question like "Whether our college Network requires subnetting or not?" increase critical thinking of topics. Effectiveness of the method mostly depends on nature of the questions. Question should not be straight forward like "Define Subnetting and Supernetting". Question have to be designed carefully and intelligently such as "Why layered approach is used in TCP/IP protocol suite?" to test the students' understanding and the skills of applying that understanding. These types of questions are also help to achieve course outcomes such as "Describe the basis and structure of layered protocol model."

### Project Based Assessment

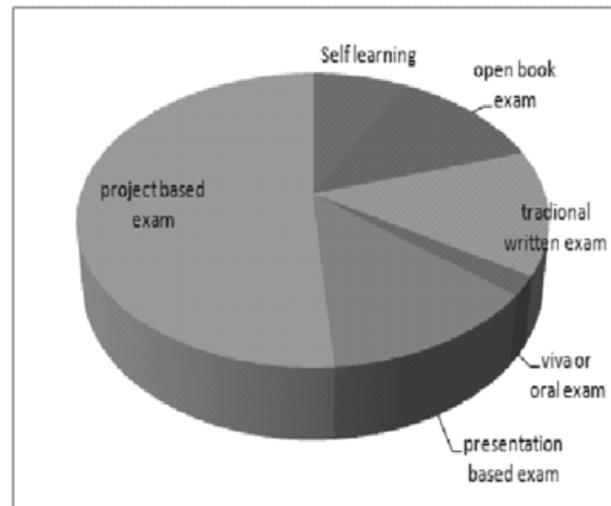
In this scheme one or more than one project is allocated to a group of students. Students already know basic of computer networks. But they don't know how to apply these basics to the real time project. For example they know definition of LAN, MAN and WAN. But don't know how to deal with creation of LAN, MAN and WAN. One of the projects was to simulate college campus network and optimize network speed. In this case students got lots of difficulties such as which cable they have to use i.e. whether to use CAT 5 or CAT 6 cable, which interconnecting device, Switch or Router, they have to use. When they use switch then they can understand which the limitations of switch are and why to go for router. These types of difficulties they have solved with either through discussion with the teacher or through Internet. Another difficulty was how to simulate the network. For simulation of network they have used NS-2 tool. This method help to assess course outcomes like "design and implement data link or network layer protocols with simulation in networking environment". Group projects also helped students to develop skills and increase the ability to identify and analyse complex engineering problems.

### 5. Survey Of Assessment Methods And Attainment Of Computer Networks Course Outcomes Based On Assessment Methods

The exams are finally taken by students, so their opinion matters the most. To know the opinion of students, a survey was conducted on more than 75

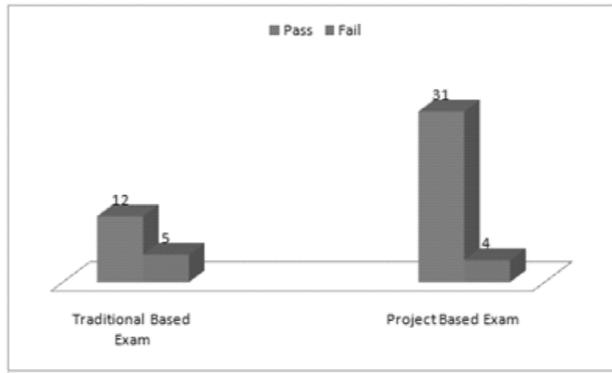
students about various methods of assessments in exams and their effectiveness. The results are similar to what is discussed in the paper so far. The survey was carried out on the engineering students of, who are undergraduate, postgraduate. The discussion on various questions is as follows:

When it is asked to the students what exam method they like the most then the most common answer received was the project based learning. Fig.1[1]. Shows the response of students about the method of assessment.



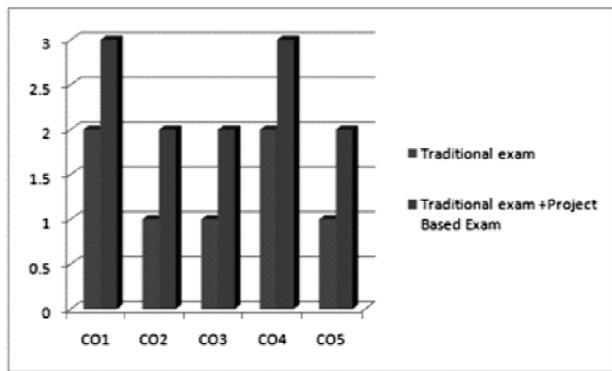
**Fig. 1 what kind of assessments the students like the most?**

Out of the 75 students taken the survey for Computer Network Course, around 47% (35 students) think that the project based exams are the best method for assessment, around 25% (19 students) think that the presentation based exams are the best method for assessment while only 1% (8 students) and 12% (9 students) are in favor of viva based and traditional exams respectively. Fig 2 shows out of 17, total 5 (29%) students who have given viva or traditional exams have got failed in exams. 4 (11%) out of 35 students who have given the project based exams have got failed in exams. The results shows that the students who have given traditional exams, has more failure rate than the students who have given project based exams



**Fig 2. Student Passing Ratio**

So Fig 3 shows Overall attainment of course outcomes in Computer Networks which is calculated out of 3(3-High, 2-Medium, 1-Low). The Fig. 3 shows that the attainment of course outcomes is satisfactory when project based assessment coupled with traditional assessment is used.



**Fig. 3 Attainment of course outcome in Computer Network**

## 6. Conclusion

All the Assessment methods discussed have their own advantages and disadvantages. For modern education systems traditional Assessment methods may not work well. From Fig.2 and Fig 3 it has been proven that Project based assessment coupled with traditional assessment techniques shows better result in passing as well as attainment of course outcome of course Computer Network. If properly designed and implemented, project based assessment provides adequate opportunity to learn and explore the extremes in course to be studied.

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