

USAGE OF DIGITAL TOOLS FOR FORMATIVE ASSESSMENT TO IMPROVE TEACHING LEARNING OUTCOMES

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ABSTRACT

Outcome-Based Education (OBE) leads to guarantee that a graduate student will be qualified for their profession and be able to be accepted globally by establishing the courses that students have finished by the time they graduate. During the learning process of an individual student, formative assessment helps to analyze the outcomes, strengths and weaknesses of students. There are many effective modern digital ICT tools available for formative assessment to improve the teaching learning outcomes, such as Socrative, Mentimeter, Slido, Google Classroom, Flipgrid, Pear Deck, Poll Everywhere, Edulastic, Classkick, Nearpod, Kahoot, Padlet, Quizizz, Quizlet, Testmoz, Spiral.ac and Google Forms, etc. Now a day's student's attention span and concentration is very low. Formative assessment figure out whether a student's doing well or needs help by monitoring the learning process and teachers can provide the feedback about the learning level of the individual students. If formative assessment is made a digital practice students will actively listen & engage themselves in classroom activities joyfully. Interim & summative evaluation takes place after the learning process when a course or module is completed. The grades assessed through interim & summative assessment will tell whether the student achieved the learning goal or not. The completion of Course Outcomes and Programme Outcomes mapping is required in order to continuously improve the quality of OBE. This proposed work aim to practice digital tools in formative assessment of students, students' performance improvement will be tracked progressively. Feedback shall be given to the students by the teachers who shall change the pace & method of teaching according to the students learning capacity. Later it emphasis the value of framing COs for various courses in the curriculum, performance indicators for 7 POs, accurate CO-PO mapping, and methods for evaluating its efficacy or attainment. A sample CO-PO accomplishment computation will be addressed.

Index Terms: *Formative Assessment, Interim Assessment, Summative Assessment, Modern Tools, Outcome-Based Education.*

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I. Introduction

Knowledge retention after the learning time is essential if the "graduate" is to be able to apply and depend on a thorough understanding of that knowledge for application in their chosen area. This deeper learning is often reached when learning is not restricted to memorization of a list of unconnected facts but occurs from the learner actively participating in the learning process and thoroughly understanding and recalling the knowledge in its context.

By providing feedback to students throughout the learning process and resulting in improved learning outcomes, formative assessment is intended to support learning. Offering formative assessment chances has been acknowledged as having a substantial positive impact on student learning. In order to motivate pupils to learn, formative evaluations are typically methodical in approach and intended to be made available to them during a certain study period. Although it has been suggested that the focus should be on three specific drivers when designing any formative assessment, it is generally agreed that the outcome of any formative assessment should be one that ultimately helps improve learning: using a method to inform students of gaps in their learning, familiarising students with the expectations of summative assessments, and providing feedback that directs the direction of student learning [8].

By following teachers' examples, giving advice, giving directions, and providing specific information about assessment and success criteria, students can eventually become active and effective self-monitors of their own learning. Feedback is intended for both teachers and students. It was developed and is used by teachers to make decisions on the preparation, diagnosis, and

remediation of student learning. In order to highlight successful or excellent elements and adjust or improve problematic elements, students utilize it to keep track of the strengths and flaws in their performances. Formative assessments, in contrast to summative ones, should ideally take place in a relaxed setting, be given at a time that is relevant to the students' learning process, and involve active participation from the students. Formative evaluation will only help students advance if they can take use of the possibilities and identify areas where they need to improve their knowledge or abilities [4], [7] & [9].

The main component of formative assessment is ongoing communication between teachers and students to address specific needs. In classroom activities like continuing discussions and feedback loops, where prompt feedback is utilised to guide future learning, formative assessment is widely used. As a result, evaluation is crucial to the learning process. Peer and self evaluation, for instance, is an essential part of formative assessment and can help students comprehend what and why they are learning.

Numerous conceptualizations of formative assessment place differing emphasis on different elements of the process as a result of divergent underlying theoretical ideas. The focus on gathering information about student learning and using it to guide student learning is the main characteristic that links all of these characteristics.

Feedback is recognised as a crucial component of formative assessment in order to achieve this [2]. Feedback, in the words of Hattie and Timperley, is "input concerning one's performance or comprehension supplied by an agent such as an instructor, classmate, book, parent, or experience" [5]. Evans argues that all interactions enabled by assessment design, occurring both inside and outside the current learning environment, overt or covert, and importantly drawing from a variety of sources, can be considered as feedback [3]. Teachers may change their lesson plans or provide feedback to their students in response to test results. Students can influence their own learning processes for the better by having this information [2].

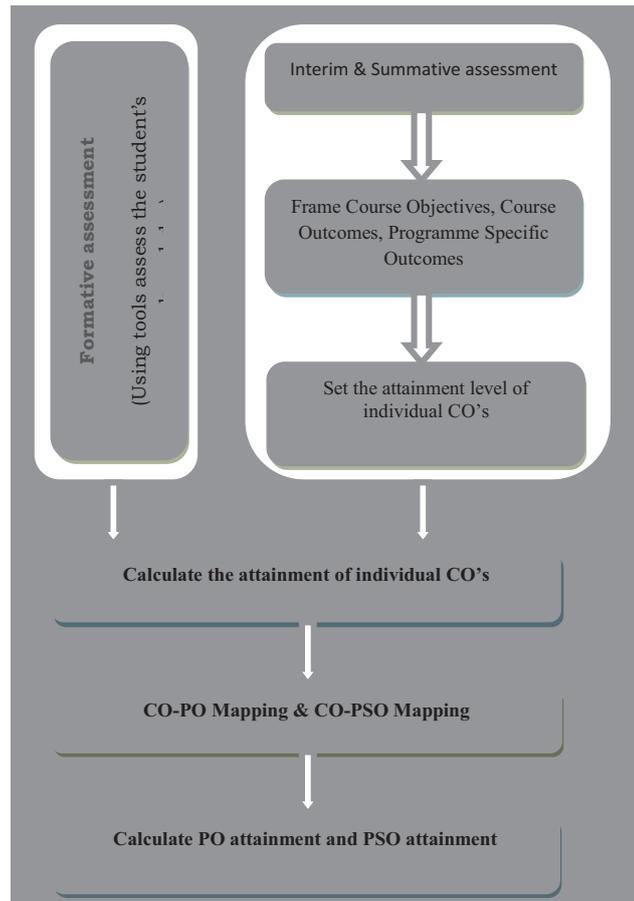


Fig. 1. Outcome Based Assessment Process

Two approaches to formative assessment are Socratic and Slido. These approaches can complement each other, and elements of each approach are often used by teachers in their classroom practice. A brief outline of each approach is provided in the subsequent section.

The proposed work is organized as follows. In Section II, we discuss about the online assessment methodologies to contribute the design of online formative assessment tools. Section III will discuss about interim and summative assessment procedures. Section IV illustrates the results of formative and summative assessment with detailed analysis. Section V provides a concluding discussion.

II. Proposed Online Assessment Methodologies

A. Formative assessment

There are many different ways to approach assessment, which enables both the teacher and the student to track their progress toward reaching the learning objectives. The term "formative assessment" refers to methods for spotting problems, learning gaps, and misconceptions along the

route and evaluating how to close them. When students recognize that the objective is to increase learning rather than apply final marks, it can even strengthen their capacity to take ownership of their learning. Students may evaluate their performance using a variety of methods, such as quizzes, polls, observations, journals, picture exercises, interviews and focus groups, tag feedback, gathering several sources of evidence, and more.

Formative assessment, which is conducted continuously throughout a class or course, aims to increase student attainment of learning objectives by using strategies that can accommodate unique student requirements.

Summative assessments, on the other hand, measure students' learning, knowledge, proficiency, or accomplishment at the end of a teaching period, such as a unit, course, or programme. Summative tests are virtually always officially graded and frequently given a lot of weight (though they do not need to be). Instructors can examine a variety of methods to combine these approaches, and summative assessment can be utilized in conjunction and alignment with formative assessment to great advantage.

Both assessment methods can differ in a number of ways:

- Informal / formal
- Immediate / delayed feedback
- Embedded in lesson plan / stand-alone
- Spontaneous / planned
- Individual / group
- Verbal / nonverbal
- Oral / written
- Graded / ungraded
- Open-ended response / closed/constrained response
- Teacher initiated/controlled / student initiated/ controlled
- Teacher and student(s) / peers
- Process-oriented / product-oriented
- Brief / extended
- Scaffolded (teacher supported) / independently performed

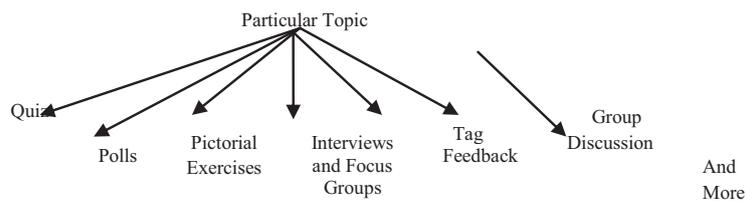


Fig. 2. Formative Assessment pattern for Theory courses

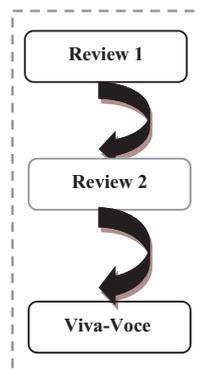


Fig. 3. Formative Assessment pattern for Internship and Project work

B. Online Formative Assessment Framework (OFAF)

The OFAF framework was created to pinpoint places where students' comprehension of the primary ideas covered in the sessions might be strengthened in order to enhance both learning and teaching methods. The suggested tool for this study and upcoming experiments is Socrative inside this paradigm. A set of questions addressing the major ideas of the lecture are prepared by the teacher during the assignment phase. Each session will conclude with a test. When all students have responded to a question or the allotted time for the question has passed, the question is then displayed in the application phase, where there is an option to select the proper response for each answer option. The numbers of students who have afterwards, during the feedback phase, the reported findings provide instructors with rapid feedback on the degree of knowledge acquisition and in-depth comprehension of the session material among learners. Additionally, students get the chance to evaluate themselves and determine which portions of the lesson they did not comprehend. At the conclusion of the quiz, the suggested tool Socrative tracks each participant's progress and presents overall findings as bar charts. Educators can look over the data they've gathered and identify themes that students frequently struggled with in class.

Purpose of OFAF is as follows:

- Enhance learning
- Proper teaching practise

The OFAF process is classified into 4 which are shown in the following figure.

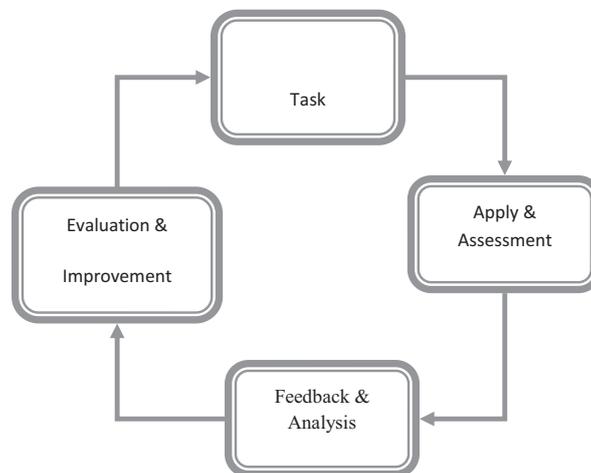


Fig. 4. Online Formative Assessment Framework (OFAF)

- Task - Prepare game-quiz questions based on LOs
- Apply - Conduct the quiz after each session to cover the learning outcomes
- Feedback & Analysis – It will give immediate feedback for learners and educator. Also find common areas of weakness and identify areas of improvements
- Evaluation and Improvement – It will help to update the Curriculum and Teaching pedagogies

Additionally, teachers can elicit additional details from students regarding their failure to identify the proper response. This could be further commentary and clarification to double-check your findings. Therefore, during the evaluation and improvement phase, educators decide whether the teaching methods they have adopted need to be changed, or whether new teaching methods need to be replaced or combined with the methods currently practiced. Additionally, educators can develop and improve curricula to support the student learning process. Finally, once common areas of weakness are properly identified, educators can assess whether the reason lies in the teaching method or curriculum they have chosen. Thus, educators can identify future improvement areas for course delivery and design. It aims to improve learning and teaching practices and to better plan for future program development.

The detailed steps of socrative are listed in the following table.

Table 1 Socrative Procedure

Register with Google account/Create Account	✓
Login	✓
Create the test and Launch	✓
Student can enter room for taking test	✓
Complete the test and see the Score	✓
Faculty can monitor individual students performance question wise	✓
Give Feedback to the students	✓

III. Interim and Summative Assessment

A. Interim Assessment

Interim assessment is a technique for evaluating students' knowledge and skills within a constrained time frame. used to assist in decision-making in classrooms and elsewhere. Interim tests may be given after a student has learnt or demonstrated knowledge in a subject area, at predetermined intervals, or immediately after (competency-based assessments). In this overview, we look at how states can replace summative exams with many interim exams spread out throughout the course of an academic year. To test student performance in relation to state standards, the unit assessments employed in this study are being developed as modular, scenario-based assessments. In order to help teachers comprehend their students' present conceptual knowledge of a subject matter, detect gaps before and after instruction, and select the most productive pedagogical activities, such as individualised and group instructional next steps, these evaluations are being developed. The "cognitive lens" through which teachers evaluate their students' current levels of conceptual, procedural, and strategic knowledge of crucial concepts may therefore be feedback provided within a framework of LPs and KPs. Such feedback should be developed to help teachers assess not only the students' current level of comprehension but also to identify particular areas of underlying misconceptions or gaps in knowledge within the domain and to provide direction to teachers about the upcoming instructional stages [10], [11] & [13].

B. Summative Assessment

Any evaluation technique that assesses pupils' cumulative learning over a predetermined time period, usually a course or a school year, against predetermined standards. Summative test results are used in various ways by different states and districts, including as a benchmark for students to compare their performance to, as part of state and local accountability systems to

measure school performance, as part of teacher evaluations, and in some cases as a requirement for graduation. An evaluation of learning at the conclusion of a unit of teaching or at a certain time is known as a summative assessment. The comparison is made between student knowledge and skill levels and benchmarks.

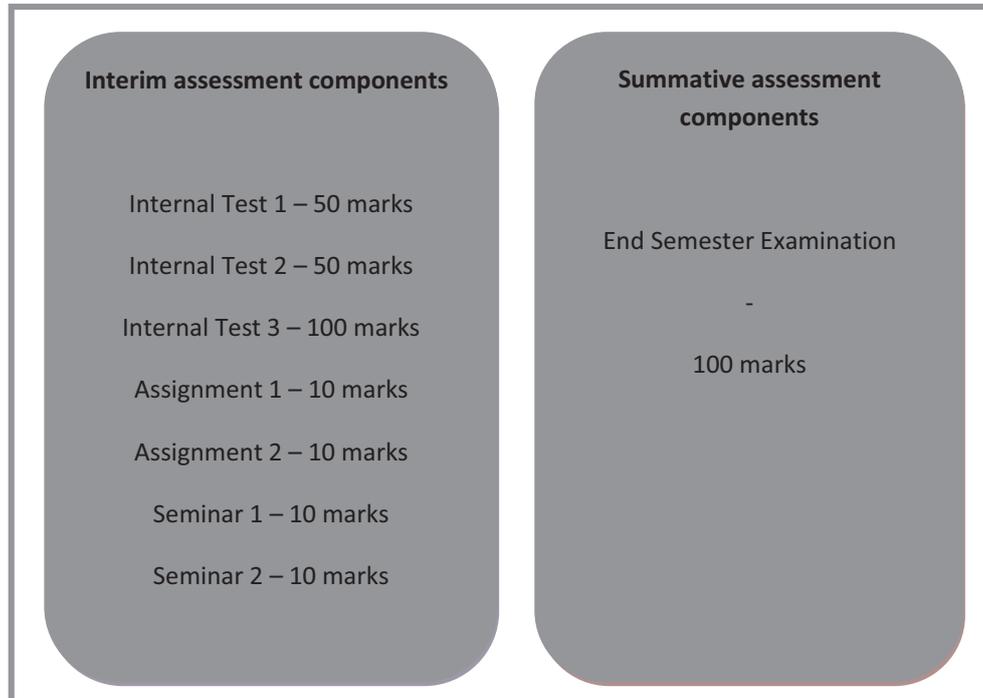


Fig. 5. Assessment Components

The outcomes of learning are assessed by course outcome and programme outcome. The sample course outcomes for the subject computer architecture as given below.

**STATE BOARD OF TECHNICAL EDUCATION & TRAINING,
TAMILNADU DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS
N-SCHEME
Course Name : 1052:Diploma in Computer Engineering
Subject Code : 4052410
Semester : IV Subject Title : Computer Architecture**

Course Objectives	
<p>Know the fundamental blocks of computer</p> <p>Realize the function of I/O in different operation modes</p> <p>Use of I/O processor</p> <p>Know about different memory types and their operations</p> <p>Study about the fundamental blocks of CPU</p> <p>Know about the computer arithmetic</p> <p>Study the different processors</p>	
Course Outcomes	
CO1	Able to Understand the basic Structure of the computers
CO2	Able to know the benefits of the I/O processor
CO3	Able to learn the various memory management techniques
CO4	Able to understand the concept of Parallel processing, pipelining and advanced processors
CO5	Able to express the view of hardware designs
Programme Outcomes	
PO1	Basic and Discipline specific knowledge: Apply knowledge of basic mathematics, science and engineering fundamentals and engineering specialization to solve the engineering problems
PO2	Problem analysis: Identify and analyse well-defined engineering problems using codified standard methods.
PO3	Design/ development of solutions: Design solutions for well-defined technical problems and assist with the design of systems components or processes to meet specified needs.
PO4	Engineering Tools, Experimentation and Testing: Apply modern engineering tools and appropriate technique to conduct standard tests and measurements.
PO5	Engineering practices for society, sustainability and environment: Apply appropriate technology in context of society, sustainability, environment and ethical practices.
PO6	Project Management: Use engineering management principles individually, as a team member or a leader to manage projects and effectively communicate about well-defined engineering activities

PO7	Life-long learning: Ability to analyse individual needs and engage in updating in the context of technological changes.
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To attain the Program Outcomes (POs) and Program Specific Outcomes (PSOs), curriculum is used. Course outcomes (COs) for each course are unique and are matched to PSOs and POs. Using a set of performance evaluation criteria, COs are quantitatively evaluated. The implementation of outcome-based education in institutions can result in better learning outcomes as well as a forward-thinking approach to education.

IV. Results and Discussion

The process of assessment is crucial to both teaching and learning. It encourages educators and students to evaluate both the instructional strategy and the learning results. Teachers must first assess the level of student learning before deciding whether to go on to the next lesson and how well the pupils are actually understanding it. Both formative and summative evaluations are used in the classroom, and each type is appropriate for both online and traditional learning settings. For a course to be effective, both sorts of assessments must be used, and a successful blending of these two assessment techniques can enhance student learning. This study examined the rapid advancement of technology and its significant influence on formative assessment. The continued development of technology will almost certainly have a substantial impact on formative assessment.

The sample formative assessment for the course Computer Architecture and Relational Database Management System is shown in figure 6 & 7. The question wise result analysis of the same course for formative assessment is given in the figure 8. Table 2 depicts the detailed analysis of student's feedback about the formative assessment. We collected the course instructor feedback also to improve the results of formative, interim and summative assessments. The obtained results shows that the online modern tools enhance the outcome based education through the above assessments.

CA QUIZ 1											Finish
<input type="checkbox"/> Show Names <input type="checkbox"/> Show Responses <input type="checkbox"/> Show Results											
NAME ^	SCORE % ↓	1	2	3	4	5	6	7	8	9	10
Aadhil Mohamed M S	50%	✓ C	✓ A	✗ C	✗ A	✗ A	✗ D	✗ D	✓ D	✓ A	✓ C
albart	30%	✓ C	✗ D	✓ A	✗ A	✗ C	✗ A	✗ C	✓ D	✗ B	✗ D
BALACHANDAR.S	30%	✗ A	✗ B	✓ A	✗ A	✗ C	✗ A	✗ D	✓ D	✓ A	✗ B
Bhuvaneshwari p	50%	✓ C	✗ B	✓ A	✓ D	✗ A	✗ A	✓ A	✗ C	✓ A	✗ D
D.sharmiladevi	40%	✓ C	✓ A	✗ D	✗ B	✗ D	✗ B	✗ D	✓ D	✗ B	✓ C
DHIVAKAR	60%	✓ C	✗ C	✓ A	✓ D	✗ C	✗ A	✗ C	✓ D	✓ A	✓ C
Jerold	30%	✓ C	✗ B	✗ B	✗ B	✓ B	✗ A	✗ D	✓ D	✗ B	✗ A
Kalaiyaranan	50%	✗ A	✗ C	✓ A	✗ B	✓ B	✗ A	✗ D	✓ D	✓ A	✓ C
Kannan	50%	✗ B	✗ B	✗ B	✗ C	✓ B	✗ A	✓ A	✓ D	✓ A	✓ C
Kirubakaran	70%	✗ A	✓ A	✓ A	✓ D	✓ B	✓ C	✗ C	✓ D	✓ A	✗ B
M. Sangeetha	50%	✓ C	✗ C	✗ D	✓ D	✗ D	✗ A	✗ D	✓ D	✓ A	✓ C
Nithishkumar	10%	✗ A	✓ A	✗ C	✗ B	✗ A	✗ D	✗ C	✗ A	✗ B	✗ B
Sabari Nathan	60%	✓ C	✓ A	✓ A	✗ A	✓ B	✓ C	✗ D	✓ D	✗ B	✗ D
THANGAVEL	40%	✗ D	✗ D	✓ A	✓ D	✗ D	✗ A	✗ C	✓ D	✗ B	✓ C
V.Deepa	20%	✓ C	✗ D	✓ A	✗ A	✗ D	✗ A	✗ B	✗ B	✗ B	✗ A
Velmurugan	20%		✗ B	✓ A	✗ C				✓ D		
Velmurugan	60%	✗ A	✓ A	✗ A	✗ B	✓ B	✗ A	✗ C	✓ D	✓ A	✓ C
Vishwanathan	40%	✗ A	✓ A	✗ B	✗ A	✗ D	✓ C	✗ D	✓ D	✓ A	✗ B
18 Class Total	50%		39%	61%	28%	33%	17%	11%	83%	56%	44%

Fig. 6. Socrative Analysis for the Course Computer Architecture

DBMS UNIT1 - QUIZ1											Finish
<input type="checkbox"/> Show Names <input type="checkbox"/> Show Responses <input type="checkbox"/> Show Results											
NAME ^	SCORE % ↓	1	2	3	4	5	6	7	8	9	10
Aadhil Mohamed M S	40%	✓ B	✗ C	✓ B	✗ C	✗ A	✗ D	✓ True	✗ D	✓ D	✗ D
BALACHANDAR.S	50%	✗ A	✓ D	✗ C	✓ B	✗ A	✗ A	✓ True	✓ A	✗ B	✓ A
Bhuvaneshwari p	80%	✓ B	✓ D	✗ C	✓ B	✓ C	✓ B	✓ True	✓ A	✓ D	✗ D
D.sharmiladevi	80%	✓ B	✓ D	✓ B	✓ B	✓ C	✗ D	✓ True	✓ A	✓ D	✗ C
Dhivakar	30%	✗ C	✓ D	✗ C	✗ C	✓ C	✗ C	✓ True	✗ C	✗ B	✗ C
Jerold	60%	✗ C	✓ D	✗ D	✓ B	✓ C	✓ B	✓ True	✓ A	✗ B	✗ D
Kalaiyaranan	50%	✗ C	✓ D	✗ C	✗ C	✗ D	✓ B	✓ True	✓ A	✗ B	✓ A
Kannan	80%	✓ B	✓ D	✓ B	✓ B	✗ A	✓ B	✓ True	✗ D	✓ D	✓ A
Kirubakaran	40%	✗ D	✗ C	✓ B	✗ C	✓ C	✗ C	✓ True	✗ B	✓ D	✗ D
M. Sangeetha	70%	✗ D	✗ A	✓ B	✓ B	✓ C	✓ B	✓ True	✓ A	✓ D	✗ D
Nithishkumar	90%	✓ B	✓ D	✓ B	✓ B	✓ C	✗ D	✓ True	✓ A	✓ D	✓ A
Nithishkumar	0%										
THANGAVEL RAJ	50%	✗ A	✓ D	✗ C	✓ B	✗ A	✓ B	✗ False	✓ A	✓ D	✗ D
V.Deepa	70%	✗ C	✓ D	✗ C	✓ B	✗ A	✓ B	✓ True	✓ A	✓ D	✓ A
Velmurugan	20%	✗ C	✗ A	✗ D	✗ C	✗ A	✓ B	✗ False	✗ D	✓ D	✗ D
Vishwa	40%	✗ C	✗ C	✓ B	✗ A	✗ D	✗ D	✓ True	✓ A	✓ D	✗ D
Vishwanathan	70%	✓ B	✓ D	✗ D	✓ B	✓ C	✗ D	✓ True	✗ D	✓ D	✓ A
17 Class Total	38%		69%	44%	63%	50%	50%	88%	63%	75%	38%

Fig. 7. Socrative Analysis for the Relational Database Management System

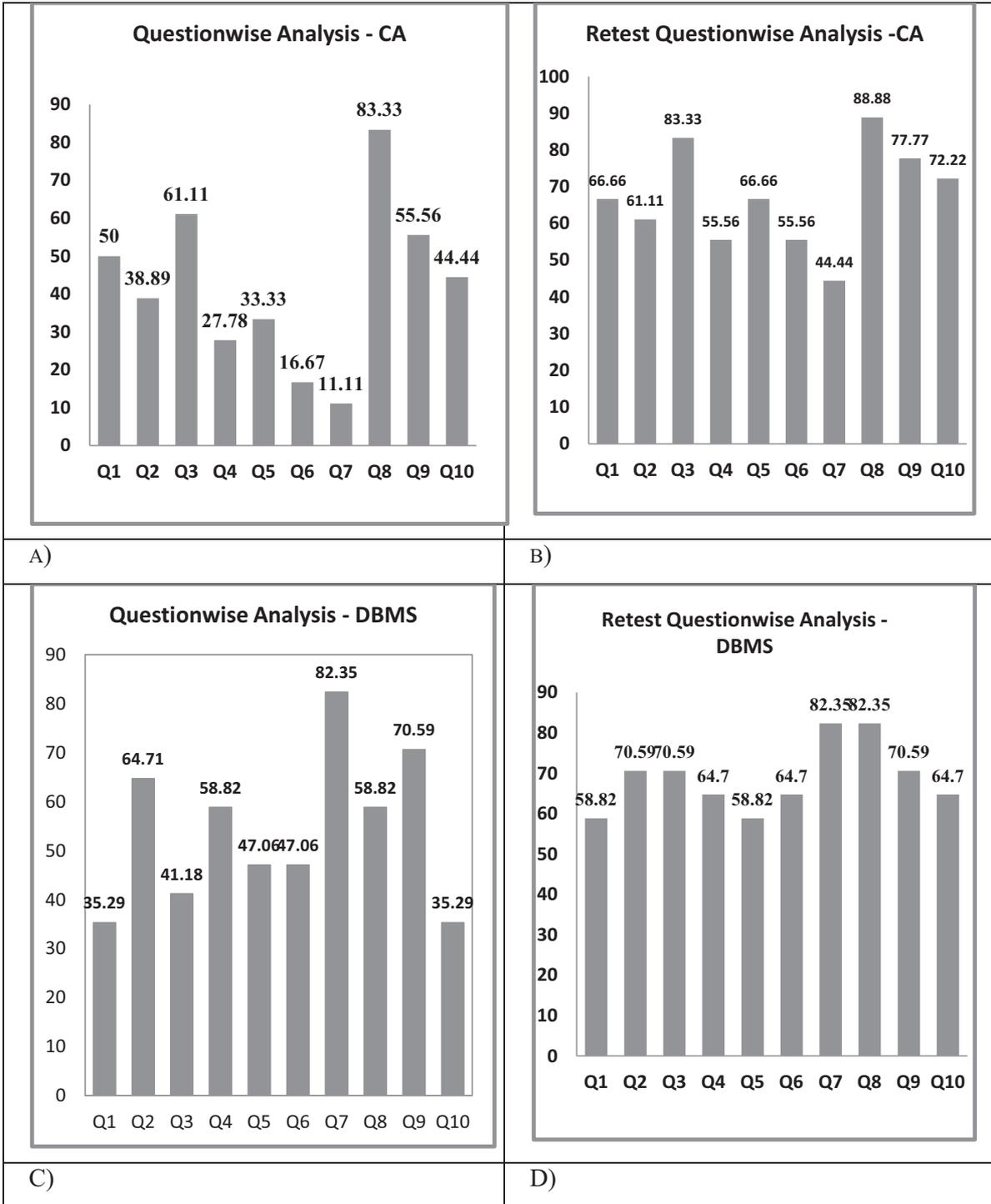
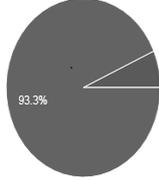
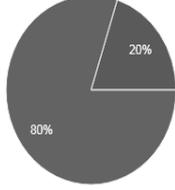
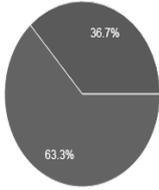
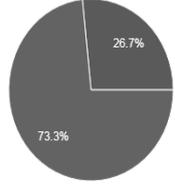
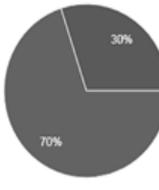
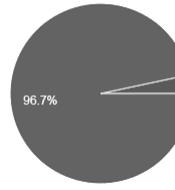
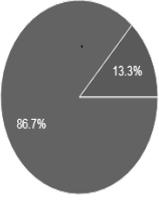
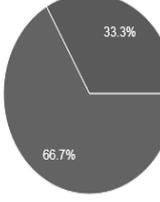
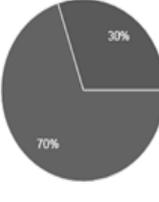


Fig. 8. Question wise Analysis for sample courses

Table 2 Students Feedback Analysis About Formative Assessment

Q.No	Feedback Questions	Analysis	Q.No	Feedback Questions	Analysis
1.	Did you feel motivated to learn through the formative assessment? Formative assessment-ன் மூலம் கற்றுக்கொள்ள உந்துதலாக உணர்ந்தீர்களா?		2	Did the formative assessment evaluation help you to improve? Formative assessment மதிப்பீடு உங்களை மேம்படுத்த உதவியதா?	
3.	Whether the answers are discussed? பதில்கள் விவாதிக்கப்படுகிறதா?		4.	Whether the instructor's feedback on my report was useful? அறிக்கை (Answer) குறித்த பயிற்றுவிப்பாளரின் கருத்து பயனுள்ளதாக இருந்ததா?	
5.	Did the formative assessment refine your skills in analyzing and critical thinking Formative assessment பகுப்பாய்வு மற்றும் விமர்சன சிந்தனையில் உங்கள் திறமைகளை மேம்படுத்தியதா?		6.	Was the faculty accessible to you to clarify your doubts? உங்கள் சந்தேகங்களைத் தெளிவுபடுத்துவதற்கு ஆசிரியரை அணுக முடியுமா?	

7.	Were you satisfied with the teaching in general? கற்பித்தலில் நீங்கள் திருப்தி அடைந்தீர்களா?		8.	Were you satisfied with class discipline in general? பொதுவாக வகுப்பு ஒழுக்கத்தில் நீங்கள் திருப்தி அடைந்தீர்களா?	
9.	Is your self-assessment activities increased? உங்கள் சுயமதிப்பீட்டு நடவடிக்கைகள் அதிகரித்துள்ளதா?		10.	Any other comments வேறு ஏதேனும் கருத்துகள்	Most of the students asking daily formative assessment
<p>● ஆம் ● இல்லை</p>					

V. Conclusion

Overall, our proposed studies on formative assessment using digital tools have shown that students can become engaged, self-aware, proactive, and confident in their learning if they are given good opportunities for feedback and portfolio creation through formative activities in all modules. This evaluation incorporated knowledge from numerous courses and was thorough and organised. The findings emphasise the significance of the teacher's participation in formative assessment and point out numerous significant influencing elements that must be taken into consideration. Instead of focusing just on receiving a passing mark during formative assessment, students are attempting to fill in any learning gaps by taking ownership of their learning. In this way, formative assessment makes sure that learners are capable of to enhance the performances in examination and grading standards. The opportunity for students to reach for the goal and assess how they are doing to attain it is provided by the ability to discuss the learning outcomes of the lessons at the beginning of each lesson and to remind them throughout the course.

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