Assessment of learning outcomes for online and offline modes of teaching: A comparative study

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Abstract:

Due to Nationwide lockdown of all sectors which was announced from 24th March 2020 to 31st May 2020 due to COVID-19 pandemic, the only option that was available for education sector is to continue the process of teaching & learning through online platform. Each platform whether it is offline or online has its own merits and drawbacks. The learning outcomes of the students are being defined in the form of course outcomes (CO). The CO's have been assessed in the subject of Applied Physics for the students of first year Bachelor of Engineering (BE) for both offline & online platform. In the present study, improvement in the students' performance (theory/written type of evaluation) in the form of attainment of the defined CO's in online platform is observed to be 85% and above. However, the performance got reduced to 4.81% in laboratory examination as more weightage was given to Viva-Voce (verbal questioning) type of evaluation. A detailed analysis of the students' performance along with possible conclusions have been presented in this article.

Keywords: Course Outcomes, Online & Offline platform, Viva-Voce exam

Introduction:

Now a day online platform for teaching & learning has become blessing in disguise due to the COVID-19 pandemic situation. According to Tallent-Runnels, (2006), online classes are courses that are delivered completely on the Internet. The faculty members were entrusted with the responsibility of completing the semester without compromising with the quality of content delivery and evaluation. Hence to achieve this goal, we have used the following online platforms; google meet & webex. Further, Means et al (2010) explain "online learning has become popular because of its potential for providing more flexible access to content and instruction at any time, from any place. It has been observed that with respect to the content delivery and doubt clarification, there is not much difference between online & offline platforms as listed in Figure 1. But when comes to evaluation part, the only question that was before us is "how to take care of ethical standards of students"?

Students who enters first year B.E degree will be having different psychological, social, emotional and financial background (Ganesh & Pranesha, 2018). The role of faculty is to act as a Facilitator (guide by the side), which means that faculty should focus on overall development of the student. This fact cannot be implemented to the fuller extent in online platform of teaching. Akkoyunlu and Soylu , (2008) states that e-learning environments pose such disadvantages as hindrance of the socialisation process of individuals, lack of sufficient recognition between the teacher and the learner and limitations concerning the communication among learners.

Online platform has made teaching & learning task easy and effective. However when comes to evaluation and overall development of students, online platform has its own limitations. Compared with the traditional classroom face-to-face learning, online accounting learning has the advantages of diversified teaching methods and shortening the time and space distance in learning. The problems reached were not resolved in time. At the same time, due to the relatively fixed class time of online courses, students are often in a position of passively accepting knowledge in the classroom and have no time to actively think (Chu Zhang, 2021). There is less interaction between lecture and student in online platform and it is difficult to read and understand the materials from media. (F L Damayanti & N Rachmah, 2020)

Hence normally first year students will be in a state of confusion. Lux and Davidson (2003) explained that e-learning is generally most effective when used as a supplement to, rather than a replacement for, engineering education.

Some of the techniques have been identified to overcome the ethical standards of the studetns during online evaluation. First of all by designing questions with higher level Bloom's taxonomy (Apply & Analyze) we can make student to think and only those students who have understood the concepts thoroughly can answer to such questions. Secondly, introducing more of Viva-Voce type evaluation pattern. Thirdly, if possible better to conduct tests or exams under digital supervision or manual supervision.

Method of data collection and analysis:

Applied Physics with course code18PY2BSPHY is a five credit course offered for first year Bachelor of Engineering (B.E) students. For the present study, students' performance during August – December 2019 (Offline semester) and January – May 2020 (Online semester) have been considered. In every semester irrespective of platform three internal tests with one quiz and lab exam was conducted as a part of continuous internal evaluation (CIE). Same data have been used for the present study. In offline semester the tests & quizzes were conducted in a class room with one room invigilator. However in online semester, students were asked to write the answers on a sheet of paper and upload the softcopy of the same in google classroom. There was no provision to supervise the students while writing the test as some students were from rural area where network connectivity was the issue.

Results:

As it is known, due to COVID-19 pandemic episode, nationwide lockdown of business, transport and education sectors was announced from 24th March 2020 to 31st May 2020. With regard to education sector, in many engineering colleges the new semester was in full swing. In order to keep the cart moving, an online platform such as google meet for content delivery was adopted. During online platform of teaching, a teacher has to prepare more in comparison with offline class (Hong Yun et al, 2020). Effectiveness of online teaching which is carried out during *January – May 2020 semester* in comparison with traditional offline teaching which is carried out during *August – December 2019 semester (Pre-COVID semester)* has been made in this study. Course outcomes (CO's) have been used as a tool to identify the effectiveness of the teaching and learning process.

With regard to the Applied Physics course for first year Bachelor of Engineering (BE) students, three CO's in respect of five theory units have been formed in the light of Bloom's Taxonomy to assess the extent of learning. The CO's are as follows:

CO1*: Understand, define and explain the fundamental principles of quantum mechanics, transport phenomena, dielectric and semiconductor material properties of solids, laser and optical fiber and concept of vibrations*

CO2*: Apply the concepts of quantum mechanics, metallic, dielectric and semiconductor properties of solids, laser and optical fiber and types of vibrations to obtain desired parameters*

CO3*: Use appropriate Tools to develop the concept of physics, perform as a member of team to build a model and make an oral presentation*

Table1 gives the class average (CA) marks for both offline and online modes of teaching. One common thing in both the cases is that the CA has increased from Test -1 to Test – 3. But in online mode there is an increase in CA from 2% to 32%. With regard to laboratory (practical class) exam there is a decrease in class average in online mode to the extent of 4.81%. This is because for online laboratory exams more weightage was given to verbal question and answers

(Viva Voce / face to face interaction) for which the student need to understand the concepts thoroughly and sincere hard work and practice is required to reproduce the answers.

Table 2 tells us about the attainment of CO's on the average scale of 3. It is clear from Table 2 that there is an increase in the distribution percentage of CO's attainment in online platform when compared with offline platform.

Also, Figures 2-5 represents graphically performance of the students in both online & offline modes of teaching. It is clear from the figures as well that the students' performance in online platform is better when compared with offline platform except for the laboratory examination which is of Viva-Voce type.

As usual one simple question arises in the mind that 'what might be the reason for better performance in online platform'? Here are some of the points responsible for improved performance of students in online platform: 1) More time for preparation 2) Group discussion 3) Not following the code of ethics strictly. The biggest drawback of online platform of evaluation is that students cannot be supervised during the tests. Hence there is a greater chance for students following malpractice methods. This problem can be minimized by conducting the exams offline or by introducing more viva-voce type of evaluation methods.

Conclusion:

Both online and offline platforms of teaching & learning have their own merits and drawbacks. Offline platform is good in terms of evaluation process and teacher takes the role as a facilitator. Whereas in online mode students can watch the lectures many times at their convenience. We usually conduct the test or exam process with a full belief that students will follow the code of ethics strictly. However, it has been noticed that majority of students do not follow the code of ethics strictly in online platform as there will be no supervisor during tests or exam. By the result of which an average student may get good marks in comparison with a hard working student. This gap can be eliminated by conducting the evaluation process alone offline or through standard Viva-Voce type. Finally to conclude I would also like to say that online platform can be used as a supplement to offline platform of teaching. If not possible to have complete offline class, one can think of having at least the tests or exams strictly on offline platform.

Acknowledgement :

The author expresses their gratitude for the constant motivation and encouragement from the Management and Principal of B.M.S College of Engineering, Bengaluru-19.

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Table 1: Class averages for two platforms of teaching learning processes

Test No.	Class average (On scale of 10)		Percentage change |[(a)- (b)/ (a)]x100|
	Offline (a)	Online (b)	
TEST-1	5.71	5.83	2.25
TEST-2	6.02	7.97	32.36
TEST-3	6.92	8.74	26.34
Lab exam	22.02/25	20.96/25	4.81

Table 2: Course outcomes for two platforms of teaching learning processes

COURSE OUTCOMES		GRADING AVG (OF 3)	DISTRIBUTION %		
			3	2	1
Offline Mode	CO1	2.25	73.08%	13.46%	13.46%
	CO2	2.13	53.85%	38.46%	7.69%
	CO3	2.60	100.00%	0.00%	0.00%
Online Mode	**CO1**	**2.96**	**95.52%**	**4.48%**	**0.00%**
	CO2	**2.82**	**85.07%**	**11.94%**	**2.99%**
	CO3	**2.97**	**97.01%**	**2.99%**	**0.00%**

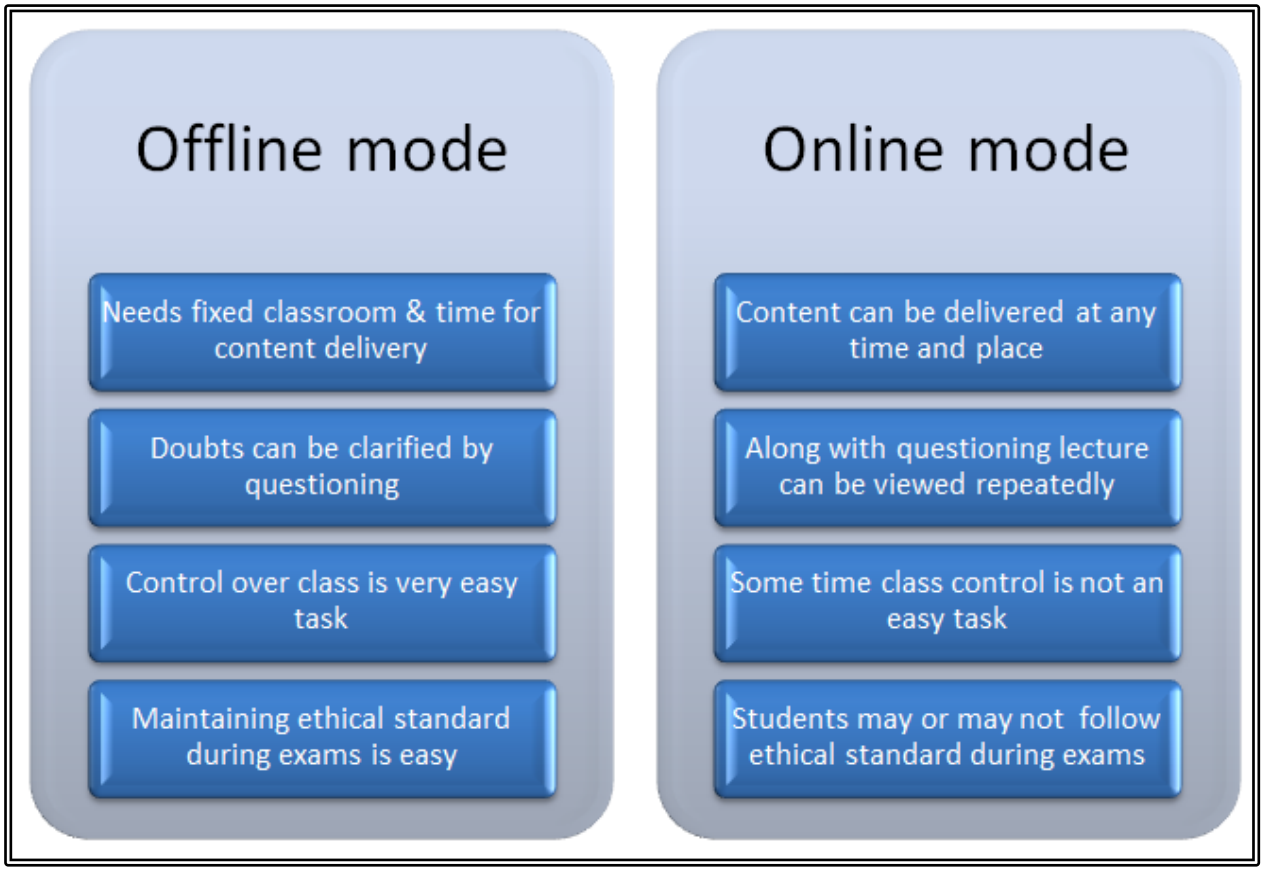

Figure 1: Major differences between offline & online modes of teaching learning

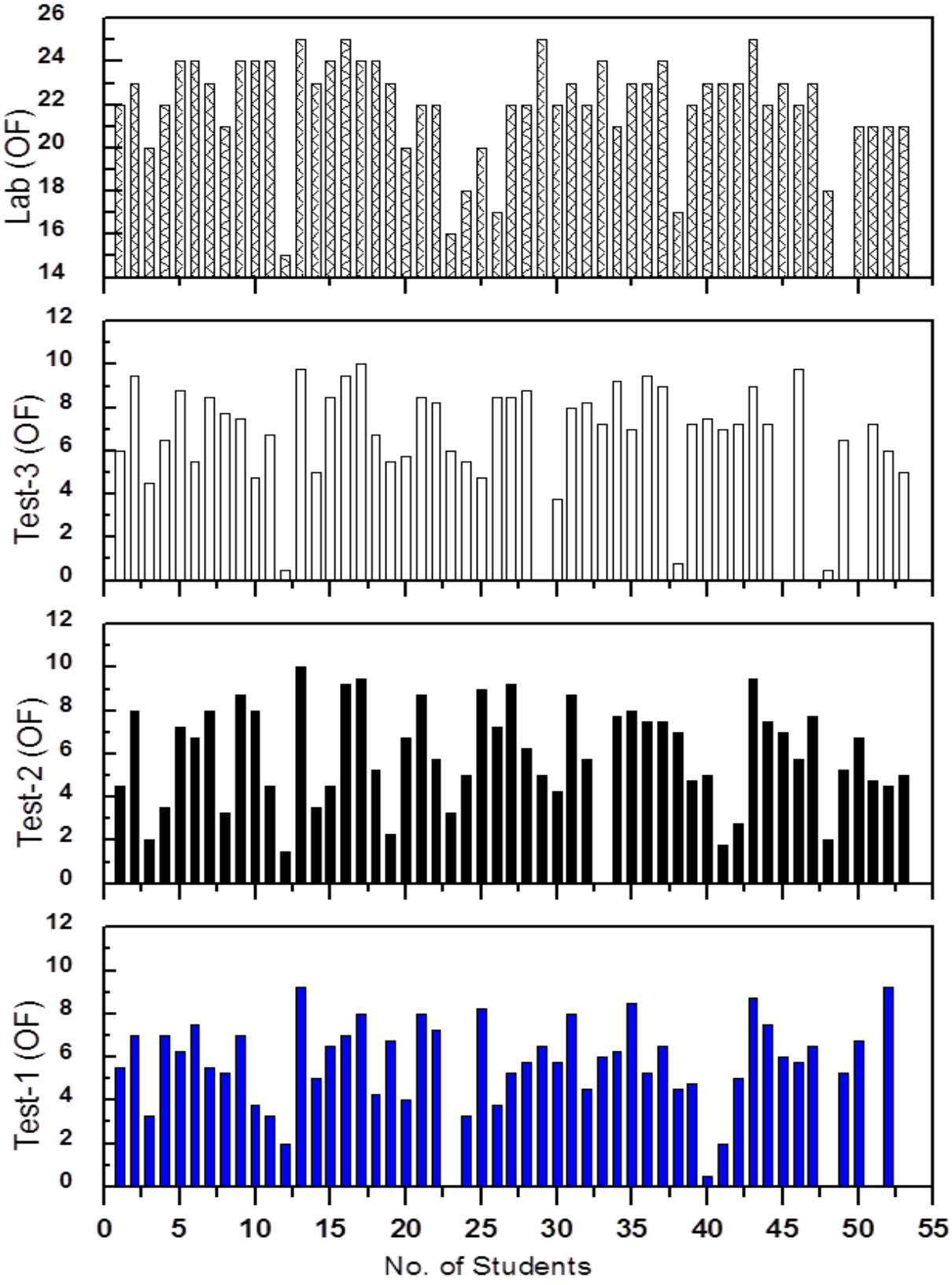

Figure 2: Continuous Internal Evaluation marks of OFFLINE mode students

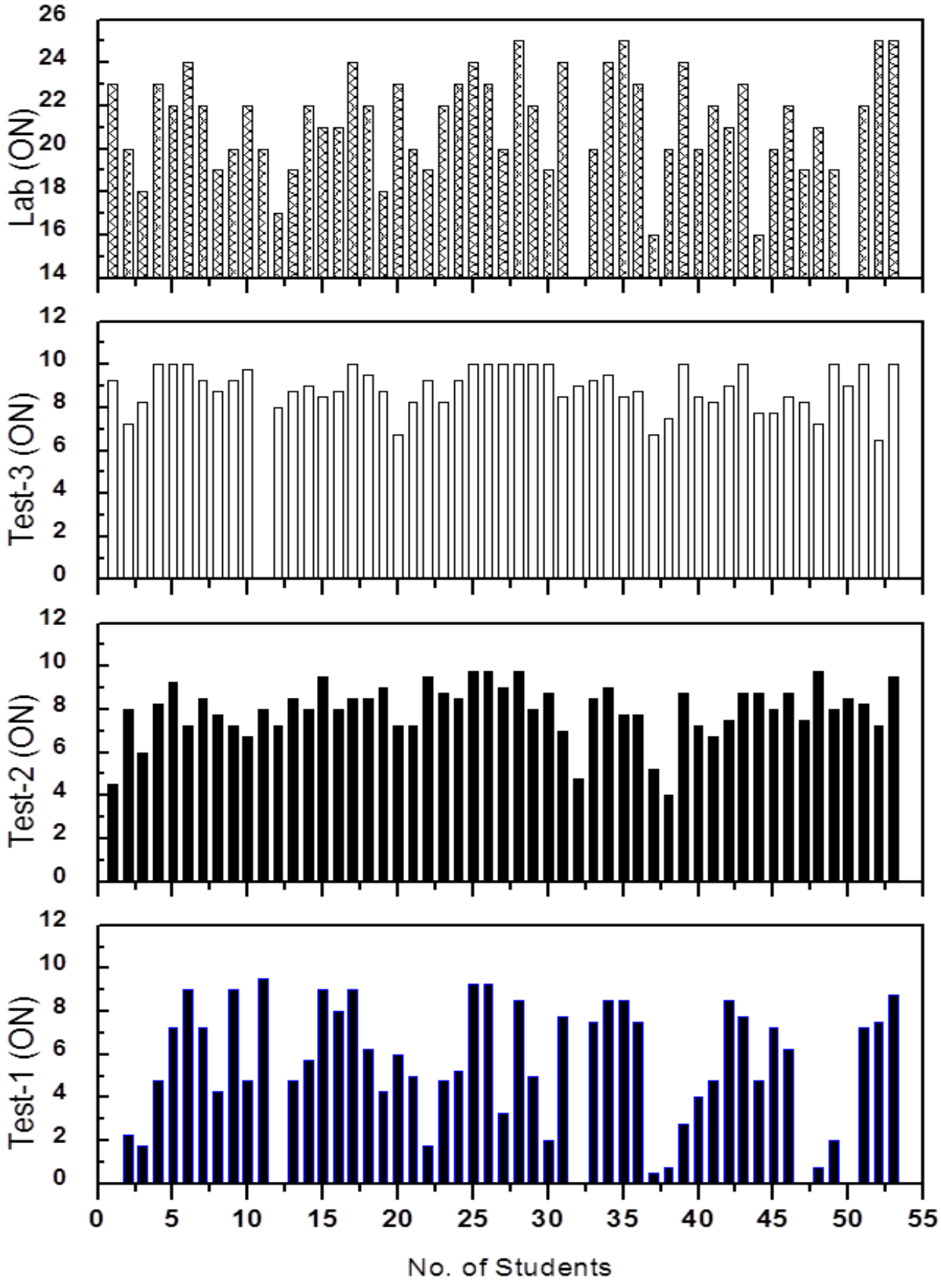

Figure 3: Continuous Internal Evaluation marks of ONLINE mode students

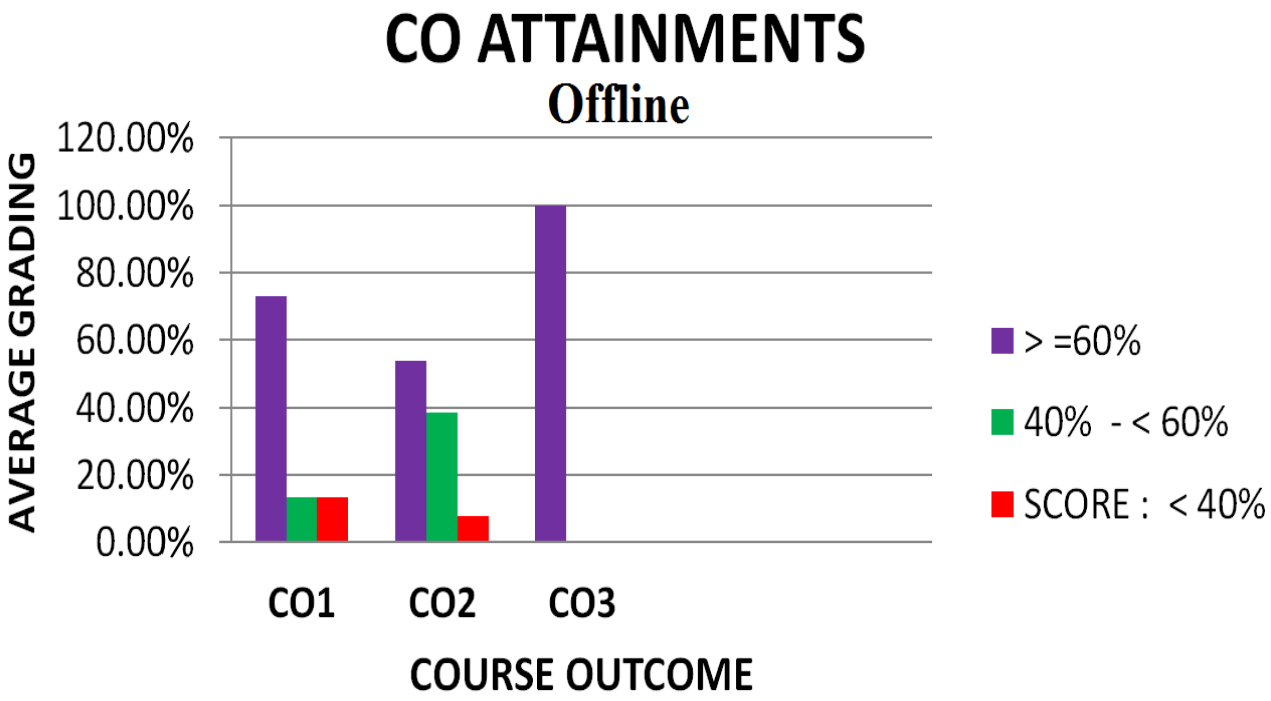

Figure 4: Attainment of Course Outcomes for OFFLINE mode students

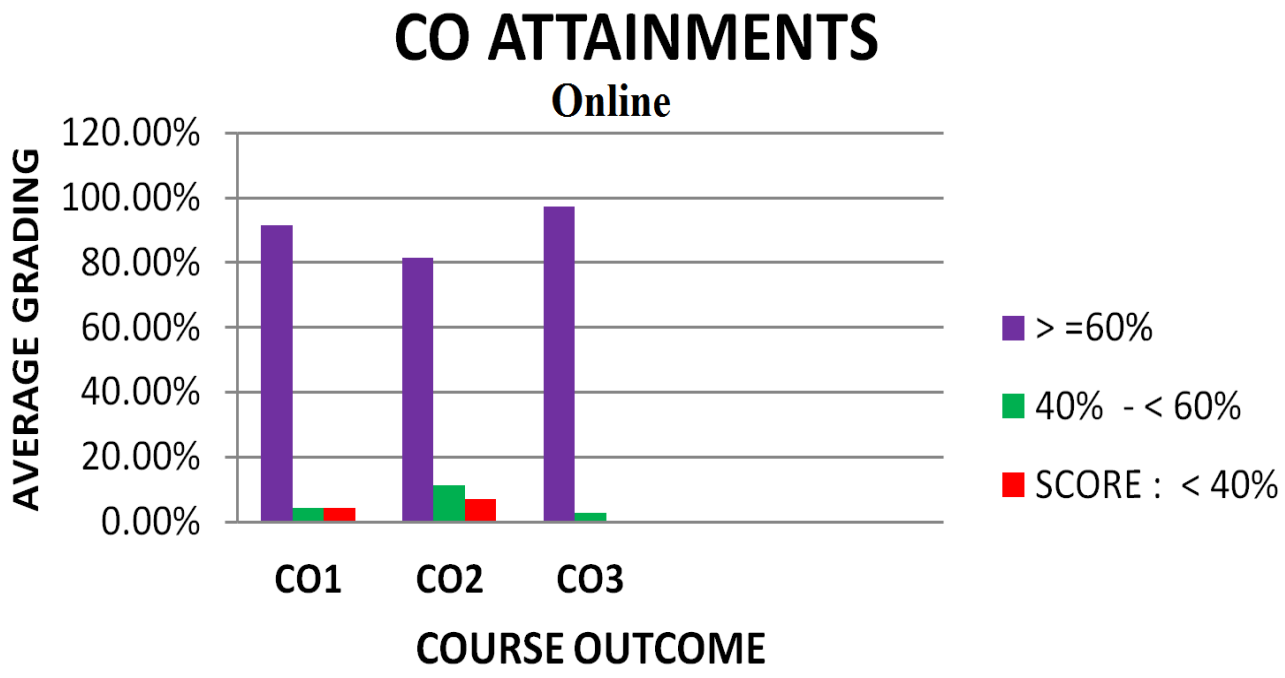

Figure 5: Attainment of Course Outcomes for ONLINE mode students