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Enhancing Learner Engagement in Online Education through ADDG9E Model

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***Abstract*—Nowadays, Online Education has been an inevitable choice of practice in the teaching-learning process. Learner engagement is one of the ineluctable challenges faced by the course teachers. For sustaining the learner's engagement throughout the course, teachers have to plan teaching-learning activities such as learning environment, content delivery, active student engagement, assessment, and evaluation. To plan teaching–learning activities effectively, the ADDG$_9$E Instructional Design model, the combination of ADDIE and the Gagne's 9 events models, has been proposed. Computer Programming CP101x – online bridge course has been offered to first-year engineering students. This course has been offered to improve the problem-solving skills of the learners. The proposed model has been implemented for organizing an online bridge course using the Moodle platform. The experimental results show that the proposed model has improved the learner's engagement, sustainability in learning, formative and summative assessment scores compared to physical classroom teaching. The course feedback shows that how well the learners have enjoyed their learning in the proposed ADDG$_9$E Instructional Design model-based online bridge course on computer programming.**

***Keywords*— ADDIE Model, Gagne's 9 Events Model, Online Instructional Design, Online Learning, Online Course Design, Student Engagement, Self-Learning, Self-Motivation.**

***JEET Category*—Practice**

1. INTRODUCTION

STUDENT engagement in classrooms is the most difficult task for teachers. If classes happen continuously without any mode change, the students would start disliking the classes over time. This results in the loss of motivation or interest towards the subject for the learners. Online classrooms have more challenges than physical classroom teaching. The teaching-learning process would be more effective in this case only when students have motivation and self-discipline for working. There should be mutual interest between the teacher and the learners. The teachers have to be cautious as there are chances that students would be out of the vicinity without any notice. The teachers have to plan their content delivery in such a way that the learners are continuously engaged all the time. They also need to ensure that the learners actively participate in various pedagogical methods followed during online classes.

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Online learning is going to be the future of education. The Covid-19 pandemic scenario confirmed this prediction. Most of the Universities and educational institutes adopted this paradigm shift for the online mode of the teaching-learning process. The eLearning industries are developing different applications for facilitating online teaching. Many free platforms and applications are available nowadays. It is the teachers' responsibility to choose the best platform based on students' comfort. Better student engagement higher the course enrollment is the long-term benefit that the Institute can get from the online learners.

Apart from selecting the suitable application for the online mode of content delivery, the teachers have to identify the suitable Instructional Design (ID) model for their course plan or session plan preparation. These ID models help the teachers to incorporate pedagogical practices in their content delivery. The ADDIE model is predominantly used by all teachers. It includes five phases like Analysis, Design, Development, Implementation, and Evaluation. It provides flexible guidelines for the preparation of course plans and assessment strategies for teachers. Gagne's Nine instructions design model is based on the mental conditions for learning. It is based on the information processing model when adults are presented with different stimuli. The teachers have to prepare their lesson plan such that it stimulates the thought process of learners and would be retained in memory for a longer period. This paper proposes to integrate both ADDIE and Gagne's Nine Event instructional design model for online teaching and learning process to sustain the student engagement as well as their continual self-learning with discipline.

There are many reviews made by educational researchers on the impact of instructional design models and systematic ways of using them. Brieger et. al. (2020) analyzed six different learning theories suitable for online teaching for adult learners. In her article, Laura (2020) explained the cognitive science of learning and online learning. Stefaniak et. al. (2020) explored how teachers use different ID models and their components while practicing their teaching process. Mamun et. al. (2020) used macro and micro levels of tasks for enhancing the learning of students in an online environment.

The ADDIE model of instructional design (Hanafi et. al., 2020) has been implemented to investigate the impact of mobile learning applications on students' worship education. The ADDIE model is applied in video creation on multimedia

learning to attract the students, faculty from outside class (Nicholas, 2020). This has also served as a reference for the faculty who are interested in creating learning videos. An online learning community tool has been developed with the reference of the ADDIE model to share the innovation and knowledge of English learners (Jianfeng, 2020). ADDIE model is also used to enhance the ethical and moral competencies among nurses in the medical field (Sanghee et. al, 2020).

Gagne's model has been applied in teaching non-procedural skills for managing diabetic patients (Estilita, 2020). The process of migrating the contents to MOOCs has been explained with the case-study through Gagne's model (Rodrigo et. al., 2020). An optimal framework for designing an online course has been proposed by Yu (2020). There are few studies on the analysis of various parameters such as emotions, engagement, motivations, learning styles, flow, students performance, cognition, dropouts, collaborations have been discussed using the online learning environments (Ozhan et. al. 2019; Thai et. al., 2020; Mubark et. al. 2020; Oyung et. al. 2020).

Hasan et. al. (2012) developed V-model for E-Learning activities using Gagne's nine events instructional design model. Llie et. al. (2014) added two new events like learning organization and final appreciation to the existing nine events of Gagne's instructional design model for providing operational guidance for instructional approach. Llke (2014) conducted a study with different instructional design models for science teachers while teaching their application course. The results showed that most of the teachers preferred Gagne's nine events and Kemp's instructional design model. Chen et. al. (2016) developed a five-step *(Identify, Choose, Create, Engage, Evaluate)* online instructional design model, built upon the traditional and online ID models. This ICCEE model retains the student enrolment and improves student engagement. Karthikeyan et. al. (2019) carried out a study to examine whether the integration of technology and pedagogical practices motivate the K-12 learners and inculcate the habit of self-learning practices among them. Nancy et. al. (2020) proposed a multilevel framework for integrating learning design and analytics in the curriculum component for supporting professional learning and technology development.

From the literature survey, it has been understood that only very few research work dealt with the instructional design models for online mode of teaching. The following research issues are identified from the literature survey: Do online classes engage students? Do they support and motivate them continuously? How do online classes bring behavioral changes among students? How do they sustain self-discipline among the students? Considering these issues, the following research questions were framed:

RQ1:How do online classes support student engagement?

RQ2:How far online classes support sustainability in learning?

In this paper, the authors proposed the ADDG$_9$E methodology for the blended mode of conducting online classes and for having better student engagement. The Computer Programming CP101x, a bridge course on C programming was given to the first-year students during their vacation in online mode, by adopting the ADDG$_9$E model. Section 2 describes the proposed methodology, section 3 discusses the results and section 4 concludes the paper.

I. METHODOLOGY

ADDIE and Gagne's Nine Events Instructional Design models have been adopted for teaching online classes and for having a high level of student engagement. The online teaching and learning process has four major activities like setting up a learning environment, content delivery in online mode, active student engagement, and assessment, as shown in Fig. 1.

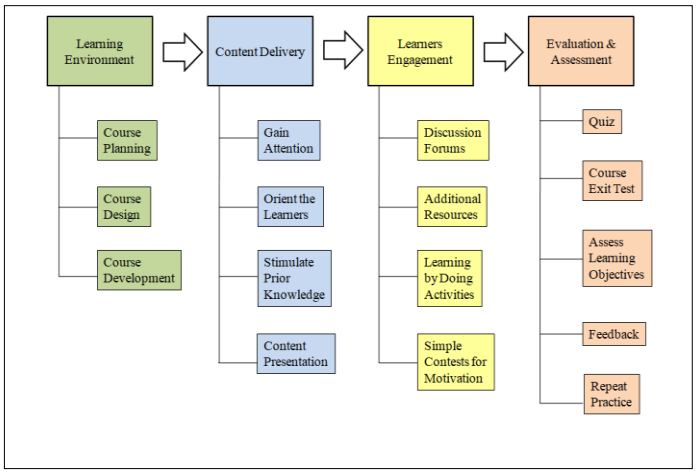

Fig 1. Proposed ADDG$_9$E Model for Online Teaching Learning

TABLE I
ACTIVITIES OF ADDG$_9$E MODEL

ADDIE / Gagne's Nine Events Instruction Model Sequences	Proposed ADDG$_9$E Model's Activities
Analyze (A)	Select Course, Identify target learners, Define
A1. Course Planning	Course Objectives, Identify a set of tasks, Assign tasks and responsibilities, Select Online Platform
Design (D)	Define Session Objectives, Define Assessment
A2. Course Design	Pattern and Grading Policy, Select software tools/packages, Promote course to target learners
Development (D)	Enroll learners, Prepare learning materials,
A3. Course Development	Upload videos, Prepare topics for Discussion Forums, Prepare Quizzes, Publish content
A4. Implementation (G9E)	Content Delivery
A4G1. Gaining Attention	Grab Attention, Connect to Learners Emotionally, Ask Questions Present Problem, Play Video
A4G2. Orient the Learners	Share session Objectives to Learners, Lay the foundation for Learning, Allow Learners to organize their Learning
A4G3. Stimulate recall of Prior Knowledge	Link session topic with prior learning, Bring all Learners to the same level, Use multimedia for Recall process (like quiz, flip cards, rapid-fire)
A4G4. Present Content Material	Blend information with image, audio, and video, Present short videos with Reflection spot, Ensure no overload to Learners
A4G5. Provide Learner Guidance	Share additional learning materials, Facilitate the assimilation of learning, Engage learners in Discussions, Moderate Discussions, Ensure conceptual understanding
A4G6. Elicit Performance "Practice"	Provide Learning by Doing activities, Share Video tutorials, Share solved problems, Quizzes with more than one attempt, Post challenging Questions, Ask Learners to post questions

A4G7. Provide Informative Feedback	Provide specific feedback to Quiz questions, Discuss solutions to challenging questions, Interact with learners for clarification, Motivate Learners
A5. Evaluation	Conduct Formative Assessment, Obtain Session Feedback, Conduct Summative Assessment, Obtain Course Feedback
A5G8. Assess Learning Objectives	Analyze learners performance, Issue Badges/Certificates
A5G9. Enhance Retention and Transfer	Conduct test after a month Check their performance in the related course

The proposed methodology used both these ID models: ADDIE model has been used for course planning, development, and evaluation; Gagne's 9 events model has been followed for content delivery and assessment of course objectives, as shown in Table I.

Course planning was done exhaustively by all Course coordinators. The choice of Learning Management System (LMS), a methodology for course content preparation, weekly schedule, session plan, and assessment plan was discussed and the detailed plan was prepared. The following evaluation and assessment strategies were adopted in ADDG$_9$E's model to have a higher level of learners engagement and motivation: (i) Learning by Doing (LbD) Quiz based on shared Lecture Content (ii) Assimilation Quiz (AQ) based on the additional Learning Resources shared (iii) Reflection Quiz (RQ) based on the Discussions in the Forum (iv) Knowledge Quiz (KQ) based on the overall knowledge from all types of resources (v) Course Exit Test at the end of the course. Based on this, the Grading Policy and eligibility criteria for the Certificate were defined for the course, as shown in Table II. The CP101x course was planned to run for 6 Weeks and the details of the activity planned and weekly schedule are shown in Tables III and IV.

TABLE II
GRADING POLICY AND ELIGIBILITY CRITERIA

Assessment Type		Weight	Number of Questions	Number of Attempts
Continuous Assessment Test (CAT)	Learning by Doing (LbDs)	10%	Vary depending on the topic	2 (Higher Grade)
	Assimilation Quiz	20%	10	1
	Reflection Quiz	10%	5	1
	Knowledge Quiz	30%	15	1
Exit Test (ET)	Course Exit Test	30%	30	1
Eligibility Criteria for Certificate				
Participation Certificate and Course Completion Certificate (with Letter Grade)		Overall Score >= 50% S: 90 - 100%; A: 80 - 89%; B: 70 - 79%; C: 60 - 69%; D: 55 - 59%; E: 50 - 54%		
Participation Certificate (Grade: P)		Overall Score 30-49% AND Activity Completion Progress >= 65%		

TABLE III
ACTIVITY PLANNER

S.No	Description	Planned Date
1.	Program Schedule, Task Allocation & Moodle Setup (trainingtce.gnomio.com)	01-May-2020 to 03-May-2020
2.	Learning Materials Development	04-May-2020 to 31-May-2020
3.	Assessment Quiz Preparation	03-May-2020 to 31-May-2020
4.	Criteria for Weekly Badges and Grading Policy Setup	6-May-2020
5.	Notification for Participants	03-May-2020 to 13-May-2020
6.	Course Registration by Learners	10-May-2020 to 15-May-2020
7.	Release of Learning Materials	Every week Wed
8.	Release of Assessment Tools	Every week Mon– Wed
9.	Course Exit Test	End of June 2020
10.	Participation Certificate / Grade Certificate	End of June 2020

TABLE IV
WEEKLY PLANNED ACTIVITIES

Description	Start Time	End Time
Course Content	Wednesday 9.00 am	-
LbDs	Wednesday 9.00 am	Wednesday 8.59 am
Discussions	Wednesday 9.00 am	Wednesday 8.59 am
Coding Challenges	Wednesday 9.00 am	-
Live Interaction	Sunday 6.00 pm	Sunday 7.00 pm
AQs, RQs, KQs	Monday 9.00 am	Wednesday 8.59 am

The course CP101x was implemented using Moodle (gnomio.com) for Learning Management System (LMS). The course content was shared in PDF format as well as in Video Lecture formats. Discussion Forums helped the learners to share their experiences and clarified their doubts or issues. Wikis gave support to learners for solving the Coding Challenges posted by IT companies for their campus recruitment process. This Wiki portal (inside the Moodle) was used as a platform for discussing the optimal solution for the challenges posed. Moodle Chat or WhatsApp Chat was used for Live interactions with Teachers.

The assessment plan ensured that all learners were participative in all the activities. Constructive feedback was provided to each learner for each activity. The learners who completed the activities for each week were given a Badge and an announcement was made in the WhatsApp group. This type of continuous support motivated the learners for participating in all the activities.

II. RESULTS AND DISCUSSIONS

The course CP101x was offered to first-year students after the completion of the second semester during their vacation. Before this course, 119 students had undergone a programming course namely Python programming during their second semester. Among them, 107 students registered for this bridge course; 96 students showed progress in the course, and 83 students earned the course completion certificate. In this paper, the performance of these 83 students and their behavior in online classes are analyzed and measured.

A. Student Engagement Activities

In the CP101x course, 116 participating instances were

consisting of 6 announcements, 61 learning resources, and 55 activities. The activities include 6 Discussion forums, 2 Wikis, 40 Quizzes, 6 weekly feedbacks, and a course exit feedback.

TABLE V
ACTIVITY DESCRIPTIONS

Description	Number of Activities	Total Marks	Number of Participations
Learning by Doing (LbD)	21	157	96
Assimilation Quiz (AQ)	6	60	92
Knowledge Quiz (KQ)	6	105	91
Reflection Quiz (RQ)	6	50	87
Exit Test (ET)	1	30	91

The Table V lists the different activities for the course CP101x. The screenshots shown in Fig. 2, depict the content management in Moodle and the activity log report of participants.

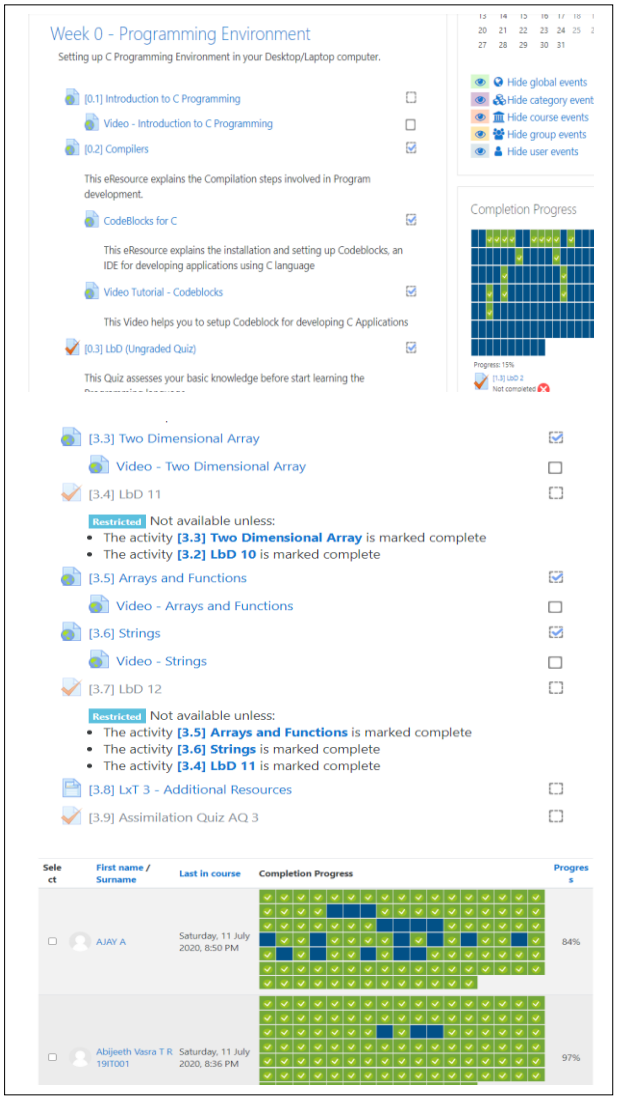

Fig 2. Content Management in Moodle and Activity Log Report

The learners were motivated and kept continuously engaged in different sets of activities. Tables VI, VII, and VIII show the number of participation in discussion forums/wikis, completion of KQs, and earners of weekly badges. The values from Tables VI, VII, and VIII support the first research question RQ1. The number of participants in different engaging activities proved that the learners were motivated to a greater extent.

TABLE VI
WEEKLY PARTICIPATION IN DISCUSSION FORUM / WIKIS

Number of Active Participants in Week 1	May 13 – May 20	49
Number of Active Participants in Week 2	May 20 – May 27	55
Number of Active Participants in Week 3	May 27 – June 13	34
Number of Active Participants in Week 4	June 10 – June 21	17
Number of Active Participants in Week 5	June 21- July 1	21
Number of Active Participants in Week 6	July 1 – July 8	10

TABLE VII
WEEKLY ACTIVITY REPORT (COMPLETION OF KQS)

Number of Participants completing Week 1 activities	May 13 –20	90
Number of Participants completing Week 2 activities	May 20 –27	68
Number of Participants completing Week 3 activities	May 27 – June 13	82
Number of Participants completing Week 4 activities	June 10 – 21	84
Number of Participants completing Week 5 activities	June 21- July 1	82
Number of Participants completing Week 6 activities	July 1 – 8	80

TABLE VIII
WEEKLY BADGES

Number of Registered Participants	107
Number of Active Participants (Week 0 to Week 6)	96
Number of Participants received Week 0 Badges	6
Number of Participants received Week 1 Badges	7
Number of Participants received Week 2 Badges	6
Number of Participants received Week 3 Badges	9
Number of Participants received Week 4 Badges	2
Number of Participants received Week 5 Badges	2
Number of Participants received Week 6 Badges	3

B. Assessment and Evaluation Reports

Formative and summative assessments were carried out for the course CP101x in different timelines. LbDs, AQs, and RQs constitute formative assessments whereas KQs and ET constitute summative assessments. Tables IX and X show the detailed assessment and grade report of the course CP101x.

TABLE IX
ASSESSMENT REPORT

Description	LbDs	KQ	AQ	RQ	ET	Total
Number of Students scored > 90%	56	0	1	0	3	0
Number of Students scored 70-89%	21	46	48	34	35	45
Number of Students scored 50 - > 69%	14	23	22	23	40	28
The number of students who scored < 50%	18	29	30	36	19	37
Number of students not Participated	23	34	31	39	35	22
Total Active Participants			96			
Total Registered Participants			107			

TABLE X
CERTIFICATE ELIGIBILITY AND GRADE REPORT

Participation Certificate & Course Completion Certificate with Grade A: 13 Students, Grade B: 32 Students, Grade C: 19 Students, Grade D: 6 Students, Grade E: 3 Students	73 Students
Participation Certificate	13 Students

The values from Tables IX and X further support the research question RQ1. The learners were participated in assessment activities enthusiastically and proved that they have utilized the opportunities provided to a greater extent.

C. Feedback Analysis and Report

The course CP101x obtained feedback from the learners every week, as shown in Table XI. The course got 89 responses for the course exit feedback, as shown in Table XII.

TABLE XI
WEEKLY FEEDBACK ANALYSIS

Description	Week1	Week2	Week3	Week4	Week5	Week6
Number of Responses	68	48	32	31	87	84
Number of Responses *(for the rating 3 to 5 – Good, Very Good, Excellent)*						
Adequacy of Learning Materials	67	47	32	30	86	83
Quality of Learning Materials	60	40	27	27	83	79
Complexity Level of Assessment Questions	57	48	32	30	86	83
Level of satisfaction	62	38	19	26	78	72

Description	Rating5	Rating4	Rating3	Rating2	Rating1
Level of writing C programs using conditions and looping statements	28	28	29	3	1
Level of writing C programs using functions	23	29	34	3	0
Level of writing C programs using arrays and strings	19	29	36	5	0
Level of writing C programs using structures and pointers	12	27	40	9	1
Level of writing C programs using file concepts	16	19	44	9	1
Quality of Learning materials (PDFs, Videos, other web resources) shared	25	38	24	2	0
Quality of Weekly Quiz Questions (KQs, AQs, RQs)	28	23	35	3	0

Description	Yes	No
Were you given the opportunity for interacting with the Faculty?	82	7
Were you given the opportunity for interacting with the other learners?	79	10
Was the participation in Discussion Forum useful to you?	81	8
Would you recommend this course to your friends?	83	6
Would you register here for another course?	73	16

The feedback survey also received textual comments from the participants. The word cloud formed from the feedback is shown in Fig. 3. The values from Tables 11 and 12 and Figure 3 support further to the research question RQ1.The course content, the mode of content delivery, and the assessment strategies used in this course benefited most of the learners.

Fig 3. Word cloud from the Learners Feedback

D. Sustainability in Learning

This section discusses the correlation between different student engagement activities and how they are supported in sustained learning. Table XIII shows the correlation values between different assessment activities like LbD, AQs, RQs, KQs, ET, and Total marks. From Table XIII, it is evident that LbDs support AQs, RQs, and KQs to some extent; AQs are the greatest support for performing well in KQs; it is also seen that there is a very low correlation between LbDs/AQs/KQ and ET. As LbDs, AQs and KQs are sequenced activities, there exists positive relationship between them. There could be various reasons like the learners would not have prepared for the exit test or would not have done it sincerely.

TABLE XIII
CORRELATION ANALYSIS

	LbDs	AQs	RQs	KQs	ET	Total_Marks
LbDs	1.000	-	-	-	-	-
AQs	0.705	1.000	-	-	-	-
RQs	0.649	0.814	1.000	-	-	-
KQs	0.668	0.873	0.824	1.000	-	-
ET	0.262	0.133	0.202	0.130	1.000	-
Total Marks	0.768	0.892	0.868	0.908	0.470	1.000

The scatter plot is drawn between the percent of activities completed and the total marks/ET marks. From Fig. 4, it is evident that the habit of completing all the activities helped those scoring higher marks in ET; also supported them to earn higher total marks. However, there exist few outliers such that their participation was poor but scored higher marks and it could be ignored. This supports the research question RQ1.It is evident that the online classes and the related assessment activities highly engaged the learners, which in turn supported them to score higher marks in the subsequent test.

The scatter plot is drawn between the marks of LbDs, AQs, KQs, and ET, and their relationship between them is studied, as shown in Fig. 5. It is seen that one who performed well in LbDs, also scored high marks in AQs and KQs; similarly, participation in AQs helped them in getting a good score in KQs. There exists no linear relationship between KQs and ET; however, KQs helped each learner to score more than 30% in ET. The lowest mark in ET was 9/30 and the highest mark was 29/30. Most of the marks were present in the range KQ marks ≥ 20 and ET marks ≥ 20. This supports the second research question RQ2. It is evident that the online classes and the student engagement activities supported them to perform well in the exit test; the assessment activities enabled sustained learning to the participants.

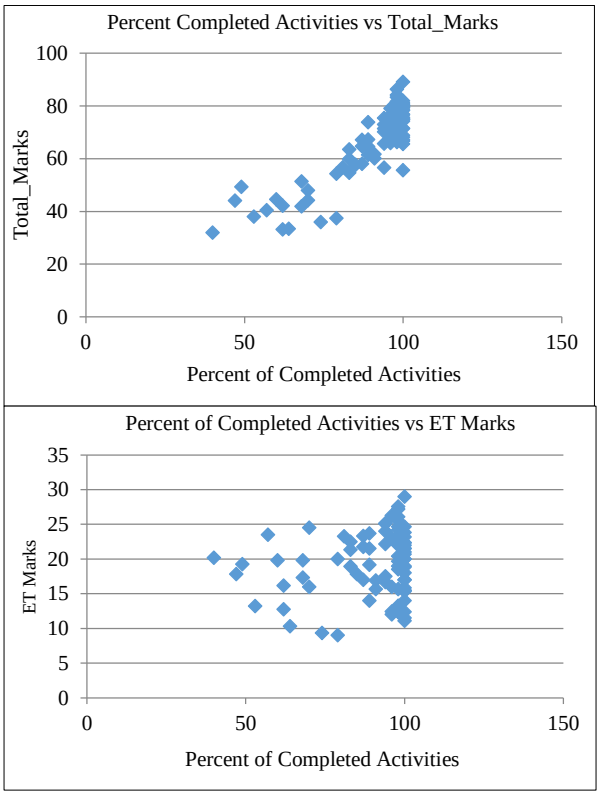

Fig 4. Correlation Analysis between Marks and Activities

The participants of CP101x had undergone Data Structures (DS) in their next semester and participated in the test after 3 months. The C programming concepts that they had learned through the CP101x course would have supported them in learning this course. Figure 6 shows the performance comparison of these participants between the scores of CP101x and Data Structures courses. The average score of all the participants in both the courses is shown in Fig. 6. More participants scored more than average marks of the DS course. It is seen that only one student scored <50 marks and all the other participants scored ≥ 50% in the DS course.

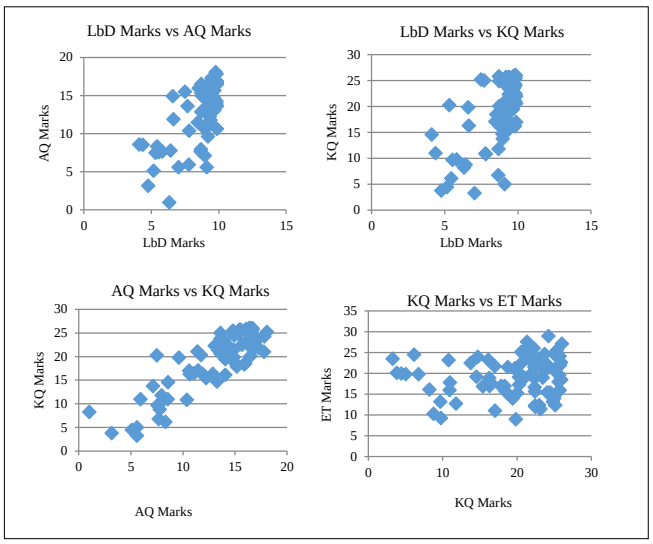

Fig 5. Correlation Analysis between various Quiz Marks

The expectation is that more data points to be placed in the Region 3 i.e. learners performed better in CP101x as well as in DS courses; fewer data points in the Region 1. 28 learners scored higher marks in DS course (Region 3); 20 learners were present in Region 1 and 22 present in Region 4. These 42 students scored ≥ 50% in the DS course. 85% (70/83) of learners got benefited from the CP101x course. They were able to use the learned concepts in the subsequent course and scored pass marks (≥ 50%). This supports the research question RQ2 that the online classes and suitable student engagement activities help the learners in the sustainment of learning.

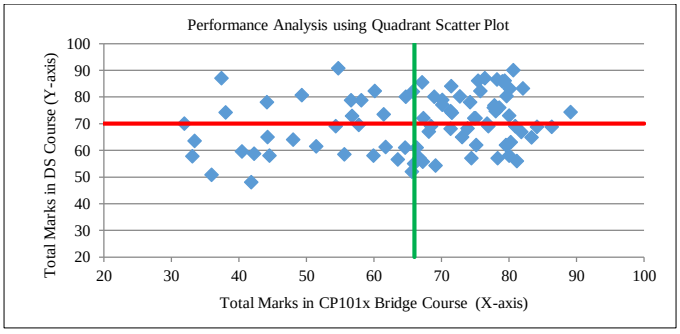

Fig 6. Performance Analysis – CP101x Course and Data Structures Course

Fig. 7 shows the comparative analysis of those 83 participants in three different courses: the python course *(during the second semester)*, Bridge course *(CP101x during their vacation)*, and DS course *(during their third semester)*. The participants who scored less than 50% in CP101x also got marks in the DS course and there is a considerable increase in the mark band 51-60 and 61-70 in the DS course, as also shown in Fig. 7.

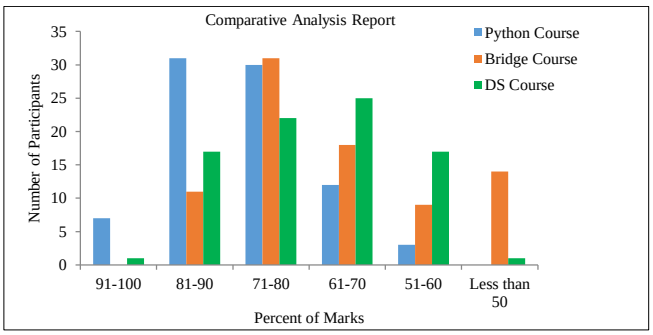

Fig. 7: Comparative Analysis – Python, CP101x Course, and DS Courses

Fig. 8 shows the performance of 15 students who performed low in the Python course (51-70%) and showed progress in CP101x and DS courses. 53% of these students (8/15) had shown improvement in the DS course while others got pass marks (≥ 50%) in the DS course. It gives strong evidence to research question RQ2 that the learners are motivated and the bridge course through online teaching mode would give additional support to learners.

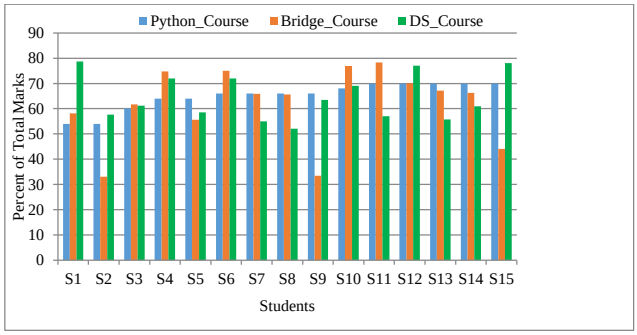

Fig. 8: Performance Analysis – Continuous Improvement

E. Hypothesis Testing

This research study has been further analyzed with hypothesis testing. Group 1 (controlled group) consists of 83 students who had undergone the CP101x course and Group 2 consists of 35 students who had not undergone the CP101x course. Both the groups of students had a Data Structures course in the same learning environment and appeared for the test. This test score has been used for the hypothesis testing to address the research questions RQ1 and RQ2. Null hypothesis H_{10}: The progress and the completion of activities does not require to get Pass marks in the course CP101x.

Alternate hypothesis H_{1a}: The progress and the completion of activities are required to get Pass marks in the course CP101x.

The correlation coefficient of two variables 'percent of completion of activities' and 'Total_score' is 75% and the p-value is 0. As the p-value for Group 1 (controlled group) is less than the significant value 0.05, the null hypothesis H_{10} is rejected and H_{1a} is accepted. The results of hypothesis testing H_{10} and H_{1a} are evident that the student engagement activities carried out during online classes supported the learners to get higher marks so that they are eligible for course completion certificate (RQ1).

1) Null hypothesis H_{20}: Average marks in the test for the DS course is $\mu < 70\%$
Alternate hypothesis H_{2a}: Average marks in the test for the DS course is $\mu \geq 70\%$

TABLE XIV
DESCRIPTIVE STATISTICS

	Group 1 (Controlled Group)	Group 2
Mean	70.38916	64.65714
Standard Error	1.1629	2.283276
Median	70	64
Mode	69	53
Standard Deviation	10.59452	13.50804
Sample Variance	112.2439	182.4672
Range	42.7	48
Minimum	48	40
Maximum	90.7	88
Count	83	35
Confidence Level (95.0%)	2.313378	4.640175
p-value	0.045	0.327

The descriptive statistics for both the groups are shown in Table XIV. As the p-value (0.045) for Group 1 (controlled group) is less than the significant value of 0.05, the null hypothesis H_{20} is rejected and H_{2a} is accepted. The results of hypothesis testing H_{20} and H_{2a} are evident that the online classes are effective and impart student engagement which in turn enables sustained learning among the students (RQ2). The most common value 0.05 is chosen as the significant value which means that hypothesis may fail with 5% chance for full population.

III. CONCLUSIONS AND FUTURE WORK

Online education is one among the essential activities of current Covid-19 situation. Engage the student's on the course is the real challenge for the teachers. In this work, a hybrid model ADDG$_9$E is proposed to design the instructional activities of an online course CP101x computer programming for the first-year engineering students. The students were participated in all the activities and 83 students received the course certificate successfully. From their participation data and log analysis, students' engagement, assessment, feedback, learning sustainability and hypothesis testing values are discussed in detail. From this discussion, it is the proposed ADDG$_9$E model is highly suitable for online education for enhancing the learner engagement. The ADDG$_9$E instructional model may bring challenges for the researchers when there are focuses on learner's styles, learner's skill and learner's attitude in online education.

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