

Adopting MOOC Based Approach for 'Self- Learning' of Students

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Abstract: One of the NBA graduate attributes addresses self- learning ability of students. Though courses like seminar, mini projects and project expose the students to independent learning to a certain extent, a separate one credit, non-instructional course was perceived at final year of Automobile Engineering curriculum. Two different approaches; one using modular course approach and the other, MOOCs based approach were used for deployment of the course. The article presents design, deployment as well course outcomes attainment details of the approaches. It draws conclusion based on the comparison between these two models and highlights effective use of MOOCs for self-learning as well as choice based credit system.

Keywords: self-learning, PO, modular course, MOOCs

1. Introduction

Life-long learning is one among the graduate attributes that the curriculum of any engineering program aims at. The students should demonstrate the ability to learn independently so that they would continue their learning even after completing their formal training. The curriculum of any engineering program typically comprises of various elements like theory courses, laboratory courses, mini projects, seminars, projects etc. in order to offer learning opportunities for the students. An effort is made through these elements to achieve various program objectives as framed for the program, based on the graduate attributes. Among these elements, seminars and projects mainly expose the students to self-learning.

A modular course typically comprises of number of modules and allows the flexibility in terms of choice for the students. A student can choose one or more modules as per the requirement of the curriculum. While designing curriculum for its undergraduate program at Automobile Engineering Department of Rajarambapu Institute of Technology, a separate one credit course was perceived at final year so as to encourage self learning ability of students. Two separate approaches were used for deploying the said course. Initially, a modular course Automobile Engg. Dept., R.I.T., Sakharale, MS 415414 satyajit.patil@ritindia.edu

comprising various industry relevant modules was

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designed and deployed. However, based on the review of the same, another approach using Massive Open Online Courses (MOOCs) offered by various platforms like National Programme on Technology Enhanced Learning (NPTEL), edX, Coursera etc. was tried for next cycle. This work presents details of these approaches and draws conclusions based on the comparison between the same. The article highlights effective use of MOOCs through program curriculum. There does not seem to be evidence of such an effort in the literature and hence the major contribution of the work lies in its originality.

2. Background for the Course on 'Self-Learning'

One of the graduate attribute as mentioned by NBA, AICTE for undergraduate engineering program is life-long learning [1]. A program outcome (PO) listed in [2] addresses the need and ability for life-long or self-learning. The student is expected to become self-reliant in his/her learning and hence demonstrate capability to learn independently. This becomes especially important as the student is supposed to acquire knowledge and skills on his/her own during his/her professional life. The undergraduate automobile engineering program aims to develop this capability amongst the students and thus established a program objective (PO) based on the same. The PO reads, 'Graduates will be capable of self-education and clearly understand the value of life-long learning.' Also, many students may not go for higher education after completing the program and thus it is felt appropriate to expose them to self learning at this stage. Also, there are areas/concepts like IPR, innovation management, venture capital, creativity in design and many more which are not being addressed in the curriculum but student exposure to them is essential. Exposure to such topics, it is felt, could be provided through such a course on self learning. This course was perceived to be one credit, choice based and non-instructional course with two contact hours per week offered in final year of Automobile Engineering. Since it is a non-instructional course, the contact period is primarily meant for assessment and evaluation purpose. Two separate approaches were used to deploy the course in two successive academic years viz. 2014-15 and 2015-16. In 2014-15, the course was deployed in modular form, hence referred to as 'Self Learning Modular Course (SLMC)'. In 2015-16, MOOCs offered by edX, coursera, NPTEL and Quality Enhancement in Engineering Education (QEEE) were used to deploy the said course. Details of these two approaches and comparison have been

presented in subsequent sections.

3. Modular Course on Self Learning

This section presents the approach adopted in academic year 2014-15 called as 'Self Learning based Modular Course (SLMC)'. Design and deployment details of the course along with CO attainment levels have been presented.

3.1 Design and Deployment of the Course

As mentioned earlier, SLMC was perceived as non-instructional one credit course offered at eighth semester of the program with two contact hours per week. The course comprised of five modules as listed below in Table 1.

Table 1 Modules of SLMC

Sr. No.	Modules
1	Intellectual Property Rights (IPR)
2	Technology Development (TD)
3	Innovation Management (IM)
4	Indian and Global Automotive Industry (IGAI)
5	Entrepreneurship (EDP)

The students were required to select any module of their choice. The course was perceived to attain the following outcomes as listed in following Table 2, on completion of the course.

Table 2 SLMC Course Outcomes

Sr. No	Expected Outcomes
1.	To demonstrate ability to learn/grasp the content independently or with little help.
2.	To address the industry & business needs in view of technology development and management.
3.	To interpret and present the business challenges and case studies by putting the theoretical knowledge in perspective.

ISE (In semester evaluation) mode was proposed for students' evaluation which meant the students' performance evaluation would occur throughout the semester. As a part of course deployment, week wise activity plan and evaluation plan were prepared and shared with the students. The learning resources for the modules like books, websites, various project reports and handbooks were shared with the students in order to facilitate the learning. After first 4-5 weeks wherein the students were engaged in orientation and

initial reading of the resource material, they were required to work on individual assignments/tasks related to module of their choice. Few of the assignments/tasks given to the students have been presented on sample basis in Table 3 below.

Table 3 Sample Assignments

Sr. No.	Module	Sample Assignments
1.	IPR	i. Patent search report on 'Eddy current brakes with ABS for automobiles'.
		ii. Report on 'Patents - Present Indian Scenario'
		iii. Report on "Patenting of Hybrid Vehicle Technology.
2.	TD	i. Development of Sugarcane Harvester at RIT: Power Source and Transmission.
		ii. Development of Digging Machine at RIT.
		iii. Development of BAJA Vehicle at RIT.
3.	IM	i. Development of Wireless Printing Technology
		ii. Social Networking Sites
		iii. Development of Autonomous Vehicle
4.	IGAI	i. SWOT A nalysis of Indian Automotive Industry with respect to Global Automotive Market.
		ii. Technology Change in Indian Passenger Car Industry: A Report
		iii. Report on Vehicle Testing Standards: Tests and Ratings. (ANCAP, EUNCAP, NCAP)
5.	EDP	i. A Case Study on Planning of Project by using Project Management Technique - Deterministic Project.
		ii. A Case Study on College Alumnus Who is now a Successful Entrepreneur.
		iii. A Case Study on Funding Agencies for Entrepreneurship.

Student evaluation was carried out through the semester continuously as per evaluation plan shared with students. The performance was evaluated on the basis of scores, the students obtained in examination (quiz/written test/presentations) based on learning resources, introductory talk on the assignment, progress presentations and quality of report submitted by the student.

1.2 Attainment of COs

In order to assess the attainment of the outcomes of this course, course end survey was conducted. Following Table 4 presents the attainment levels of the outcomes for the said course.

Table 4 Attainment of Course Outcomes of SLMC

Sr. No.	Expected Outcomes	% Attainment					
		IPR	TD	IM	IGAI	EDP	Average
1.	To demonstrate ability to learn/grasp the content independently or with little help	84.0	86.1	83.0	73.6	89.1	83.19
2.	To address the industry & business needs in view of technology development and management	78.6	83.0	84.6	70.0	78.7	79.02
3.	To interpret and present the business challenges and case studies by putting the theoretical knowledge in perspective	77.3	80.0	92.3	84.5	83.9	83.62

Compared to target attainment level of 75%, the achievement levels for the POs seem to be satisfactory. Though, the high attainment levels cannot be directly attributed to independent learning ability of the students, it definitely indicates growing confidence among the students for the same owing to exposure to SLMC.

4. Use of MOOCs for Self Learning

This section presents the MOOCs based approach adopted for the course on self-learning during academic year 2015-16. The course was christened as 'MOOCs based Self Learning Course (MSLC)'. Details regarding design and deployment of the course along with CO attainment status have been presented.

4.1 Design and Deployment of the Course

MSLC like SLMC, was planned as one credit course with two contact hours per week. However, instead of modules, freely available MOOCs were planned to be utilised for the said course. Thus, some 12 such MOOCs typically of 4-8 weeks duration offered by online platforms like NPTEL, edx, Coursera and QEEE from amongst which the students would choose from, were identified by a team of faculty members. The details of these MOOCs have

been presented in Table 5. The courses belonged to technical as well as non-technical topics which are relevant for typical engineering student. The students were required to choose any MOOC of their choice.

Table 5 MOOCs used for MSLC

Sr. No.	Title of course	Duration (weeks or hrs.)	Offered by	Dates
1	Basics of NVH and Its Measurement	Short term - 8 weeks course - 20 hrs.	NPTEL	January 18 - March 11, 2016
2	Principles of Human Resource Management	Short term - 8 weeks course - 20 hrs.	NPTEL	January 18 - 8 April, 2016
3	Introduction to Research	Short term - 4 weeks course - 10 hrs.	NPTEL	January 18 - 25 February, 2016
4	MATLAB Programming for Numerical Computation	Short term course - 20 hrs.	NPTEL	January 18 - March 11, 2016
5	Leadership for Engineers	5 weeks 2 - 4 hrs./week	DelftX- Delft University of Technology	January 5, 2016
6	Risk and Opportunity: Managing Risk for Development	4 weeks of study 4-6 hrs./week	Coursera	January 18 - 14 February, 2016
7	Technical English for Engineers	Short term course - 20 hrs.	NPTEL IIT Madras	January 18 - March 11, 2016
8	Introduction to Venture Capital: How to Get Money for Your Startup	6 weeks	RWTHAachen University	January 26, 2016
9	Intellectual Property Law and Policy - Part 1: IP and Patent Laws	6 weeks	University of Pennsylvania	February 2, 2016
10	Creative Problem Solving and Decision Making	40 hrs., self-paced	Delft University of Technology	
11	Introduction to Project Management	6 weeks 2 - 3 hrs./week	University of Adelaide	February 17, 2016
12	Introduction to Management Information Systems (MIS): A Survival Guide	7 weeks 3 - 4 hrs./week	Universidad Carlos III de Madrid	February 23, 2016

Following course outcomes as presented in Table 6, were expected to be met by the students on completion of the course.

Table 6 MSLC Course Outcomes

Sr. No.	Expected Outcomes
1.	Appreciate the use of MOOCs for independent learning.
2.	Build confidence to complete a course independently.

Care was taken to choose the MOOCs which were being offered during the semester period. The list of the MOOCs was shared with students well before the beginning of semester so that they got ample time to make their choice. Weekly plan and evaluation plan were prepared and shared with the students in first week itself. A progress sheet as presented in fig.1 was designed to track students' progress during the course. The same could also be tracked with the help of progress sheet of the student available on the platform. Fig. 2 presents screenshot of one such report as a sample. The role of faculty during the contact hours was limited to collect feedback on the student learning through interactions and encourage them for further learning. The students were encouraged to share their learning with the peers in the batch during the contact hours. As a part of the MOOC, the students were required to take quizzes and work on assignments. On completion of the MOOC, the students were required to give formal presentation on the learning in front of the faculty and peers; and submit brief report on the same. The criteria for students' evaluation are weekly progress reports, scores obtained in online tests/assignments/quiz, final presentation and final report. The evaluation scheme is presented in Table 7.

Day:		Date:		Reporting Time:	
Title of Course:					
Name of Student			Enrollment No.		
Work carried out in PREVIOUS WEEK :					
Course content covered:					
Brief on MOOC sessions attended					
Additional references used					
Assignment / Quiz status					
Discussion with supervisor / colleagues.					
Any OTHER TASK carried out (not covered above):					
Supervisor's comments: (Suggestions / Targets etc.)					
Name of Supervisor :					
Signature of Supervisor			Signature of Student		

Figure 1 Weekly Progress Tracking Sheet

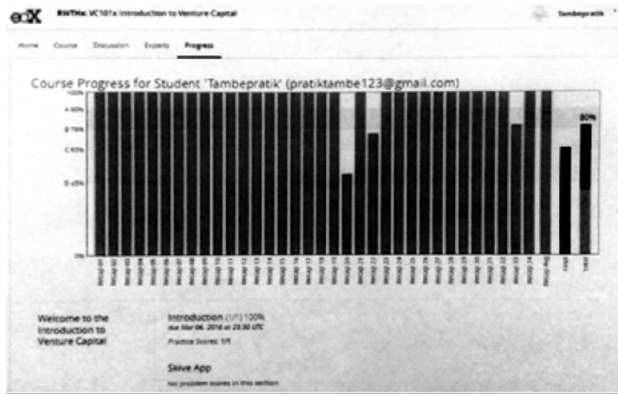


Figure 2 Progress Status of a Student on MOOC Platform

Table 7 Evaluation scheme for MSLC

Weekly progress (10)	Final Report (10)	Online Marks (15)	Presentation (15)	TOTAL (50)
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4.2 Attainment of COs

Attainment of course outcomes was mapped through course end survey. Following Table 8 presents the attainment levels of the outcomes for the MSLC approach.

Table 8 Attainment of Outcomes of MSLC

Sr. No.	Expected Outcomes	CO Attainment (%)
1.	Appreciate the use of MOOCs for independent learning.	78.87
2.	Build confidence to complete a course independently.	75.96

Compared to target attainment level of 75%, the outcomes level have been met for both outcomes, though they are falling slightly short of attainment levels obtained for SLMC approach as reported in section 3.2. The slight difference is attributed to random variations.

5. Discussions based on Comparison Between Two Approaches

This section presents discussions based on comparison between the above presented two approaches viz. SLMC and MSLC for the course on self-learning.

5.1 SLMC Approach

In case of SLMC, the approach is less structured and hence required efforts to bring clarity to the students as well as faculty members. It is demanding for the faculty members to come up with innovative individual assignments for the students. It is especially true when the class size is of the order of 80-90 students. Also, heterogeneity of students in the class meant few students enjoyed the challenging assignments while others could not meet the demands as per expectations. Mixed reactions were received from students about the course when the feedback was taken. This in fact, led the authors to try a new approach towards the course.

5.2 MSLC Approach

In case of MSLC, the students had wide variety of topics to choose from. They were exposed to courses offered by reputed institutions and universities at national and international level. The students showed preference towards a digital medium like MOOCs. Use of MOOCs provided more flexibility in terms of pace of learning and time. The student progress could be tracked on the platform as the course progresses. Use of MOOCs enabled few students to switch over from one course to the other as the different courses opened up at different stages. This helped students who either lost motivation for the course midway or couldn't cope with the course or for some reason wanted to switch over.

Based on student feedback, it seems there are some minor problems associated with MOOCs. Direct interaction with faculty members as in case of conventional classroom is not possible. Though, the platforms provide discussion forums for such interactions, it has its own limitations. Another fact brought to the fore by students is lack of Indian context for the case studies/examples shared by faculty from foreign university. Majority of such universities/institutions offering the MOOC belong to either USA or Europe and the students are required to relate the learning in Indian contexts. Difficulty levels of MOOCs are different and thus student evaluation on same scale may not be possible. Difficulty in understanding the pronunciations of foreign faculty and poor audio quality, in some cases, are the issues with MOOCs model. However, with the feature of subtitles, it remains no more relevant. For evaluation purpose, the grade a student earns cannot be solely relied upon since it is possible for the student to take

someone's help while taking quizzes or completing the course assessments. This is another limitation of this model.

Recently, The University Grants Commission (UGC) through its UGC (Credit Framework for Online Learning Courses through Study Webs of Active-Learning for Young Aspiring Minds [SWAYAM]) Regulation, 2016, released on 19th July, 2016 [3] has notified the credit transfer policy for MOOCs available on its platform 'SWAYAM'. The UGC has also released list of around 2000 MOOCs based on diverse areas that would be hosted by SWAYAM. It is argued that use of MOOCs through such courses shall be a step towards choice based learning and help implement choice based credit system (CBCS).

6. Conclusion

The article presents two different approaches namely SLMC and MSLC towards a course on self-learning. The details regarding design and deployment of these models have been presented along with attainment levels of course outcomes obtained through course end surveys. Based on comparison as presented in the work, MSLC model

owing to scalability, exposure involved for students and acceptance by students, appears to be better as compared to SLMC though there doesn't seem to be significant differences with regard to course outcomes attainment levels. Self-learning course using MOOCs could be used to build confidence among the students about independent learning.

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