

# Analysing the Impact of MOODLE and its Modules on Students Learning, a Case Study in Mechanical Engineering

Trishul P. Kulkarni<sup>1</sup>, Dr Bhagwan G. Toksha<sup>2</sup>, Dr Santosh P. Bhosle<sup>1</sup>, Bijlee Deshmukh<sup>3</sup>

<sup>1</sup>Department of Mechanical Engineering, Maharashtra Institute of Technology, Aurangabad, India

<sup>2</sup>Department of Basic Science and Humanities, Maharashtra Institute of Technology, Aurangabad, India

<sup>3</sup>Department of Civil Engineering, Maharashtra Institute of Technology, Aurangabad, India

<sup>1</sup>trishul.kulkarni@mit.asia

<sup>2</sup>bhagwan.toksha@mit.asia

<sup>3</sup>santosh.bhosle@mit.asia

<sup>3</sup>bijlee.deshmukh@mit.asia

**Abstract:** A systematic study is carried out as a specific case on analyzing the impact of ICT tool particularly MOODLE and its modules on students learning. Course named Manufacturing Processes offered in fourth semester of degree program in Mechanical Engineering is selected. A course offering is made through blended mode consisting conventional face to face learning and online learning through MOODLE and compared with control group. This paper reports the effectiveness of using technology in blended fashion over the conventional face to face learning. Success rate in content based test is found to be 21% more over the control group. Statistical parameters evaluated for content based test are found in favor of strong participation with the t-value 2.617, the P-Value is 0.013. The result is significant at  $p < 0.05$ . A post course survey is employed to analyze the effectiveness and acceptance among participants about various MOODLE modules.

**Keywords:** Information and Communication Technology (ICT), MOODLE, Blended Learning.

## 1. Introduction

ICT (Information and Communication Technology) is extensively applied all over the world in various educational systems. In the current scenario it is almost impossible to think about the teaching and learning process without use of ICT. In recent times, ICT based educational tools are employed for collection of data, processing of information and knowledge creation (Costa et al., 2012). The growing ICT infrastructure has produced an opportunity for every educational institution to use the internet as a communication medium with the students. For an effective and efficient access to learning materials, e-learning is becoming a crucial resource for Institutions (Kakasevski et al., 2008; Waterhouse, 2005). Learning Management Systems (LMS) is one of the most important instructional components of ICT. The reports on Learning Management Systems such as MOODLE and its various capabilities are present in literature (El-Bahsh and Daoud, 2016).

Open source ICT-based educational tool like Modular Object-oriented Dynamic Learning Environment (MOODLE) (<https://MOODLE.org>) is the most widely used platform. It is an open-source Learning Management System that supports an extensive set of educational features, such as interaction, feedback, conversation, and networking. These features are key parameters for success of the educational process. MOODLE contains advanced methods of teaching and learning which have been implemented and used in several higher education

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**Trishul P. Kulkarni**

Department of Mechanical Engineering,  
Maharashtra Institute of Technology, Aurangabad, India  
trishul.kulkarni@mit.asia

institutions across the globe. MOODLE offers the creation, organization, announcement, communication, collaboration, and assessment of learning and educational activities. Acceptance of such information technology tool is being examined at high school level is available in literature (Atefeh et al., 2011).

Horton (2006) defined the term blended learning as 'any mixture of any form of learning possible: classroom, virtual-classroom, or standalone e-learning'. Kester et al. (2007) describe a system (using MOODLE) that helps learners to match their knowledge with complementary content expertise in reaction to requests for knowledge sharing. Authors (Martín-Blas et al., 2009) and (Caridade et al., 2012) provided the subject specific use and incorporation of LMS particularly MOODLE. Reports are available about benefits of using e-learning platforms (S.S. Mahmoud, 2008; A. Moura et al., 2009). Recently Impact of an eLearning Platform is being studied on online courses about tourism destinations (Garbani-Nerini et al., 2018) and learning experiences outside school through blended learning environment is also explored (Coll et al., 2018).

In past few years use of ICT in various higher education streams are being carried out. Sumak (Sumak et al., 2011) reported factors affecting acceptance and use of Moodle in faculty of Electrical Engineering and Computer Science. This study concluded empirically that the actual use of Moodle depends on two main factors i.e. behavioural intentions and attitudes toward using Moodle. Méndez (Méndez et al., 2011) reported motivational features in blended learning using Moodle platform to an introductory Engineering course. In this study course wise participation index is studied. Open source learning platforms like Moodle are also implemented in medical courses. Seluakumaran (Seluakumaran et al., 2011) explored use of Moodle in physiology medical course. It was concluded that incorporating Moodle improved student performance in their final summative exams and had a positive impact on student learning outcomes.

The aim of the present paper is to analyze the impact of blended mode with tools available in the MOODLE platform in support of conventional classroom teaching. It discusses the results of a study carried out in the mechanical engineering department through the application of tools like pre-course

survey, content based test and post-course survey to students with the objective of characterizing the use of MOODLE and of its main modules.

The paper intends to contribute to systematization of the educational activities with the respective modules available in MOODLE. It aims to analyze the response of the students to the blended mode and its effectiveness on learning occurred in Mechanical Engineering course.

## 2. Methodology

A batch of 70 students was selected for blended mode for the course of Manufacturing Processes offered in fourth semester in the department of Mechanical Engineering. Although face to face instructional mode is compulsory for all the students, use of online course was optional. MOODLE is used as LMS through which online course is offered. Conventionally for such studies only one group is selected and test is conducted before and after the treatment. In the present study along with experimental group (WP and SP) a control group of students defined as NP who have not used blended mode is used for analysis.

This blended course was offered for the duration of one semester, students were categorized into three categories based on their participation in online course, No Participation (NP), Weak Participation (WP) and Strong Participation (SP). No participation (NP) is the control group in the present study and this NP group has not participated in online component of course by their own choice. Once students opted for blended mode after a due date, the registration for online course was closed. No participation is defined as students have not opted for Blended mode, weak participation is defined as student opted for blended mode but participated in less than 50% of overall activities offered through online course, and strong participation is defined as student opted for blended mode and participated in more than 50% of overall activities offered through online course.

Students were briefed about LMS and encouraged to register and use the MOODLE regularly. Online course using MOODLE was designed and developed by authors based on university curriculum. It was offered through online service provider website [www.gnomio.com](http://www.gnomio.com). (<https://www.gnomio.com/>) Various modules were provided through this platform

namely Video lectures, Quiz, Lessons, Assignments, Chat Forums and external links related to content. Lessons along with text include links, images, and flash animations. Out of the available modules Video lectures, Quiz and text/slides were selected for analysis in the present work.

A survey regarding online learning exposure was conducted at the beginning of the course. A content based online multiple choice test was conducted for all the three groups. Test data was analyzed by using statistical test. At the end of course, feedback questionnaire regarding blended mode was collected using a four point Likert Scale. Response to every item is based on scale from 1 to 4, wherein 1 = Strongly Disagree, 2 = Slightly Agree, 3 = Agree, 4 = Strongly Agree. High score shows positive perception towards the blended learning. Procedural flowchart adopted in the present work is as shown in figure 1.

### 3. Problem Statement

The problem statement of this report is defined to determine the effectiveness of a blended learning approach using MOODLE and to determine students' achievement in a pilot study for a specific course with following objectives,

1. To carry a systematic study beginning with awareness of ICT to the extent of understanding in blended mode environment.
2. To investigate to what extent a blended learning approach using MOODLE could affect students' achievement.

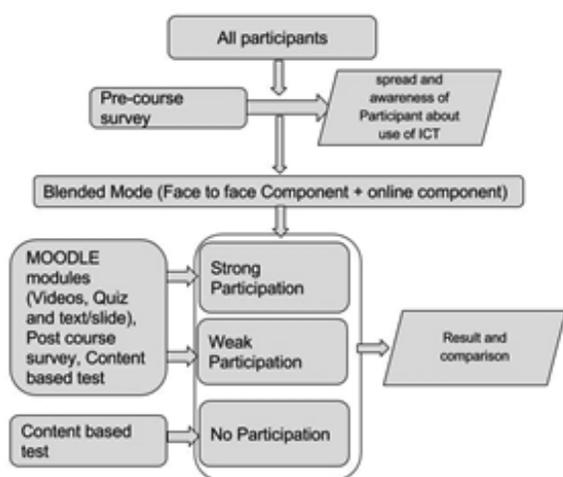


Figure 1 : Methodology flowchart

3. To examine the MOODLE modules in a blended mode that improves students' participation.
4. To determine the relevance of blended learning approach using MOODLE and students learning.

To understand the spread and awareness of participants about use of ICT, a pre course survey was conducted, It was found that all participants have smart phone and access to internet. Most of them (82.8%) had no previous experience of taking online course. Frequency of using ICT tools like watching educational videos and reading e-books is 10% never used, 31% rarely used, 31% often used and 28% regularly used. Response to question 'How much you are interested to take online course?' reveals 80% of participants showed interest in taking course through online mode, however about 84% of all students registered for online course and 50% of all students strongly participated in online course.

Table 1: No of students and average marks obtained by students for different levels of participation

Sr No	Level of participation	No of students	Average marks obtained by students (Maximum marks 20)
1	No Participation	11	10.72
2	Weak Participation	24	12
3	Strong Participation	35	14.05

Average marks obtained by students vs. Level of Participation

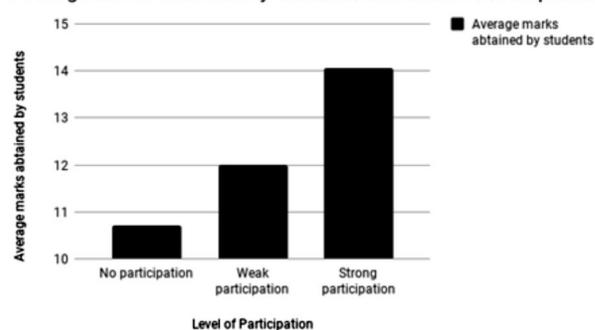


Figure 2: Graphical representation of average marks obtained by students for different levels of participation

The result of average marks obtained by students in content based test for different levels of participation is presented graphically in figure 2. It can be observed that NP group has scored least marks, while SP group has scored highest marks. The success in terms of performance in test revealed that the SP group performance was higher than WP and NP groups. The

percentage change in test marks of NP to WP group were 12% and that of WP to SP group were 17%. Statistical analysis using single t-test is performed to test whether SP group has better performance compared with the class average. T-test reveals that t-value is 2.617 and p-Value is 0.013, the result is significant at  $p < 0.05$ . The t-test result showed statistical significant difference between SP and rest of the students (Boslaugh, 2012).

**Table 2: Descriptive analysis of configured modules in MOODLE**

Sr No	Item	WP		SP	
		Mean	Standard Deviation	Mean	Standard Deviation
1	Watching videos through online component helped me to learn efficiently	3.41	0.59	3.61	0.58
2	Watching videos through online component improves my academic performance	3.39	0.63	3.62	0.61
3	Overall, Watching videos through online component is advantageous for my learning	3.42	0.71	3.67	0.51
4	Attempting quiz through online component helped me to learn efficiently	3.01	0.68	3.51	0.6
5	Attempting quiz through online component improves my academic performance	3.02	0.65	3.48	0.63
6	Overall, Attempting quiz through online component is advantageous for my learning	3.01	0.62	3.04	0.67
7	Access of text/slides through online component helped me to learn efficiently	3.17	0.67	2.86	0.58
8	Access of text/slides through online component improves my academic performance	3.14	0.68	3.41	0.52
9	Overall, Access of text/slides through online component is advantageous for my learning	3.31	0.64	3.44	0.51

Table 2 compiles the descriptive analysis of modules in MOODLE and blended mode. It is evident from table 2 that the highest mean item in case of WP group was item no 3 “Overall, Watching videos through online component is advantageous for my learning” while the lowest item in case of WP group was “Blended mode makes it easier to learn” Finding reveals that WP group has positive perception towards use of videos for learning compared to other two selected configured modules and neutral perception towards blended mode. The WP group has shown lowest positive perception towards quiz modules as evident from the item no 4, 5 and 6. Also it is observed from table that all items scored near and above 3.0 which mean WP participants' perception about all three modules is positive. Data indicates watching videos related to educational content makes their learning more effective and efficient.

As shown in table 1, The highest mean item in case of SP group was item no 3 “Overall, Watching videos through online component is advantageous for my learning” while the lowest item in case of SP group was “Access of text/slides through online component helped me to learn efficiently”. Finding reveals that SP group has positive perception towards use of videos for learning on other two selected configured modules. Also it is observed from table that all items scored near and above 3.0 which mean SP participants' perception about all three modules is positive. Data indicates watching videos related to educational content makes their learning more effective and efficient.

Comparison between WP and SP group about three selected modules and overall blended approach indicate very interesting findings. Overall mean values and standard deviation values are significantly different from each other for SP and WP groups. These values follow a consistent trend indicating behavioral difference as a specific attribute of the groups. SP group has highest difference for mean values related to quiz module over WP group and considerable difference in 'Access of text/slides' module. Watching videos has a positive perception for both groups slightly to higher side for SP group.

Feedback analysis with NP group with all twelve parameters is null value as they were not participating in the any of online activities by choice.

As outcome of the present study, in order to

implement blended learning mode at policy level successfully, following guidelines may be beneficial,

1. Institutional Support in regard to infrastructure
2. Training for course design and development of online component through structured online courses and expert lecturers
3. Development of the pilot programme
4. Teaching and learning updates are to be provided on best practices
5. Students scaffolding and training to adopt blended mode
6. Trained support staff within the faculties
7. Assessment of online course has to be devised

## 5. Conclusions

This study presents data about students' awareness about ICT particularly MOODLE and its effectiveness for an engineering course. The major conclusions derived from the present study are

1. Previous exposure of online learning technology tools contributed positively to be a part of SP group and it also has a positive impact on their performance.
2. Usage of MOODLE plays important role in success of students and hence this study encourages engineering faculty members to utilize such tools.
3. This research contributes to MOODLE modules acceptance among students as per the data presented in table 1 and 2. It is also concluded from SP group performance that blended mode have positive impact on their learning progress in the engineering context.
4. Descriptive analysis concludes that there is significant weightage to behavioral difference of the participants towards usage of MOODLE and its modules.

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