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Improvement of Student learning outcomes by implementation of Model Making Approach for Student Evaluation

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Abstract: There are various methodologies adopted for educational improvement. While looking at the conventional method of educational evaluation, there is quite lesser exposure to the practical implementation of the concepts which are taught in class during theoretical evaluation. To cope with this issue we have developed this method of evaluating the students based on designing and preparing the working model of the mechanism. This will help them to make use of the theoretical principles which they are studying for practical mechanism making and making working model from the same. It will ultimately enhance their skills while reducing the burden of coping up with large content of syllabus and even improving result as a whole. We implemented this method and ultimately found substantial improvement in the burden over students with corresponding improvement in the results while comparing the results of similar batch for other examinations, or comparing the results with previous batch of students.

Keywords: Evaluation Method, Model making, Assessment Method, Working Principle, Rubric

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1. Introduction

There have been great recent advances in terms of educational improvement or advancement in current scenario. Sticking with the traditional education system and evaluating students just based on their writing content or their writing skills will not suffice the current Industrial need. In subject like theory of machines where students are taught about various mechanisms and their applications for proper functioning of machine it is quite essential for even meeting with the practical needs for learning the subject. Hands on training of the students will make them more Industry ready and will even enable them to deal with any of the practical scenario which they face.

Even it is necessary to make them realize how a particular mechanism is essential for proper functioning of the machine and how that mechanism is contributing towards the working of the machine itself. For judging this it is essential over actual working of the mechanism and even to understand the principal which is behind the working of the mechanism. This understanding of the principle will even enable them to deal with the scenarios where they have to use this principle in a quite different way or need to twist the principle for making it suitable for the scenario which they are facing.

For having all this conditions to actually incorporate on ground it is essential that students are having through understanding of the concepts of

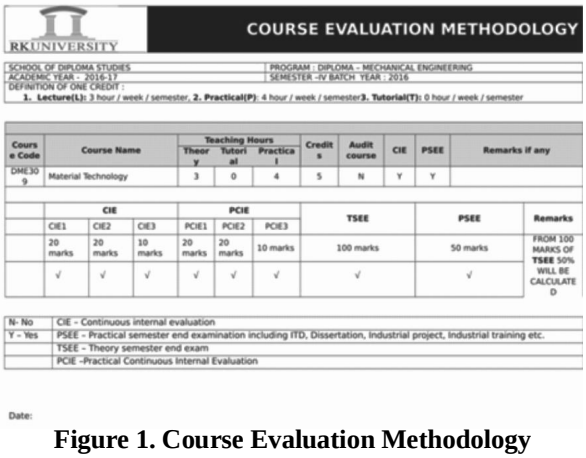
different mechanisms. For this it is further essential that students are having hands on training over making of a mechanism and even handling the mechanism. This makes it necessary that they develop the mechanism and make it work based on specified standards requirements which are required. It will make them understand how particular part of the mechanism will be functioning in a particular situation.

To make this possible we faculties at RK University have incorporated the making of the mechanism and making it function as a part of our examination. Being part of the examination it will encourage students to actively participate in this event and even learn the principles behind each of the mechanism used. Different mechanisms which were produced by the students were finally used for exhibition for making other students aware and even to encourage them for such activities.

2. Assessment Methodology

Figure 1 demonstrates the course evaluation methodology for the subject of Theory of Machines. This evaluation was carried out during the Second Continuous Internal Evaluation (CIE – 2). Evaluation included preparation of the model and finally showcasing the actual working of the mechanism model which is prepared. This showcasing includes actual working of the mechanism and explaining the actual working mechanism of the model. Students showcased the working of mechanism while showcasing its importance and various areas where this mechanism's can further be implemented.

From total marks of 150 for theoretical assessment of students, students are evaluated by this method in



RKUNIVERSITY

COURSE EVALUATION METHODOLOGY

SCHOOL OF DIPLOMA STUDIES | PROGRAM : DIPLOMA - MECHANICAL ENGINEERING
ACADEMIC YEAR - 2016-17 | SEMESTER -IV BATCH YEAR : 2016
DEFINITION OF ONE CREDIT :
1. Lecture(L): 3 hour / week / semester, 2. Practical(P): 4 hour / week / semester3. Tutorial(T): 0 hour / week / semester

Course Code	Course Name	Teaching Hours: Theory	Tutorial	Practical	Credits	Audit course	CIE	PSEE	Remarks if any
DME309	Material Technology	3	0	4	5	N	Y	Y	

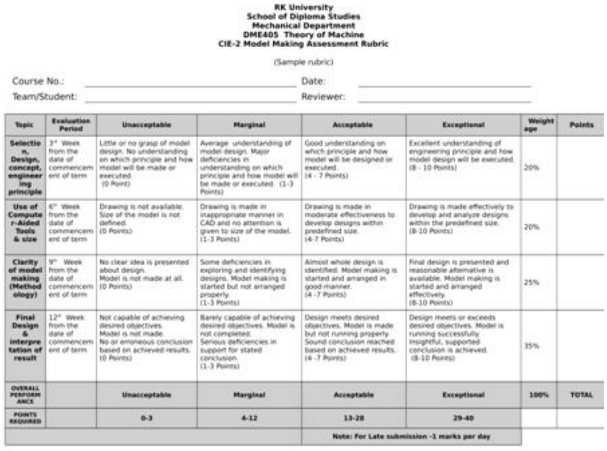
CIE			PCIE			TSEE	PSEE	Remarks
CIE1	CIE2	CIE3	PCIE1	PCIE2	PCIE3			
20 marks	20 marks	10 marks	20 marks	20 marks	10 marks	100 marks	50 marks	FROM 100 MARKS OF TSEE 50% WILL BE CALCULATED
√	√	√	√	√	√	√	√	

N- No	CIE - Continuous internal evaluation
Y - Yes	PSEE - Practical semester end examination including ITD, Dissertation, Industrial project, Industrial training etc.
	TSEE - Theory semester end exam
	PCIE -Practical Continuous Internal Evaluation

Date:

Figure 1. Course Evaluation Methodology (Theory of Machines)

the slot of 20 marks for Second Continuous Internal Evaluation (CIE-2). They were assessed based on various parameters which are provided in Rubrics of the evaluation. In this students were analyzed based on four parameters of Unacceptable, Marginal, Acceptable and Exceptional.



RK University
School of Diploma Studies
Mechanical Department
DME405 Theory of Machine
CIE-2 Model Making Assessment Rubric

(Sample rubric)

Course No.: _____ Date: _____
Team/Student: _____ Reviewer: _____

Topic	Evaluation Period	Unacceptable	Marginal	Acceptable	Exceptional	Weightage	Points
Selection, Design, concept, engineering principle	3rd Week from the date of commencement of term	Little or no grasp of model design. No understanding on which principle and how model will be made or executed. (0 Point)	Average understanding of model design. Major deficiencies in understanding on which principle and how model will be made or executed. (1-3 Points)	Good understanding on which principle and how model will be designed or executed. (4 - 7 Points)	Excellent understanding of engineering principle and how model design will be executed. (8 - 10 Points)	20%	
Use of Computer-Aided Tools & size	6th Week from the date of commencement of term	Drawing is not available. Size of the model is not defined. (0 Points)	Drawing is made in inappropriate manner in CAD and no attention is given to size of the model. (1-3 Points)	Drawing is made in moderate effectiveness to develop designs within predefined size. (4-7 Points)	Drawing is made effectively to develop and analyze designs within the predefined size. (8-10 Points)	20%	
Clarity of model making (Methodology)	9th Week from the date of commencement of term	No clear idea is presented about design. Model is not made at all. (0 Points)	Some deficiencies in exploring and identifying designs. Model making is started but not arranged properly. (1-3 Points)	Almost whole design is identified. Model making is started and arranged in good manner. (4 -7 Points)	Final design is presented and reasonable alternative is available. Model making is started and arranged effectively. (8-10 Points)	25%	
Final Design & interpretation of result	12th Week from the date of commencement of term	Not capable of achieving desired objectives. Model is not made. No or erroneous conclusion based on achieved results. (0 Points)	Barely capable of achieving desired objectives. Model is not completed. Serious deficiencies in support for stated conclusion. (1-3 Points)	Design meets desired objectives. Model is made but not running properly. Sound conclusion reached based on achieved results. (4 -7 Points)	Design meets or exceeds desired objectives. Model is running successfully. Insightful, supported conclusion is achieved. (8-10 Points)	35%	
OVERALL PERFORMANCE		Unacceptable	Marginal	Acceptable	Exceptional	100%	TOTAL
POINTS REQUIRED		0-3	4-12	13-28	29-40		
				Note: For Late submission -1 marks per day			

Figure 2 Rubrics for Model Making Assessment

We will be discussing regarding various assessments which were carried out during the semester.

1. First assessment carried 20% of the weight age. This assessment was carried out considering Selection of the mechanism concept for model preparation, its design method adopted and finally over the engineering principle which is utilized for its successful implementation. Its evaluation was scheduled on 3rd week of the date of commencement of the term.

2. Second assessment was carrying 20% of the weight age. This assessment was carried out taking into account how much student is utilizing Computer Aided tools for their drafting or design work of their mechanism. It includes how student is utilizing CAD for drafting the mechanism based on predefined size. This evaluation was carried out during 6th week of the commencement of the term.

3. Third assessment was carried out for evaluating the clarity which student possess regarding the model making. It included the methodology adopted for its preparation. This evaluation carried 25% of the total weight age of total assessment. This assessment was carried out during 9th week

of the commencement of the term. In this assessment final design is presented and reasonable alternative is identified. Systematic model making is started during this period and arrangement of the final process is made effectively.

4. Final assessment was carried out concerning the final design and interpretation of the result. This evaluation carried total weight age of 35% of the total score. It assesses whether the model is running successfully with desired output. It even gives insights over whether successful conclusion is achieved. This assessment is carried out during 12th week of the commencement of the term.

All this evaluation procedure finally gave the total score for the Second Continuous Internal Evaluation of the Students.

3. Results

This evaluation method was adopted for the subject of Theory of Machines. This technique is adopted since two academic years. We have collected all the data for the assessment marks of the students while adopting this evaluation method which were finally analyzed. This assessment is adopted during the academic term of 2015-16 and 2016-17. Results obtained in CIE – 2 during this academic term were compared with the results obtained during CIE – 1 for the same students. Even the results were compared with the results obtained during the academic year of 2013-14 and 2014-15, CIE-2 examination.

Figure 3 shows the graph which is comparing marks distribution for CIE – 2 examinations for the subject of Theory of Machines over different Academic Year. It can be judged from the graph that results can be substantially improved over subsequent academic years after implementation of the assessment method of Model Generation. It can be studied from the graph that results over the Academic Year of 2016-17 and 2015-16 is quite improving gradually as compared to the results and average score per student during the academic years of 2013-14 and 2014-15 for the same CIE – 2 evaluations for the subject of Theory of Machines.

Even while comparing the marks for CIE – 1 and CIE – 2 examination for the Theory of Machines it is observed that there is substantial improvement in the overall obtained marks distribution of the students in CIE – 2 as compared to CIE – 1 during the academic term of 2016-17 and 2015-16 while implementing the Model Making as an evaluation method as compared to conventional evaluation procedure. This is represented schematically in Figure 4 and Figure 5.

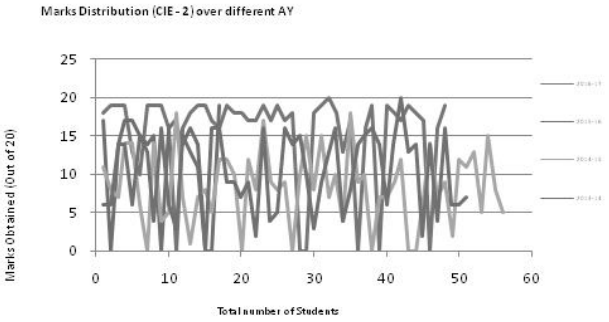


Figure 3.Graph showing marks distribution of CIE - 2 examination over different Academic years.

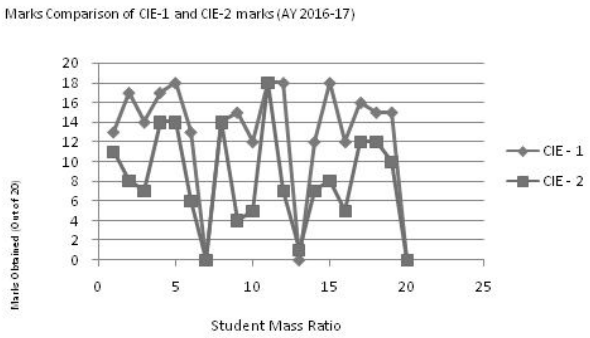


Figure Marks Comparison for CIE - 1 and CIE - 2 examination for the Academic Year of 2016-17

We can observe from Figure 6 and Figure 7 when conventional method of evaluation was adopted that results of CIE – 2 were comparatively lower as compared to CIE – 1. The main reason for the same can be greater amount of content as a syllabus for the evaluation for CIE – 2 examination. Such a burden can be substantially reduced by making students inclined

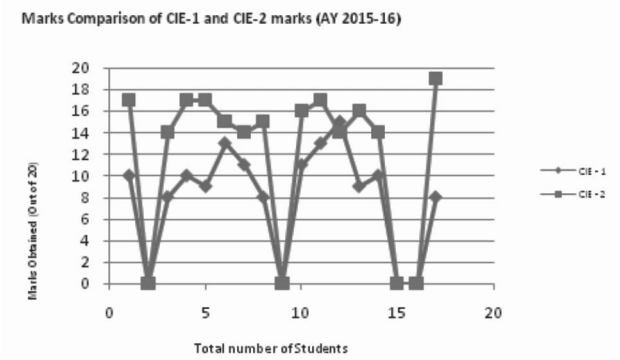


Figure Marks Comparison for CIE - 1 and CIE - 2 examination for the Academic Year of 2015-16

towards practically making of the mechanism which they have already studied during their regular classes. This will further help them to brush up their terminologies and principles related to the subject.

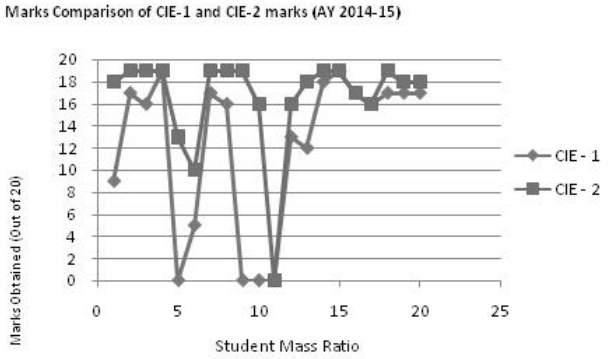


Figure 6. Marks Comparison for CIE - 1 and CIE - 2 examination for the Academic Year of 2014-15

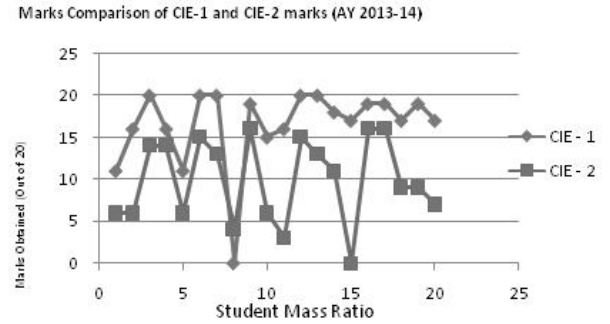


Figure 7. Marks Comparison for CIE - 1 and CIE - 2 examination for the Academic Year of 2013-14

4. Various Mechanisms for Model Exhibitions

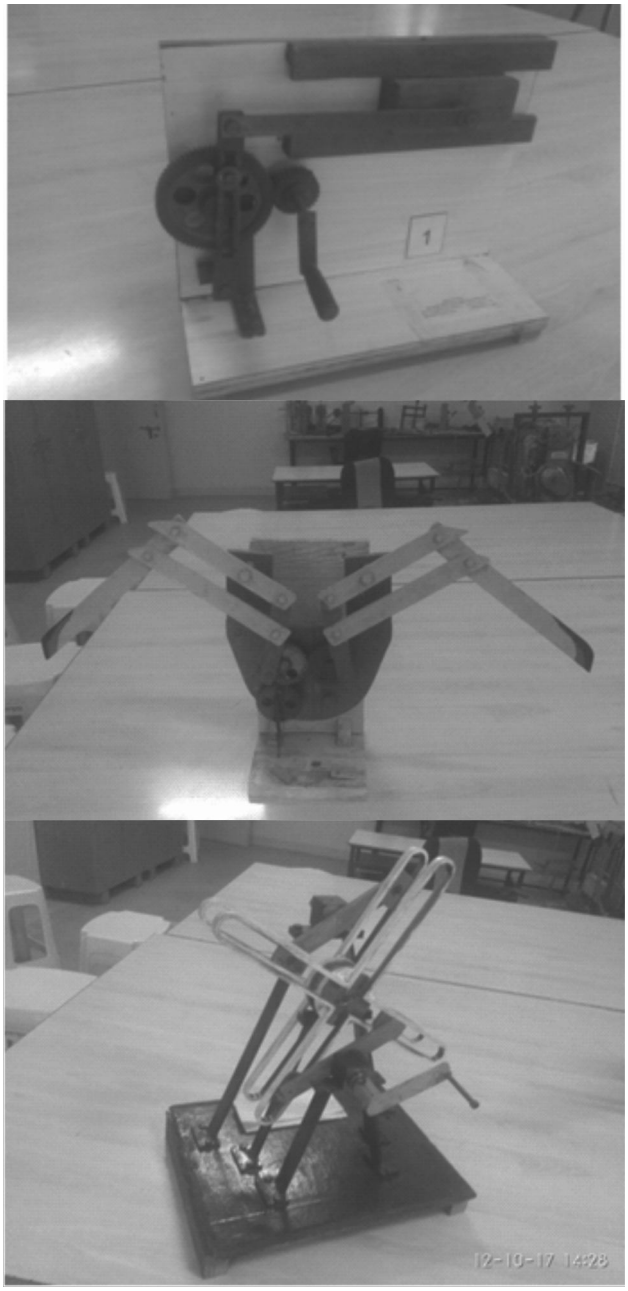


Figure 8. Sample Mechanisms Prepared

5. Discussion/Conclusion

We can say from this study that substantial overall improvement in the development of students can be achieved by means of moving from the conventional evaluation pattern to a practical based pattern of Model Making. This greatly helps them to be more familiar with the physical laws which are governing towards the functioning of the mechanism which they have prepared.

This evaluation method also helps in removal of the excess burden over the students of having to memorize large amount of theoretical content given in the books. They are just required to implement the laws of mechanisms which they are aware in practical life. It will even encourage and motivate students to develop a practical centric focus and even develop a practical oriented approach to any of the problem which they are solving.

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