Analysis of New Methodologies applied in Teaching Engineering Graphics to have a Moderate Explanation

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Abstract: Engineering Graphics is a subject dealt by the Mechanical faculty which is a common course for all the First year B.Tech students. It is the only course where the entire inputs are carried on a drawing sheet and come out with a final considerable output. It is the new course where students have no basic knowledge before getting into the course. The instructor has to take a continuous 3 hours class which includes theory and practical which is scheduled only to have a smooth proper learning. Besides explaining the syllabus on the blackboard with chalk new methodologies should be implemented to have a better explanation which must reach the same content to every corner of the student. As there is advancement in every field, Engineering Graphics is proposed to have an advance teaching Methodology whereby every student is at most equally shared the same teaching content.

1. Introduction

Engineering Graphics can be termed also as Engineering Drawing which is the art of manipulating the design of components and parts relating to the Engineering [1]. The subject mainly involves sketching the component which we can say a part of machine or the machine assembly. As the Drawing sheet is constrained to a particular size, the scale of the object to be drawn on the sheet is either reduced or enlarged depending upon the requirement. Engineering Graphics is the most important outlook for the mechanical Engineers as it is minimum and basic need to design the machine parts and for the assembly too[2]. The most important Projections are: Orthographic Projection: The object is placed in Space where the front view is projected on vertical plane and top view is projected on horizontal plane. Perspective Projection: The outcome of the drawing is influenced by the observer’s eye position, height and the distance of the object. Isometric Projection: This projection will make the length, width and the height making equally inclined to 120° as the sum of 3x120°’s make 360°. The word Isometric means same measurement as all the inclination are 120°. Engineering Graphics plays a predominate role in both manufacturing and design as it not only explains the arrangements in a machine but also tells methods to
employ for manufacturing the individual blocks. It does not only convey the ideas but convert the concepts into reality which finally eliminate confusion by standardization of nomenclature and practices when we study. Many new methodologies have been implemented worldwide to teach Engineering Graphics in an effective manner. Many of the Students come out from a rural background and different Technical background. The main agenda or the theme is to motive the weaker ones and also to have a moderate explanation [3]. The weaker ones are motivated obviously as they are from poor technical background and also to the rural background people with poor basic Knowledge. A web comic is a Teaching Methodology where the students found more motivated and come out with a moderate output. For example we can make students clear what is a gear in webcomic rather than drawing the diagram[4]. A web comic is a Teaching Methodology where the students found more motivated and come out with a moderate output. Web comic, Information and Communication Technology, Interactive Fusion Method and Technical Drawing Evaluation Grid are some of the methodologies found in the recent years which are found motivated to the students and could result positive approach in the positive results. The clear concept can be found out by putting them into a clear structure like which is discussed in this paper[5].

2. Methodology
2.1. Web comic
Web comic is implemented in Italy and survey is found out based on the output [6]. Mosaics and sculptured images are even used in the churches which are to support the priest while he preaches the people who are illiterate [7]. Later on the same comics is found important in teaching field in the 90’s [8]. There was a controversy developed between Yang and Hosler. Yang only published paper in 2003 without any experimental results but Hosler proved that Web comic plays a motivated role for the weaker students with the recorded proofs in the year 2011 [9]. The Subject Engineering Graphics is imperative in nature to enlighten the student interest in engineering. The University of Brescia stated that the students with poor technical ground feel the topics too complicated [10]. It is found the students failing the exam are because the less attention they are paying.

2.2. Information and Communication Technology
Information and Communication Technology is the technique developed in Indonesia to have an expertise result to the students who are taught Engineering Graphics subject [11]. The faculty not only restricted to prepare the material and explain the students but also expected to reach the learning objectives [12]. The teaching fellow had to be a role model as tutor, mentor, instructor and motivator also [13]. It is their proved that the multimedia animation has dominance grasping than a conventional teaching. So a model is developed by the Indonesia which is termed E-book based multimedia animation Engineering Drawing (E-MMAED) [14]. The interactive fusion method is developed by Zhejiang University, China [15]. The method is developed as they found the ability of drawing the graphs and reading is declining in the recent years. They are found not drawing according to the standards and also no basic knowledge of thin lines, continuous lines etc. The students found motivated and paid maximum attention when they are taught to multimedia teaching rather than the normal convention teaching.

2.3 Technical Drawing Evaluation Grid
It is the learning Methodology developed in the year 2014[16] by the three Italian universities Brescia, Udine and Cassino and Southern Lazio. The intension of developing this methodology is to understand
the fundamental basic concepts of engineering drawing. They found the students felt difficult due to the lack of the knowledge at the school level itself [17]. It is used as assessment grid for the evaluation of the knowledge and the acquired skill of Engineering Drawing. So it can be used as reference framework for both national and international concepts.

Figure 1. Web Comic

Figure 2. Information and Communication Technology

Figure 3. Interactive Fusion Method

Figure 4. Technical Drawing Evaluation Grid

2.4 Comic Evaluation Grid with Communication Technology:
A new method is applied to our Engineering Students where the above three methodologies are carried out excluding Technical fusion method with few modifications in the implementation. The main theme is to have an innovative teaching to the students who are found weaker in understanding Engineering Graphics. This method involves trying to prepare the comic pictures relating to Engineering Graphics. As it having the heavy syllabus covering in the prescribed time, the comic pictures played a vital role in which the weaker students got motivated. A moderate development is noticed in the starting but gave a better outstanding finally. Teaching material is prepared referring various text books and visiting various websites. The material is tested to the students if they could cope up or still any modifications we can make. Concept is distributed in the teaching material in such a way that the student could easily have an easy grasping power. So students are asked to develop a mini project based on the concept at last and then planning based revision is made finally. A testing Grid is prepared to have an evaluation in the students to get an estimated graph report of the student’s performance. Assembling all the three gave a better result.

3. Results and Discussion
A survey is carried out from the year 2017-18 batch students. As there are 5 sections in our college, I have implemented the above three methodologies separately to the three sections and the Comic Evaluation Grid with Communication Technology to the other 2 sections. The same is followed for the next two years. The methodologies are implemented as per the below table. It is distributed to the sections based on the technical and innovative power and mainly the previous examination results.

| Academic year | Total Number of students |
|---------------|--------------------------|
|               |                          |

Table 1. Students distributed with the Methodologies for 60 students

| Methodology | Web comic | Information and Communication Technology | Technical Drawing Evaluation Grid | Comic Evaluation Grid with Communication Technology | Comic Evaluation Grid with Communication Technology |
|-------------|-----------|------------------------------------------|----------------------------------|--------------------------------------------------|--------------------------------------------------|
|             |           |                                          |                                  |                                                  |                                                  |
| Academic Year | Number of students for 60 |
|---------------|--------------------------|
| 2017-18       | 13 14 11 8 9             |
| 2018-19       | 14 16 15 10 10           |
| 2019-20       | 15 13 12 9 10            |

Table 2. Students result with less than 50%

| Methodology | Web comic | Information and Communication Technology | Technical Drawing Evaluation Grid | Comic Evaluation Grid with Communication Technology | Comic Evaluation Grid with Communication Technology |
|-------------|-----------|------------------------------------------|----------------------------------|-----------------------------------------------------|-----------------------------------------------------|
|             |           |                                          |                                  |                                                     |                                                     |
| Academic Year | Number of students for 60 |
|---------------|--------------------------|
| 2017-18       | 21 23 23 24 24           |
| 2018-19       | 22 23 22 24 24           |
| 2019-20       | 19 20 21 22 22           |

Table 3. Students result with 50-70%

| Methodology | Web comic | Information and Communication Technology | Technical Drawing Evaluation Grid | Comic Evaluation Grid with Communication Technology |
|-------------|-----------|------------------------------------------|----------------------------------|-----------------------------------------------------|
|             |           |                                          |                                  |                                                     |                                                     |
| Academic Year | Number of students for 60 |
|---------------|--------------------------|
| 2017-18       | 26 23 26 30 29           |
| 2018-19       | 24 21 23 31 28           |
| 2019-20       | 25 27 27 29 30           |

Table 4. Students result with more than 70%
4. Conclusion
The Comic Evaluation Grid with Communication Technology found a little bit not supportive in the starting academic year but later on found it could be student friendly once if we could work on it. As it a COVID situation and as the classes going in on-line mode, expecting there must be advancement in the implementation of the methodology. Faculty trying to make use of the drawing applications present in the Windows to make the students understand concept effectively and conducting some motivation like web comics. However an online application of teaching must be developed to teach Engineering Drawing subject effectively as the entire world is facing a pandemic situation of COVID.

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