Efficient & Flawless Output in Engineering Drawing, Through Pat Software Tools

L. Ranganath, Basam Koteswararao, Marut Dev Sharma, P. Appalraju, P. Vijay

Abstract: Perception, Analyzing skills and cogitating levels of the 21st century students makes them to stand one step ahead of the yesteryear's practices of teaching. 20th century was an era wherein it was a mandate for everyone to have a teacher or instructor to guide and make a student learn the concept as well train them as an expert in that domain. The traditional way teaching concepts still holds it upper hand or supremacy in most of the domains of engineering subjects. Areas like Engineering Drawing not only needs the traditional methods but also the aid of software’s as virtual approach plays a vital role in bringing accurate output & helps for a better understanding. The traditional method of chart and scale is never an outdated one, its the pioneer in drawing but the need of the hour has changed as the student is thinking through a creative aura of imagination/virtual reality, and which can be easily executed in less time, through the software, than the traditional method. Moreover its been evident that the 21st century students and highly inclined towards the Practical Learning, through a survey conducted on 75 students who were taught with both traditional and applied approaches. This paper's purpose is to elevate this concept. Understanding and executing is very important in drawing, but efficacy is the most important ingredient in achieving the accurate result which can be possible with the aid of, a variety of soft ware tools. This improvisation of efficacy is possible at both ends, Instructor as well the Learner. Finally this paper aims at discussing the usage of 10 possible software tools that were already tested and used for effective teaching of Engineering Graphics.

Keywords: Effective teaching, Engineering Drawing, Engineering Graphics teaching, Teaching made easy, Software tools

1. INTRODUCTION
Drawing is an age old concept for every human being who played with a pencil, pen and eraser. But, the aspect of drawing has changed its facet when it comes under the domain of Engineering. Standards were set, Rubrics were added and the new face of the age old everyone's drawing turned into professionals “Engineering Drawing”. Now the question is, Is drawing a tough or easy subject? It might have been an easy task when the teacher gave the student a freehand in school, to draw a tree without any restriction, where the student or the learner used to draw a brown colour branch with green colour leaves. This particular aspect was so easy because the learner had a visual in his mind and he can easily depict it on the chart.

But coming to the perspective of engineering drawing there will be a restriction or condition, which asks the learner to draw a line, which is kept at an angle of 30° and how it looks from the top view as well as from the front view. This kind of specific drawing needs the best ways in executing as well as teaching or in providing guidance. As there is a dearth in applied teaching this aspect of engineering drawing appears to be a tough subject. At this juncture when the student can't visualize as per the conditions laid as well when there is no proper guidance that is a point where the student starts getting confused why and how it happens, i.e., why should I look it from the top angle why I should look it from the side angle. All such questions crop up and the student gets more confused. In turn all the questions that which erupted in their minds will allow them to come to a conclusion that only strong minds will understand this kind of subject and thus the concept of understanding the Engineering Drawing will go missing. To avoid this kind of confusion the instructor if could arrange a setup in such a way that movable projectors will rotate in the required dimensions and see that, the to be visualized image appears on the screen and thus the required front view and the top view of the line will be viewed and this kind of practices in the classroom will be more encouraging as well as fun, exciting to the students and thus draws attention of the student towards learning.

Even though, this is the best practice of using projectors in the classroom, this also involves some of the drawbacks wherein the moment of the projector to here and there in the classroom and utilization of manpower. So it is not possible all times to provide with these kind of facilities or external sources and this is the situation where the software tools come into picture and play an interesting role. A software, Laptop or Personal computer and Projector, With these three simple tools the instructor if could arrange a setup in such a way that movable projectors will rotate in the required dimensions and see that, the to be visualized image appears on the screen and thus the required front view and the top view of the line will be viewed and this kind of practices in the classroom will be more encouraging as well as fun, exciting to the students and thus draws attention of the student towards learning.
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1. Solid Works (it’s need not be solid works it can be any 3D modeling software)
2. AutoCAD (How to draw on a sheet can be shown by using this software)
3. ActivInspire (Geometry tools like scale, protractor, compass, the eraser will be used virtually)
4. Magnifier (To zoom in and Zoom out the screen especially while teaching AutoCAD)
5. Epic pen (Pen on Desktop, it works on any application)
6. Icecream screen recorder (To record the class)
7. Explaindio (make effective animation slides and videos with Text)
8. Movie Maker (avoiding the unnecessary steps and make the video more efficient)
9. VideoScribe (pen with Animation hand)
10. H5P (interactive videos)

This point onwards attempts in explanation will be there to elaborate on how effectively software works in Engineering Drawing:
TARGET : Line inclined to plane making an angle \( \theta \).

II. SOLID WORKS:

This tool used in [3] [6] various research works for effective results. Now when we display the same figure on screen which was shown below in fig:1,2,3 and 4, he/she will visualize how it's front view will obtain and the same top view. It is not the end why we need to draw the straight line below the reference line need to be shown as well. That part of animation is possible in Solid Works by rotating an entity, by rotating HP we can visualize the setup that Front view comes on Top and Top view comes in bottom this representation need to be done on drawing sheet.
Teaching simplified in the above said manner will enable the student/learner [4][7] to comprehend the concept in the easiest way and will be able to draw the required graph on his own. To explain the above-mentioned concept, SOLID WORKS, AUTOCAD, EPIC PEN are the tools used. Effectiveness is also one of the most important characteristics to be employed by an Instructor in his/her classroom. In tune with that, the Instructor if uses animations [5] at frequent intervals i.e., in the beginning, middle and end of the class, which will be more impressive than the images, will help the Instructor to make the class more effective.

Figure 1: Line making an angle \( \theta \) in the first quadrant
Figure 2: Demonstrating the concept using Epic Pen tool
Figure 3: Rotating Horizontal plane by using the rotating command in Solid Works, and how it will be visualized in its front view and top without changing the position of the observer
III. VIDEO SCRIBE

Video scribe is a good replacement of teachers writing. Instructor need not turn towards the board, instead he can have eye contact with students and the writing on the display/projector screen will be done like below. A sample picture is shown below in fig5. In starting of the class what we will discuss today’s class, yesterday class, how we will execute the course all these can be done in below way.

It's a proven psychological fact that a moving [8] picture leaves more chances for a better understanding of the explanation being given by the instructor during his/her lecture. Since the moving hand on the display/projector screen keeps on moving, the instructors role on the board gets minimized and thus can have a total grip on the students and that’s an added advantage for a novice instructor.

IV. ACTIVINSPIRE

By using the above tools, below is the diagram which was recorded
The above procedure can be recorded by the Instructor for class purpose. Once the explanation is done on blackboard, if he/she plays the video of the above, then student will easily understand.

**ICE-CREAM SANDWICH:**
The recording process for the above mentioned procedure can be done by Ice-cream Sandwich screen recorder, which is user-friendly and freeware. The screen will be recorded easily, but the way tutor did cannot be displayed as it is, because when the tutor playing it, it goes very slowly, it needs to be made fast and error free.

**MOVIEMAKER:**
Movie maker is another tool which will help a user to edit video and increasing the speed ratio, and this software can act as a solution for the flaw that is there in Ice cream Recorder, which is mentioned above.
EXPLAINdio:

Explaindio is a typical tool which can be used not only for editing videos but also for creating impressive presentations as well. Focusing on using this particular software will make class more interactive and effective.

Chapters like Orthographic and Isometric need more visualization, SolidWorks or any 3D modeling software will make this job easier for a teacher. Below is an example of Orthographic projection problem. First student will be shown 3D [9] [10] model with colors. Based on colors sorting of views will be done next as exercise. Which will create a greater impact in learning.

MAGNIFIER:

Magnifier is the tool used to zoom the screen at a particular area for 100% or 200% or more than that, this is the best tool for bigger classrooms[12] [13]. When the class size is large and there is any vision problem for a learner, this mode of showing the screen will be a definitely benefit solution.
Using all the above tools some videos are made just for awareness to teach drawing & can be referred @ the link provided here ↓ for a better understanding.

https://www.youtube.com/user/mechranga1/videos

**H5P (INTERACTIVE VIDEO EDITOR):**

A student's knowledge after completion of a concept will be evaluated through the assignments given by an Instructor. The above Fig:13, is such an example which tests a student knowledge. This will be another magnificent tool to test the knowledge of student whether he understood the concept or not.

(How to use H5P) -
https://www.youtube.com/watch?v=UAj4Ar57pBE

SCREEN SHOTS OF SOME CONCEPTS DONE USING ABOVE TOOLS:
Figure 14: Ellipse and Isometric drew using Activ Inspire software

Figure 15: projection of Solid problem (Hexagonal pyramid) in solid works
IV. CONCLUSION

Considering different influencing factors from different spheres, it's very much evident that the 21st century generation (Engineering Student Community) have a greater inclination towards smart learning and is highly interested to learn things from animations, software's and through practical models. In the domain of teaching chalk and talk played a vital role, but today the situation is strongly recommending a replacement & in accordance with that the Instructor choice of teaching tools should get modified, without forgetting the base for Engineering Drawing.

This is possible only when the teacher change himself, by employing new technologies or mapping the real-world technology, taking them away from class and bring them back with importance all together he needs to be a magician to grabs everyone attention towards subject. Then only the purpose will be full filled.

It is not guaranteed that by following with all tools and concept 100% attention but to an extent of 80% will be sure. The survey depicts that almost all are interested in practical demonstration and interactive teaching. Not many are showing interest in chalk and talk concept.

Here is the result of a survey:

![Figure 17: Results of the survey](image-url)
REFERENCES


