

**2006-1872: CUBISM IN EDUCATION, FLEXING TO ALL PATRONS' NEEDS FOR EDUCATION, LEARNING STYLES, CULTURES...**

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## **Cubism in education: Flexing to all patrons' needs for education, learning styles, cultures...**

### **Abstract**

This paper will consider the use of technology as a medium for innovation in engineering education, which can certainly be expanded to all fields and disciplines. For the most part, technology has been invading all classes and subjects. From kindergarten to college graduates, all students and educators have been influenced by the technology in the classroom. In this paper we will provide a historical perspective of such practices and examine the most popular usage of technology in the classroom. Then we will introduce concepts of classes that can address multiple aspects of education and learning. We will show how such classes can be created and how the correct use of technology and documentation can help educators and learners seek different aspects of the subject, see the multidisciplinary sides of the subject, and experience the right styles and cultural perspectives when utilizing the technology fully. We will provide examples of how a simple engineering concept can be addressed in such an educational setting with a fully multidimensional perspective. Finally, we will provide guidelines so that every school, company, educational institute, government agency, and patron of knowledge can help shape such classes that will dominate the future of education.

### **Introduction**

In the new era of modern technology, classes and the available technical capabilities for online classes are considerably different than anyone could have imagined a decade ago. However, in most cases the professors and the lecturers who are using the modern marvels are not fully utilizing their capabilities. Most of the distance education classes or other types that are streamlined to different audiences focus on the two most important aspects.<sup>1,2,3</sup> The first of those is reaching the students across a long distance and providing them a time-flexible access to lectures. This will reduce both the cost and the inconvenience. The second major consideration is saving the professors' time and re-offering the class over the Internet by running the old lecture series. That way one can economically provide classes for a select group of students. These are impressive strides and provide possibilities that have expanded our horizons as educators beyond our imaginations.

However, with all this great use of technology the authors believe there are even more possibilities that have been neglected or not fully utilized. This goal of this paper is to shed some light on such possibilities. The authors believe that with the right use of this technology, we can reach different students, different cultures, and different styles while employing a truly flexible solution for all generations.

### **Cubism and different aspects of education**

Cubism,<sup>4</sup> which can be called the most influential style of the twentieth century, was created by Picasso and Braque about 1907 in Paris. However, to most art observers cubism and Picasso are inseparable. Cubism is based on allowing the viewer to have a simultaneous presentation of

multiple views, disintegration, and the geometric reconstruction of objects in flattened, ambiguous pictorial space; figure and ground merge into one interwoven surface of shifting planes. It was the goal of cubists to represent the subject on a 2-dimensional canvas via a multicultural and social role, depicting psychological, environmental, historical, and other aspects of the subject's perspective. It is exactly this multidimensional aspect that this paper is focusing on.

With the new technology, one can do the same thing with any subject. For example, a subject in engineering such as heat flow can be addressed from different aspects. The first and basic view would be the physics perspective. One can see another view from the mechanical engineering angle and yet another from material engineering; and perhaps from the industrial engineering perspective, one can see how heat flow is used in packaging and enclosures. In addition, one can see how this subject evolved in time and how the two major historical developments of the subject—science and technology—occurred. It is also possible to view the same subject through eras, such as how the 17<sup>th</sup>-century scientist believed it to be and how that paradigm changed to an 18<sup>th</sup>-century belief and then to the 20<sup>th</sup>-century and modern vision. It is true that all of the mature subjects of today have multiple perspectives in their fields as well as historical development.

It is the authors' belief that the new technology and the capabilities available to us can accomplish this multidimensional, multifaceted treatment of any subject.

### **What are the classes of today missing?**

Most of the classes today miss this multidimensionality.<sup>5</sup> Some professors and some instructors do have the right perspective. There are numerous programs and educational series that aim to do this. However, they are more of an exception for today's classes. The emphasis of the professor in today's class is to make sure that the student has the right detail needed for the class, follow the syllabus, and provide the student with the most basic knowledge. The goal is to make all effort for the class "dateless," i.e., not address the dates and events during the time the class is taped. The goal in most cases is to make the classes last longer for a larger number of students over a fewer number of years. The professors would like to show the relevant mathematical formulations and perhaps some applications.

It should be noted that industrial training classes are in a sense totally opposite. The goal is to train the people with the most updated material. The instructors know that their material is going to be dated soon, so they try to get right to the point and not dwell on the subject in depth nor have lectures and sessions that speak to the fundamentals, which can be found in books and printed material. The lecturer in such classes would like to go more in depth, but his or her task is to get the most current development out to the audience.

It seems that a combination of the two approaches is the ideal. In addition, the conscientious lecturer and professor also try to include different material and different items for those who learn via different styles of teaching. In these classes, demos may be brought in or a discussion enhanced with pictures.

## **What can the new technology offer?**

We believe that the new technology can offer a wonderful tool to both of the above-mentioned classes. The first and most important capability is documentation. Video-streaming technology, which has been recognized and used by many instructors, universities, and companies, is the ultimate and compact way to document lectures.

Additionally, demos can be much more creative. For example, the demo can be a video clip specially prepared for the particular class or presentation or it can be a video conference call (digitized and saved) of the professor getting a tour via video conferencing from the industrial liaison. It can be a remote access to the instrument that is sitting thousands of kilometers away from the lecture room, or many other possibilities.

The lecture notes are available for download before and after the lecture. This includes the instructor's changes and additions to the notes.

As one can see, all of the above are being utilized by most institutions. So the question is, what is new?

## **True flexibility in education**

We believe that by utilizing the above, we find we can do more. The idea of cubism in education is that possibilities exist by adding three components to the above-mentioned aspects.

1. Offering different aspects of the same subject. For example, let us say a professor in electrical engineering would like to teach continuity equation. Typically this comes as a mathematical equation in electromagnetic class. So that is the starting point for the EE students. However, we can also see this from another engineering perspective such as the fluid dynamic aspect of mechanical engineering; in chemical engineering this same concept is treated slightly different, and in agricultural engineering it is treated in a unique way also. Then we can prepare a lecture on different numerical ways one can deal with this concept and equation. In addition, we can include a couple of industrial applications by having the right engineers in the related industries show the application aspects of their production. The same subject, then, can be treated via history of science as well as history of technology. For example, the equation was treated with a very different perspective at the time of James Clerk Maxwell (1873), and understanding the historical perspective can help the student have a very different and broader knowledge of the subject. In the flexible classes, the student can have all of these perspectives available to him/her.
2. Offering different teaching styles for different learners. By now it should be obvious to the reader that this is possible. Each class can have resources that help different types of learners. Each module can also have such resources available to the students, such as an audio file of the lecture, lecture notes, or even a highlighted summary available for download for the student to listen to while driving. Other items would also be available to students and learners of different tastes.

3. Creating synergy and managing of the project. Perhaps the most important part of flexible classes is the managing team. When there are many modules that are taken separately, a directing team is needed to put it all together. When a student of electrical engineering takes the class, the path for the student will be different from the student of mechanical or chemical engineering. There needs to be a way for each student to find the right path for their discipline, their interest, their learning style, and their own peculiarities. This is the piece that will define the true class of tomorrow, when true utilization of the technology is created. There are many active efforts in the Internet industry to help users find the material that they are interested in via user profiling based on age, gender, interest, and previous purchases. The authors believe that the same can be done for education.
4. Different classes can be managed via documented modules. The directing team needs to keep changing the classes and be in touch with the users. The classes need to be augmented; more material needs to be added and other ongoing changes need to be done. However, with the new technology such efforts are absolutely scalable. And the true cubism in education will be possible.

To help the reader, we are in the process of creating a limited version of such a site (which will be ready soon, please see author's professional site). We decided to look at some of these issues based on lectures on continuity education, and we are currently taping the lectures.

## Conclusions

In this paper we introduced a new educational concept called cubism in education. This is defined as a flexible and true way to teach classes that not only cover different aspects of a subject, from technical to social to psychological and even political, but also are able to flex to the various student-learning styles so the modules with the resources would be available to different styles of learning and interest. While technologically it can be done, it needs to be managed efficiently and effectively. Profiling the learner, the needs of the learner, and the learner's preferred style of learning are all important in offering a flexible and multidimensional perspective of the subject.

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