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Flipping Classroom for Generation Y

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Abstract **– Flipping classroom is becoming a popular practice but the necessity of using a digital tool to flip a classroom has been questioned. The challenge is how we can use the concept effectively for any course at all levels of education. Depending on the course content, appropriate digital tools are needed to reinforce the course content in a flipped classroom. A simple quiz like assignment becomes tedious and boring and is not very effective for enforcement and retention of material. Experiencing this issue in the classroom, the author decided to use a web application that allows to create an interactive learning environment using videos from various sources. By using this tool, the author was able to use the classroom for explaining major concepts and complete hands-on labs. The students were required to use the interactive videos to focus on the other aspects of the content outside the classroom such as terminology and further enforcing logic. This tools has been used for three consecutive years in the classroom and has proved successful in flipping the classroom as needed.**

Keywords **– Cognition, Digital Tool, Flipping Classroom, Playposit, Feedback.**

I. INTRODUCTION

The three broad areas of human cognition are attention, memory, and critical thinking [1]. These are the key pillars of a learning process. Any learning technique or methodology used in the classroom should focus on these three areas. On the contrary, the GEN-Y student primarily want to focus on the hands-on aspects, i.e. the critical thinking area, of the course content both inside and outside the classroom. But there are theoretical concepts in any course that need to be understood that focus on the memory area of human cognition. Retaining terminology is important as a result of which the student can discuss the topic among peers and with their potential employers in an intelligent manner. Students' attentiveness in classroom is every instructors concern especially because of electronic media such as cellphones causing distractions. In this paper, the author focuses on how a class can be flipped using interactive media and address these three areas of human cognition.

Flipped classroom is a methodology that is beneficial only if used effectively. Some studies show that students have discovered an active and deeper learning, greater in-class collaboration and positive interaction with the teacher in a flipped classroom as compared to other teaching models [2]. Each course is different therefore the instructor should use effective and improved approach for that particular course [3]. It is important to understand that flipped classroom technique is not for every course (6, 9). Most flipped classroom methodologies assign material to read or view before the lecture and class time is devoted to projects, labs and discussions [4].

Another issue that studies have shown is that small percentage, i.e. 20-30%, of Gen-Y students actually read the textbook [5]. In instructor's opinion, it is imperative to generate interest to read the textbook. Reading textbook has many advantages such as emphasis of material learnt in classroom, terminology retention, advanced concepts or basic concepts that need review. Interactive homework such as the one discussed in this paper can generate interest in reading the textbook.

II. METHODOLOGY

The technique used in the author's classroom assigned online content both before and after the chapter material was reviewed in the classroom. Therefore, it was a different version of the flipped classroom methodology. The challenge that lead to this experiment was how learning of terminology and other concepts that cannot be emphasized enough through labs or hands-on-material can be included in the course material. Homework's are a good assessment technique but the students should be able to receive feedback without being under the pressure of grades. Also, the feedback should be quick and interactive such that students have a chance to improve throughout the semester (7, 10).

Sometimes, it is difficult to use digital tools as a teaching instrument in computer science or technology courses because students in this major learn to create such tools therefore they are also very critical of such tools (a skill they learn in courses to become a better designer). The digital tool used can easily be a hit or a miss. The experiment was completed in three courses teaching C/C++ (freshmen, first year), Java (sophomore/junior, second/third year) and Computer Networking (junior/senior, third/fourth year) over a period of three years. The videos bulbs were designed by the instructor and the student feedback was recorded for each video bulb.

III. DIGITAL TOOL: PLAYPOSIT®

An important aspect of using a digital tool is its availability. Ease of use by both instructor and student is vital. A web-based tool is available on any system with a live internet connection. A tool that is highly interactive and can be used across courses is the one that is favored by the instructors.

Playposit® (previously known as eduCanon®) is a web-based tool that is extremely interactive and can be customized based on the course [10]. This is an existing tool available in the market and provides support for both academic and corporate institutions. The author has used this tool across different levels such as freshmen, sophomore and juniors as mentioned earlier. Figure 1

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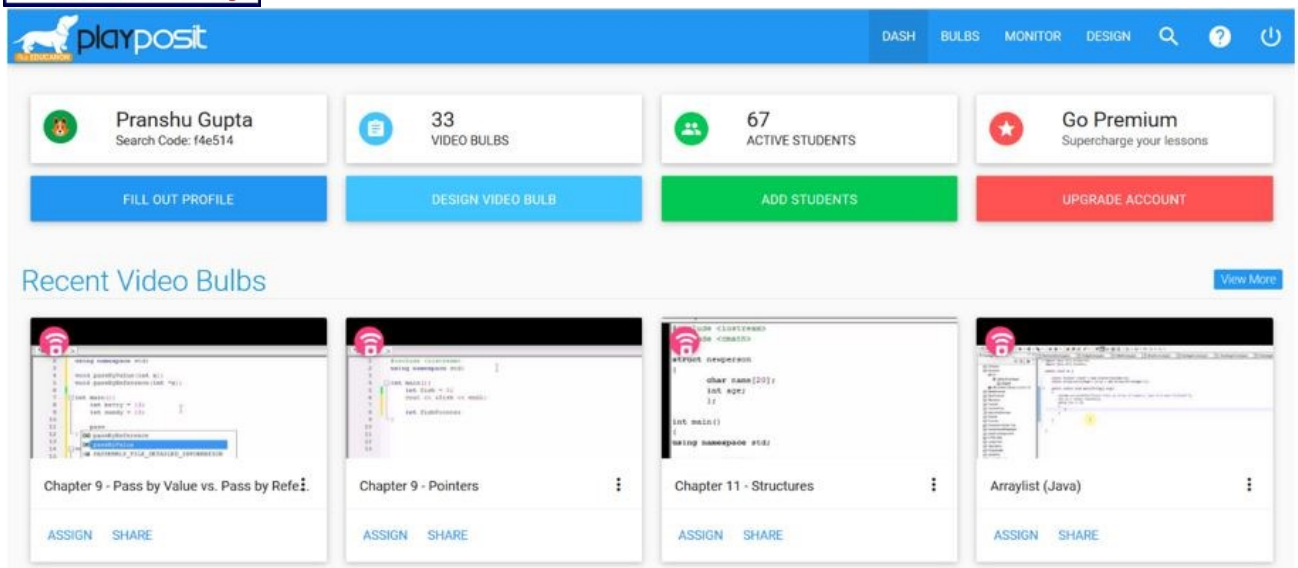

Fig. 1. Instructor interface.

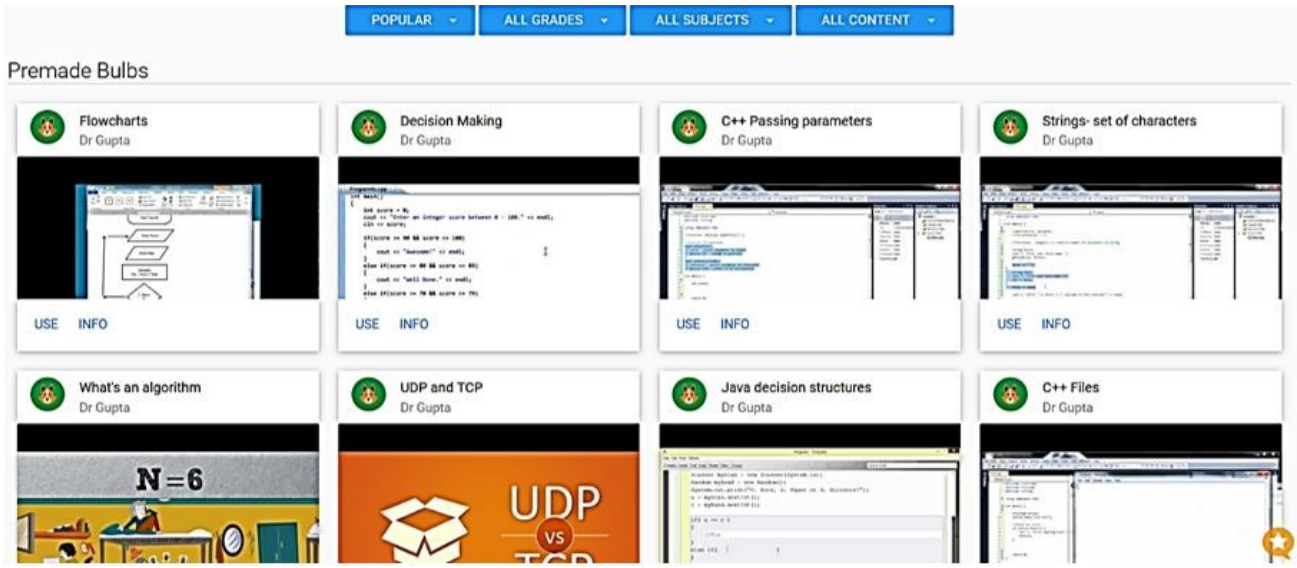

Fig. 2. Premade Bulbs.

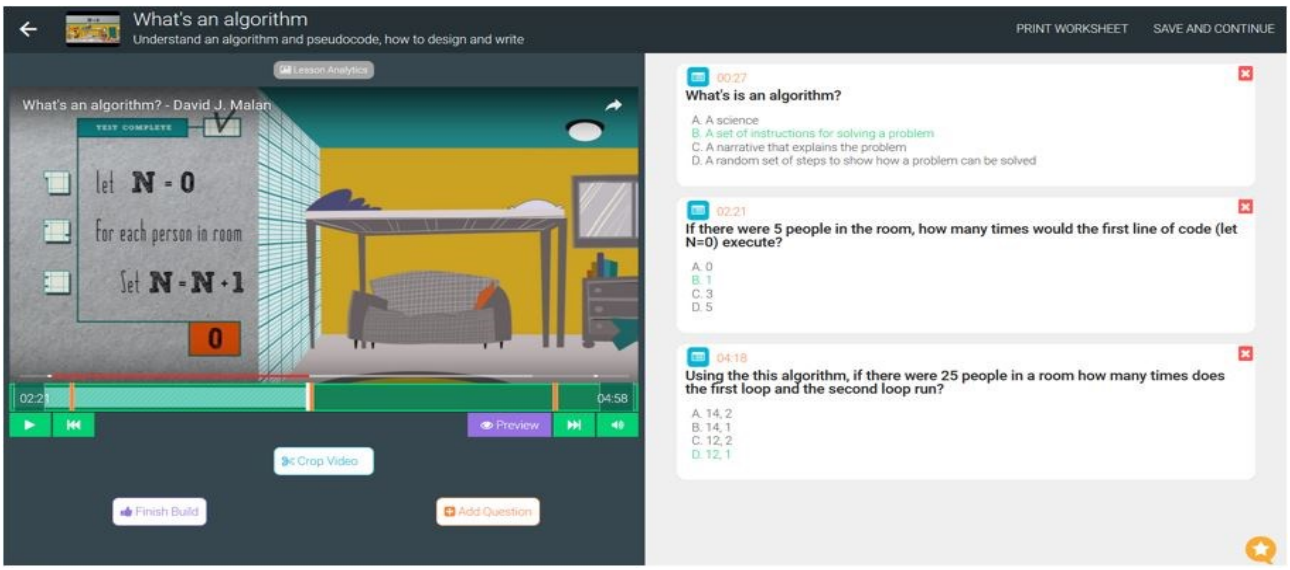

Fig. 3. Questions in the video.

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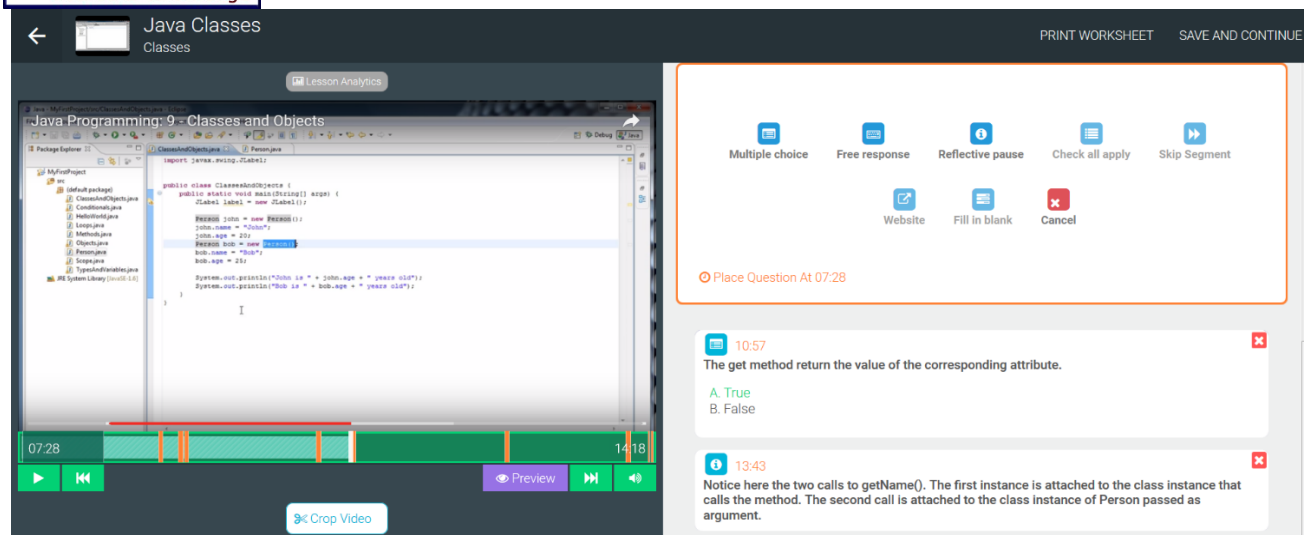

Fig. 4. Types of questions.

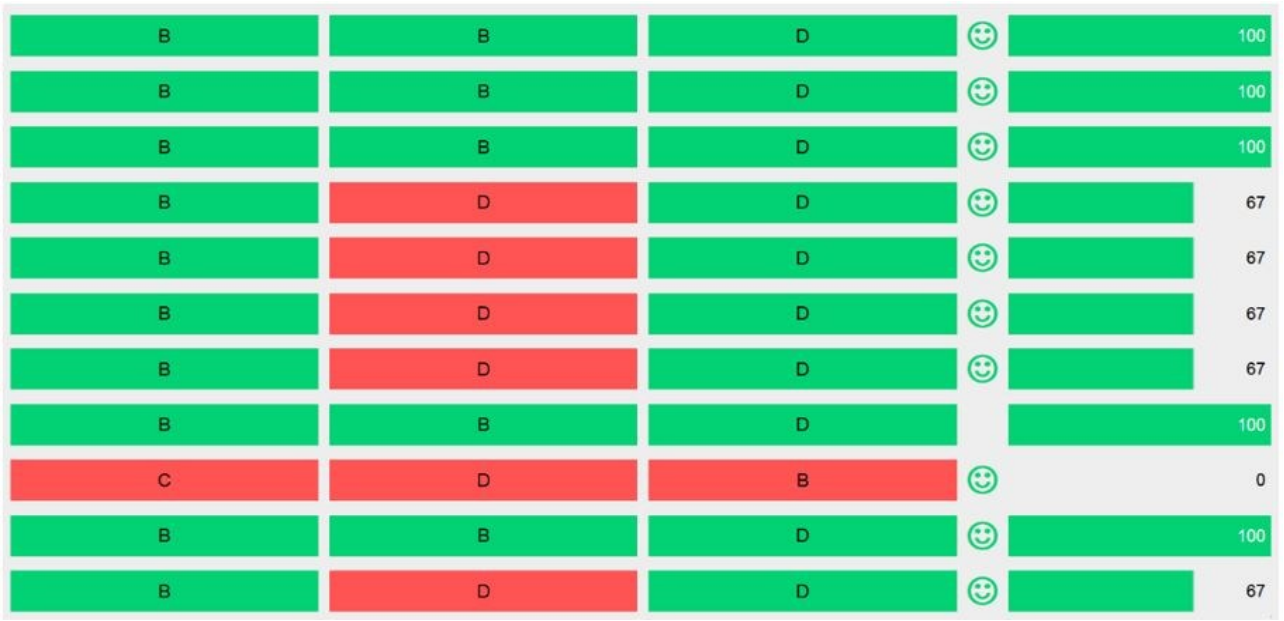

Fig. 5. Student responses.

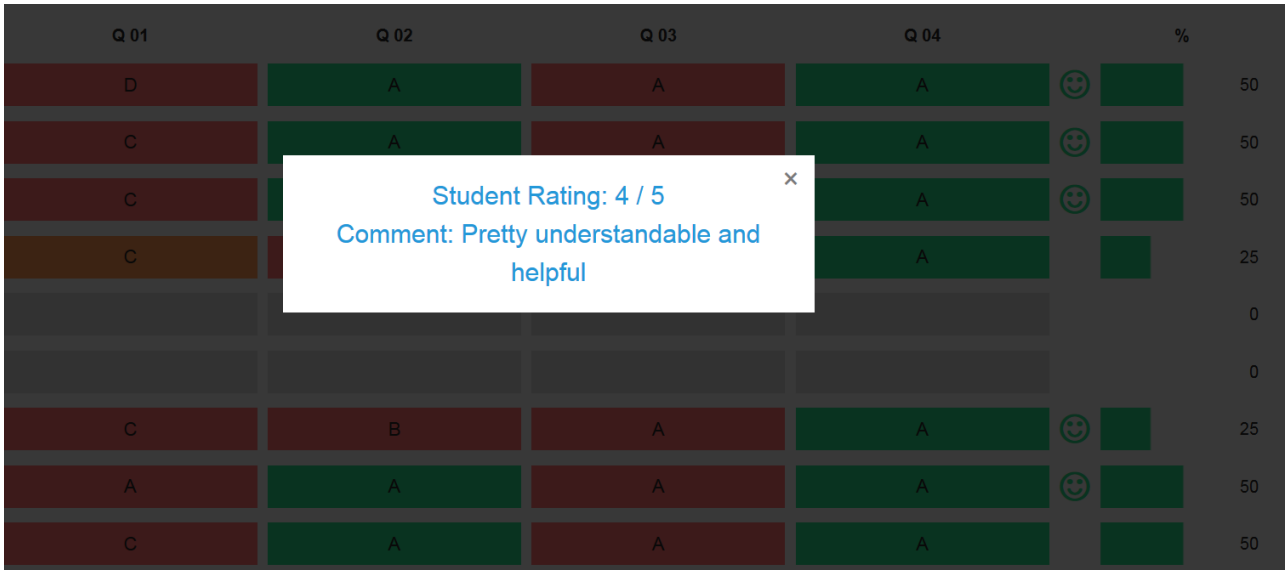

Figure 6. Student rating and comment

displays the instructor interface. The interface shows the number of interactive videos created, number of active students enrolled in the courses taught by that professor.

This tool helps in designing interactive videos known as video bulbs. Video bulbs are created using videos from different sources such as YouTube® or any other video repository. The instructors can decide to make the bulbs public so that other instructors across the globe using playposit® can re-use the video and do not have to re-invent the wheel. Figure 2 shows that video bulbs repository created by the author.

Once a raw video is imported into playposit®, the instructors can add questions at different locations in the video as shown in figure 3. The orange vertical lines in the play panel shows where questions have been added. Also the right side panel shows the question added and at what time in the video the question has been added. The student views a certain section of the video and based on that section they answer the question. Questions can be theoretical such as the first question or can be applied questions such as questions 2 and 3 shown in figure 3.

Question 2 and 3 are not straightforward terminology questions as compared to question 1 (shown in figure 3) which is a definition question. Applied questions are very helpful for students in understanding the concepts, as they watch a section of the video with the explanation of the concept and the following question asks students to apply the concept. The free version of the tool allows to create multiple choice, free response and reflective pause questions as shown in figure 4. The paid version allows other questions such as multiple answer, fill in blank and more.

The students watch the video and it pauses when a question is encountered. The video continues after the student has answered a question. The gradebook view from the instructor's perspective is shown in figure 5. Correct answers are colored green and incorrect answers are red. Students can also leave a smiley or sad face for each video and also leave a text comment for the video.

IV. Results

The students provided a very positive feedback for this tool. Especially, when an animated video was used to explain a concept. Some comments the instructor received were "It was pretty informative", "Pretty understandable and helpful" and more as shown in figure 6. We can see from figure 5 that even though a student did not answer any questions correctly, they still have a smiley face for the video. The student found that the interactive video was helpful in understanding the material. The tool does require some research to find good videos that explain the concept or the instructors can create their own videos. An advantage of this system was that videos can be re-assigned or reset for students.

We can see from table 1 that even though students did not score well on some videos but they still liked the video. This was emphasized by their comments as mentioned earlier. Same results are shown in table 2 for a different course which included more theoretical concepts of computer science. The students learnt and showed more confidence in talking about the subject matter. Especially, it can be seen from table 1 and 2 that a student received a score of zero but still liked the video as they learnt and reinforced the content using the video.

This tool helped address the three key pillars of learning or areas of human cognition – attention, memory and critical thinking. The students were very enthusiastic to watch videos because it was not a quiz-like assignment and therefore the instructor had their full attention. These videos can be made available to the students until the end of the course; therefore students can re-do the video if they did not score well on the earlier attempts. In this manner, students are receiving immediate feedback and thus students were more attentive in reading and answering the questions.

The questions help in emphasizing terminology which addresses the memory area of human cognition. Questions can be created to understand definitions, or terminology in specific courses. An example is shown in figure 3, "What is an algorithm?" This also helps in facilitating of textbook reading. In order to understand the concept and definition, the students will be enforced to read the chapter from the textbook.

Figure 3 also shows how to stress critical thinking. Question 2 in figure 3 is an applied question where students have to understand the concept shown in the video and then apply the content they viewed in the video to the question. Same critical thinking is tested in question 3. Therefore, this tool addresses all key pillars to a learning process.

Playposit® offers a library of premade lessons that are organized according to discipline and teachers can customize and use it for their classroom [11]. The paid version enables to print the lessons as worksheets. This is not a feature provided by its competitors. In the author's opinion, the free version has capabilities that can be beneficial for flipping the classroom using interactive media.

V. Conclusion

Playposit® is a tool that can be used for both learning and grading purposes. The author found it more helpful for learning as compared to grading purposes. Automated grading is an added advantage that comes with the tool and there is integration available with learning management system. The advantages of using such a tool are that we can flip the classroom either way – assigning content after or before class, use of interactive media with quick feedback, generate interest in reading the textbook, and automated grading. It can be used for a diversified set of courses. Other advantages of this tool is that videos can be shared among faculty and can be edited based on class needs. Most importantly, the tool when used for flipped class environment will address the three key pillars of learning. Therefore, it is important to decide which course is appropriate for flipped environment and also which digital tools are suitable for that particular course. This type of digital tool can accommodate many types of courses, both theoretical and applied.

Table 1. Programming course student feedback Video vs. Score

Networking Course						
	Disliked					
	100	80	60	40	20	0
Video 1						
Video 2						
Video 3		2				
Video 4	2					
Video 5						
Video 6						
Video 7				1		
	Liked					
	100	80	60	40	20	0
Video 1	4		2			
Video 2		3	1	1		
Video 3	2	1	1	1		
Video 4	3		2			
Video 5	1	3	2			
Video 6	3	3				
Video 7		1	3	1		

Table 2. Networking course student feedback Video vs. Score

Programming Course						
	Disliked					
	100	80	60	40	20	0
Video 1		3		1	1	
Video 2	1			1		
Video 3						
Video 4			2			
Video 5	1	2				
Video 6	3				1	
Video 7	1					
	Liked					
	100	80	60	40	20	0
Video 1	10	7	7	1		
Video 2	11		17			
Video 3	10	14	4	1	1	
Video 4	15	2	10	2		
Video 5	9	20	3	1		
Video 6	17		11		3	1
Video 7	14	9	5			

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AUTHOR'S PROFILE

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Dr. Gupta completed her Bachelors (2002) in Electrical Engineering from Wilkes University, USA followed by a Masters (2005) in Secure Software Engineering, from James Madison University, USA and doctorate (2014) in computer science from Kansas State University, USA. She is currently working as an Assistant Professor at DeSales University, USA. Dr. Gupta is a member to Association of Computing Machinery and Society of Women Engineers.