

# Gaming Pedagogy For Effective Learning In Engineering Colleges

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**Abstract:** Our conventional teaching style teaches how to listen, memorize, and how to apply it to the real world. However, it is a good style of teaching, participation of the student in a subject is very less. Most of the time, it is faculty centric. Furthermore, in this style of teaching, practical knowledge is very less, most of them working towards the marks. In order to improve the teaching methods and to reduce the gap between the student and faculty, many academicians did their research in active learning. It improves the quality of teaching, and gave different ambient to the students. In this dissertation, gaming pedagogy is designed for engineering college students. Millennium learners prefer active learning; most importantly, they are visual learners. The mind map is one such technique, here they need to associate something related. Though it is a group activity, it cannot be conducted as a game. Teaching with images arouses their curiosity and if it is clubbed with a game their interest goes infinite. Hence, the pedagogy called connexion was designed to attract the diverse learners. Here, the class was divided into groups. One set of students was asked to prepare the task for connexion game called authors, and the other set was simply

participants. The authors weaved together the images available in the public domain for finding the concept. Doing so they came up with lots of questions with the items they were exploring and they even developed some good strategies. They also designed clue questions for the participants to answer with the help of the teacher. For this study, connexion game conducted for the subject programming for problem solving using C. For detailed analysis fifty students chosen in our class; Students assessed in a specific concept via a connexion game. From the result, it is observed that ninety percentage of the students actively participated and understood the concept easily. The feedback also collected from the students, it shows that they are enjoying gaming pedagogy. As an end result, this gaming made the authors to think critically and the participants have a good conceptual understanding in addition to a good revision exercise and entertainment for them.

**Keywords :**Teaching, game, connexion, learners, pedagogy.

## 1. Introduction and Literature Survey

Students who born after 1980 are considered as Gen X students (Oblinger et al. 2005). They are more active, but in the media or gadgets. Gen X students are expecting different instructional styles than the traditional teaching approach. Conventional education depended on didactic methods for instruction (Peddle et al. 2011). The need of active learning strategies becomes more important in the context of experimental learning (Maier et al.1994).

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The recent rise of experimental learning, challenges included in conventional instructional method, expanding the call to utilize numerous active learning strategies (Kolb et al. 1984). Students generational diversity demands more innovative instructional strategies for retention and improvement. This generation student creates more challenges and opportunities for teachers to redesign curriculum by using latest technologies which makes pedagogy more dynamic (Pardue et al. 2008). To make them involved, teachers intended active learning pedagogy.

Active learning pedagogy entails students to play jointly in small groups to understand, study, condemn, and resolve problems instead of just taking notes (Cooper et al. 1990). Active learning affords a realistic experience and promotes learning via empirical learning techniques.

Although active learning research exists three decades before (Qualters. 2001, Kuh. 2001, Bonwell et al. 1991), we have started using recently because active learning pedagogy is the demand of the hour today. The basic aim of active learning is to induce the scholarly people to gain higher order thinking skills. Activity based learning came up to inculcate higher order skills. To infuse higher order skills, the instructors came up with a problem based learning (Emily et al. 2010), project based learning (Phyllis et al. 2011). Nevertheless, this needs the students hard work in learning the concepts very clearly, in turn the terminologies. In addition, the designer of the above pedagogy has to be very competent enough to design the activity. Though most of the Engineering students are naturally problem solver, from Gen x, some group of students needs the attention of the faculty always, i.e. they do not think themselves, even though they possess the capability i.e. they have the skills, but do not apply to studies in other words they do not carry forward their learning to higher semesters.

Mind map and concept map (Valery et al. 2015) are the two different pedagogies designed to make the students or teachers to think about connexions. These pedagogies are again a failure for a set of students who do not even try to remember new jargons with their meaning or concepts. They do not recollect what needs to be studied at the end of the semester for their exams even though they have their curriculum and syllabi. They are with the characteristics that they learn many jargons attached to the media or gadget applications but do not apply to studies.

From the study, it illustrates that students are assorted learners. They are majorly classified into four, to be specific, auditory learner, visual learner, cognitive learner and kinesthetic learner. Auditory learner has a preference to verbal instruction via hearing material. Visual learners benefit from the strategies of learning using pictures, flashcards and picture, etc. (Dicarlo et al. 2006). Cognitive learners like to contribute information. Kinesthetic learners favor an experimental approach learning (Meehan. 2008). By offering diverse approaches diverse styles of learners can be suited.

A game is an activity controlled by training rules that call for changing degree of probability. In which, players contend through the use of experience or skill to achieve defined goals (Massey et al. 2005). Educational games promote numerous learning methods with the aid of visual and auditory stimuli, whereas encouraging group debate and contribution (Peddle. 2011). A game can be well-designed to persuade critical thinking and logical thinking (Cruickshank et al. 1980). The important benefit of employing games, as a teaching strategy, is that students get the chance for immediate response, through the discussion of correct answers and their validations. An additional advantage of games is the occasion for teachers to assist discussion and elucidate fallacy (Sugar et al. 1999). From the study, it shows that games encourage learning and collaboration among students. Hence, teachers designed gaming pedagogy to attract such students.

## **2. Problem identification**

Programming for problem solving (basically C programming) is a common subject offered in all disciplines of first year engineering students. Students who complete science stream in schooling feel this paper as one of the difficult subjects. In order to make the concepts of C as simple as possible, gaming is chosen as a tool for learning this subject.

## **3. Connexion game**

Connexion is a well-liked Indian television game show that is hosted on Vijay TV. The game show has been viewed by millions of audience worldwide. This game comprises of n number of teams and clues are given for finding the words, proverbs, film name, etc.

The clues may be pictures or audio. By using the clues, participants have to identify the hidden answer. In this dissertation, the concept of the same game is used to understand C concepts more clearly.

#### 4. Connexion game design for programming for problem solving

The purpose of this game is to recollect and understand the concepts whatever taught in the class room. Fifty students were selected from bio-medical













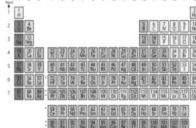


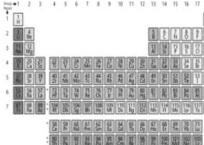
**Table 4.1. Experimental Setup**

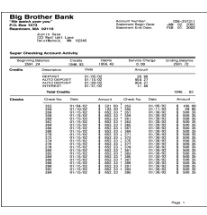
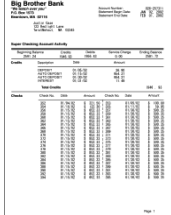
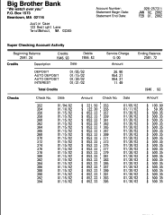

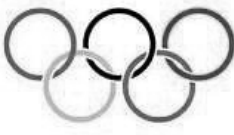












Total number of students	50
Total Number of authors	14
Total number of participants	36
Total number of questions	15
Maximum time given for finding the answer for a question	3 min
Total time allotted for the game	45 min
Slots	2
Participants in each slot	18

department. Out of fifty students, 14 students were chosen as authors and remaining students were chosen as participants. Authors, who prepared the clues for conducting game, they are also responsible for hosting the game. Participants were allowed to discuss among themselves for finding the answer. No points were given for partial answers. Game was conducted in 2 slots for 2 days. Each slot comprised 18 participants which were divided into 6 teams with 3 members in each team. Time period for game was 45 minutes. 15 questions were given to each slot and questions could be answered within 3 minutes as shown in table [4.1].

After completion of the experimental setup, clues were prepared. For that, firstly the concepts of C were listed such as structure, pointer, data type, keywords, operator, array, etc. Clues were prepared in two ways. In the first method, definition of concepts was given as clue and in another method, name of concepts was given as clue to find the concept as shown in table [4.2]. Clues are displayed in the form of pictures using projector. Teacher acted as guide, they provided the support in finding answers to the participants.

**Table 4.2 : Conceptual Clues for Connexion Game**

Clue1	Clue2	Clue 3	Expected Answer
		 	Pointer
			String
			Operator
			Structure
			Array

			Looping
			Singly Linked List
			Doubly Linked List
		Files	
		Keyword	
		Data type	
		Function pointer	

**5. Experimental Results**

Before commencement of the game, clues were reviewed by teachers and authors for finding the effectiveness of the clue. For that, feedback was collected from teachers and authors. Table [5.1] illustrates questions prepared for collecting feedback, Table[5.2] shows the scale used in the feedback and average value of the feedback for the clues obtained from 20 members.

**Table 5.1 : Question prepared for obtaining the feedback regarding clues**

S.No	Questions
1	Clues are sufficient to find the answer
2	Clues clearly defines the concepts
3	Clues are not related to the concept
4	Clues are easy to understand
5	Pictures are clear

**Table 5.2. Feedback results regarding the usefulness of clues**

Scale	Usefulness of clues (Average of 20 persons feedback in %)
1- Not at all	0
2- Not much	0
3- Some what	10
4- Quite a bit	15
5- A lot	75

From the feedback results related to clues, it is observed more than 70% of the students state that clues were designed really suitable and useful for recollecting the concepts. Only 10% to 15% of the students felt clues are difficult since they were not sincere in studies and motivation is required for them to show interest in studies. After that, for understanding the usefulness of connexion game in learning, a survey was conducted. For this survey, 38 students from participants side were asked to fill the feedback form prepared by teacher. Carefully designed questions asked in the feedback form were listed in the table [5.3]. Of 38 students, 35 students submitted their feedback form. Table [5.4] shows average feedback value obtained from 35 students.

**Table 5.3: Questions prepared for acquiring feedback regarding beneficial of the game in learning**

S.No	Questions
1	Was the gaming activity conducted beneficial?
2	Have you enjoyed playing the connexion game?
3	Is the game helpful to understand the concepts in a better way?
4	Did you feel that you learnt a new learning methodology?
5	Do you think that the game is useful to recollect the concepts?
6	Did you feel that the game was not enjoyable?
7	Whether the game is beneficial for learning or not?
8	Whether sufficient timing was given to guess answers?

From the feedback results related to beneficial of the game in learning, it is observed that more than 85% of the students stated that the gaming pedagogy is more useful in recollecting the concepts and

**Table 5.4 : Feedback results regarding the beneficial of the game in learning**

Scale	Beneficial of the game (Average of 35 students feedback in %)
1- Never	28
2- Rarely	28
3- Sometimes	57
4- Usually	28.5
5- Always	60

enjoyable. They felt, it is a platform for interacting with other students. 57% of the students stated that, timing is not sufficient due to the clues difficulty level to find the answer in a stipulated period. 28% of the students felt that the problems were of medium complexity and they wanted highly complexity problems to be failed. 28% of students gives negative feedback. But we analyzed the students profile, from that we observed this negative feedback is received only from the students not showing interest in any subjects. They need special care and attention for performing better in studies. Evaluation is done with Likert Scale to validate the students perception about the game and also checks the benefit of the game in learning. An opportunity was given to students for writing their own feedback about the use of connexion that is listed in the table [5.5]. From their own feedback, qualitative data also was generated; It was very helpful for understanding the benefits of the game to the students in learning.

**Table 5.5. General comments regarding connexion**

S.No	General comments which were received from the students regarding gaming pedagogy
1	Clues are very useful to find the concept.
2	Connexion game is very useful for understanding the concept.
3	Game is enjoyable and funny.
4	Game is very useful to remember the concept in the exam point of view.
5	Connexion is a fun game and it is a new learning style.
6	Connexion game makes to understand the concept in a better way.
7	Game gives a way to break the conventional teaching.
8	Game gives a space to interact with other students and it builds a team for learning.
9	Game gives new environment for learning.
10	Game enables to share the knowledge.
11	Complexity level needs to be increased
12	Not effective
13	Time is not sufficient to find the answer
14	This style of teaching reduces the gap between student and faculty
15	Not able to apply for solving problems

General comments show that connexion game based learning is increasing student learning and satisfaction. Students find the connexion game which was used in class review before the commencement of the test is highly useful in learning course material. It

shows that the gaming technique makes the students learning enjoyable and effective.

## 6. Limitation and recommendation for future research

Even gaming technique makes the students to understand the concept more clearly. However, it is not useful for design oriented papers. The poorly designed game leads to failure or dissatisfaction. Connexion game is suitable only for small sample size. We used Connexion game for understanding C concepts. In future, these gaming concepts will be tried for other subjects like data structures, Artificial Intelligence, etc.

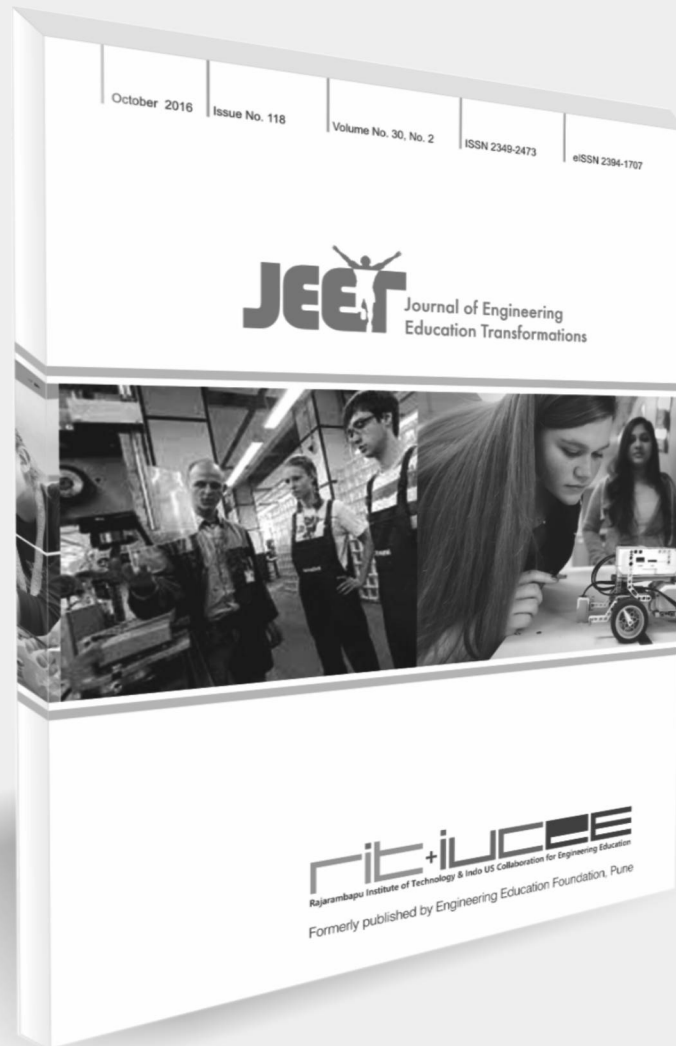
## 7. Conclusion

The use of games in engineering education can require critical thinking to make a decision. In this dissertation, connexion game was designed to remember the jargons in computer programming by way of relating the concepts with day to day life terminology. It greatly improved the students attention to answer sportively and hence involuntarily the jargons registered in their mind with their clear definition too. Hence, during their next classes, the definitions were heard loudly from the students. This paved a natural way to get further interest in learning the coding. It also gave a feeling of satisfaction to the instructor as the assessment was immediate. Lastly, a study was conducted to assess the perspective of educational games with 50 students. The study observed the advantage of using connexion game as improvement of student learning, 82.5% of the students frolicked, 71.5% of the students were found interactive and involved. The factors that discouraged instructors from using games included latent negative reaction of students 32.5%. This study confirms that the students perceived connexion game as an excellent mode to emphasize knowledge learning and be capable of helping students to revise their concepts.

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