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Understanding Knowledge Domain in Outcome Based Education Through Cooperative Learning Method

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Abstract: The Outcome Based Education (OBE) plays a major role in improving the quality of an education system. In OBE knowledge, skills and attitudes of a graduate are the major components. In this paper effective teaching of cognitive domain in the outcome based education is analyzed. The jig saw based cooperative learning method is the one which involves group participation model that encourage peer teaching and learning in an effective way. On practicing the cooperative learning method 91.67% of expected attainment is achieved. This method proves to be the effective one for understanding cognitive domain in the outcome based education.

Keywords: Attainment, Blooms' Taxonomy, cooperative learning, jig saw method, Outcome Based Education.

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1. Introduction

The world's third largest economy and biggest patron to the global workforce is India. Currently 32 is the median age of India's 136 core population. Over the last 10 years, India brought in lots of transformation in the field of Education. The learning outcomes in the education system are enhanced with the student centric learning system. Despite the improvements the Indian higher education institutions fail to find a best place in the world [1]. In India, NAAC (National Accreditation and Assessment Council) and NBA (National Board of Accreditation) are signatory bodied involved in assessing the quality of education in Educational Institutions. The NBA became a member of WA (Washington Accord), an international agreement between bodies that accredit engineering degree programmes. NBA Accreditation focuses on Outcome Based Education which is a student centered instruction that measures student on their performance and achievement i.e. outcomes. Knowledge, attitudes and skills of a graduate comes under various outcome [2].

Outcome Based Education highlights the learning outcomes that students must demonstrate during the time of graduation. Several theories have been evolved for the effective implementation of OBE [3-7]. The curriculum is a structured entity in most of the OBE model which has a set of learning objectives and means to achieve those objectives. In OBE the learning objectives are labelled as learning outcomes

and encouraging instructors to translate the existing learning objectives to learning outcomes. [8].

The understanding of Outcome Based Education among the teaching community is little, hence the effort taken to make the faculty aware about different parts of OBE is presented here. Outcome of an engineering graduates are the combination of knowledge, skills and attitudes. Dr. Benjamin S Bloom designed and developed an important framework and Published in 1956, for teachers to focus more on higher order thinking. Bloom's Taxonomy has acted as a base for many concepts and advanced everywhere in the world by academicians for the preparation of learning evaluation materials [9].

This paper is organized in to six sessions. The various levels of revised Bloom's Taxonomy is given in section 2, section 3 discusses the Learning approach in understanding the different levels of cognitive domain. Methods and materials used for effective teaching of cognitive domain are discussed in section 4. The section 5 explores the results and outcome of the study and section 6 concludes the findings of the paper.

2. Revised Bloom's Taxonomy

Benjamin et al., [9] generated the first cognitive domain taxonomy for classifying the level of abstraction of questions which often arise in educational settings. Anderson and Krathwohl [10] revised the Taxonomy to help teachers understanding and better implementation. The various levels of revised Bloom's Taxonomy are shown in Figure.1.

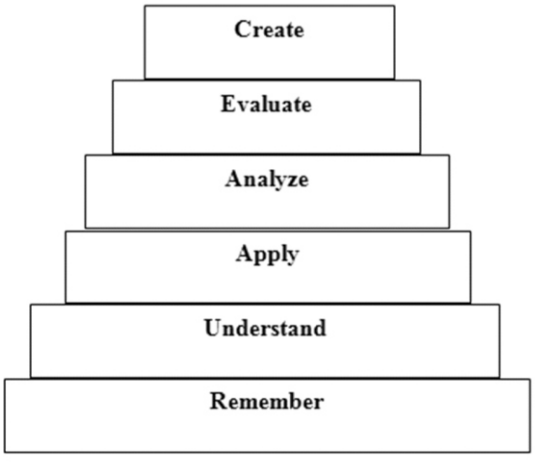

Fig. 1 : Structure of Revised Bloom's Taxonomy

It is clearly shown in Figure.1 that remembering is the lower level of cognitive domain and creating is at the higher level. The six levels of cognitive domain are described as follows [10].

1. Remembering:

Identifying or remembering things from memory. If memory is being used to construct or retrieve meanings, lists, or data, to recall past knowledge, it is referred to remembering.

2. Understanding:

Generating context from a number of functions, such as classifying, interpreting, summarising, exemplifying, inferring, explaining contrasting graphic or written messages.

3. Applying:

Executing a process helps to carry out or use it to solve the engineering problem.Models, demonstrations, interviews, and simulations are examples of items that can be used to implement what has been studied.

4. Analysing:

Breaking down materials or ideas into pieces and finding out how they relate to one another or interrelate, as well as how they relate to a purpose or broader structure. Attributing, arranging, and differentiating mental acts, along with being capable to differentiate between parts or components, are all included in this feature. When analysing, one may show this mental feature.

5. Evaluating:

The values of an ideas are judgmental by the students, when the students reaches this knowledge level by testing, critiquing and decision making based on requirements and expectations. Critiques, guidelines, and studies are only a few examples of items that can be produced to illustrate assessment processes. In the modern taxonomy, testing falls before generating because it is frequently a needed part of the preparatory actions before one creates.

6. Creating:

Putting elements with each other to form a logical

or whole function; reconfiguring elements into a different structure or pattern by creating, producing or preparing. Users must bring parts with each other in innovative ways or synthesise parts towards something fresh and unique to produce a new product or type when the participant create. In the current taxonomy, this is the most complicated mental feature.

3. Learning Approach In Understanding The Different Levels of Cognitive Domain

The Traditional method of teaching involves delivery of the messages through overhead projector and “chalk and talk” method. The behavioural learning viewpoint is at the core of this model and that has been passed away for decades as a teaching my thology in all the educational academy.

The learning process is typically passive, and the participants have little influence over their learning [11]. In learning and teaching, the standard lecture method in the classroom is counterproductive. The traditional approach of learning prohibit the students to ask question or quarries on what they have pick up or to correlate that with what they have learnt already [12]. As a result, problem-based education is regarded as a creative way to motivate students to enrol how to gain or learn about real-world problems. [13].

The jigsaw approach has been shown to enhance understanding while also promoting student collaboration. It is also considered as a helping tool for communication and listening [14-16]. In primary and elementary education this approach has been tried successfully [17-19].

The traditional teaching methods can be replaced with Jigsaw technique, which is a collaborative learning technique. As students work and evaluate essential concepts relevant to the course, this method increases not just the student's self-confidence, and also his or her group work results and communicative competence[20]. The jigsaw method has ten steps;

1. Divide students into jigsaw groups of 5 or 6 individuals.
2. Appoint a representative from each group of students.
3. Split up the day's lesson into 5-6 pieces.
4. Assign one section to each student to learn.
5. Encourage students to read through their section at least twice to familiarize themselves with it.
6. Form temporary "expert groups" by getting one student from each jigsaw group together with students from the same section.
7. Reintroduce the students to their jigsaw classes.
8. Make each student give a presentation to the group about their chapter.
9. Watch the mechanism as you move from group to group.
10. Offer a quiz on the content at the end of the session.

4. Methods And Materials Used For Effective Teaching Of Cognitive Domain

In this paper the case study taken for analysis is effective teaching of cognitive domain in the outcome based education. A three day residential workshop on “Outcome Based Education” was conducted for the

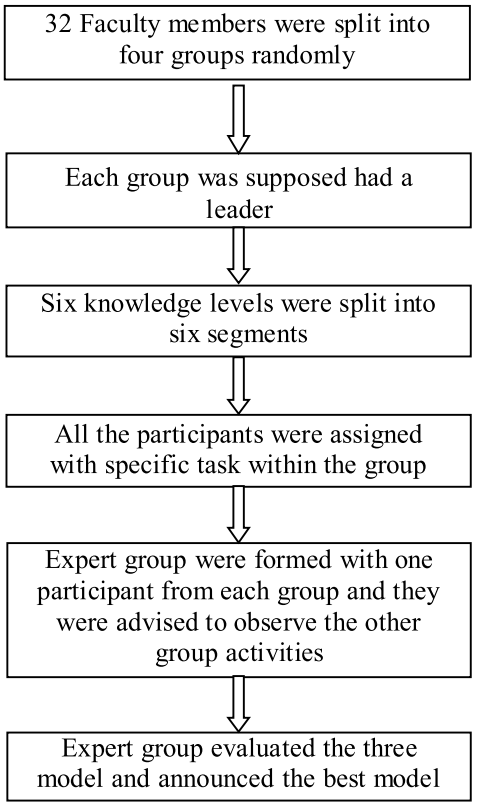

Fig.2 : Step by step procedure of Learning with jig-saw method

32 faculty members of Kongu Engineering College and the samples are taken from the workshop for the analysis of effective teaching learning assessment of outcome based education with jigsaw cooperative learning methodology. The creation of a three dimensional model was taken as an outcome of the session.

The steps involved in the learning of the cognitive domain with jig-saw a method is as shown in Figure 2.

The materials required for the creation of the three models were placed on the entry of the hall and the eight member group is split after entering into the hall. The Remembering, understanding and application of the materials were effectively learnt in the first part of the session and analysis of the errors in the design, evaluation of correct design and creation of the three dimensional model was executed in the second part of the session.

5. Results And Discussion

The sample three dimensional structures considered for the effective teaching of the six knowledge levels was a creation a paper model of a chair. The materials required for the creation of the 3D model were displayed as shown in the Figure. 3.

Fig. 3 : Materials required for the creation of the 3D model

After the four groups are split, the members in the groups were supposed to pen down the materials they saw and the application of each and every material was specified. The group leaders were allowed to take away one set of materials. The expert team was allowed to discuss their errors and suggestions and the Figure 4 shows the activity of creation of 3D model. The models created as the outcome of the session are depicted in Figure 5. Out of four models created, one with bird symbol backed the best model.

Fig. 4 : Cooperative learning activity of creation of 3D model

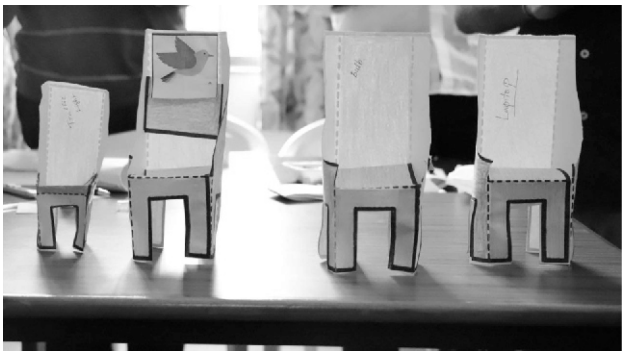

Fig. 5 : 3D models created as the outcome of Cooperative learning

Table 1. : Quiz Results

S. No	PARTICIPANT	SCORE (20)
1.	Participant 1	16
2.	Participant 2	14
3.	Participant 3	12
4.	Participant 4	12
5.	Participant 5	
	*	
	*	
	*	
28.	Participant 28	
29.	Participant 29	8
30.	Participant 30	8
31.	Participant 31	6
32.	Participant 32	6
No of Participants obtained scores above 50%		22
Expected attainment 75% (24 Participants) scores above 50%.		
Actual Attainment		22/24*100 = 91.6%

From the above table it is inferred that the expectation of attainment of the workshop session of 75% participants should score above 50%. Finally the score achieved is 91.6%.

6. Conclusion

The case study taken for analysis is effective teaching of cognitive domain in the outcome based education is discussed in the paper. The jig saw based cooperative learning method isthe one which involves group participation model that encourage peer teaching and learning in an effective way. This uses learner centered methods as prescribed in the outcome based education. The 91.67% of expected attainment is achieved with this method of learning in the effective teaching of the cognitive domain in the outcome based education.

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References

[1] Ernst and Young LLP, 'Perspective 2030: Recounting two decades of transformation in higher education' Higher Education in India: Vision 2030, FICCI Higher Education Summit 2013.

[2] www.nbaind.org. Accreditation Manual for UG Engineering Programmes (Tier-I), June 2015.

[3] Dee Fink L (2003), 'Creating Significant Learning Experiences: An Integrated Approach to Designing College Courses', Jossey-Bass, A Wiley Imprint, San Francisco.

[4] Dee Fink L (2009), 'Designing Courses for Significant Learning: Voices of Experience', Jossey-Bass Series on New Directions for Teaching and Learning, A Wiley Imprint, San Francisco.

[5] Richard Felder and Rebecca Brent (2009), 'Designing and Teaching Courses to Satisfy the ABET Engineering Criteria', Journal of Engineering Education, vol: 92, no: 1, pp 7-25.

[6] Glatthorn, A. A. (1993), 'Perspectives and imperatives: outcome- based education: reform and the curriculum process', Journal of Curriculum and Supervision, vol: 8, no: 4, pp. 354-363.

[7] Rashid, M. H. (2013), 'The Process of Outcome-Based Education - Implementation, Assessment and Evaluations' 2013 ASEE International Forum, Atlanta, Georgia.

[8] LiliyaAkhmadeeva, Maureen Hind and Carolyn J. Sparrey(2013), 'Overcoming Obstacles to Implementing an Outcome- Based Education model: Traditional versus Transformational OBE', Proceedings of 2013 Canadian Engineering Education Association (CEEA13) Conference, pp 1-5.

[9] Bloom, B. S. and Krathwohl, D. R. (1956), 'Taxonomy of educational objectives: The classification of educational goals by a committee of college and university examiners', Handbook 1: Cognitive domain. Addison-Wesley , New York.

[10] Anderson, L. W. and Krathwohl, D. R. (Eds.). (2001), 'A taxonomy for learning, teaching and assessing: A revision of Bloom's Taxonomy of educational objectives: Complete edition'. New York: Longman.

[11] Orlich, D. C., Harder, R. J., Callahan, R.C., and Gibson, H.W. (1998), 'Teaching Strategies: A Guide to Better Instruction', Houghton Mifflin Co, New York.

[12] Teo, R. and Wong, A. (2000), 'Does Problem Based Learning Create A Better Student: A Reflection', 2nd Asia Pacific Conference on Problem –Based Learning: Education Across Disciplines, December 4-7, Singapore.

[13] Boud, D. and Feletti, G. (1999), 'The Challenge of Problem-Based Learning', (2nd Ed.), London: Kogan Page.

[14] Charania NA, Kausar F and Cassum S. (2001), 'Playing jigsaw: a cooperative learning experience', Journal of Nursing Education, vol: 40, pp 420–421.

[15] Millis, B. J, Cottell, P. G., Jr. (1998), 'Cooperative

learning for higher education faculty, American Council on Education', Series on Higher Education, The Oryx Press, Phoenix, AZ.

[16] Perkins, David V., Saris and Renee N. (2001), 'A "jigsaw classroom" technique for undergraduate statistics courses', Teaching of Psychology, vol: 28, pp 111–113.

[17] Elora C. Voyles, Sarah F. Bailey and Amanda M. Durik (2015), 'New Pieces of the Jigsaw Classroom: Increasing Accountability to Reduce. Social Loafing in Student Group Projects', The New School Psychology Bulletin, vol: 13, pp 11–20.

[18] Souvignier E and Kronenberger J. (2007), ' Cooperative learning in third graders' jigsaw groups for mathematics and science with and without questioning training', British Journal of Educational Psychology, vol: 77, pp 755–771.

[19] Tanner K, Chatman LS and Allen D (2003), 'Approaches to Cell Biology Teaching: Cooperative Learning in the Science Classroom—Beyond Students Working in Groups', Cell Biology Education, vol: 2, pp 1–5.

[20] Bharti Bhandari, Bharati Mehta, ManishaMavai, Yogendra Raj Singh and Anish Singhal (2017), 'Jigsaw Method: An Innovative Way of Cooperative Learning in Physiology', Indian Journal of Physiology and Pharmacology, vol: 61, no: 3, pp 1-7.