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Enhancement of teaching learning process by Blended Teaching

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Abstract: The teaching-learning process is one of the most fun ways to learn for a lifetime of a learning experience and inner competence. Teaching provides a kind of opportunity to share free trade of information and ideas in a useful environment. Effective teaching should follow the strategic path of dealing with the main motto of student vision and innovation. Drawing on the concentration of students in the classroom is a great influence, which gives the image of a good class. The experiential-based learning approach relates the concept of teaching to industrial standards and applications, where the student gets to know why, where, and what to learn. Current and future generations of students are born in the technological age and are more passionate about utilizing web resources. The traditional blackboard teaching class seems passive and, in experiential that fails to grab the attention of millennials. Blended teaching (Flipped Classroom) can make the classroom dynamic and interactive. We have practiced some active learning techniques such as Flipped STAD, reciprocal teaching, and flipped classroom to make the classroom interactive and dynamic. This article discusses the experiences and barriers of blended teaching combined with classroom practices. This article will help the aspirants who are in thirst to adopt innovation in teaching

Keywords: Blended teaching, flipped classroom, reciprocal teaching, effective teaching, STAD

1. Introduction

It is a general tendency among the student community to experience boredom when there are no student engagement activities and it is quite difficult for the lecturer to teach a vast subject effectively without spending much time while conducting activities [1]. It is also seen that in conventional teaching practices students usually fail to solve more problems [2]. Flipped classroom models generally eliminate this problem, because students are made to solve numerical problems within the classroom and take away theoretical concepts as homework by which both the student and lecturer are benefitted [3]. Flipped classroom models are maybe normal flipped class and blended flipped class but are more flexible as the classroom can be converted to the regular conventional class whenever it is necessary [4]. This flexibility of the blended flipped classroom model

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makes it easy for implementation as well [5]. The research was conducted to assess the effectiveness of flipped classrooms (A classroom improvement activity) against traditional teaching techniques [6-8]. This mixed flipped classroom approach was applied to engineering students pursuing their degrees.

2. Background

In traditional blackboard teaching, the class will be passive and not student-centric, it is observed that blended teaching (flipped classroom) can make the classroom dynamic and interactive [9]. There should be a gradual improvement to shift the methodology of teaching [10]. Students' learning capacity, engagement, teamwork, and communication skills improve with blended instruction [11-12]. Some of the most significant elements to consider when implementing a blended method of instruction include

1. Practice on technology tools like Edmodo, Google classroom, TED-Ed, and Moodle, etc.
2. Set clear objectives and outcomes for each activity
3. Develop good content which enhances the skills of the students
4. Refine and improve the content and methods
5. Conduct some online quizzes, MCQ and take the feedback from the students
6. Gradually implement a flipped classroom
7. Take the feedback from students and faculty regularly

Collaborative Learning activities help slow learners improve their learning abilities. This grouping of students is based on rank, gender, and problem-solving abilities and they participate in activities that increase student engagement [13-15].

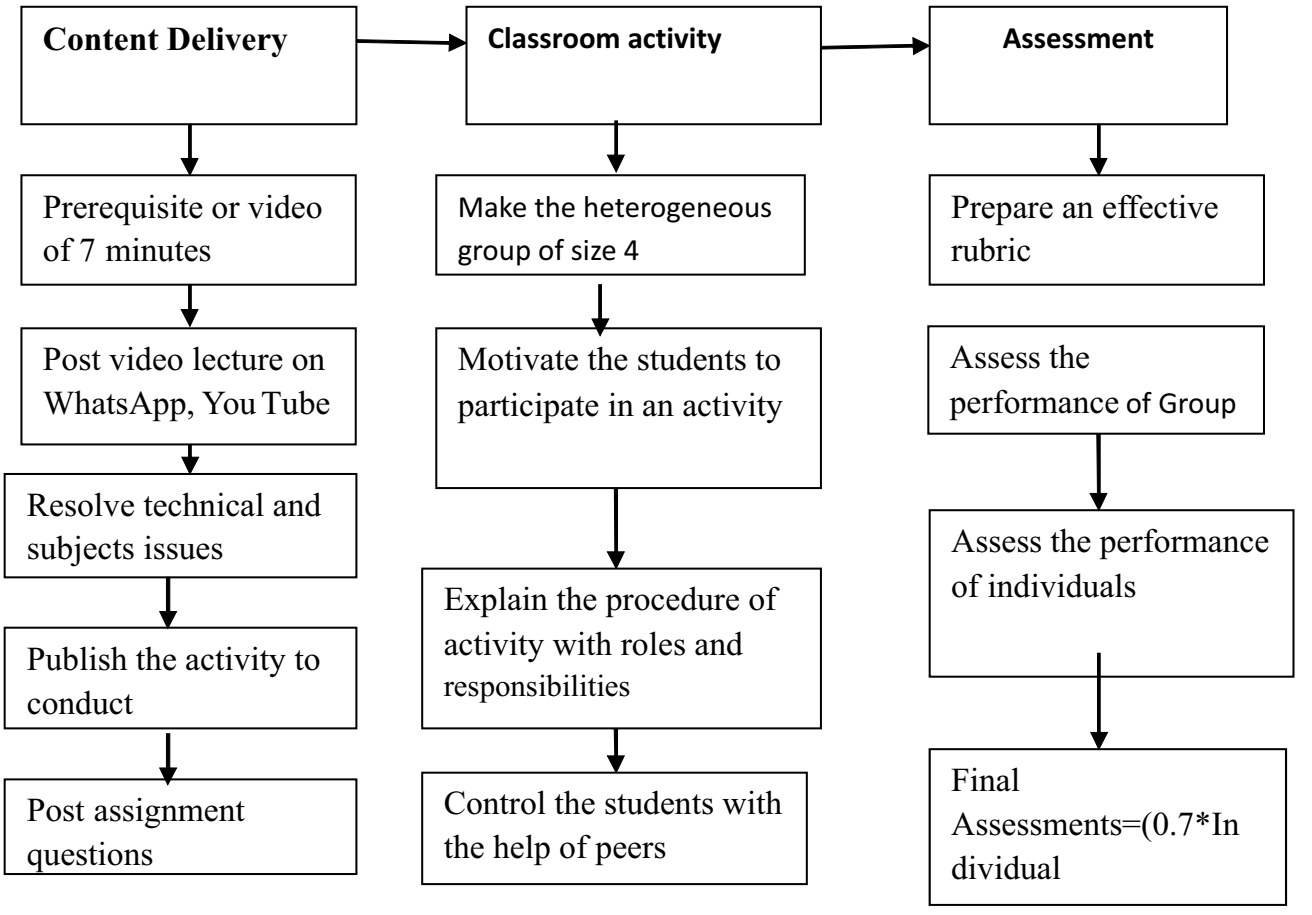


Fig. 1: Flow diagram for the teaching-learning process

3. Methodology

The teaching-learning process is divided into three phases: 1. Content delivery 2. Classroom activity 3. Assessment. The flow diagram for the teaching-learning process is given in figure 1. The content delivery includes provision of pre-lecture video, post lecture video, assignment questions, solutions to technical issues. The efficiency of the content delivery can be analyzed by conducting classroom activity, the detailed analysis about classroom activity is discussed in the succeeding modules. The outcome of the activity can be measured through different levels of assessments. The assessment details and formation of rubrics are detailed in the modules that are cited in the below sections of this article.

3. Blended Teaching Techniques:

3.1Flipped classroom:

a) Scope: Flipped classroom and its practices

Flipped classroom instructional model relates to the concept of gaining prior knowledge about the concepts that are to be discussed in the upcoming class. Flipped classroom module is giving the sense that, usually students will learn in class and compute assignments or exercises at home [16]. The term flip stands in the point that, students will learn at home and practices discussions, exercises group discussion in class.

b) Design and Practice

The effectiveness of the flipped classroom can be experienced by selecting the suitable appropriate for the practice. The pre-learning module is identified and, the users are facilitated through a pre-knowledge gaining approach. The students have their responsibility in gaining knowledge [17] from the identified sources. The users are segregated into smaller groups in real-time. The users experience an active mode of learning. The instructors can facilitate the students suitably by introducing small group activities among them. The flipped classroom encourages a collaborative learning approach and ensures a diversified learning environment.

c) Effectiveness of the activity

The flipped classroom encourages a collaborative learning approach and ensures a diversified learning environment. The traditional method of teaching provides knowledge in a non-experiential manner. In contradiction, the flipped classroom provides knowledge so that, students can realize the concept, its applications, and the purpose of the theme. In short, flipped classroom module claims its role as an experiential methodology for the users to learn effectively. For analysis, an assessment was conducted using the traditional method and flipped classroom approach. Fig 2 shows the outcomes for the flipped classroom, the analysis reveals that there is a substantial rise in the learning rate as compared to the traditional delivery method.

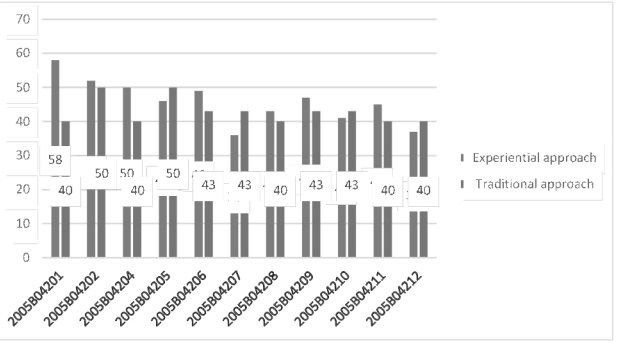


Fig 2 : Flipped classroom and its outcomes

3.2 Classroom Activities & Reflections:

3.2.1 Collaborative Learning

Section 3.1 discussed the flipped classroom approach and its effectiveness. The flipped classroom module depends on several tools and methodologies for its assessment. This section briefs out some interesting activities that support flipped classroom implementation among user groups.

a) Implementation Details

Students- Teams- Achievement-Division (STAD)

The Students- Teams- Achievement-Division (STAD) is a group activity that can be used as an assessment tool during flipped classroom practices conducted in the classroom. This method is suitable for shared learning levels. The students are placed in small groups or teams. For analysis, consider a group of 60 students is segregated into batches. The batch size of 4 will lead to the formation of 15 successful groups [18-19]. Students are grouped based on the following criteria:1. Based on their learning style 2. Based on Gender.

The importance of furnishing such criteria are

Criteria 1:Equally motivates different learning levels.

Criteria 2: Encourages learning without bias.

Flipped classroom-based STAD (FSTAD) and its flow

This article focuses on STAD in correlation with a flipped classroom, Figure 3 shows Flipped classroom-based STAD and its flow is discussed in this section. In normal STAD practice, the students are segregated into small groups and, a concept or topic is discussed in the class before the discussion. In a flipped classroom-based STAD, the concept is delivered in the form of the virtual source using web resources or prerecorded video shared to students using any of the Learning Management System (LMS). The students will come to class with prior knowledge concerning the topic of interest. The students are segregated into small groups and, the group discussion is implicated among the groups. The group discussion is felicitated by the corresponding instructor to ensure equal learning among the existing group. A quiz can be initiated after observation of the level of outcomes from different groups. The quiz can be taken by the students on an individual basis. The individual marks are cumulatively added and assessed on a group basis. The team with the highest marks was rewarded.

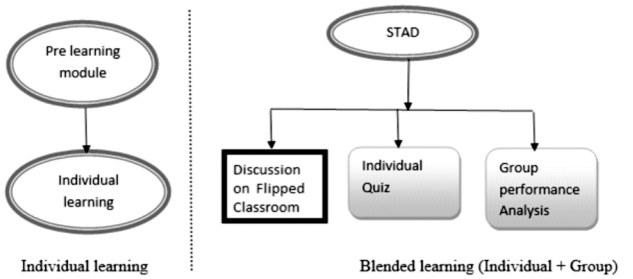


Fig. 3 : Flipped classroom-based STAD

Level of assessment for FSTAD

FSTAD allows students assessment in two ways: 1. Formative assessment 2. Summative assessment for individuals and groups.

- Formative assessment for an individual includes observation by the instructor of an individual, interim quiz.
- Summative assessment for the individual includes individual reports and Quiz results.
- Formative assessment for the group includes progress presentation and group quiz
- Summative assessment for the group includes the overall achievement of the team.

3.3 Reciprocal teaching

The important claim in this article, we can use any number of assessment tools at the reader's convenience. There are so many web resources available nowadays that allow the readers to select the tools according to their convenience. The important key is the tools are designed in the view of a common base. Consider the reciprocal teaching that relates flipped classroom, STAD in their design. The practicing methodology looks very close with a minute difference. The readers can compromise that, anyone can use any tools, but expertizing in one tool makes the things realizable irrespective of the tools and their design.

For analysis, consider the activity reciprocal teaching in correlation with flipped classroom approach. Fig 4. shows the design flow for Flipping and reciprocal teaching.

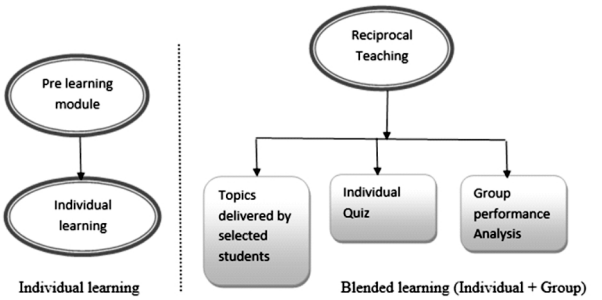


Fig. 4 : Flipped classroom-based Reciprocal Teaching

Fig 4 is a circular reference of Fig 3, it is evident from the diagram that, the flow is similar with a small modification in the design. The design and practice of modified reciprocal are discussed below.

1. Flipped classroom task is initiated among students.

2. Students gain prior knowledge about the topic of interest individuals

3. Students are grouped with minimum and comfortable batch sizes depending on the class size.

4. A set of students will demonstrate the concepts and workouts gained by themselves through virtual

learning.

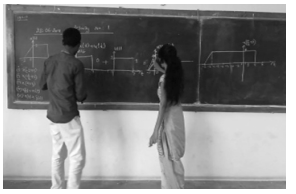
5. Remaining steps and methods are similar to FSTAD (circular reference)

Constraints while implementing the activities

There is no free lunch, each activity and practice has its advantages and disadvantages. The most important constraint is lack of resources, some rural students do not have web resources due to their poor economic backgrounds. These students are the main victims while practicing any activities that relate to web activities. These students are forcibly behaving as free riders. Motivating such students is an important aspect while practicing any outcome-based approach. Less intention to those students will make them a strong protestor for activity-based learning. The resolution can be obtained by practicing a blended approach, a special contact class can be conducted apart from the regular teaching hours and the topic of interest and related materials are shared with those students on a manual basis. Another approach the students can be counseled to complete their activities on their campus itself. In this pandemic situation, it is very hard to convince and address the students from rural backgrounds. Research is still going on to meet out the needs of rural students without any constraints. This article is also having constraints in the successful implication of blended teaching when the point of complete remote learning is the mandatory source of learning.

Evaluation of the success of activity:

In this pandemic situation, blended teaching is the only hope for the education platform. Keeping this point, as a point of hope, let us analyze the trends for the activities that, we analyze in the earlier sections. Figure 5 shows blended teaching Activity & reflections. The important observations while implementing the teaching modules and activities are 1. Active involvement of students 2. Collaborative learning skills and practices 3. Sustainability in solving problems 4. Development in personality, improvement in communication 5. Self-building of confidence to face the real world.



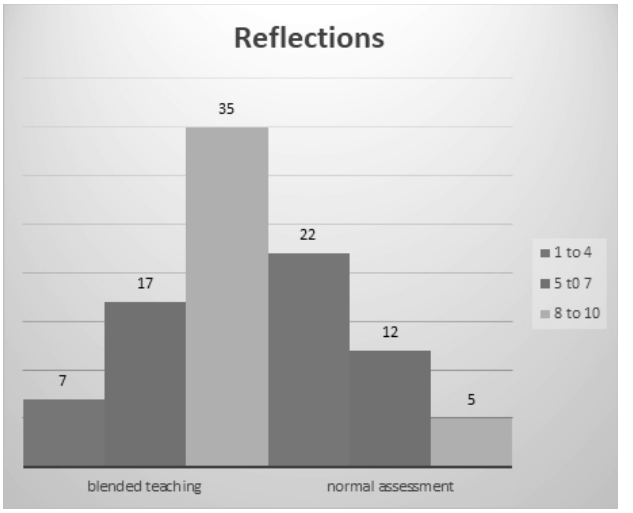


Fig. 5: Blended teaching Activity & reflections

Table 1: Blended teaching Activity summary

Scores	Blended Teaching	Normal teaching
Number of students attended : 49 students / 39 students		
1 to 4	**5**	**22**
5 to 7	**17**	**12**
8 to 10	**35**	**2**

Table 1 gives the reflections of blended teaching; reciprocal teaching observations are presented here for analysis. The Group of 20 students is selected and the topics are demonstrated in different methodology until the entire class gets satisfied with the topic of interest. The table reveals that there is a considerable increase in the learning rate, such that, the average and best score seems remarkable. The students' attendance also has attained certain improvement.

4. Effective assessment:

4.1 Rubric for Individual students:

Table 2 : Rubric for Individual assessment

Parameter	Outstanding (5 marks)	Good 4Marks)	Average (3 marks)	Poor (1 mark)
Participating in discussion (formative)	Enthusiastically participated with good outcomes	Actively participated	Participated some times	Rarely participated
Helping team members in solving problems (formative)	Helping team members and solved all the issues	Helping team members and solved some issues	Tried to help other members	Passive
Quiz performance (summative)	Every correct answer give 1 mark of a maximum of up to 5 marks			

Rubric for Group:

Table 3: Rubric for Group assessment

Parameter	Outstanding (5 marks)	Good (4 Marks)	Average (3 marks)	Poor (1 mark)
Meaningful discussion group (Formative)	The discussion gives highly relevant information which solves the problems	The discussion gives more relevant information	Discussion is mixed of relevant information and irrelevant	Discussion is irrelevant
Achievement of the final task (summative)	Achieve the desired output with outcomes	Achieve the desired output	Achieve the output with some errors	Not achieve the desired output
Quiz score by group(summative)	Every Correct answer give 1 mark of a maximum of up to 5 marks			

Table 4 : Assessment of individual performance

Individual score: Max Marks: 20

	Assessment			
	Group	**Score**	**Individual performed less than median score Yes/No**	**One most important reason for individual performance**
1	1	10	No	He is good at the subject
2	1	12	No	Good in calculations
….	…	….	….	……
60	15	13	No	Good at creativity

Table 5 : Assessment of group performance

Team score: Max Marks: 20

Team No.	No. of Students	Team Score (Median Score)	The team performed less than the median score (Yes/No)	One most Imp. Reason for Teams performance
1	4	12	No	He is good at the subject
2	4	11	No	Good in calculations
3	4	10	No	Good in verbal
4	4	12	No	Excellent in subject
5	4	9	Yes	Poor in verbal
6	4	10	No	Well in verbal
7	4	11	No	He is good at the subject
8	4	9.5	Yes	He is poor at the subject
9	4	11.5	No	Good in calculations
10	4	12.5	No	Good in verbal
11	4	13	No	Excellent in subject
12	4	10.5	No	He is good at the subject
13	4	11.5	No	Good at verbal skills
14	4	10.5	No	Good at calculations
15	4	9.5	Yes	Very poor at creativity

Conclusion & Future scope:

To implement a blended model of teaching, an intensive study was done to showcase the methodologies and techniques for implementing effective blended teaching. This article is prepared to identify and analyze different strategies involved in the blended teaching approach. Flipped classroom concept is taken for analysis, in which students will learn the concept on self -learning basis. The classroom becomes a collaborative space, in which, students can work collaboratively and realize things in an experiential approach. This enables an active learning culture in a normal classroom. However, the important barrier in the implication of flipped classrooms is no voice attendees. The students with a lack of web resources are the important aspirants to drop out from the activity practices, even though they have good learning skills. The web resources make the students stay away from this experiential approach. The teaching community needs to provide manual support, so that, to enhance uniformity in learning. The effectiveness of blended teaching needs proper training to instructors as well, before implementing any practices. The result and discussion prove that blended teaching will improvise the students' abilities in terms of critical thinking, applying knowledge, and lifelong learning. The assessment results show a fair growth in the learning aspects of the students in comparison with the normal teaching-based assessment. The blended teaching will provide an unbiased and active learning base among students. The teachers, in turn, will get instant feedback about the student caliber and their approach towards learning.

In short, the blended teaching will make the pedagogy student centric and, it will help the students to reach their milestones.

References:

[1] Brooks, D. W., Nolan, D. E., & Gallagher, S. M. (2001). Web-teaching: A guide to designing interactive teaching for the World Wide Web (Vol. 9), Springer.

[2] Keengwe, J., Onchwari, G., &OnChwari, J. (2009). Technology and student learning: Towards a learner-centered teaching model. AACE Journal, 17(1), 11-22.

[3] Jiang Jin-gang, Zhang Yong-de, Du Hai-yan, QiaoYu-jing, Wang Mo-nan, Dai Ye(2016), design and application of flipped classroom teaching model, the 11thinternational conference on computer science and education(ICCSE 2016), august 23-24 2016, Nagoya University, Japan.

[4] Ang SweeWen, NorasykinMohdZaid, JamalludinHarun (2016), enhancing student's ICT problem-solving skills using flipped classroom model, IEEE 8thinternational conference on teaching, assessment, and learning for engineering (ICEED).

[5] Dave Towey(2015), lessons from a failed flipped classroom, IEEE international conference on teaching, assessment and learning for engineering(TALE).

[6] KuntineeManeeratana, ThanyaratSinghanart, and PairodSinghatanadgid(2016). A preliminary study on the effectiveness of a flipped classroom in Thailand, 2016 IEEE international conference on teaching, assessment and learning for engineering(TALE)

[7] Aluvala, S., &Pothupogu, S. (2015). A Traditional Novel Approach for Skill Enhancement of Teaching-Learning Process in Engineering Education. Journal of Engineering Education Transformations, 28(4), 92-95.

[8] Kumar, K. S. Alok, G. Reddy, M. S. and Reddy, N. B.S. (Nov-2018) An integrated Multidisciplinary skill development strategy for effective execution from virtuality to reality in Engineering Education. In IEEE 6th International Conference on MOOCs, Innovation, and Technology in Education (MITE) pp. 79-83, IEEE.

[9] Anuradha, P., 2019. The teaching-learning process. International Journal of Advanced Science and Technology 28, 709–714.

[10] Alok, G., Pothupogu, S., Reddy, M. S., &SaiPriya, P. (2018, November). Trenchant Pathway to bring Innovation through Foundations to Product Design in Engineering Education. In 2018 IEEE 6th International Conference on MOOCs, Innovation, and Technology in Education (MITE) (pp. 43-47). IEEE.

[11] Archibald, D. E., Graham, C. R., & Larsen, R. (2021). Validating a blended teaching readiness instrument for primary/secondary preservice teachers. British Journal of Educational Technology, 52(2), 536–551. https://doi.org/10.1111/bjet.13060

[12] Ravat, S., Barnard-Ashton, P., & Keller, M. M. (2021). Blended teaching versus traditional teaching for undergraduate physiotherapy students at the University of the Witwatersrand. South African Journal of Physiotherapy, 77(1). https://doi.org/10.4102/sajp.v77i1.1544

[13] van Leeuwen, A., & Janssen, J. (2019, June 1). A systematic review of teacher guidance during collaborative learning in primary and secondary education. Educational Research Review. Elsevier Ltd. https://doi.org/10.1016/j.edurev.2019.02.001

[14] Dass, S., Ramananda, H. S., Jagadeesha, B., Rajesh Kumar, P. C., & Cherian, R. K. (2021). Effectiveness of collaborative learning among gen z engineering students. Journal of Engineering Education Transformations, 34(3), 70–78. https://doi.org/10.16920/jeet/2021/v34i3/155375

[15] Salunke, M., Vijayalakshmi, M., & Burli, S. B. (2016). Collaborative Experiential Learning Model. Journal of Engineering Education Transformations, 0(0). https://doi.org/10.16920/jeet/2016/v0i0/85524

[16] Turan, Z., & Akdag-Cimen, B. (2020). Flipped classroom in English language teaching: a systematic review. Computer Assisted Language Learning, 33(5–6), 590–606. https://doi.org/10.1080/09588221.2019.1584117

[17] Colomo-Magaña, E., Soto-Varela, R., Ruiz-Palmero, J., & Gómez-García, M. (2020). University students' perception of the usefulness of the flipped classroom methodology. Education Sciences, 10(10), 1–19.

https://doi.org/10.3390/educsci10100275

[18] Alok, G., Anushalini, T., &Condoor, S. (2018). Effective Approach towards Development of Idea through Foundations to Product Design. Journal of Engineering Education Transformations, 31(3), 47-52.

[19] B.Girirajan, L.M.I. Leo Joseph, Ch. Rajendra Prasad, A.Chakradhar. (2020). Multi-faceted impact of small group work to cooperative learning: A strategy for course design and delivery.Psychology and Education (2020) 57(9):556-561.