

Activity Based Teaching Learning: An Experience

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Abstract: The paper presents activity based teaching learning for undergraduate students. This also gives the analysis of the effectiveness of these activities. The objective of proposed pedagogical practice is to enhance the course learning, beyond the traditional mode. In the traditional mode of teaching the course was not able to make a positive impact on learning. This is because of monotonous lecturing and absence of activities. Activity Based Teaching Learning (ABTL) is an effort to overcome the limitations of traditional mode of course delivery. Progressive pedagogical models are used for the enhancement of course learning. To meet the objective different activities are designed and practiced along with class room teaching. The frame work includes teaching through games in Digital Communication course for 6th semester Electronics and Communication Engineering (ECE) students and worksheets in Basic Electronics for 1st year students. In the proposed approach, the active learning provides more opportunities to learn beyond the classroom teaching. Effectiveness of these activities is assessed through academic performance.

Keywords: Activity based learning, game based learning, worksheet.

1. Introduction

The paper address the in-depth learning in a set of courses like basic electronics in first semester of all disciplines and digital communication for sixth semester in Electronics and Communication engineering program, through activity based learning. Traditional mode of course design and classroom delivery includes chalk and talk for theoretical concepts and tutorials, supported by set of experiments. However these activities did not focus the students with different learning styles and failed to enhance their course learning. In most cases course projects, mini projects, minor projects and capstone projects carried out throughout the programme to evaluate the attainment of student outcomes *a to k*, in an outcome based education framework proposed in ABET and NBA [1,2,3,4].

It is a real challenge to make the students strong in their theoretical concepts to carry out projects. To facilitate this project based approach, learning through activities is practiced in the lower semesters of engineering programme. These issues are addressed by redesigning the curriculum, Adopting activity based pedagogical teaching learning practices. The framework of pedagogical activities designed and practiced in teaching learning includes several activities: mid lecture wakeup activities, game based learning, worksheets, simulations, one minute papers, group discussions, hourly plans, think pair and share, case studies, implementation assignments, quizzes etc. In this paper few activities are identified and practiced. Worksheets activity is carried out for first year students in Basic Electronics course and game based learning is practiced in Digital Communication course for sixth semester students of ECE, to strengthen the course learning beyond the traditional teaching.

The paper demonstrates:

- In depth learning in two courses using worksheet and game based approach as ABTL pedagogical tool.
- Effectiveness of the activities practiced in learning of the course and continuous improvement and curriculum modifications.

The framework of ABTL component is discussed in Section 2. Implementation of ABTL is discussed in Section 3. Conclusions are provided in Section 4.

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2. The Effective Learning Framework

The main idea of the frame work shown in Figure 1 is that, effective teaching and learning techniques lead to student satisfaction and motivation to learn when properly supported by a positive learning environment.

A. The Proposed Framework

The proposed framework consists of four main components:

1. **Strategies:** Use of different student-centered techniques to support and enhance learning.
2. **Roles:** Assigning roles and responsibilities to all the stakeholders to ensure their active participation and collaboration.
3. **Assessment:** Assessment and evaluation methods to measure monitor and promote learning.
4. **Environment:** Effective learning environment both inside and outside the classroom.

B. Strategies for Effective Learning

Effective learning needs an interactive classroom environment to motivate and encourage students. Such an environment requires flexible and adaptable teaching strategies to support and develop student's learning potential. Student-centered learning techniques can significantly increase student learning, motivation and their ability to think critically and creatively [6].

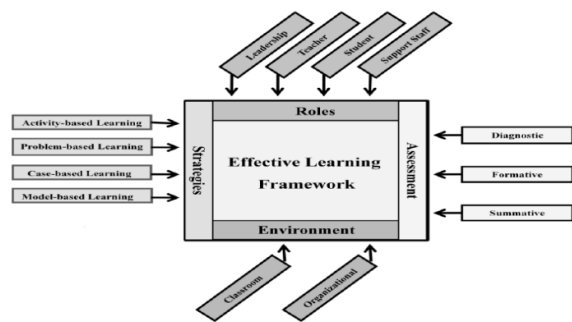


Fig. 1: The Student-centered Effective Learning Framework

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3. Activity Based Learning

Activity-based learning is based on effective student-teacher interaction. Active learning encourages students to inquire, explore, experiment, collaborate and experience the joy of learning [7]. In this technique the role of teachers shifts from that of delivering knowledge to that of facilitating and motivating [8].

A. Learning Through Worksheet

The objective of the engineering education is to train the students to apply their knowledge to solve problems in

societal context. Different pedagogical activities are practiced toward this during teaching learning process. Project based teaching learning is one of the proven practices in engineering education, and is effective once the competency is built to apply the theoretical concepts to solve engineering problems. The challenge is to cater the students with different learning abilities towards this objective. The homemade worksheets are used to teach any subjects and can be used for any age students [12]. Activity based learning through worksheet is used to facilitate project base learning by strengthening the fundamental concepts during classroom teaching.

1) *Scope: Work Sheets for engineering students:* The worksheet activity is extensively used in tertiary education to improve their linguistic and mathematical abilities. This paper demonstrates the ABTL using worksheets practiced for first year under graduate students.

The benefits of this pedagogical frame work are:

1. It provides interactive classroom environment.
2. The course instructor can break the monotony of the classroom teaching using this activity.
3. The students are allowed to correct their early missteps.
4. The presentation skills are monitored and corrected regularly.
5. Peer learning by think pair and share is possible.
6. The students are motivated to think beyond the typical pattern of evaluation.
7. The positive reinforcement motivates the student improve.
8. The immediate feedback is used to refine the concept dependent teaching technique.

1) Design and practice of work sheet activity:

The objective of the ABTL is to build the competency to solve real engineering problems. The challenge is to design an activity to focus students with different ability and learning styles. The worksheet activity is practiced to meet the objective. Students are informed about the theme and the expectation of the worksheet in advance and the theme based worksheets are designed by the course instructor and practiced in the classroom. The time spent for this activity is either first 30 min of the class, discussion on the performance and participation is continued for next 30 min. Most of the time student is monitored and corrected individually, worksheets are designed for group activity also.

2) *Difference between normal assignment and worksheet:* The worksheets are theme based, it could be to focus mathematical concept, or to improve writing and analysis skill. The Table 1 demonstrates the difference between the normal assignment used in the conventional teaching method and the theme based worksheet designed in this framework.

Table 1: Difference Between Normal Assignment And Worksheet

Sl. no	Normal assignment	Designed Worksheet	Theme is
1	Write the axioms and postulates of Boolean algebra	A+____=1 A+____=A	To improve Logical thinking
2	Show how opamp can be used as an integrator.	What is the output of the following circuit.	Logical and mathematical

3) *Effectiveness of the activity:* The ABTL using worksheet is practiced and the effectiveness is measured using academic performance of the students as well as using the student's feedback. The Figure 2 shows the influence of the activity on the student performance. The workshop activity for first year students is practiced after minor-1. In minor-1 the student performance was very poor. As a remedial strategic planning ABTL using worksheet is designed and practiced. The performance in minor 2 is improved considerably.

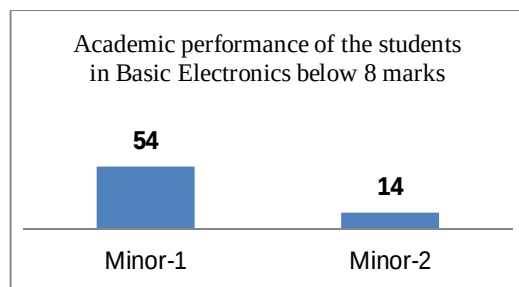


Fig.2: Academic Performance

The effectiveness is analysed using the students feedback also. The feedback questions framed by the instructor are:

1. Activity motivates to apply theoretical knowledge to solve given problem?
2. Activity is relevant in particular course/concept?
3. The worksheets are beyond typical pattern of evaluation.

The Figure 3 reflects the student feedback for this activity. The analysis is done on 1 to 3 scale, 3 being the strongly agree, 2 being the moderately agree and 1 indicates

disagree. 85% of the students strongly agreed that they got motivated take up project based learning by applying theoretical knowledge to solve given problem. 95% of the students agreed that the design of the worksheet was relevant. 90% of the students found the worksheets were beyond typical pattern of evaluation. Worksheet is used as an effective pedagogical tool in ABTL. The competency towards the project based learning is achieved.

B. Learning Through Games

Educational games have become popular in the academic community recently. Educational games can be used to enhance the learning experience by improving student's motivation and engagement. The integration of games in the learning process requires involvement of instructors in the development process to enhance the learning [10].

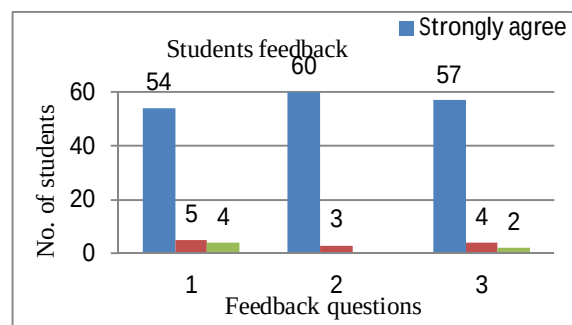


Fig. 3: Students Feedback

1) *Scope: Game based learning for engineering students:* The games are the activities attracting any class of students. The monotonous teaching and learning, limits the learning span of a student. This paper demonstrates the ABTL using games practiced for sixth semester under graduate students of ECE. The benefits of this pedagogical frame work are:

1. It provides interactive classroom environment.
2. It provides scope for group discussions and thinking beyond the curriculum.
3. The presentation skills are improved.
4. Peer learning by think pair and share is possible.
5. The students are encouraged to apply the theoretical concepts to real time scenarios.
6. The immediate feedback is used to fill the gap of teaching and learning.
- 7.

100	99.	98	97	96	95	94	93	92	91
WINNER	BER	DECODER	FM	MATCHED FILTER	P(e)	- TWO STEPS	DIGITAL	COMPANDING	COMMUTATOR
81	82	83	84	85	86	87	88	89	90
PSK	NOP	NON UNIFORM QNTZ	CHIP RATE	BASIS FUN	QUANTIZATION	Signal Rate	MEW LAW	SATELLITE COMM	CHANNEL
80	79	78	77	76	75	74	73	72	71
MOVE BACK BY SAME STEP	FORCE CODER	BPSK	PCM	FSK	Audio frequency	SNR	A LAW	PWM	Multipath fading
61	62	63	64	65	66	67	68	69	70
DM	threshold	N	M -DUO BINARY	EQUA LIZER	CODE LENGTH	CARRIER	PM	SKIP	RZ DATA
60	59	58	57	56	55	54	53	52	51
GRAY CODE	axial channel	Pass band transmission	Duo binary coding	+TWO STEPS	M ary mod	SFH	COAXIAL CABLE	M -duo binary coding	MATCHED FILTER
41	42	43	44	45	46	47	48	49	50
DATA RATE	NYQUIST RATE	- Two steps	REPEATER	Flat top SAMP LING	CUT OFF FREQ	BASEBAND	48 SINC PULSE	NRZ	DPCM
40	39	38	37	36	35	34	33	32	31
BONUS CHANCE	NOISE	SYNCHZN	AF	OPTICAL FIBRE	RF	DIG MODULATION	MOVE FRONT BY SAME STEP	CHANNEL CODER	PRECODER
21	22	23	24	25	26	27	28	29	30
UNIPOLAR	WIRED CHANNEL	CLADDING	NOP	CORE	POLAR	PAM	LOS	TDM	NLOS
20	19	18	17	16	15	14	13	12	11
ISI	BW	Dispersed cosine spectrum	BIPOLAR	Source code	MULT IPATH	DISCRETE	Sampling	PREDICTOR FILTER	NOP
1	2	3	4	5	6	7	8	9	10
START	SER	ASK	AM	EYE PATTERN	Redundant bits	TIR	FADING	MANCHESTER CODING	WIRELESS CHANNEL

Fig. 5: Template for Snake and Ladder Game

2) *Design and practice of game based approach:* Game based approach resembles snake and ladder game as shown in Figure 5. This activity was designed for 6th semester ECE students in Digital Communication course. To conduct this activity 85% of the course content needs to be completed. Hence this was scheduled typically after minor II. For the student to activity participate acceptance of the game are informed

well in advance. Class of 60 students is grouped into two of 30 each. Digital dice and timer are used as game components.

To score the face value points of the tossed dice the second group has to answer the question posed by the first group on the topic of respective grid in the scheduled time. The winning group was rewarded.

3) *Effectiveness of the activity*: As the activity is conducted after minor II, the students could revise thoroughly 85% on the course content. This led to improved preparation for the SEE. Reading was exhaustive so as to pose difficult question to the opponent team. This activity helped the course instructor to identify and bridge the gap in the classroom teaching. The effectiveness is analysed using the student's feedback as shown in Figure 4.

The feedback questions framed by the instructor are:

1. Activity motivates to strengthen theoretical knowledge.
2. Activity helped them to get connected to the real time scenarios.
3. Activity helped to prepare well for SEE.

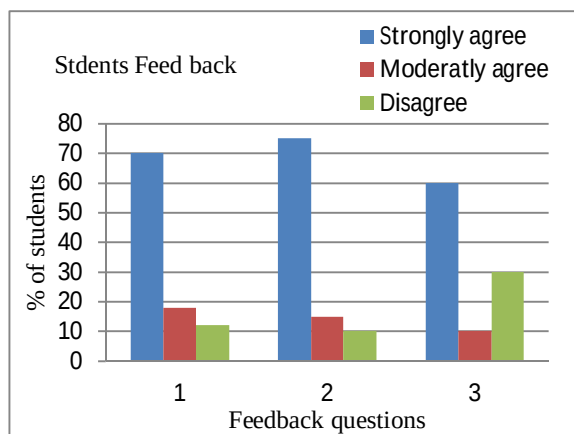


Fig. 4: Students feedback

4. Conclusion

The activity based teaching learning for undergraduate students is demonstrated in this paper. The effectiveness of the activities in this framework is also discussed. The analysis shows the enhancement in the course learning beyond the conventional teaching through ABTL. The ABTL found effective in improving the academic performance as well as bridging the gap between the theoretical concepts and real time scenarios.

References

- [1] Accreditation Board for Engineering and Technology (ABET). (2001, Nov). Engineering Criteria 2000: Criteria for Accrediting Engineering Programs, Effective for Evaluations During the 2002–2003 Accreditation Cycle, Baltimore, MD. <http://www.abet.org/images/Criteria/2002–03EACCcriteria.pdf>.
- [2] <http://www.nba-aicte.ernet.in/manual.html>
- [3] Bradley Univ., Elect. Comput. Eng. Dept. (2002, Aug.) Capstone project: Evaluation relative to professional level http://cegt201.bradley.edu/~gld/prof_cap.html
- [4] Richard M. Felder, Rebecca Brent, "Designing and Teaching Courses to Satisfy the ABET Engineering

Criteria", Journal of Engineering Education, January 2003. 92 (1), 7-25.

[5] Stiggins. R. J. (2002). Assessment crisis: The absence of assessment for learning. Phi Delta Kappan, 83(10), 758-765.

[6] Paterson, A. S., Jackson, W. J., Grieve, A. P., & Paterson, A. S. (2012). The Enhancement of Generic Competencies through the Application of Student Centred Learning: The Students Perspective (No. 1201). Accountancy Research Group, Heriot Watt University.

[7] 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.

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

[9] Bloxham, S., and West, A., "Understanding the rules of the game: Marking peer assessment as a medium for developing students' conceptions of assessment", Assessment and evaluation in higher education, 29, 6, 2004, 721-733.

[10] Torrente, J., Del Blanco, Á., Marchiori, E. J., Moreno-Ger, P., & Fernández-Manjón, B. (2010, April). Introducing educational games in the learning process. In Education Engineering (EDUCON), 2010 IEEE, pp. 1121-1126.

[11] Boettcher, J. V. (2007). Ten core principles for designing effective learning environments: Insights from brain research and pedagogical theory. Innovate: Journal of Online Education, 3(3), n3.

[12] S. J Ball, "Mixed- Ability teaching: the worksheet method," British Journal of Engineering and Technology, 1980, page: 36-48.