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EFFECT OF FLIPPED LEARNING ON LEARNING ENGAGEMENT OF SECONDARY SCHOOL STUDENTS

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Abstract: Change is the law of nature, and Education is not an exception to this. In this digital era, many innovative technologies have their influence on the teaching-learning process. Flipped learning is one such innovative pedagogy that attempts to increase student involvement and Engagement in learning. Flipped learning reverses the traditional learning environment by delivering the content outside the classroom and actively engaging students in learning activities during the class-time. In this experimental study, the researcher has attempted to investigate the differences in Learning Engagement of Secondary School Students who were taught using Flipped Learning Instructional Pedagogy compared to Traditional Learning mode. The analysis of the data collected shows that there is a significant difference in the mean scores of Learning Engagement of students who were taught using Flipped Learning and Traditional learning mode. Further, students taught using Flipped Learning were found to have better Learning Engagement and higher participation in the classroom activities than their counterparts.

Index Terms **- Flipped Learning, Learning Engagement**

I. INTRODUCTION

'Student engagement is the product of motivation and active learning. It is a product rather than a sum because it will not occur if either element is missing' – Elizabeth F Barkley

Education is dynamic; it changes continuously. This continuous change is essential for the development of any society. The introduction of digital technologies in the field of Education has resulted in the development of digital pedagogy. These digital pedagogies help teachers and learners to disseminate information in a suitable form in modern society. Children of today are exposed to modern technologies and digital devices. They are very comfortable in handling digital devices and quickly adapt to modern technologies. To teach these techno-smart children, teachers need to use innovative digital pedagogy in their classrooms and chalk and talk. Teachers need to introduce various activities to the learners and engage them in the processes of learning. As students are exposed to the technology, they are aware of information, which is already known to them; thus, teachers' job shifts from the information providing to providing situations to learners where they can apply their knowledge. Therefore, the classroom must be dynamic and involve every learner actively in constructing their knowledge. The learning activities provided by the teacher must engage all learners in such a way that their learning becomes fun. When learners cherish and enjoy the activities that they are doing, their retention of knowledge also increases, and they work collaboratively with their peers (Webb, Doman, Pusey, 2014). It promotes a sense of belongingness and connectedness between all its members.

Engagement in learning increases academic achievement(Stone, 2012). Students' Learning Engagement is the investment of time and effort of learners towards their learning resources to optimize their learning experiences and enhance learning outcomes. It is the students' involvement in learning before, during, and after the class. Flipped learning is one such innovative pedagogy that engages the learner before, during and after the class. Flipped learning is a reversal of traditional instructional process and uses innovative digital strategies to deliver learning resources and engage students before and after class sessions. It has three phases – Pre-class, In-class and Post-class. The Pre-class and post-class sessions happen at students' own pace, place and time. Pre-learning resources and post-learning activities are provided to the students to access at their pace, place and time. These pre-learning resources and post-learning activities were prepared using innovative digital technology. They will be available to learners with the help of digital technology at their place and time. The in-class session that happens when learners meet their peers and teachers is designated with active learning collaborative strategies (Hernandez, 2012). Learners are connected with each other and would invest their learning in seeking beyond the requirement. Instead of traditional lectures and writing notes, the teacher uses various activities to involve all learners and intellectually engage them. The teacher uses both group activities and individual activities, which utilizes digital and non-digital work. Strategies like group discussion, questioning, jigsaw, games, think-pair-share, and short written exercises are some non-digital group and individual activities that teachers use during class sessions and involve every student in their classes. Teachers can also use digital activities like Plickers quiz, H5P, and LMS to involve their learners.

II. RATIONALE OF THE STUDY

Flipped learning is a pedagogy that involves every student actively in the process of learning. Students invest their time and effort in learning. Learning Engagement is concerned with students' involvement and is more than involvement or participation, the amount of physical and psychological energy that the student devotes to the academic experience (Astin, 2013). Learning Engagement refers to both the time and energy pupils devote to productive educational activities and the effort institutions apply to using effective educational practices (Kuh et al., 2008). Learning Engagement has three dimensions – Behavioural Engagement, Emotional Engagement, and Cognitive Engagement. Behaviourally engaged students will obey the behavioural norms like attendance and involvement, emotionally active students would experience affective reactions like Interest and sense of belongingness, and cognitively engaged students would invest their effort in learning. They would seek to go beyond the requirements and engage in learning activities.

Flipped learning is an instructional pedagogy that reverses the direct instruction from group learning to individual learning resulting from transforming the group learning using active learning strategies. Flipped learning has three phases – Pre-class, In-class, and Post-class. During Pre-class sessions, learners are provided with digital learning resources either prepared by the teacher or pooled from OER to access at their pace and time. The in-class session is the synchronous session that happens inside the classroom. Both teacher and students meet in real-time in School, and students will be engaged with learning activities provided by the teacher. Finally, post-class sessions occur at the pace and time of students outside the class; post-class activities increase retention and stimulate students' intellect. The use of Active learning strategies during in-class would enhance these components and increase Students' Learning Engagement.

In-class sessions of Flipped learning is a phase in which student-student and student-teacher interaction are maximum, and every student is actively involved in learning activities (Sterner, Adawi, 2017). These group and individual learning activities are designed in such a way to increase achievement, positive behaviours, sense of belongingness (Pathare, 2018) in students and to nurture their creativity. Educationally purposeful activities are designed to lead the learners to regulate their self-learning and to lead them to reach the desired learning outcomes.

The active learning strategies, which include group learning and individual learning activities, make students more active during the class. The learner is not a passive listener to the teacher's talk but actively interacts with peers and teacher (Barrie et al., 2019). Flipped learning increases Teacher-student interaction time and allowed learners to complete the learning activities by providing sufficient time. It improves students' learning and allows teachers to work with individual students or in small groups to help students to connect the knowledge and learning (Villanueva, 2016). Learners when divided into Small homogenous groups and made available with the learning resources and learning activities, every learner gets enough opportunities to participate in classroom activities, clarify their doubts. Peers extend their cooperation in completing the group projects, and learners enjoy their learning (Herreid, 2013).

As evidenced from above, Learning Engagement is the learner's involvement in the learning process; it gives accountability to the learner in their learning. Flipped learning is one such pedagogy that maximises the student-student and student-teacher interaction during class to increase Students' Learning Engagement. Furthermore, flipped learning involves every learner in and out of class sessions actively. Therefore, the researcher attempted to investigate the effect of Flipped learning on Students' Learning Engagement in this experimental study.

III. OBJECTIVES

1. To compare the effect of Flipped Learning Instruction with Traditional learning on Students' Learning Engagement.
2. To find out the difference in Learning Engagement of Experimental and Control group students who were taught using Flipped Learning Instructional Pedagogy and Traditional Learning Pedagogy.
3. To find out the difference in Scores of Pre-test and Post-test in Learning Engagement of Boys and Girls who were taught using Flipped Learning Instructional Pedagogy and Traditional Pedagogy.
4. To investigate the Main and Interaction effect of Teaching methods and Sex on Students' Learning Engagement from Control and Experimental groups.
5. To investigate the Main and Interaction effect of Teaching methods and Levels of Socio-Economic Status on Students' Learning Engagement from Control and Experimental groups.

IV. HYPOTHESES OF THE STUDY

1. There is no significant difference between the Control group and the Experimental group's Pre-test scores of Learning Engagement.
2. There is no significant difference between the Control group and the Experimental group's Post-test scores of Learning Engagement.
3. There is no significant difference between the pre-test and post-test mean scores of Learning Engagement of the Experimental group of Students.
4. There is no significant difference between the pre-test and post-test mean scores of the Learning Engagement of Control group of Students.
5. There is no significant difference between the pre-test and post-test mean scores of Learning Engagement of Boys of Experimental group.
6. There is no significant difference between the pre-test and post-test mean scores of Learning Engagement of Girls of Experimental group.
7. There is no significant difference between the pre-test and post-test mean scores of Learning Engagement of the Boys of Control group.
8. There is no significant difference between the pre-test and post-test mean scores of the Learning Engagement of Girls of Control group.
9. There is no significant Main and Interaction effect of Teaching methods and Sex with each other on Students' Learning Engagement.
10. There is no significant Main and Interaction effect of Teaching methods and Socio-Economic Status with each other on Students' Learning Engagement.

V. Methodology

In the present experimental study, randomised matching pre-test post-test equivalent group design was used. The researcher identified 48 students of class 9 in a Private Secondary School in Bangalore city having access to technology for learning after school hours. Ravens Progressive Matrices and Socio-Economic Status Scale (Developed by Prof. Haseen Taj, 2012) were administered to all students to equalize the groups. They were divided into two groups randomly and equated on these two variables, namely Intelligence and Socio-economic status, using t-test. When no significant difference was found in groups, they were randomly assigned to experimental and control groups with 24 students in each group. Later a Pre-test on Science Achievement and Learning Engagement was administered to both Experimental and Control groups using the tools developed by Vandana M & Prof. Haseen Taj (2019).

The experimental group of students were taught using Flipped learning Instructional pedagogy and control group of students were taught using the traditional method of teaching. The researcher prepared pre-recorded videos on the lesson to be taught, slides, animations, images, and also Opensource videos and images on the lesson to be taught and was made available in LMS MOODLE. The experimental group of students accessed this learning material in LMS before the class session and later participated in group learning activities like Think-pair Share, Group discussion, and Learning cards and individual activities like quiz and writing during the class session, and conducted post-class activities like H5P, Moodle Quiz, Discussion Forum in LMS. The Control group of students were taught the same content using a traditional method in which lecture and demonstration method was used, and few questions were asked to students during the class to check that learning had taken place. Both Experimental and Control groups of students were taught in Flipped learning instruction and Traditional learning, respectively, for seven weeks. Post-test on Learning Engagement was administered to both the Experimental and Control group of students after seven weeks of teaching.

VI. Findings

The data on pre-test and post-test scores on Learning Engagement was analysed using t-test, 2 way ANOVA and findings were tabulated as shown below.

Table 1: Showing Pre-test scores of Students' Learning Engagement between Experimental and Control group

Groups		N	Mean	SD	t value	Level of Significance
Pre-test on Learning Engagement	Experimental	24	156.08	8.871	1.194	NS
	Control	24	152.25	12.986		

NS = Not Significant

Table 2: Showing Post-test scores of Learning Engagement between Experimental and Control group Students

Groups		N	Mean	SD	t value	Level of Significance
Post-test on Learning Engagement	Experimental	24	185.38	11.831	4.275	**
	Control	24	167.88	16.190		

** = Significant at 0.01 Level

Table 3: Showing Pre-test and Post-test scores of Boys and Girls Students' Learning Engagement of Control group Students

Groups		N	Mean	SD	t value	Level of Significance
Control Group	Pre-test on Learning Engagement	24	152.25	12.986	14.229	**
	Post-test on Learning Engagement	24	167.88	16.190		
Control Group	Pre-test on Learning Engagement of Boys	12	150.00	12.461	12.560	**
	Post-test on Learning Engagement of Boys	12	164.00	14.302		
Control Group	Pre-test on Learning Engagement of Girls	12	154.50	13.648	9.467	**
	Post-test on Learning Engagement of Girls	12	171.75	17.628		

** = Significant at 0.01 Level

Table 4: Showing Pre-test and Post-test scores of Students' Learning Engagement of Experimental group Students

Groups		N	Mean	SD	t value	Level of Significance
Experimental Group	Pre-test on Learning Engagement	24	156.08	8.871	19.615	**
	Post-test on Learning Engagement	24	185.38	11.831		
Experimental Group	Pre-test on Learning Engagement of Boys	12	153.42	10.255	13.179	**
	Post-test on Learning Engagement of Boys	12	183.42	13.675		
Experimental Group	Pre-test on Learning Engagement of Girls	12	158.75	6.621	14.199	**
	Post-test on Learning Engagement of Girls	12	187.33	9.866		

** = Significant at 0.01 Level

The data on post-test scores on Learning Engagement of students of Experimental and control group were analysed using 2 way ANOVA and findings were tabulated as shown below.

Table 5: Showing Observed data for 2 Way ANOVA of Teaching method (Traditional Learning and Flipped Learning) of Boys and Girls of both Groups.

Teaching Method		Traditional Learning	Flipped Learning
Sex			
Boys	N	12	12
	Mean	164.00	183.42
	Standard Deviation	14.302	13.675
Girls	N	12	12
	Mean	171.75	187.38
	Standard Deviation	17.628	11.831

Table 6: Results of 2 way ANOVA for Learning Engagement with Independent variables namely, Sex and Teaching method

Source of Variation	Sum of Squares	Df	Mean Squares	F - Value	Level of Significance
Sex	408.333	1	408.333	2.043	NS
Teaching Method	3675.000	1	3675.000	18.384	**
Sex X Teaching Method	44.083	1	44.083	0.221	NS
Error	8795.833	44	199.905		
Total	12923.250	47			

Table 7: Observed data for 2 Way ANOVA of Teaching method (Traditional Learning and Flipped Learning) of Low, Moderate and High levels of SES of both Groups.

Teaching Method		Traditional Learning	Flipped Learning
Levels of SES			
Low	N	6	6
	Mean	176.50	180.17
	Standard Deviation	14.025	11.873
Moderate	N	11	12
	Mean	162.36	183.00
	Standard Deviation	17.591	11.521
High	N	7	6
	Mean	169.14	195.33
	Standard Deviation	13.898	6.772

Table 8: Results of 2 way ANOVA for Learning Engagement with Independent variables namely, Levels of SES and Teaching method

Source of Variation	Sum of Squares	Df	Mean Squares	F – Value	Level of Significance
Teaching Method	3120.298	1	3120.298	12.174	**
Levels of SES	798.998	2	399.499	2.199	NS
Levels of SES X Teaching Method	872.790	2	436.395	2.402	NS
Error	7631.069	42	181.692		
Total	12923.250	47			

VII. DISCUSSION OF RESULTS

Table 1 reveals that there is no significant difference between the control group and experimental group students in their Pre-test scores of Learning Engagement. It is observed that the obtained t value 1.194 is less than the table value 2.021 at 0.05 level; from this, it can be inferred that both groups have the same Learning Engagement before the treatment. Hence hypothesis 1 is accepted.

Table 2 reveals that there is a significant difference between the control group and experimental group students in their Post-test scores of Learning Engagement. It is observed that the obtained t value of 4.275 is greater than the table value of 2.704 at the 0.01 level. From this, it can be inferred that both groups differ significantly in their Learning Engagement after the treatment. Further, it is observed that the Experimental group of students have a higher level of Learning Engagement than the control group of students. Hence hypothesis 2 is rejected. This result is in agreement with the findings of research conducted by Pathare (2018) that flipped learning strategy helps the students to use new technology for learning and enable them to acquire deep knowledge, and Flipped learning enhances students learning experience with high degree of satisfaction (Awidi & Paynter, 2019) and academic performance (Alamri, 2019). This finding is also in agreement with the findings of Maheshwari & Seth (2019) that implementation of Flipped classroom pedagogy improves Students' Engagement and involvement.

Table 3 reveals that there is a significant difference between the pre-test and post-test scores of Learning Engagement of control group students. It is observed that the obtained t value of 14.229 is greater than the table value of 2.797 at 0.01 level, there is a significant difference between the pre-test and post-test scores of Learning Engagement of Boys of the control group, it is observed that the obtained t value of 12.560 is greater than the table value of 3.055 at 0.01 level and there is a significant difference between the pre-test and post-test scores of Learning Engagement of Girls of the control group, it is observed that the obtained t value of 9.467 is greater than the table value of 3.055 at 0.01 level. Hence the hypotheses 4, 7, and 8 are rejected.

Table 4 reveals that, there is a significant difference between the pre-test and post-test scores of Learning Engagement of Experimental group of students, it is observed that the obtained t value of 19.615 is greater than the table value of 2.797 at 0.01 level, there is a significant difference between the pre-test and post-test scores of Learning Engagement of Boys of the experimental group, it is observed that the obtained t value of 13.179 is greater than the table value of 3.055 at 0.01 level and there is significant difference between the pre-test and post-test scores of Learning Engagement of Girls of the experimental group, it is observed that the obtained t value of 14.199 is greater than the table value of 3.055 at 0.01 level. Hence the hypotheses 3, 5, and 6 are rejected. The results infer that the Learning Engagement of experimental group students increased after the treatment; further, it is also observed that Learning Engagement increases for both boys and girls after the treatment. Similar results were found by Hasan et al. (2019), and results showed increased students' Learning Engagement (Hernandez, 2012). Results showed students were highly motivated to work in groups, and there is a positive attitude among students towards collaborative work. The students are involved in group learning interactive activities and utilize their time in learning the concepts better. They invest their time both outside and inside the classroom in learning and engage actively during the class time to involve themselves in interactive activities (Webb et al., 2014).

It is observed from table 6 that Sex has no significant Main effect ($F = 2.043$, $p > 0.05$) on Students Learning Engagement, Teaching method (Traditional learning and Flipped Learning) has a significant Main effect ($F = 18.384$, $p < 0.01$) on Students' Learning Engagement and there is no significant interaction effect of Sex and Teaching method ($F = 0.221$, $p > 0.05$) on Students' Learning Engagement. The result shows that sex has no effect on Students' Learning Engagement, and Flipped learning engages both Boys and Girls actively during learning and increases learning Engagement (Herreid et al, 2013).

It is observed from table 8 that Levels of SES has no significant Main effect ($F = 2.199$, $p > 0.05$) on Students Learning Engagement, Teaching method (Traditional learning and Flipped Learning) has a significant Main effect ($F = 12.174$, $p < 0.01$) on Students'

Learning Engagement and there is no significant interaction effect of Levels of SES and Teaching method ($F = 2.402$, $p > 0.05$) on Students' Learning Engagement. The result shows that levels of SES have no effect on Students' Learning Engagement; irrespective of levels of SES, Flipped learning enhances students' Learning Engagement. It allows students to participate in collaborative activities in class time and engage them outside the classroom (Webb et al., 2014).

VII. Educational Implications

Flipped learning is an innovative pedagogy that uses digital technology for content delivery outside the classroom and involves all students actively. It engages all students in learning and students role changes from passive listeners to active participants. Learners are accountable for their learning. Learners self-regulate their learning, the effort and time spent by learners in their learning will also increase the interest, achievement of learners.

As active learning strategies are used in flipped classrooms, it increases student engagement. Active learning classrooms involve students actively during class sessions. Students invest their time outside the classroom and learn the pre-learning materials, and during class time, they were engaged in activities that promote their creativity and work collaboratively with peers. Students connect their knowledge and learning from pre-learning material and complete their in-class assignments. Active learning strategies help learners connect emotionally, and they are involved in activities that enhance their cognition, and a positive change in their behaviour is seen.

The results shows that there is a significant difference in Learning Engagement of the experimental and control group of students, further mean value of 185.38 (Experimental group) is more than the mean value of 167.88 (Control group), indicating Flipped learning has enhanced the Learning Engagement of the experimental group of students; hence teachers should make use of active learning strategies of group and individual learning during the class time which increases student-student and student-teacher relationships. Also, time spent during the class time will be more meaningful in developing student-teacher relationships.

The results shows that there is a significant difference in pre-test and post-test on Learning Engagement of the experimental group of students; further, the mean value of 185.38 (Post-test) is greater than the mean value of 156.08 (Pre-test), indicating the active learning strategies used during the in-class session has a greater influence on Students' Learning Engagement thus, teachers can flip their classes to increase Learning Engagement of their students, teachers should create pre-learning resources to deliver them out of their class-time and make use of their class-time and space to increase Learning Engagement of their students.

The results also shows that there is a significant difference in Pre-test and Post-test scores of Learning Engagement of Boys of Experimental group, further mean value of 183.42 (Post-test) is greater than the mean value of 153.42 (Pre-test), and there is a significant difference in Pre-test and Post-test scores of Learning Engagement of Girls of Experimental group, further mean value of 187.33 (Post-test) is greater than the mean value of 158.75 (Pre-test) shows that Learning Engagement is increased for both Boys and Girls after the treatment (Flipped learning). Hence, School Heads and Principals must motivate their teachers and students to implement and use flipped learning strategies. Furthermore, a group of teachers of the same subjects must connect to create digital pre-learning resources and create and conduct activities to suit the lesson.

The results of 2 way ANOVA shows that there is no significant Main effect of Sex and significant Interaction effect of Sex and Teaching Method on students' Learning Engagement, also there is no significant Main effect of Levels of SES and significant Interaction effect of Levels of SES and Teaching Method on Students' Learning Engagement. The teaching method has a significant Main effect on Students' Learning Engagement. Hence, teachers should make use of Flipped learning in their instructional process to build active learning classrooms. Teachers should use group learning and individual learning strategies to engage the students actively and encourage them to be involved in classroom discussions and group projects to increase their Learning Engagement.

It is found that the Learning Engagement of students taught using Flipped learning is better than those taught using the traditional method. Therefore, active learning strategies and innovative digital pedagogy like Flipped learning attempt to increase students' learning engagement, and teachers should use Flipped learning instead of traditional classes to involve their students actively in the learning process.

VIII. CONCLUSION

Recently, human society is shifting to the digital system. Every field is significantly influenced by technology, and the use of technology enhances their working efficiency. Education is dynamic, and it should change with changing time and adapt new methodologies and pedagogies. In this age of digital technologies, we see the human relationship is depleting, but, Flipped learning is a digital pedagogy that retains not only human relations but also increases human interactions during the learning process. Flipped learning gives scope for both digital teaching-learning as well as increases peer teaching and student-teacher interaction. Hence, it is concluded that Flipped learning is one of the best innovative pedagogy to increase student involvement and Engagement in learning, thereby impacting achievement positively.

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