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Blended Learning Models for Modern Classroom: An Empirical Study

Cruz Valan Ashok[1]; Dr. Vikas Kumar[2]

[1]Student, Department of CS & IT, Chhatrapati Sivaji Maharaj University, Panvel, Navi Mumbai, India.
[2]Professor and Head, Department of CS & IT, Chhatrapati Sivaji Maharaj University, Panvel, Navi Mumbai, India.

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Abstract: Massive advancement in technology forces the teaching strategy to transform itself from traditional face to face teaching-learning methods to online technological teaching-learning strategies. Learning by merging traditional with technical oriented pedagogy is the essential need of the hour. With the development in technology, tools, its usage, benefits and interest in its adaption by recent generation, make blended learning models mandatory in classrooms. Hence this study analyzes the effectiveness, benefits, suitability and challenges of using Blended Learning Models by school students, college students and teachers. An empirical survey was carried out among teachers and students of various levels using structured Likert scale questionnaire and data were collected on awareness about the models, its effectiveness, benefits, difficulties and challenges in technological utilization. Further this study discovers the most commonly used model and best suitable model for different educational levels. SPSS was used to evaluate data to understand the perception across various level groups. The analysis provides the effectiveness of Blended Learning and suggests recommendations for further development and improvement in its implementation.

Keywords: *Blended Learning Models, Awareness, Effectiveness, Most Used and Most Needed Models.*

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I. INTRODUCTION

➢ *Background of the Study*

Education has undergone an immense transformation with the rapid developments in technology. Conventional pedagogical practices have been enhanced with the online tools for creating flexible and engaging learning environment. Blended Learning combines both traditional face to face teaching methods as well as online, technical oriented, technology involved teaching practices.

➢ *Objectives*

- To identify various Blended Learning Models in practice
- To analyze the blended learning Effectiveness
- To compare the perception levels of various teaching-learning groups
- To recognize the most utilized models in learning
- To understand how much it has impact on various groups
- To analyze the suitability of the blended learning models in the recent times
- To study the difficulties in implementing the Blended Learning pedagogy
- To compare the used and suitable models in learning

➢ *Scope*

The study revolves around the following three groups.

- A group of School or Junior College students
- A group of Senior College Students
- A group of Teachers from both School and College

➢ *Relevance*

Traditional classroom, face to face, blackboard teaching is outdated with the arrival of new technologies. More over the Gen-Z generation likely to adapt all technical advancements and they are in favor of digitized learning. Instead of rigid and strict learning, people choose flexible and collaborative, cooperative and participatory learning. The pedagogy is also undergoing tremendous changes by incorporating various tools and techniques. The resources and opportunities for teaching and learning is now available to everyone irrespective of regions, languages and realms. Hence investigating blended learning which combines both traditional and technical instructional methods will be fitting in the present situation.

➢ *Roadmap*

The study systematically reviews the articles, books and case studies related to Blended Learning using PRISMA guidelines and then collects data using surveys conducted

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among various groups of learning levels and teachers through google forms. It uses structured Likert scale questionnaire and analyses them statistically using SPSS (Statistical packages for Social Sciences). The results are categorized and examined for achieving the objectives. Additionally, it identifies the challenges and recommends for further investigation to fulfill the gaps.

II. LITERATURE REVIEW

The aim of this literature review is to ensure blended learning as a novel and effective learning method [1] and to accept as standard model for future educational system. This review analyses the benefits of blended learning over traditional learning and e-learning, its models, levels, typologies, benefits and challenges, to help in studying the effectiveness, suitability and implementation challenges for improving the impact of blended learning.

➢ *Methodology*

PRISMA guidelines are followed in this systematic analysis of literatures. The figure 1 provides a structured framework of identification, analysis, screening and inclusion/exclusion criteria of this research process.

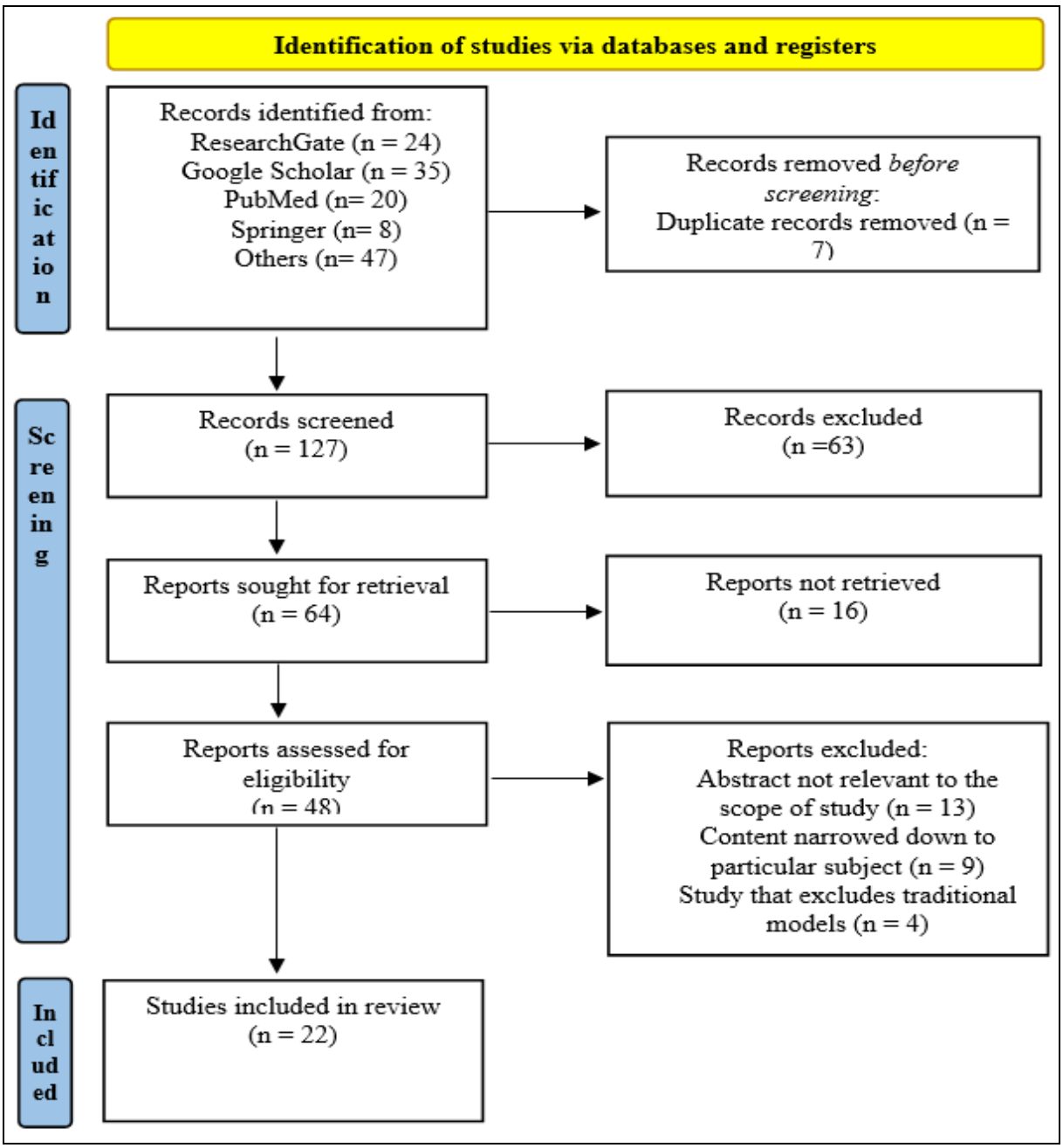

Figure 1. PRISMA Flow Diagram

There are 134 records were identified from various resources like ResearchGate, Google Scholar, PubMed, Springer and other internet resources with the keywords blended learning, blended learning models, traditional versus online, hybrid learning, online and offline, click and chalk, etc. 7 records that were identified as duplicates were removed before screening. The title and abstract and the inclusion criteria of models that blend both traditional and modern technological teaching methods were considered for screening and 63 records were excluded. 16 reports were

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excluded due to limited access and subscription paywall in retrieving full-text reports. 26 articles were excluded due to abstract not relevant to this study, content narrowing down to particular subject and exclusion of traditional models in their pedagogy. After thorough screening 22 studies were considered for review.

➢ *Review Findings and Results*

- *Definition of Blended Learning*

There is always misperception over the word blended. It is understood as blending of instructional modalities (media) or blending of instructional methods [2] or combination of media with face-to-face class room setup under physical supervision or the combination of partly online and partly under supervised location [3] or at large it is acknowledged as a grouping of face-to-face instruction with computer mediated (online) instruction [4][5].

- *Levels of Blended Learning*

The study synthesizes 4 levels [1][2][3][6] of blended learning. They are

✓ Activity level
✓ Course level
✓ Program level
✓ Institutional level

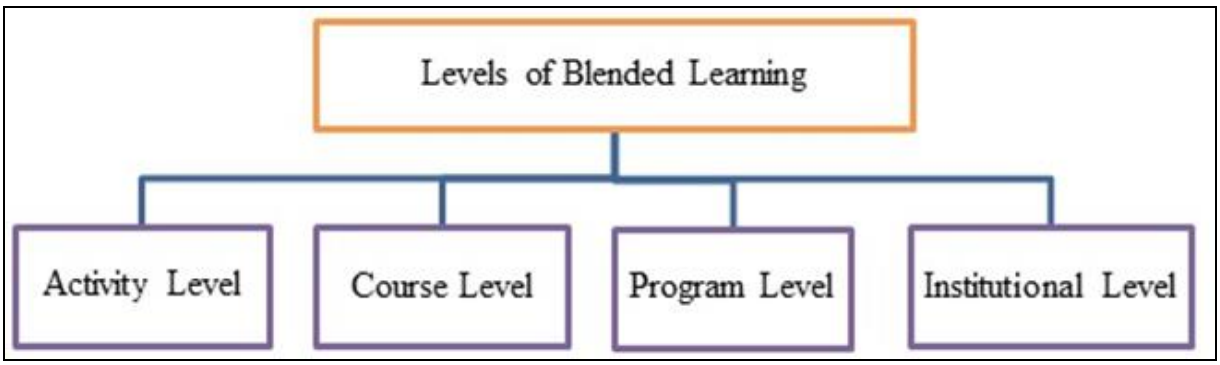

Fig 2 Levels of Blended Learning

Figure 2 categorizes the levels of blended learning. The blending is happening for only one activity in activity level and for the whole course in course level. The model is open for the whole curriculum in the program level. In an institutional level, we can blend the courses across institutions and countries.

- *Models of Blended Learning*

The review synthesizes four models namely rotation model, flex model, self-blend model and enriched virtual model [7]. In figure 3, the models of blended learning is classified.

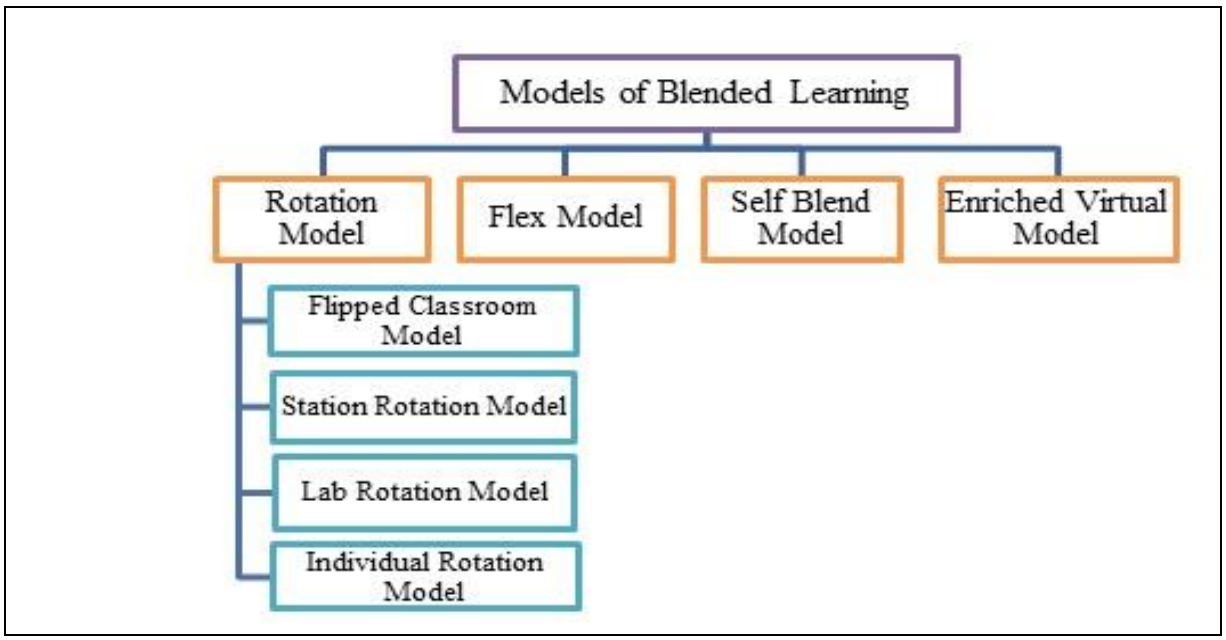

Fig 3 Models of Blended Learning

In the rotation model students switch between online and offline classes. Flipped class room [7] is the generally followed rotation model where content is provided online and then the discussions and assessments are conducted in the classroom. The students can switch the stations (classrooms, online) in station rotation model, they can rotate between class room and e-lab setups in lab rotation model and they can shift between online and offline according to their

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convenience in individual rotation model [8]. In flex model students are learning mainly through online with the assistance. The subject materials are provided to them as video presentations, online quizzes, documentaries and streamed educational events. Self-blend model is a supplementary model where the class room studies are supplemented with online classes. In enriched virtual model students sit at home and learn fully online.

- *Derived Structures/Modalities for Effective Learning*

Different modalities of teaching were found from the case studies. The table 1 clearly depicts the structures derived out of the case studies.

Table 1 Derived Models

Case Study	Targeted Group	No. of Samples	Derived Model / Structures
1	First year Engineering Students from University of Denmark	56	Before-At-After Class Structure
2	Distance Learning Students	107	In-Off-In Class Hybrid Online Model
3	Doctoral students from Universities of Uganda, South Africa and Sweden	18	Synchronous Online-F2F-Synchronous Material and Assessment Structure
4	Superior Institute in the city of Loja, Ecuador	296	Virtual Learning -F2F Learning Model
5	Studies (case studies)	57	Flipped Class Room Model, Pre Class-In Class-Post Class Model, Mixed Model, Rotation Model, Flex Model, Self Blend model, Enriched Virtual Model [3].
6	First Year Biology -Human Anatomy Course from Pompeu Fabra University, Barcelona	69	Non-attendance based Virtual Learning -F2F model

In Before-At-After Class Structure [9], the material is given through online and then interactions are done in class room and again homework is given to solve at home. In the In-Off-In Class Hybrid Online Model [10], students first sit in the class for orientation, then learn at home in fully synchronized online setup and then come to class for assessment. The Synchronous Online-F2F-Synchronous Material and Assessment Structure [11] mainly for research scholars who meet through web conferences and clarify through direct meetings and assessment and learning in synchronous online method. Some studies follow Virtual learning with face to face interaction [12] [13]. All prove to be par excellence than the conventional teaching methods.

- *Principles/Factors Needed for Blended Models Implementation*

The principles and factors needed for the blended models are cooperation, active learning, student- teacher contact, peer instruction, implementation modalities, learners' satisfaction, technology factors, human factors, institutional factors, adaptive learning systems, interactive learning software, learning management system, digital libraries, educational apps, ICT tools, virtual class room smart projectors, interactive digital boards, augmented reality and other digital tools [14[15].

- *Benefits of Blended Models*

Blended Models yield enormous advantages to students, teachers and to the institution. Some of the benefits are reduced instructional cost, synchronous and asynchronous learning, improved pedagogy, reduced class time, enhancing participation and understanding, higher levels of achievement, reducing dropout rates, improved flexible access, critical thinking, creativity, communication and collaboration, preparing for life-long learning, improved interest and engagement, boost in motivation through attention, confidence, relevance and satisfaction, improved self-regulation and improved academic performance [12][15][16][17].

- *Challenges in Implementing the Blended Models*

The identified challenges can be classified into pedagogical, technological and institutional/human categories. The pedagogical challenges include sustaining student engagement, lack of interaction, design and preparation of blended courses, communication chaos, ineffective exercises, etc. [18]19]. The technological challenges include digital divide, inadequate infrastructure, ICT tools related constraints, connectivity issues, etc. [7][15]. The institutional and human challenges include human readiness, teachers' preparedness, increased workload, resource management issues, resistance to change to ICT skills, etc. [6][11].

- *Recommendations*

The review has produced the following suggestions.

- ✓ Research can be carried out on designing pedagogical methods which include Information Communication Tools (ICT) for variety of courses.
- ✓ A study can be promoted to design guidelines to establish Learning Management System (LMS) to make it familiar among students and be benefitted more.
- ✓ An empirical study can be undertaken on the methods to analyze which model will be most suitable, so that we can increase students' participation and engagement.
- ✓ Research can be initialized to find the ways to reduce the gap created by digital divide, so that everyone can participate and utilize the technology effectively for effective learning.
- ✓ An activity can be promoted to develop FDP programs for teachers to upgrade themselves in technologies and its usage.
- ✓ Research can be done in adapting Artificial Intelligence (AI), Adaptive Learning Platforms in learning models, including Immersive Technologies like Virtual Reality

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(VR) and Augmented Reality (AR), M-Learning and collaborative tools like Google docs, Microsoft office 365, discussion boards, etc.

III. RESEARCH METHODOLOGY

➢ *Design and Implementation Approach*

The study implements Descriptive Survey Research Design to analyze the effectiveness, suitability, utilization and challenges of blended learning in recent times. It concentrates on three stakeholders' groups namely school students, college students and teachers. A quantitative approach was deployed for data collection and analysis.

➢ *Population and Sample*

The population consists of school students, college students and teachers from educational institutions where blended learning is in effect. The sampling technique deployed to collect data from respondents is convenience sampling technique. The data was collected form the institutions where blended learning models are implemented effectively.

➢ *Research Tool/Instrument*

Google forms are used as data collection tool. There are three sections in the structured questionnaire which corresponds to the three groups namely School Students, College students and Teachers.

➢ *Likert Scale Design*

Likert scale elements were framed to measure awareness, effectiveness, suitability, challenges, difficulties in implementation of blended learning models and overall perception. A five point Likert scale was used for all statements.

- Strongly Disagree
- Disagree
- Neutral
- Agree
- Strongly Agree

Additionally, two multiple choice questions were attached to measure which blended learning models were mostly used by the institutions and which models are preferred as suitable models for their learning.

A visual guide (Figure 4) was provided as introduction before the questionnaire regarding the blended models for the respondents to understand clearly about each model.

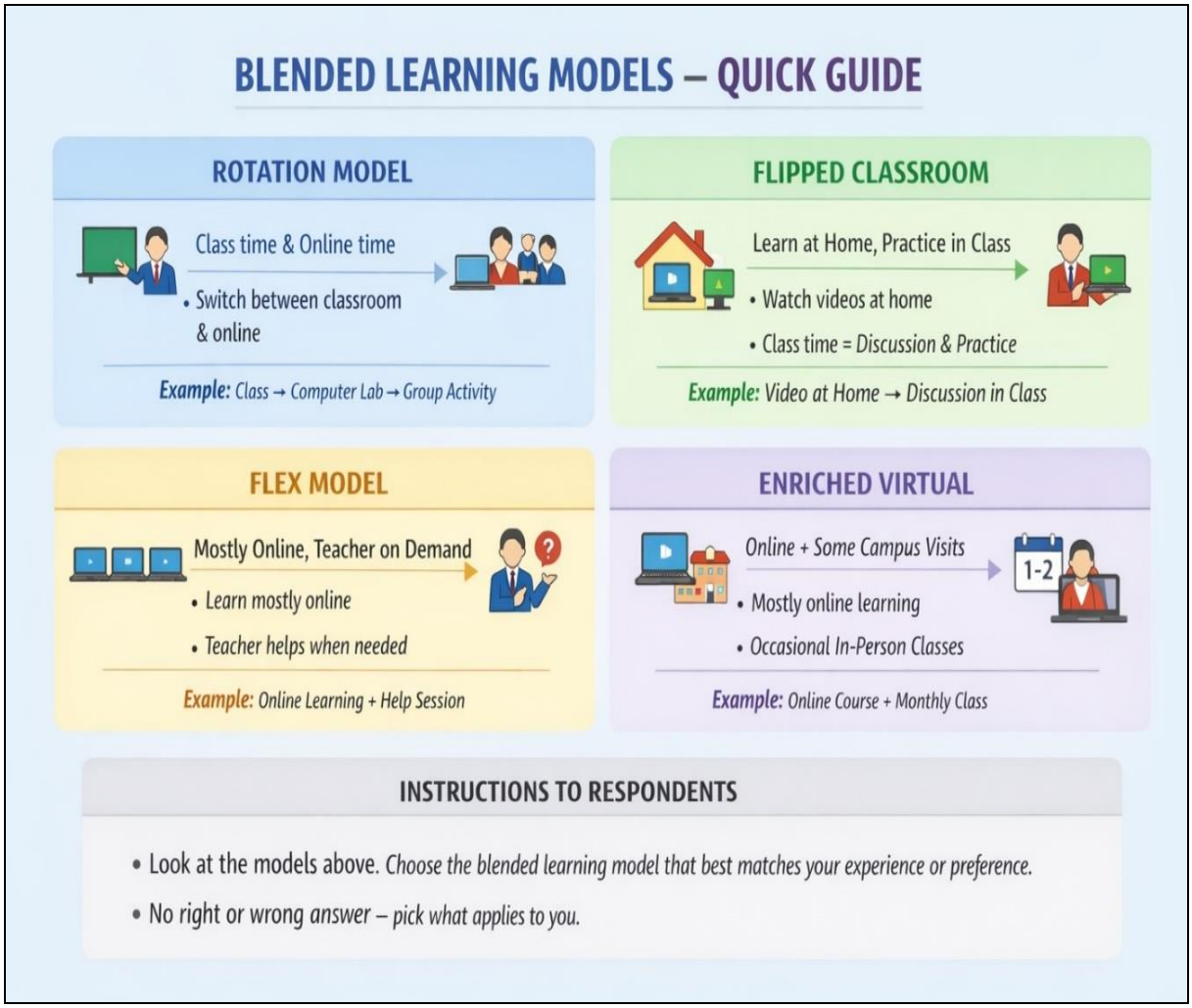

Fig 4 Blended Learning Models: Visual Guide

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➢ *Data Collection Procedure*

Google forms with meticulously designed questionnaire was shared to all three groups. The purpose was clarified to the participants and confidentiality was assured. The responses were gathered over a specific period of time and the data were entered in SPSS (Statistical Package for Social Sciences) for analysis.

➢ *Variables/Labels*

Every group is assigned with variables along with its labels for data entry and analysis. The variables and labels according to each section are as follows:

- School Students' variables are A1-A13
- College Students' variables are B1-B13
- Teachers' variables are C1-C13

Variables are associated with the corresponding labels. The important labels are Awareness of blended models, Effectiveness of integration, Understanding level, Suitability of the model, Technical challenges, Faculty support, Need for improvement, Student engagement and Overall usefulness. Other two variables from MCQ are Most used models and most needed models. The result is analyzed using data entered on these labels.

➢ *Data Analysis Techniques*

The data was processed using SPSS with the following statistical techniques.

- *Frequency and Percentage Analysis*: The multiple-choice questionnaire was analyzed with frequency analysis to find the most used models and most suitable model.
- *Descriptive Statistics:* This technique includes Mean and Standard Deviation, to analyze the Likert scale responses, for awareness, effectiveness and perception.
- *Comparative Analysis:* Comparative analysis is performed among the three groups to calculate the differences between overall perception about blended learning models using ANOVA analysis.

➢ *Hypothesis Formation*

Every research analysis has two hypotheses. They are Null Hypotheses (Ho) and Alternative Hypotheses (H).

- *Null Hypotheses (Ho):*

✓ There is no significant relationship between blended learning implementation and effectiveness
✓ There is no impact on learner's engagement
✓ Technical challenges do not affect the effectiveness of blended learning.
✓ There is no difference in the suitability of Blended learning for School students and college students
✓ There is no learning stress due to blended models
✓ Blended Learning does not enhance digital and employability skills
✓ Blended Learning does not increase teachers' workload
✓ Existing blended learning do not require improvement

- *Alternative Hypotheses (H):*

✓ There is significant relationship between blended learning implementation and effectiveness.
✓ There is an impact on learner's engagement
✓ Technical challenges affect the effectiveness of blended learning.
✓ There is difference in the suitability of blended learning for School students and college students
✓ There is learning stress due to blended models
✓ Blended learning enhance digital and employability skills
✓ Blended learning increases teachers' workload
✓ Existing blended learning require improvement

IV. DATA ANALYSIS AND INTERPRETATION

Data analysis fetches data from SPSS and interprets it to achieve the objectives. The required data are received from 36 school students, 53 college students and 31 teachers from various institutions where blended learning is in use.

➢ *Descriptive Statistics*

Mean and Standard Deviation is used to analyze the understanding of awareness, effectiveness, suitability, engagement and overall perception.

➢ *Awareness and Effectiveness of Blended Learning*

The values of awareness and effectiveness of blended learning for the three respondent groups are entered in table 2.

Table 2 Awareness and Effectiveness Analysis

Group	Samples	Awareness		Effectiveness	
		Mean	Std. Deviation	Mean	Std. Deviation
School Students	36	3.722222	0.944491	3.305556	1.141914
College Students	53	3.735849	0.683626	3.754717	0.67669
Teachers	31	3.935484	1.209283	3.967742	1.079626

The numbers in the table provide the statistics of awareness about blended learning models. We can find no difference between school and college students regarding the awareness. Teachers are more aware of the models than the students. But the standard deviation proves that college students have same opinion rather than school students and teachers. Moreover all teachers are not fully aware of all models. The effectiveness of blended learning is affirmed by the analysis. Here almost many of the college students feel that it is most effective and helpful in learning than the school students.

➢ *Model Suitability and Skill Development*

The suitability of the model for teaching and learning and skill development analysis for the corresponding groups can be derived from table 3.

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Table 3 Suitability and Skill Development Analysis

Group	Samples	Model Suitability		Skill Development	
		Mean	Std. Deviation	Mean	Std. Deviation
School Students	36	3.611111	0.903257	3.805556	1.190905
College Students	53	3.660377	0.830741	3.641509	0.810848
Teachers	31	3.741935	1.094463	4.032258	1.079626

The data proves that blended learning models are suitable for their learning and teaching. It also helps them to develop their skills in digital technology and employability skills. The standard deviation proclaims that college students are almost of the same opinion rather than school students and teachers.

➢ *Technical Challenges and Improvement Need of Blended Learning*

The table 4 exemplifies the data related to technical challenges that affect the learning and the improvement that is needed by the blended learning models.

Table 4 Technical Challenges and Improvement Analysis

Group	Samples	Technical Challenges		Need for Improvement	
		Mean	Std. Deviation	Mean	Std. Deviation
School Students	36	3.444444	1.157447	-	-
College Students	53	3.566038	0.796855	3.754717	0.896696
Teachers	31	3.612903	1.229564	4.096774	0.70023

The mean proves that all category respondents feel disturbance and difficulty due to technical issues. It can be due to internet issues, quality of connection, knowledge about the tools, etc. College students and teachers are suggesting to improve the design of Blended learning models according to the data.

➢ *Learning Stress and Teachers' Workload*

Table 5 picturizes the learning stress felt by students and the heavy workload felt by the teachers.

Table 5 Learning Stress and Workload Analysis

Group	Samples	Learning Stress		Workload of Teachers	
		Mean	Std. Deviation	Mean	Std. Deviation
School Students	36	3.25	1.250714	-	-
College Students	53	3.754717	0.829867	-	-
Teachers	31	-	-	3.483871	1.121635

Most of the college students feel that the blended learning increases their learning stress level. School students feel it less stressful. The analysis approves that teachers feel burdensome in preparing lesson plans for blended learning.

Figure 5 depicts 55% teachers feel it as additional workload. But 22% teachers never agree to it. They feel no burden of the workload due to blended learning implementation.

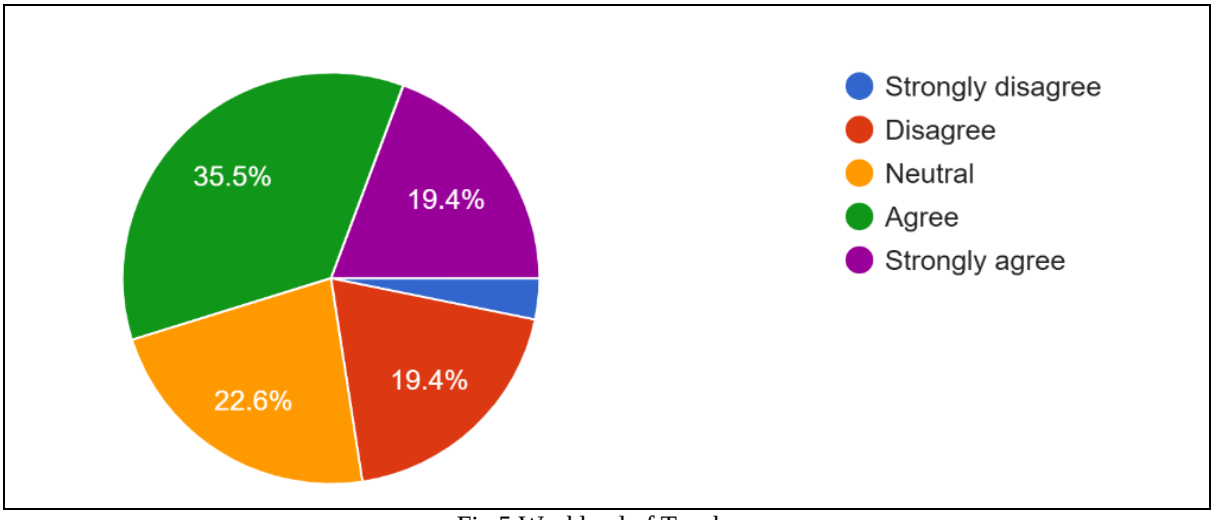

Fig 5 Workload of Teachers

➢ *Need for Different Blended Learning Models for Different Category of Students*

Figure 6 shows the result of the need of the different models for different group of students.

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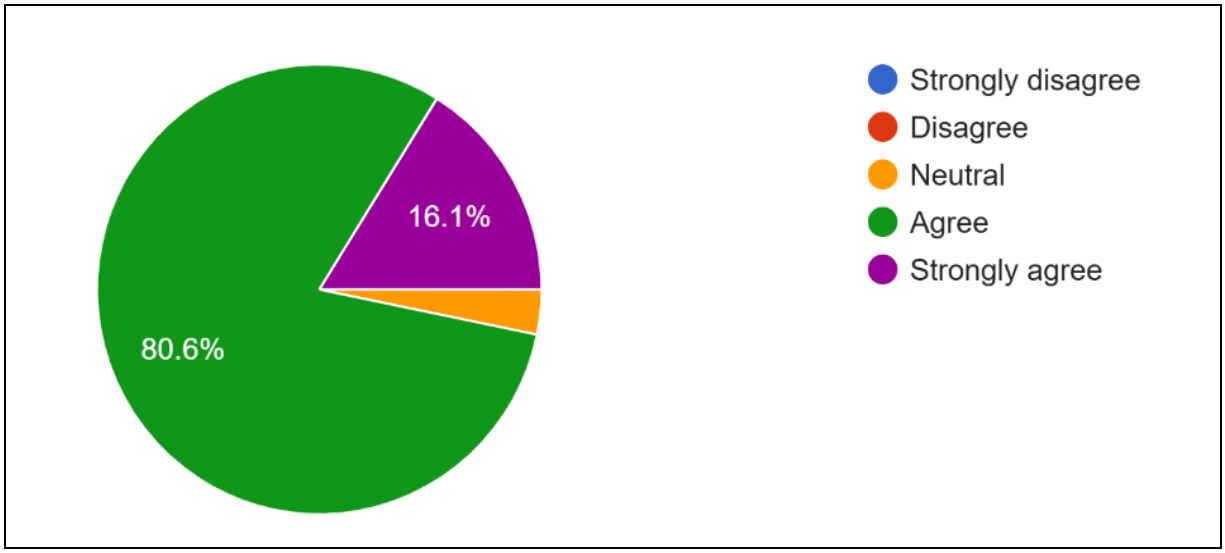

Fig 6 Need for Different Blended Learning Models

The analysis illustrates that almost all the teachers agree to the necessity for different models for different group of students. According to their level of understanding and the inevitability of technical tools decide which model can be applied for school students and which model can be utilized for college students.

➢ *Frequency and Percentage Analysis*

Frequency and percentage analysis is deployed to the multiple choice questions which decide which model is most used and which model is most suitable for the school students and college students and preferred by teachers.

- *Most Used Model*

Figure 7 depicts the models that are practiced in the schools. The widely used model in the schools is Traditional classroom with occasional online resources and the rotation model. Eventhough all the other modes are used only traditional way of teaching is more famous in the schools.

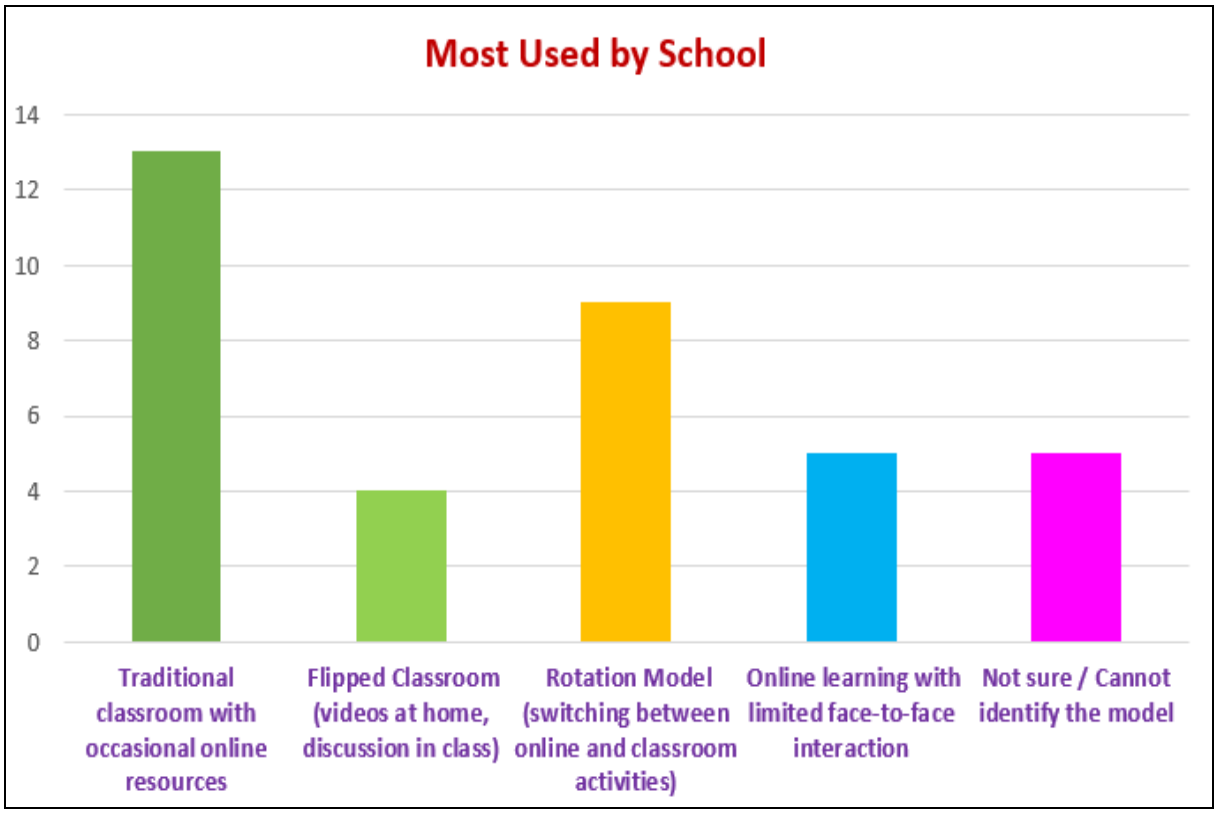

Fig 7 Most Used Model by School

Figure 8 portrays the models deployed in the colleges. The most utilized model in the college is traditional with online resources and flipped class room model. Though rotation and flipped model is used traditional is highly practiced in colleges also.

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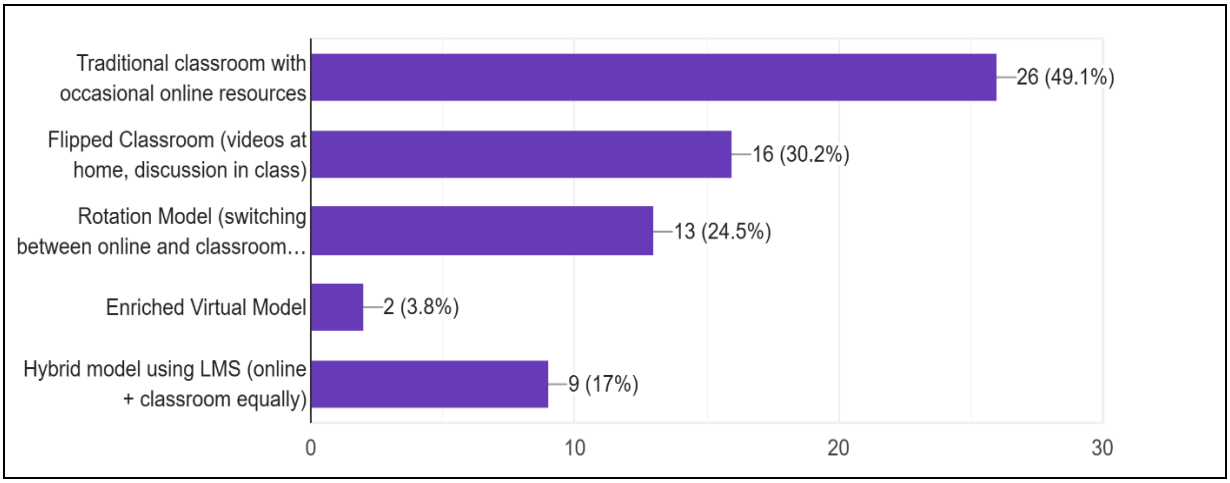

Fig 8 Most Used Model by College

Figure 9 illustrates the models exercised by teachers. The widely utilized models are Traditional with online resources and flipped class room model. Eventhough LMS based hybrid model, enriched virtual model and rotation models are in practice, teachers widely use traditional model only.

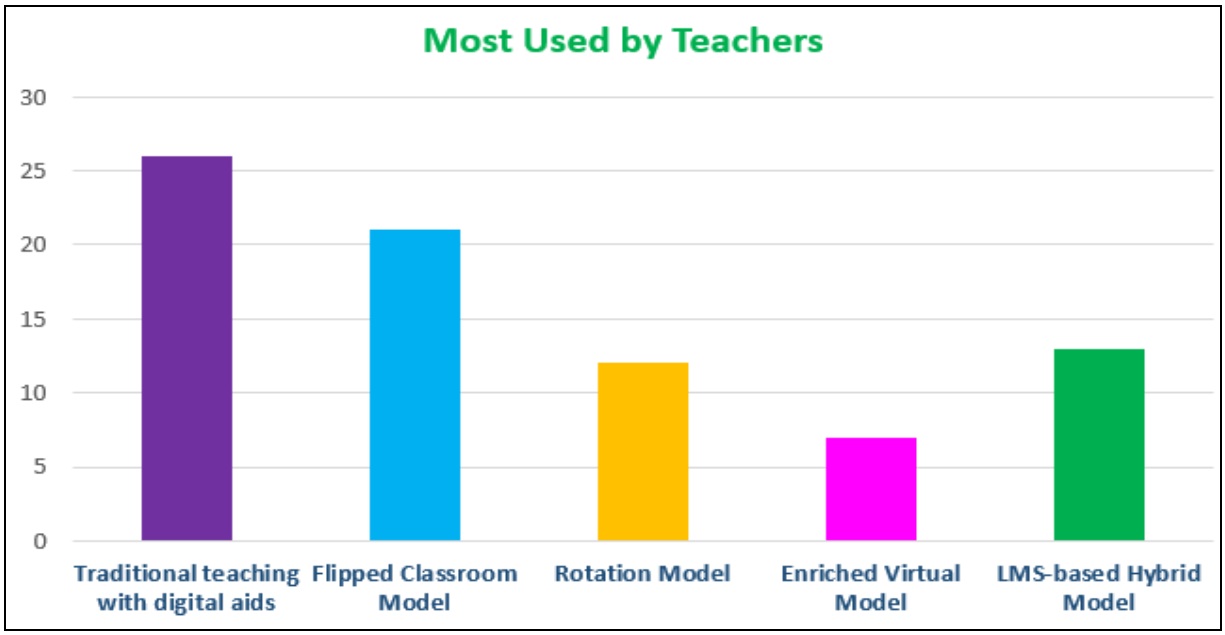

Fig 9 Most Used Model by Teachers

- *Most Needed/Suitable Model*

Figure 10, 11, 12 vividly present the most needed, most preferred model for school, college and by teachers.

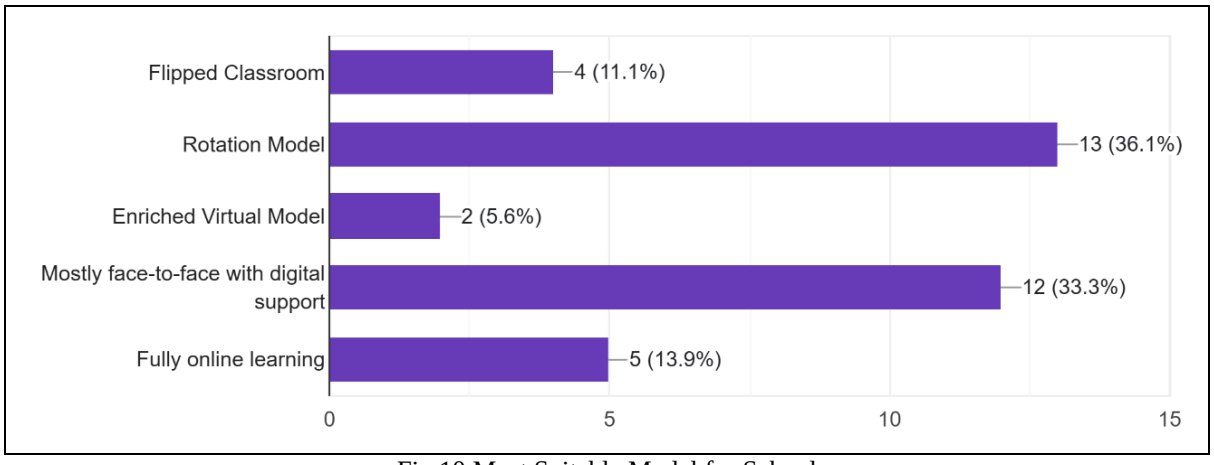

Fig 10 Most Suitable Model for School

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Figure 10 depicts rotation model as the most favored model along with traditional model. Figure 11 identifies flipped class room model and rotation model as most appropriate models by college students. Some students desire LMS based Hybrid model as best model.

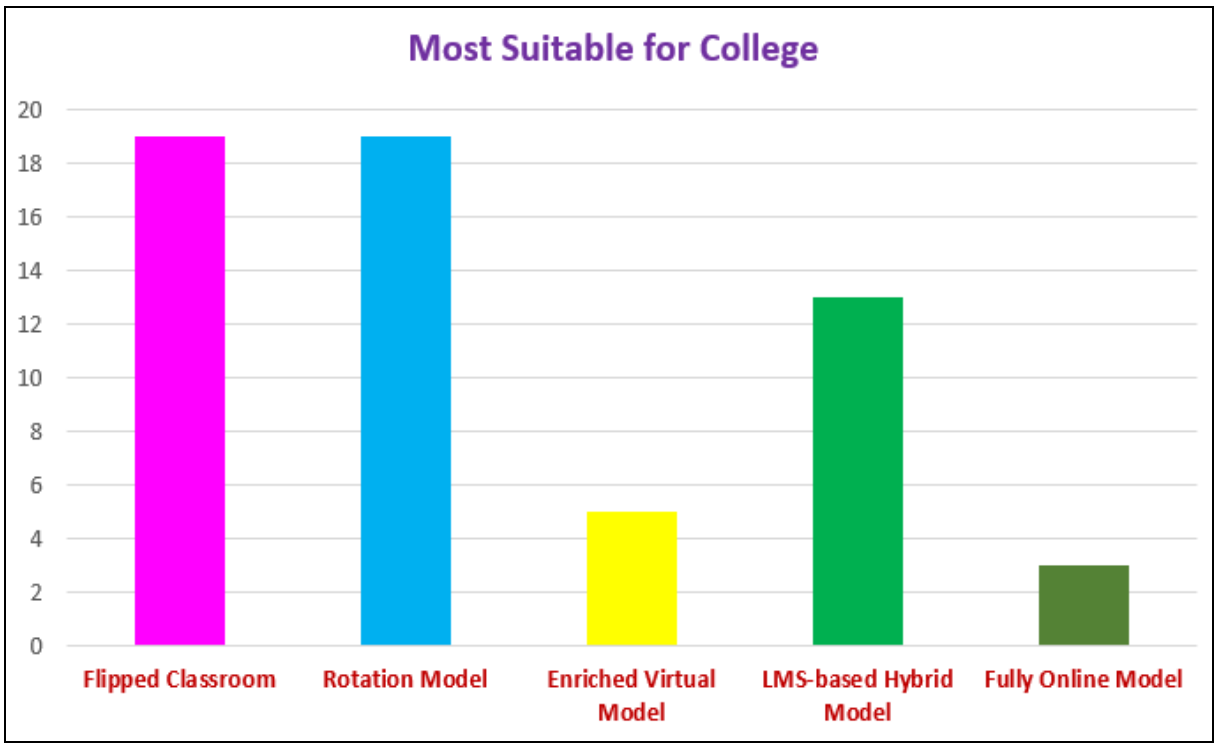

Fig 11 Most Suitable Model for College

Figure 12 picturizes the favorite models to be implemented in schools and colleges by teachers. Here the most suitable model is not suggested generally, they opt different models for different subjects. They never suggest one model as best or suitable. Apart from this many teachers suggest flipped class room model as the best suitable model for the teachers to enhance the students with subject knowledge.

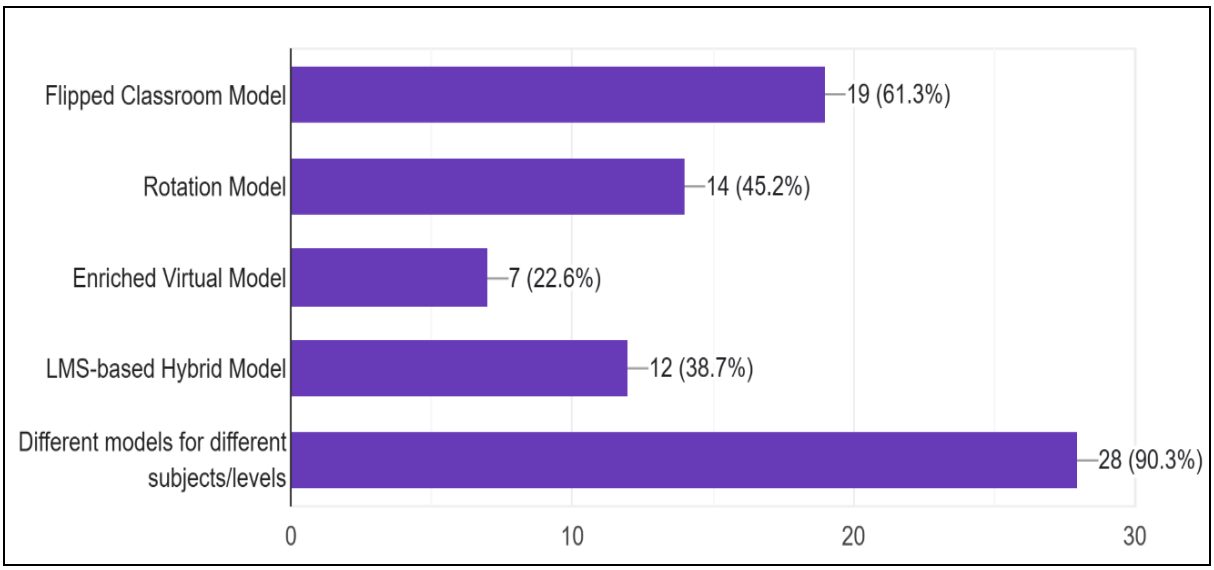

Fig 12 Most Suitable Model for Teachers

➢ *Comparative Analysis*

Comparative analysis is used to compare the overall perception about blended learning among the three groups respectively schools, colleges and teachers. This is mainly done using ANOVA analysis.

- *Overall Perception*

Figure 13 shows the overall perception of all the three groups. Though the perception is high, the students perceive the blended learning as more useful but teachers perceive it as most useful. This overall perception is calculated by comparing the overall averages of the mean values.

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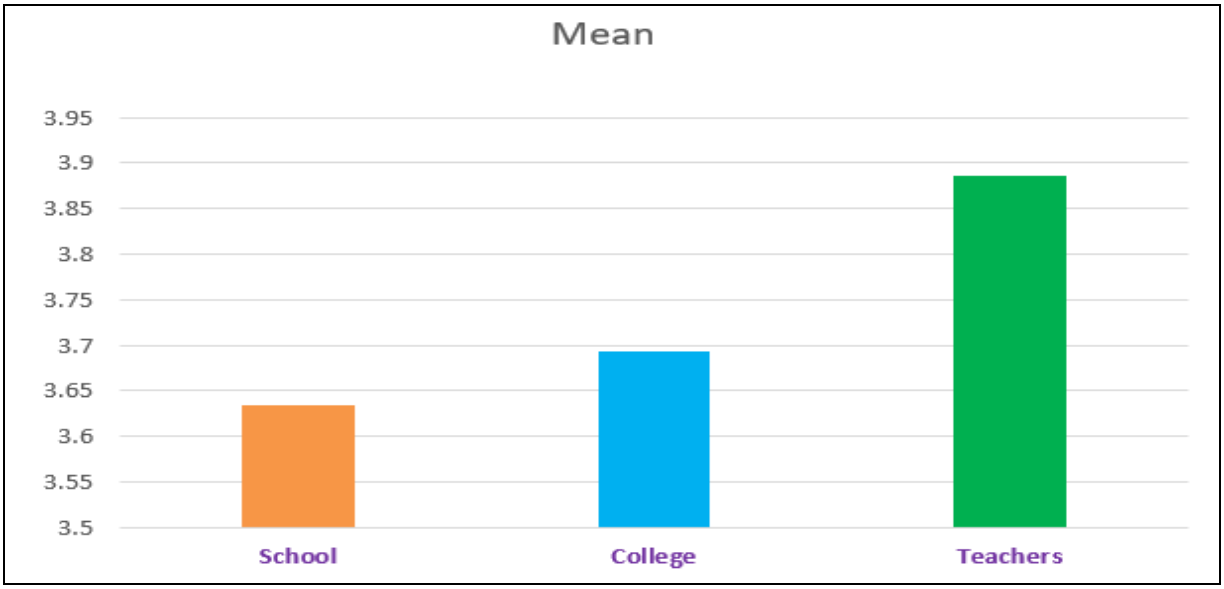

Fig 13 Overall Perception about BL

- *Overall Usefulness*

Figure 14 depicts the overall usefulness of the blended learning models. Teachers and college students are valuing it very high as it is very much helpful and the school students find it helpful. The usage of these models is much appreciated by all the respondents.

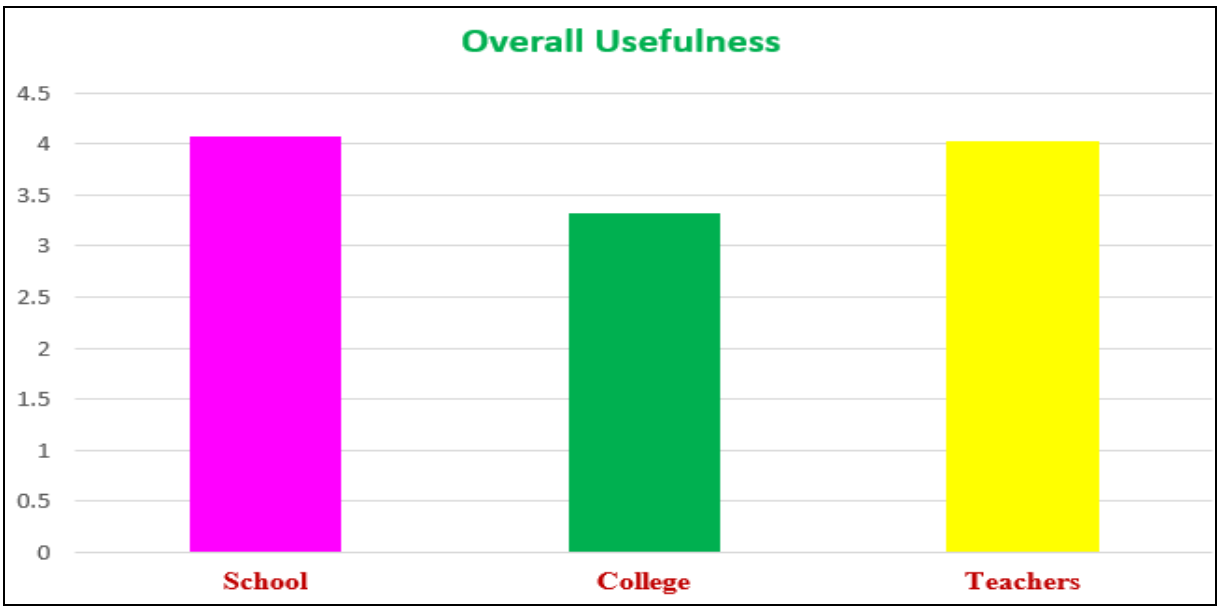

Fig 14 Overall Usefulness of BL

➢ *Hypothesis Testing*

From the findings and analysis, we are comparing the null hypotheses and decide whether to accept them or to approve the alternative hypotheses. The table describes that all the null hypotheses are rejected and the alternative hypotheses are accepted.

Table 6 Hypothesis Testing

Hypothesis	Result
H01	Rejected
H02	Rejected
H03	Rejected
H04	Rejected
H05	Rejected
H06	Rejected
H07	Rejected
H08	Rejected

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V. FINDINGS AND SUGGESTIONS

➢ *Findings*

The accumulated data from school students, college students and teachers were analyzed. The findings received from the analysis are.

- Blended learning models are widely implemented in schools and colleges, and the students are aware of these models and its implications.
- Blended Learning approach has made higher impact on the students and it is more effective.
- Majority of the respondents have a positive perspective on the effectiveness of the blended learning methods.
- Traditional way of face to face interaction and occasional online classes is the mostly used model in the schools and rotation model is also in the second place.
- The school students prefer rotation model first as the best suitable model to be utilized in the school class room and secondly they prefer traditional with online coaching.
- The college students identified traditional with online resources as highly utilized model in the class room and the flipped and rotational model as second highly identified models. They prefer flipped and Rotation model as best suitable model for college class room and then to online classes along with traditional way of teaching.
- The teachers mainly use traditional way of teaching along with digital aids. They also use flipped class room and LMS based hybrid model as their way of teaching
- Most of the teachers prefer diverse models for varied subjects and many use flipped classroom model and moderately they use Rotational model and LMS based hybrid model.
- All the respondent groups find it difficult to use due to technological issues and interruptions.
- The blended learning models proved itself to be highly encouraging for the students to develop their digital and employment skills.
- It also proves that students and teachers are finding it stressful or more burdensome using this blended model as they have to keep track of both online and offline classes and they had to spend extra time for this.
- There is also a strong feeling of the need to improve the implementation of blended learning models.
- The study finds that some teachers are still not conscious of all the models of blended learning. This is also same with the school students, but college students are far advanced in this matter.
- The overall analysis find that the college students are more active and getting more benefits from blended learning than school students.
- Though the overall mean is always positive for the blended learning, the standard deviation in school and teacher sections is not up to the level, which means variety of responses for a single question. But the college students are in the same mind regarding blended learning models.
- The overall perception on blended learning is good and it advocates to use the blended learning in all institutions as mandatory pedagogy.

➢ *Research Gaps and Recommendations*

The findings and analysis propose following suggestions for the improvement of implementation of blended learning and to utilize its full effectiveness.

- *Suggestions for the School*

✓ Schools should implement structured blended learning models, especially rotation model and traditional with digital tools, as they were chosen by the school students as most suitable for school learning.
✓ It must emphasize teacher guided face to face instruction with the controlled digital integration, rather than study at home and discuss here strategy.
✓ Orientation programs must be organized for students to make them aware of all blended learning models and make them understand the implementation of these models
✓ Teachers must be trained to prepare the contents very appropriate to the age and the digital world they are in, so that it may upgrade the understanding level of the students regarding concepts, rather than the feel of increased workload.
✓ Schools must establish technical infrastructure and internet accessibility for all students, to strengthen them in understanding and learning and to support their continuous learning without any interruption.

- *Suggestions for the Higher Educational Institutions*

✓ Colleges should continue to implement Flipped class room model and Rotation model, as they were most suggested as suitable by the college students.
✓ The blended learning models must be designed to concentrate on practical application, self-directed learning and discussion forums, mainly on skill oriented and professional courses.
✓ Institutions must provide guidelines to address the time management issues faced by students by balancing online and offline classes.
✓ Faculty development programs should be empowered to enhance online assessment strategies and digital pedagogy.
✓ Colleges should improve the design of blended learning models with industry requirements and employability skills.

- *Suggestions for the Teachers and Institutions*

✓ Teachers must be motivated to adopt flexible blended learning models according to the subjects and learning outcomes.
✓ Institutions must provide required technical support, instructional design assistance and digital tools to reduce the workload of teachers.
✓ Blended learning policies must be created to support pedagogical creativity rather than uniformity for all subjects.
✓ Teachers and institutions must take feedback from students, to improve the blended learning practices.

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- ✓ Institutions must promote long term pedagogical strategy rather than temporary solutions

- *Limitation of the Study*

The study has used convenience sampling, hence it may not produce general hypothesis. Through self-reported responses, data was gathered, so it would have been influenced by respondents' bias or personal perceptions. It mainly used descriptive analytical analysis such as mean, standard deviation, frequency and percentage and did not use advanced inferential techniques. The research was limited to selected institutions and so it may not represent all the educational setups. These limitations must be considered while interpreting the study.

- *Future Scope*

Study results and limitations pave way for the further study on the consequent areas:

- ✓ Future studies can employ probability sampling techniques to improve generalizability.
- ✓ Advanced statistical methods such as regression analysis or structural equation modelling can be used.
- ✓ Long term impact of blended learning models can be examined using longitudinal studies.
- ✓ Comparative studies can be conducted across different regions, different disciplines and different countries, so that it may provide broader outcomes.
- ✓ Qualitative methods such as interviews, group discussions can be appreciated to enhance the understanding of stakeholder experiences.
- ✓ Artificial Intelligence, adaptive learning technologies, Virtual Reality, Augmented Reality concepts can be included in blended learning environments.
- ✓ A deep study can be undertaken to design the curriculum with the blended learning pedagogy.

VI. CONCLUSION

The present empirical study analyzed the effectiveness, usage, suitability and challenges of blended learning from the perceptions of school students, college students and teachers. The findings disclose that blended learning has evolved as an effective and sustainable teaching and learning approach when appropriately implemented and utilized. The study emphasizes that learner level, subject nature and institutional support play a very much important role in deciding the suitability of blended learning models. Though blended learning is widely used, it must be aligned with the learners' interest to produce higher performance. The study concludes that blended learning should be incorporated and implemented as flexible, context specific teaching strategy, while supported with infrastructure, training and institutional policies. The valuable understandings from the findings can assist educators, administrators, policymakers and institutions to optimize the blended learning practices to improve educational effectiveness.

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