

AN ANALYTICAL INVESTIGATION OF THE EFFECTIVENESS OF DIGITAL LEARNING PACKAGES IN MATHEMATICS FOR ELEMENTARY STUDENTS

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ABSTRACT

The integration of information technology with mathematics, facilitating fundamental knowledge acquisition and comprehension at an individual's own pace, has become notably achievable in the wake of the pandemic-induced shift in teaching and learning methodologies. It is widely recognized that impactful learning must encompass a comprehensive approach, encompassing all aspects and emotions inherent in the learning process. The adoption of digital platforms has streamlined the process of recalling and comprehending mathematical concepts, which were previously challenging for students to interpret and apply. Now, with just a click, students can effortlessly retrieve and grasp these concepts without the need for manual assistance or encountering difficulties. Utilizing ICT and digital technology equips us with productive tools that offer efficient solutions to problems or assist in clarifying fundamental concepts. Huge change in technology and advancement in instructional teaching that gives the idea of developing the Digital Learning Package (DLP) in mathematics for elementary level students (Grade VI, VII, VIII) which helps the students to repeat, recall, understand the hard topic and their basic concept as many times as needed by the students. In this study to analyze the opinion scale which was developed to identify the rating of the subject expert on different instructions towards the digital learning package of mathematics. This opinion test was given to many subject experts of different India. This study revealed that majority of experts are in favor of the efficiency and appropriateness of the concept of Digital Learning Package. The end result shows that the Digital Learning Package (DLP) in mathematics highly interacts fully and helps for teaching learning process and gives a different outlook in learning process and changes the role of teacher. With the full collaboration of this in teaching learning process increases the level of achievement in students and gives an innovative dimension in student's head to think out of the box to become competitively ready in the education system.

KEYWORDS: Digital Learning Package (DLP), Mathematics, Elementary students

INTRODUCTION

In this modern era, technology has woven a ubiquitous fabric, connecting everyone and everything, and its proliferation has notably accelerated following the pandemic. In the realm of education, technology plays a pivotal role in problem-solving and disseminating specific information. Nowadays, a plethora of websites and software solutions are readily available to address various teaching and learning challenges. This fertile ground has given rise to the idea of developing a digital platform that facilitates the recall and comprehension of foundational concepts efficiently, without any need for external assistance or time wastage.

This innovative approach is achieved through the collaboration of multi-grade digital learning, empowered by technology, known as the Digital Learning Package (DLP). ICT has proven invaluable in addressing challenges across education and various fields (Moursund, 2005). While technology may have seemed daunting in the past, it has become universally accessible and widely adopted. Education and technology have evolved together, with students and teachers now well-acquainted with its use, recognizing its importance for the smooth operation of the education system. Now technology is everybody hand, office, classroom even virtual classroom, comfort in communication, transformation of thoughts, email, search engines, comfortable software, problem solving website and what not is easily become available after the growth of technologies. Research into the use of technology in classroom demonstrates that technology plays a critical role in students learning (Russel, Lucas, and McRobbies, 2003). Author believe that if normal text based content could present in innovative ways like demonstration learning, learning with the help of games, picture, animation, motion picture and help of many more technology as easily available in market now a day to engage the students in interactive and motivate the learning in students would give better result and long term memory with specific topic. That leads the author to develop a platform for student to interact and understand the text book content in innovative way and give better result in classroom and gives a clear concept related to their basics from syllabus and gives a different approach to the curriculum. Schroeder et al., (2007) showed the positive influence of the use of instructional technologies on student learning. A constructivist learning environment can be dispensing y the use of multimedia technology where students are allowed to solve any problem by the help collaboration and active participation and self-exploration (Neo and Neo, 2009). Serin (2011) discover and presents and according to the statistic it signifies that result of experimental based students are more achievable who taught the concept with the help of computer based science and technology instruction. Many other authors clams that with the use technology with little change in regular learning pattern can also very impactful for student and trigger the students mind and activate their interactive skill and make them more eager to learn. With the use of some cartoon character or any other animation attract the student attention as soon as the topic catches the student's attention their mind cells starts looking for something more and more that become stimulus for students to learn better. Gupta and Nagpal (2013); Gupta and Lata (2014) revealed that most of the experts favored the effectiveness of Multimedia Teaching Package (MMTP). It is also found that MMTP is helpful in strengthening the achievement of students as well as in maintaining the decorum in overcrowded classrooms as is the case of today's education system. Khirwadkar (1999) findings also shown that developed software package was effective in terms of academic achievement of the students and the students and teachers were found to have favorable opinion towards the software package. Sritaratorn and Sombunsukho (2011) revealed that the analysis of questionnaire for learners' satisfaction has shown that efficiency of computer instructional package was higher than a set criterion (80/80). Sritaratorn and Sombunsukho (2011) revealed that the analysis of questionnaire for learners' satisfaction has shown that efficiency of computer instructional package was higher than a set criterion (80/80). Tyagi (2012) also revealed that masters possessed a favorable assessment result for different aspects of CAI module. Further, the coefficient of variation was quite low. It shows coherence on assessment of different aspects of CAI module by the masters. D-learning also appreciates students to practise professional execution of their learning, giving them access to content of high standards and posing challenges (Chitkushev et al., 2014). All the studies given above revealed that most of the subject masters have positive attitude towards IT-enabled programmers. Hence, the main factors of it include feedback; starting from the

overall expertise of the educator/ instructor rating, the rating of the facilitator, and a feedback on the whole course quality. Besides these, some secondary factors that need to be kept in mind are system requirements (Nasser et al., 2016). Author want to state that since mathematics is practical subject and it would be more effective for student to learn the basic concept of math with the help of practical demonstration so that students can relate the math problem with their day to day life and easily implement the basic the real life and can remember the concept long and can easily recall at situation. For that all author want to deploy and self-build Digital Learning Package of mathematics for elementary students to test View and efficiency of Digital Package according to the master View with re related parameters.

OBJECTIVE OF THE STUDY

The present study I designed to analysis some objectives:

1. To develop Digital Learning Package in mathematics for students of multi grade VI, VII, VIII.
2. To develop an Assessment scale for evaluating the effectiveness of Digital Learning Package in mathematics for elementary student.
3. To analyses the views of subject expert for the effectiveness of Digital Learning Package in mathematics for elementary student.

DESIGN OF THE STUDY

METHOD USED: Descriptive method was used in the present exploration.

SAMPLE: To obtain the classified views of subject expert on numerous statements which validate Digital Learning Package in mathematics, the self-design opinion scale was testified by at least 10 subject experts individually from different private educational school of North India. Views on different aspects like content, presentation of text, relevance of content of Digital Learning Package in mathematics were evoking. Subject teachers from different school, teachers working in education sector in department of education, IT expert in IT field and technical education, expert from college of education, educator working in technical field or technical expert in education field all are included in subject expert category from North India.

TOOLS USED

1. Assessment Scale for effectiveness of Digital Learning Package (DLP) in mathematics formulated by the investigators themselves was used to seek the opinions of subject expert about effectiveness of DLP IN Mathematics. Digital Learning Package scale contains total 23 positive statements that is 11 statements are related to content selection and presentation and 12 statements related to significance for teachers and students. The method of assessment of each parameter is based on three points scale i.e. A: stands for Agree; DA: stands for Disagree; UD: stands for Undecided. Validity related to the content of the scale was established after having result from subject experts. Statements are given score in certain way 1, 0 and none for Agree, Disagree and Undecided. The sum of obtained value given to the effectiveness of the DLP in mathematics. The total score of 0 to 23 showing least effectiveness to highest effectiveness of DLP in mathematics.

2. Digital Learning Package in mathematics for multi grade of elementary (VI, VII, VIII) students was developed by investigators themselves by using different software, technique and technology such as Adobe Photoshop, Adobe After Effects, Adobe Premiere Pro, creative cloud 2020, video editing, Motion Graphics and other for video graphic, and sound. The package was prepared as per the syllabus of CBSE board from grade VI, VII, VIII.

STATISTICAL TECHNIQUE EMPLOYED

Percentage has been employed to show the responses of the subject experts.

ANALYSIS AND INTERPRETATION

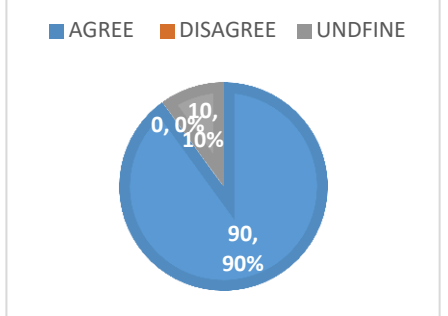
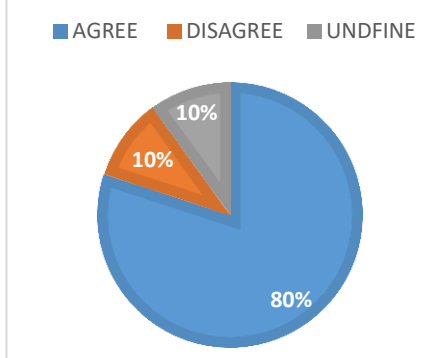
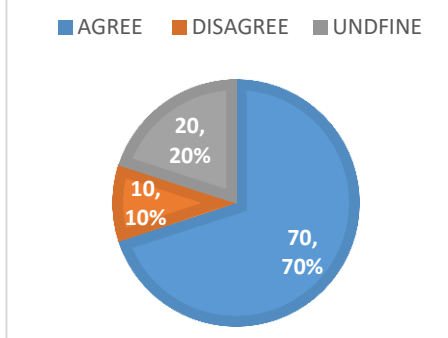
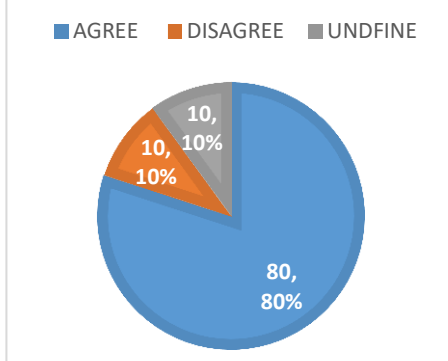
This part of the study deals with the analysis of opinions of subject experts regarding the effectiveness of the Digital Learning Package in mathematics. Section wise deep analysis has also been done by the investigator to know to identify the expert opinion regarding acceptance of Digital Learning Package in mathematics in many explanatory ways. The result of the subject experts is presented in the form of percentage and pie chart in table 1 and 3. Partwise result has been presented in table 2 and 4 and also graphical representation shown through pie chart. The overall result about the effectiveness of DLP in mathematics is also been presented in table and also graphical representation show in pie chart in figure.

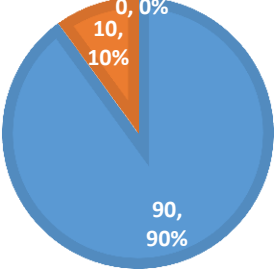
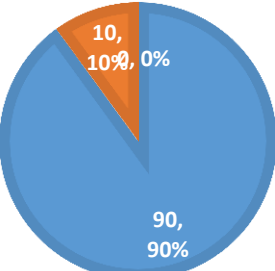
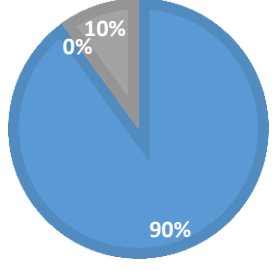
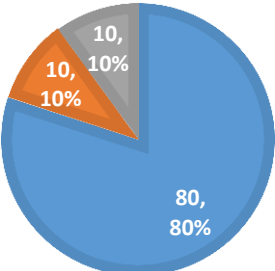
As author mention that DLP is concerned with many fact as selection of content and presentation the table 1 revealed that 90% of the subject experts have approvingly acknowledge the content of package quite stimulating and interesting, description topic, logical sequencing and hierarchical structuring, quality of audio, high resolution with better color combination with relevant example in learning material and subject oriented with the relevancy of syllabus. Furthermore 80% of subject experts are in the favor of systematically distribution of subject related topic and followed hierarchy and well profound used language and beginning and peace of the digital learning package. That further leads to revealed the 70% mathematics experts have agreed with the number of slides and retentive animation and audio-visual used in the package that also can be interpreted from the table 2 and figure 1 that 86% given their agreement, only 6% of expert disagreed and the rest 8% remain undecided about the statement given in the scale in part A that shows presentation of content. We as a developer of digital learning package in mathematics appreciated for such innovative learning idea of textbook written concept in simple and easy way by the subject experts. In the end result of the digital learning package stated by subject experts as with the use of DLP student can recall and learn the concept without any further help in better and understanding way with great representation of example with animation.

TABLE 1: SEQUENTIAL PRESENTATION OF VIEWS OF SUBJECT EXPERTS ABOUT EFFECTIVENESS OF DIGITAL LEARNING PACKAGE IN MATHEMATICS WITH RESPECT TO ‘CONTENT SELECTION AND

No.	Sequential	A	DA	UD	Pie Chart
Part A:	Content Selection and Presentation				

PRESENTATION’

A.1	The Content of Digital Learning Package is according to the NCERT textbook and syllabus as prescribed by CBSE Board.	9 (90 %)	0 (0 %)	1 (10 %)	 <p>■ AGREE ■ DISAGREE ■ UNDFINE</p>
A.2	Mode of instruction (language) and distribution of study material is as per the understanding level of students.	8 (80 %)	1 (10 %)	1 (10 %)	 <p>■ AGREE ■ DISAGREE ■ UNDFINE</p>
A.3	The number of frame in the video is sufficient and fulfills the need of content.	7 (70 %)	1 (10 %)	2 (20 %)	 <p>■ AGREE ■ DISAGREE ■ UNDFINE</p>
A.4	Topics and their relevancy with suitable example are arranged systematically.	8 (80 %)	1 (10 %)	1 (10 %)	 <p>■ AGREE ■ DISAGREE ■ UNDFINE</p>

A.5	Content hierarchy and structuring of text is logical and in specific order.	9 (90 %)	1 10 (%)	0 (00 %)	 <p>■ AGREE ■ DISAGREE ■ UNDFINE</p> <p>90, 90% 10, 10% 0, 0%</p>
A.6	Quality of audio files is clearly audible and with proper time interval.	7 (70 %)	2 (20 %)	1 (10 %)	 <p>■ AGREE ■ DISAGREE ■ UNDFINE</p> <p>90, 90% 10, 10% 0, 0%</p>
A.7	Planning of font and format with proper color combination, foreground, background and better resolution.	9 (90 %)	0 (00 %)	1 (10 %)	 <p>■ AGREE ■ DISAGREE ■ UNDFINE</p> <p>90% 10% 0%</p>
A.8	The beginning of the program is effective and stimulating.	8 (80 %)	1 (10 %)	1 (10 %)	 <p>■ AGREE ■ DISAGREE ■ UNDFINE</p> <p>80, 80% 10, 10% 10, 10%</p>

A.9	Easy and relevant illustration are used for explanation of the content.	9 (90 %)	0 (00 %)	1 (10 %)	<p>AGREE DISAGREE UNDFINE</p>
A.10	Graphic, motion animation, audio, visuals and other material is used in appropriate proportion and as per the need of the content to be explain.	7 (70 %)	2 (20 %)	1 (10 %)	<p>AGREE DISAGREE UNDFINE</p>
A.11	M.C.Q. are used for the evaluation of learning material instantly which provides immediate feedback.	9 (90 %)	0 (00 %)	1 (10 %)	<p>AGREE DISAGREE UNDFINE</p>

TABLE 2: EXPERTS OVERALL VIEWS ABOUT EFFECTIVENESS OF DLP (DIGITAL LEARNING PACKAGE IN MATHEATICS) WITH RESPECT TO CONTENT SELECTION AND PRESENTATION.

Opinion (in percent)	AGREE	DISAGREE	UNDEFINE
Content selection and presentation	84%	6%	10%

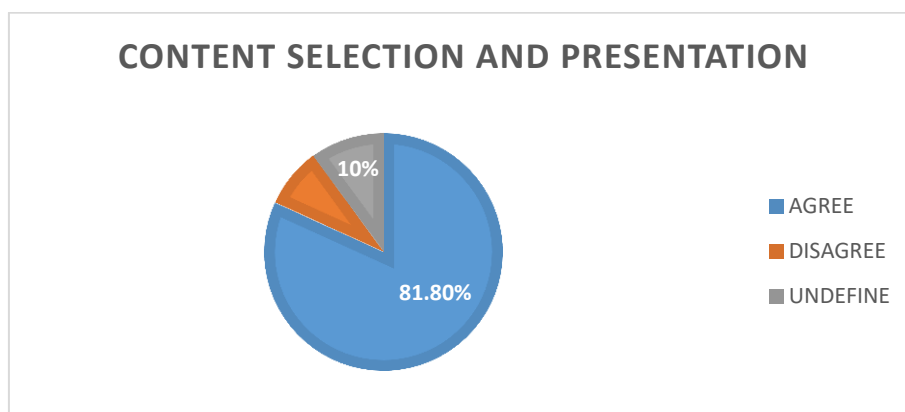


FIGURE 1: EXPERTS OVERALL OPINION ABOUT PRESENTATION OF CONTENT

TABLE 3: SEQUENTIAL PRESENTATION OF VIEWS OF SUBJECT EXPERT ABOUT EFFECTIVENESS OF DLP IN MATHEMATICS WITH RESPECT TO SIGNIFICANCE FOR TEACHERS AND STUDENTS.

No.	Sequential	AGR EE	DISA GREE	UNDE FINE	Pie-chart								
B.1	Successful in enhancing concentration and capturing the students attention.	8 (80%)	1 (10%)	1 (10%)	<table border="1"> <thead> <tr> <th>Opinion</th> <th>Percentage</th> </tr> </thead> <tbody> <tr> <td>AGREE</td> <td>80, 80%</td> </tr> <tr> <td>DISAGREE</td> <td>10, 10%</td> </tr> <tr> <td>UNDEFINE</td> <td>10, 10%</td> </tr> </tbody> </table>	Opinion	Percentage	AGREE	80, 80%	DISAGREE	10, 10%	UNDEFINE	10, 10%
Opinion	Percentage												
AGREE	80, 80%												
DISAGREE	10, 10%												
UNDEFINE	10, 10%												
B.2	Recalling and accessing the pervious concept or knowledge become possible for the students without any difficulty.	9 (9%)	0 (00%)	1 (10%)	<table border="1"> <thead> <tr> <th>Opinion</th> <th>Percentage</th> </tr> </thead> <tbody> <tr> <td>AGREE</td> <td>90, 90%</td> </tr> <tr> <td>DISAGREE</td> <td>0, 0%</td> </tr> <tr> <td>UNDEFINE</td> <td>10, 10%</td> </tr> </tbody> </table>	Opinion	Percentage	AGREE	90, 90%	DISAGREE	0, 0%	UNDEFINE	10, 10%
Opinion	Percentage												
AGREE	90, 90%												
DISAGREE	0, 0%												
UNDEFINE	10, 10%												

B.3	Provides helpful scenario for students to develop numerical and logical ability of the students.	7 (70%)	2 (20%)	1 (10%)	<p>■ AGREE ■ DISAGREE ■ UNDFINE</p> <p>70, 70% 20, 20% 10, 10%</p>
B.4	Student would be able to apply the knowledge of mathematical concept to real life situation.	7 (70%)	1 (10%)	2 (20%)	<p>■ AGREE ■ DISAGREE ■ UNDFINE</p> <p>70, 70% 20, 20% 10, 10%</p>
B.5	Helpful in removing the mathematical fear among the students and strengthens their ideas on the base.	9 (90%)	0 (00%)	1 (10%)	<p>■ AGREE ■ DISAGREE ■ UNDFINE</p> <p>90, 90% 10, 10% 0, 0%</p>
B.6	Student can learn at their own understanding with the help of Digital learning package	8 (80%)	0 (00%)	2 (20%)	<p>■ AGREE ■ DISAGREE ■ UNDFINE</p> <p>80, 80% 20, 20% 0, 0%</p>

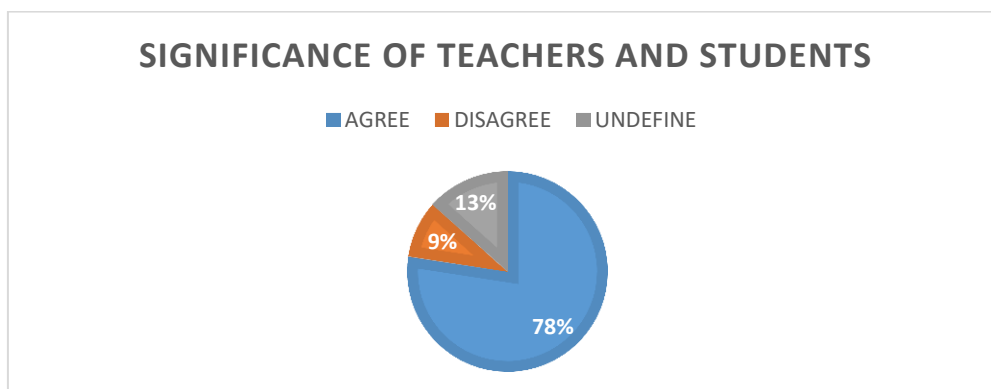
B.7	Introduces the new and innovative ways to the teachers for teaching and learning.	7 (70%)	1 (10%)	2 (20%)	<p>AGREE DISAGREE UNDFINE</p> <p>70, 70% 10, 10% 20, 20%</p>
B.8	With the help of DLP (Digital learning Package) become easy for teachers to elaborate the complex concept of mathematics	8 (80%)	1 (10%)	1 (10%)	<p>AGREE DISAGREE UNDFINE</p> <p>80, 80% 10, 10% 10, 10%</p>
B.9	Helps in maintaining discipline and decorum of a big crowded classroom with the use of DLP.	8 (80%)	1 (10%)	1 (10%)	<p>AGREE DISAGREE UNDFINE</p> <p>80, 80% 10, 10% 10, 10%</p>
B.10	DLP (Digital Learning Package) helps in making revision process easy and less time taken.	8 (80%)	0 (00%)	2 (20%)	<p>AGREE DISAGREE UNDFINE</p> <p>80, 80% 0, 0% 20, 20%</p>

B.11	Transform the teachers from authoritative to the supportive and facilitator in teaching.	7 (70%)	1 (10%)	2 (20%)	<p>AGREE DISAGREE UNDFINE</p> <p>70, 70% 10, 10% 20, 20%</p>
B.12	Digital Learning Package is easy to use in routine classroom by the teachers.	7 (70%)	3 (30%)	0 (00%)	<p>AGREE DISAGREE UNDFINE</p> <p>70, 70% 30, 30% 0, 0%</p>

TABLE 4: EXPERTS OVERALL VIEWS ABOUT EFFECTIVENESS OF DIGITAL LEARNING PACKAGE IN MATHEMATICS WITH RESPECT TO ‘SIGNIFICANCE OF TEACHERS AND STUDENTS’.

OPINION (IN PERCENT)	AGREE	DISAGREE	UNDEFINE
SIGNIFICANCE OF TEACHERS AND STUDENTS	77.2%	9.2%	13.3%

FIGURE 2: EXPERTS OVERALL VIEWS ABOUT SIGNIFICANCE OF TEACHERS AND STUDENTS



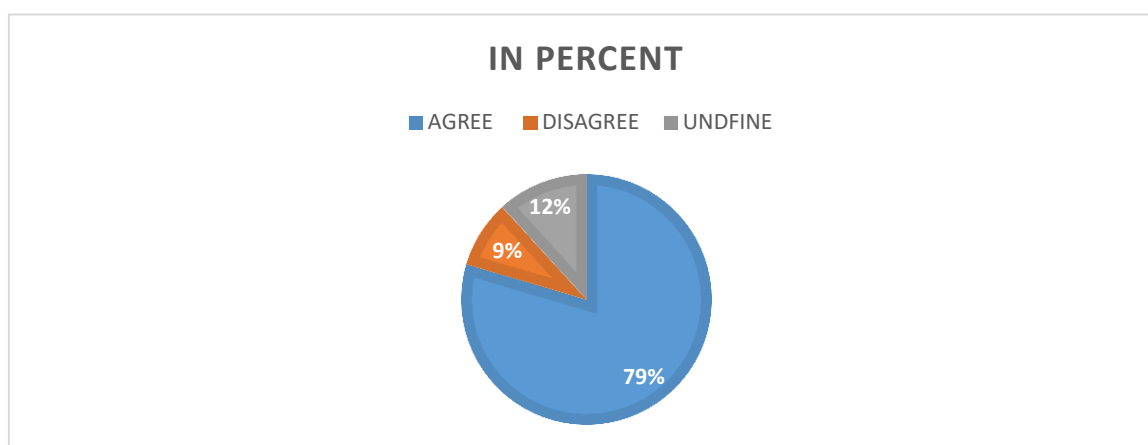
This has been profound from this part of View from above table that 90% of subject masters have positively concede the provision of innovative technique of teaching to the teachers, elaboration of complex concept of mathematics which save time and energy, visualize activities in classroom, monitor learning program of students frequently and gets feedback

effectively through assignment given to the students in the end of topic given in package. 80% masters have agreed that DLP in Mathematics is quite helpful in developing potential of teachers to discover learning, in maintaining discipline and providing revision of important points and effectively facilitates the students learning.

It reveals that 77.2% masters are agreed, only 9.2% disagreed and rest 13.3% remain undefined about the Sequential given in scale for acceptance of View and also states that this DLP is likely to be highly acceptable in real classroom for teachers to teach and students to study better and facilitator both them and classroom become more interactive and fun for all.

TABLE 5: EXPERTS OVERALL ABOUT ACCEPTANCE OF DLP (DIGITAL LEARNING PACKAGE) IN MATHEMATICS.

OVERALL VIEWS	V	DISAGREE	UNDEFINE
IN PERCENT	79.56%	8.69%	11.73%



A= AGREE DA= DISAGREE UN= UNDEFINE

Figure 2: Experts overall Views about acceptance of DLP (DIGITAL LEARNING PACKAGE) in Mathematics.

Overall View of experts on overall acceptance of DLP have been analyzed and presented in above mention table and figure for better understanding. In words if we want to interpreted from table 6 that shows 79% of the masters agreed for the successfulness of DLP in mathematics. Only 9% of masters disagreed and only 12% remain undefined about the Sequential given in View scale. That all suggest that masters favored for the successfulness of DLP. Therefore, it can be concluded that it is helpful in increasing student's achievement level at own pace in motivating and fascinating ways in this technical education system.

CONCLUSION

The author conducted this research to assess the perspectives of subject matter experts regarding the effectiveness of Digital Learning Packages in teaching mathematics to elementary students in grades VI, VII, and VIII. The analysis readily demonstrates strong support among experts for DLP and its positive impact. Subject experts emphasize that in today's technological era, the fusion of traditional classroom instruction with digital and innovative methods significantly enhances the learning experience. The study findings highlight that a majority of experts endorse the efficiency and suitability of the Digital Learning Package concept. The ultimate outcomes indicate that DLP in mathematics is highly

interactive and plays a crucial role in improving the teaching and learning processes. It provides a fresh perspective on the learning process and transforms the role of the teacher. Through the full integration of DLP into the teaching and learning process, student achievement levels rise, fostering innovation in students' thinking and better preparing them for educational competition.

In the current scenario of educational institutions, multimedia and Instructional material has overcome the barriers of time and space and provides evidence to be accepted as an anytime and anywhere tool for educating multi-disciplinary masses (Malik and Aggarwal, 2012; Mittal and Lata, 2023). The process of knowledge acquisition becomes more efficient when the learners experience an event through a multimedia simulation. These are the platforms that are efficient to cater to a lot of learners at the same time and, as Selwyn (20) points out, yet provides equal opportunities of interaction for each and every individual dilemmas and requirements of each candidate, separately. Use of digital platform makes it more easy to recall and remember the mathematical concept which were difficult in interpreting and implementing for student now in come click students can easily recall and understand the concept without any manual help or difficulty. This assessment is subject to infidelity and dishonest modes and means that might affect the genuineness in the process of education and “qualitative, and adequate allotment of credits”, as defined by Bauerlein (2018).

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