

The effect of energizing text books on Achievement levels of secondary school students in mathematics.

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Abstract: Class rooms around the world have implemented many forms of technology to enhance student's achievement levels. Energizing Text Books is a novel strategy which (2018-19) has emerged from Department of School Education Andhra Pradesh state, INDIA this year (2017-18), to give useful and additional information to the students by bringing Digital Technology in to the Text books. The purpose of the present study was to determine the effect of Energizing Text Books (ETB) on Achievement levels of Secondary school students in Mathematics. It was an Experimental study and the target population was the urban secondary school VIII grade students in Visakhapatnam district. A sample of 80 students was selected and divided in to two equal groups i.e. Experimental Group and Control Group each having 40 students. Both the groups are equated on the basis of their scores by pair random sampling from the previous examination of their class in the mathematics. The students of Experimental Group were exposed to the teaching through Energizing Text Books, whereas the students of control group were taught through traditional method of teaching in the subject of Mathematics. The unit taught to both the groups was "Exponents and powers" chosen from the prescribed syllabi. Post teaching test was conducted and results examined. Achievement Performance Rating Scale (APRS) by George J.DuPaul and Mark D.Rapport 1991 was used to assess Achievement levels of students. Findings showed that the students who were subjected to teaching through Energizing Text Books showed elevated achievement levels in Mathematics.

Keywords: Achievement levels, Digital technology, Energizing Text Books.

INTRODUCTION:

Education is the process of receiving (or) giving systematic instruction, especially at a school or university. The Indian Educational landscape is fast changing with technology and gripping the nation in an unprecedented fashion. Every student has a unique set of requirements. One might need a teacher's help to better their analytical skills, while another might need constant revision. Students living in remote regions, unlike their urban counterparts, have access to neither decent schools, nor state-of-the-art learning pedagogies. Acquiring the desired study material is also a big challenge in these regions.

Digital platforms:

To address these problems, new age digital platforms are using technology to enhance the Academic achievement. These platforms are allowing students to grasp Academic concepts better. Another aspect that students benefit from is the ability of digital platforms to provide consistent and good quality content anytime, anywhere. According to Scholastic Children's Dictionary (1996) "Mathematics" is the study of numbers, quantities, shapes and measurements and how they relate to each other. Technology has been widely recognized as an important tool in the teaching and learning of Mathematics. It influences the Mathematics that is taught and enhances students learning (NCTM 2000, p.24). 'Achievement' means the extent to which learning from instruction in a given area of learning. It is one of the most important goals of Education. Achievement is success or expertise of performance in a given skill. The term 'Digital Technology' is used to refer to a wide range of technologies which store and transmit information in digital form. This includes computers, the internet and virtual classrooms, mobile phones and Web 2.0 technologies, the label commonly applied to 'participatory and interactive media' (Hague, Cassuie & Williamson, Ben 2009, p.3). The ever-increasing needs of individuals and society in the 21st century are constantly placing much pressure on the educational institutions.

The traditional teaching methods are no longer capable of satisfying the requirements of our modern era. Digital Class Room (DCR) is a teacher-led educational content solution that intensely improves learning outcomes in schools. The programmed supplements in the existing Board Curriculum in both English and Telugu mediums to make the learning experience in classrooms are exciting, meaningful, and enjoyable. The required audio video teaching learning material including e-content is being provided to all classes and schools. As per the MOU signed with School Education Department, Digital content aligned with AP School Curriculum will be provided by Usky.in.

Energizing Text Books is an innovative program of School Education of Andhra Pradesh State in India to empower the teachers with additional resources which results in easy access to more information using Online and Offline resources that stimulate and engage learners and teachers (Commissioner of School Education Govt. of Andhra Pradesh). It provides access to teachers on support material for preparation, effective classroom transaction assessing the student. The Government envisioned the move to enhance curriculum activities, provide additional information and contextualize content to supplement traditional text books with the help of QR codes. The codes will be printed on hardened pages inside the text books. QR Code is a Two-Dimensional bar code that is readable by smart phones. Discovery of digital content from physical text book is made possible by printing a QR-Code in text books and by linking digital teaching and learning content to QR Codes placed in textbooks topic wise.

Innovation in Teaching

The Ministry of Human Resources Development and the National Council for Teacher Education have developed a dedicated digital infrastructure called DIKSHA to provide tech based solutions to teachers. Teaching and learning content, which involves Energizing Text Books, is one of the verticals of DIKSHA. Teachers often face a shortage of time to prepare for classes with students of diverse learning needs. This initiative will enable the teachers to ideate and find more content and material. The class room engagement will change as students are involved in listening, watching and learning. QR Codes prevent errors since they don't involve any manual processes, unlike URLs that have to be manually typed and thus could easily be mis-spelt and time consume to type so QR Codes are more handy. Text book Development teams identified where QR Codes are to be placed inside books. The DIKSHA Project Management Unit provides technical guidance and makes the QR Code bank available.

The National Council of Educational Research and Training (NCERT) has also started work on preparing the QR Codes, but they are likely to be available only from the next Academic year (2019-20). In Andhra Pradesh Energizing Text Books used for Classes 6th to 10th in both English and Telugu mediums for Non-Languages (Mathematics, Science and Social subjects) with more than seven million books published.

REVIEW OF LITERATURE:

The following literature review presents research related to the educational Technology.

K.BalaSubramaniam, P. Thamizoli (2010) revealed that the transition from silence to voice, from powerlessness to Empowerment is possible in non-formal learning contexts, just as it is in formal contexts, and that technology offers a means to accelerate this process if the use of technology is placed in an appropriate social context. Another study reported the role of interactive multimedia on a multi-cultural country like India. Integration of interactive multimedia and technology in the class rooms help learners to acquire skills and to be productive (Praveena. K.B. 2011). The role of technology reviewed as catalyst of teaching and learning process in India. Effective Use of Technology can motivate students, make the classes more dynamic and interesting and renew teacher enthusiasm as they learn new skills and techniques. However technology can't replace a teacher but it can be used only as a supplement tool in teaching learning process, thereby enhancing learning environment (Vijay Kumar. R. 2011). One study reviewed the use of technology in Education in the context of Indian condition. The need for interactivity in the learning process led to the computer based learning materials. Though Internet has not changed the expertise of the teachers and learners, it has helped them to change their skills and mode of operation (Gupta sheetal. 2011).

E-Learning:

Mobile Learning may be used to access the educational opportunities to different segments of the society where distance or other obstacles present a barrier to accessing formal learning centers and to enhance the quality of learning and continued professional development (Manoj Kumar. 2011). The use of ICT in Higher Education is not only a technique for educational development, but also away of socio economic development of the Nation (Sukantha Sarkar. 2012). reviewed that, If we deliver training with clarity of purpose and proper ICT support, considering the requirements of teachers, they are able to start the use of ICT in their teaching (Dr.Minalshi Barve, Dr. Vasant Barve. 2012). The present time the teacher's role in teaching is Facilitator. The teacher has to facilitate the learning by providing students with access to technology (Chinmoy Goswami. 2014). Another study revealed that the computer is most powerful tool for understanding mathematical concepts. Geogebra is a software package and specially designed for Mathematics subject as a teaching tool. They examined the effects of dynamic Mathematics software Geogebra on student Achievement in teaching of Geometry at secondary school stage. The study shows that Experimental Group has better Achievement which had received Instruction by Geogebra in comparison to Control Group in which lesson was taken without software technology (Rahul Chandra Kushwaha, Praveen Kumar Chaurasia, Achintya Singhal. 2014). E-Learning using advanced technological Gadgets and Electronic devices is going to play a huge role in future class rooms. Paper Text Books will become obsolete in the coming years (Dr. Ajay Surana and Ms.SusmaRani. 2015). It is also seen that significant positive effect of Information and Communication Technology (ICT) on achievement of Mathematics. (Soliman and Hilal 2016, Sharma. 2013, Kumud and Lata. 2013, Delen and Bulut . 2011). The relationship between Achievement in Mathematics and Science with exposure to information and Communication Technology (ICT) on 200 students of Government Senior Secondary Schools of Luthiana District of Punjab state (India).Results of the study revealed significant positive relationship of Achievement in Mathematics and Science with exposure to ICT (Amandeep Kaur, Dr. Gurmit Singh. 2017).

Innovative Technologies:

Most of the studies were found conducted on ICT. No study was found conducted on population of Government School Students of Visakhapatnam district of Andhra Pradesh. Energizing Text Book is a new concept to Educational Technology. So, solid information is yet available in the literature concerning the proposed topic. In conclusion, Research is needed to unpack the effect of Energized Text Books. This study has the purpose to investigate the "Effect of Energizing Text Books on Achievement levels of Secondary School Students in Mathematics."

METHODOLOGY:

The study aimed at investigating the effect of Energizing Text Books on Achievement levels of Secondary School Students in Mathematics. The dependent variable in the study was the Achievement in academic scores of the students, whereas the independent variable was teaching strategy in use.

It was an Experimental study and target Population of the study was the secondary school students in Andhra Pradesh state in India. The sample was picked up from four randomly selected Government Secondary Schools which are located in urban area

of Visakhapatnam District in Andhra Pradesh state. All these Four High Schools are having both English and Telugu as Medium of Instruction. Researcher consulted the Head masters of the above Schools and took permission for VIII grade students who were selected for this study. The relevant Mathematics Teachers of those schools were consulted and explained the task has to be done requesting for their cooperation to the study.

OBJECTIVES OF THE STUDY:

1. To determine the Effect of teaching with Energizing Text Books on the Academic Achievement of Secondary School students in Mathematics as compared to the traditional method of teaching.
2. To determine Effect of teaching with Energizing Text Books on the Academic Achievement in Mathematics of Secondary School girls, as compared to the traditional method of teaching.
3. To determine the Effect of teaching with Energizing Text Books on the Academic Achievement in Mathematics of Secondary School boys, as compared to the traditional method of teaching
4. To determine the Effect of teaching with Energizing Text Books on the Academic Achievement in Mathematics of Secondary School English medium students, as compared to the traditional method of teaching
5. To determine the Effect of teaching with Energizing Text Books on the Academic Achievement in Mathematics of Secondary School Telugu medium students, as compared to the traditional method of teaching
6. To determine the Effect of teaching with Energizing Text Books on the Academic Achievement in Mathematics of Secondary School students among day-scholars, as compared to the traditional method of teaching.
7. To determine the Effect of teaching with Energizing Text Books on the Academic Achievement in Mathematics of Secondary School students among Hostellers', as compared to the traditional method of teaching.
8. To determine the Effect of teaching with Energizing Text Books on the Academic Achievement in Mathematics of Secondary School students who don't use Gadgets, as compared to the traditional method of teaching.
9. To determine the Effect of teaching with Energizing Text Books on the Academic Achievement in Mathematics of Secondary School students who use Gadgets, as compared to the traditional method of teaching.

Hypothesis of the Study:

The study aimed at testing the following hypothesis.

1. There is no significant difference in the mean scores of secondary school students in Mathematics exposed to teaching with Energizing Text Books and those exposed to teaching with Traditional Text Books.
2. There is no significant difference in the mean scores of secondary school boys in Mathematics, exposed to teaching with Energizing Text Books and those exposed to teaching with Traditional Text Books.
3. There is no significant difference in the mean scores of secondary school girls in Mathematics, exposed to teaching with Energizing Text Books and those exposed to teaching with Traditional Text Books.
4. There is no significant difference in the mean scores of secondary school English medium students in Mathematics, exposed to teaching with Energizing Text Books and those exposed to teaching with Traditional Text Books.
5. There is no significant difference in the mean scores of secondary school Telugu medium students, exposed to teaching with Energizing Text Books and those exposed to teaching with Traditional Text Books in Mathematics.
6. There is no significant difference in the mean scores of secondary school students who are living at home in Mathematics exposed to teaching with Energizing Text Books and those exposed to teaching with Traditional Text Books.
7. There is no significant difference in the mean scores of secondary school students who are staying at hostel exposed to teaching with Energizing Text Books and those exposed to teaching with Traditional Text Books in Mathematics
8. There is no significant difference in the mean scores of secondary school students who doesn't have Gadgets exposed to teaching with Energizing Text Books and those exposed to teaching with Traditional Text Books in Mathematics.
9. There is no significant difference in the mean scores of secondary school students who does have Gadgets exposed to teaching with Energizing Text Books and those exposed to teaching with Traditional Text Books in Mathematics.

SAMPLE:

A sample consisted of 80 (eighty) students who were studying grade VIII from four selected Government secondary schools in urban area of Visakhapatnam District of Andhra Pradesh state in India. The selected schools have the same syllabi of Mathematics and Digital Class Rooms. Students of sample school were divided in to two groups, Experimental Group and Control Group. Both the Groups were equated at their scores of pre-test related to previous chapter in mathematics.

Procedure:

Students of sample school were divided in to two groups, Experimental Group and Control Group using a pre assessment test. Both the Groups were equated at their scores of pre-test related to previous chapter in mathematics. The chapter 'Exponents and Powers' chosen from prescribed syllabi was taught to both the groups. Teachers who regularly teach Mathematics to students are taught this chapter also in a stipulated time in a traditional method using necessary materials. Experimental Group students were explained how to use QR Codes which were in Energizing Text Books with their Gadgets (smart phones, note pads) if they have at their home. There are five QR Codes allocated to this chapter in Energizing Text Book and teachers open the QR codes with DIKSHA app in their smart phones and showed to students of Experimental Group only, in a separate room where projector and virtual board are fixed, for a stipulated time.

TOOLS:

Summative Assessment: in order to measure the Academic Achievement of the students in Mathematics, a post-test was conducted on the particular chapter that was taught. The test designed by the experimenter was conducted immediately after the concepts are taught. Both experimental and control groups were tested and their scores were the data collected for the present study.

Academic Performance Rating Scale (APRS) by George J. DuPaul and Mark D. Rapport 1991 was used to assess Achievement Levels of students. Academic Performance Rating Scale sheets are given to the teachers and are explained how to estimate performance of the students. They filled a five point Rating Scale (APRS) sheets for each student both Experiment Group and Control Group and responses are analyzed.

The scores of achievements by the students of both the groups of sample schools were recorded separately and were treated as Academic Achievements of the students for statistical analysis, to accomplish the objectives of the study.

Limitations of the Study:

The present study is undertaken with the following limitations.

- The Geographical area of investigation is limited to one District i.e. Visakhapatnam District of Andhra Pradesh.
- The study was limited specifically to VIII grade students of Government Secondary Schools in urban area.
- The Study did not deal in to the Socio Economic Status of the students.
- The study was limited to mathematics subject only.

RESULTS:**Table-1**

Group		Frequency	Medium		Gender		Residing		Having Gadget	
			Telugu	English	Boys	Girls	Home	Hostel	No	Yes
Control Group	N=40	Frequency	20	20	20	20	22	18	19	21
		percentage	50	50	50	50	55	45	47.5	52.5
Experimental Group	N=40	Frequency	20	20	20	20	29	11	17	23
		percentage	50	50	50	50	72.5	27.5	42.5	57.5

Table-1 shows that Frequency Distribution of different sub groups among Control group and Experimental Group the sample of students for Medium of instruction where Telugu medium students are 20 in Control Group and 20 students in Experimental Group, where as English medium students are 20 in Control Group and 20 students in Experimental Group. The Boys are 20 in Control Group and 20 in Experimental Group, where as the Girls are 20 in Control Group and 20 in Experimental Group. On the other hand the students residing at home are 22 in Control Group and 29 in Experiment Group, where as the students residing at Hostel are 18 in Control Group and 11 in Experimental Group. The sample students who have Gadgets are 21 in Control Group and 23 in Experimental Group, where as the sample students who haven't Gadgets are 19 in Control Group and 17 in Experimental Group.

Table-2

	Group	N	Mean	Std. Deviation	t
Final Assessment	Control Group	40	5.45	2.09	0.00**
	Experimental Group	40	9.63	5.06	
Academic performance	Control Group	40	56.90	9.05	0.44*
	Experimental Group	40	56.15	11.12	
Academic Success	Control Group	40	21.55	4.44	0.94
	Experimental Group	40	21.62	4.92	
Impulse Control	Control Group	40	9.45	1.85	0.26*
	Experimental Group	40	8.47	1.98	
Academic productivity	Control Group	40	34.60	6.13	0.85
	Experimental Group	40	34.90	7.99	

Table-2 shows that Final Assessment (Academic test scores after completing the teaching Of whole chapter) of girls show a highly significant difference among control group and Experimental group, where the effect of usage of Energizing Text Books has higher than traditional method of teaching as $m=5.45$ for Control Group and $m=9.63$ for Experiment Group with t-value, $p \leq 0.01$.

Table-3

GENDER		Group	N	Mean	Std. Deviation	T	
Girls	Final Assessment	Control Group	20	5.05	2.54	4.89**	
		Experimental Group	20	11.90	5.73		
	Academic performance	Control Group	20	59.100	10.18	0.16	
		Experimental Group	20	59.65	11.33		
	Academic Success	Control Group	20	22.70	4.93	0.22	
		Experimental Group	20	23.05	5.28		
	Impulse Control	Control Group	20	9.65	2.12	1.17	
		Experimental Group	20	8.90	1.94		
	Academic productivity	Control Group	20	36.15	7.05	0.64	
		Experimental Group	20	37.65	7.82		
	Boys	Final Assessment	Control Group	20	5.85	1.50	2.00*
			Experimental Group	20	7.35	3.00	
Academic performance		Control Group	20	54.70	7.38	0.74	
		Experimental Group	20	52.65	10.07		
Academic Success		Control Group	20	20.40	3.66	0.16	
		Experimental Group	20	20.20	4.20		
Impulse Control		Control Group	20	9.25	1.59	2.11*	
		Experimental Group	20	8.05	1.99		
Academic productivity		Control Group	20	33.05	4.73	0.46	
		Experimental group	20	32.15	7.36		

Table-3 shows that Final Assessment (Academic test scores after completing the teaching Of whole chapter) of girls show highly significant difference among control group and Experimental group, where the effect of usage of Energizing Text Books is higher than traditional method of teaching as $m=5.05$ for Control Group and $m=11.90$ for Experiment Group with t -value 4.89, $p \leq 0.01$.

In academic performance and all rest of sub scales (Academic success, Impulse control, Academic productivity) the two groups Control Group and Experiment Group are not significantly differing.

It is also revealed that Final Assessment of (Academic test scores after completing the teaching chapter) of boys show a highly significant difference among control group and Experimental group, where the effect of usage of Energizing Text Books is higher in boys than the boys who got traditional method of teaching as $m=5.85$ for Control Group and $m=7.35$ for Experiment Group with t -value 2.00, $p \leq 0.05$. It is observed that Impulse control of boys show a highly significant difference among control group and Experimental group, where the effect of usage of Energizing Text Books is less in boys than the boys who are got traditional method of teaching as $m=9.25$ for Control Group and $m=8.05$ for Experiment Group with t -value 2.11, $p \leq 0.05$. In academic performance and all rest of sub scales (Academic Success and Academic productivity) the two groups Control Group and Experiment Group are not significantly differing.

Table 4

MEDIUM		Group	N	Mean	Std. Deviation	T	
EM	Final Assessment	Control Group	20	6.10	2.47	2.13*	
		Experimental Group	20	8.65	4.75		
	Academic performance	Control Group	20	57.90	7.98	1.57	
		Experimental Group	20	62.25	9.45		
	Academic Success	Control Group	20	21.60	3.36	2.24*	
		Experimental Group	20	24.45	4.61		
	Impulse Control	Control Group	20	9.25	1.83	0.39	
		Experimental Group	20	9.45	1.39		
	Academic productivity	Control Group	20	35.80	5.23	1.59	
		Experimental Group	20	38.95	7.19		
	TM	Final Assessment	Control Group	20	4.80	1.44	4.72**
			Experimental Group	20	10.60	5.31	
Academic performance		Control Group	20	55.90	10.13	1.90	
		Experimental Group	20	50.05	9.310		
Academic Success		Control Group	20	21.50	5.40	1.89	
		Experimental Group	20	18.80	3.42		
Impulse Control		Control Group	20	9.65	1.90	3.45**	
		Experimental Group	20	7.50	2.04		
Academic productivity		Control Group	20	33.40	6.84	1.19	
		Experimental Group	20	30.85	6.71		

Table-4 shows that Final Assessment (Academic test scores after completing the teaching of whole chapter) of English medium students considered, there is a highly significant difference was noticed among control group and Experimental group, where the effect of usage of Energizing Text Books is higher than the students who are got traditional method of teaching as $m=6.10$ for Control Group and $m=8.65$ for Experiment Group with t -value 2.13, $p \leq 0.05$

It is evident Academic Success of English medium student showed a significant difference among control group and Experimental group, where the effect of usage of Energizing Text Books is higher than the students who are got traditional method of teaching as $m=21.60$ for Control Group and $m=24.45$ for Experiment Group with t -value 2.24, $p \leq 0.05$. In academic performance and all rest of sub scales (Impulse control and Academic productivity) the two groups Control Group and Experiment Group are not significantly differing.

It is revealed that Final Assessment (Academic test scores after completing the teaching of whole chapter) of Telugu medium students showed a significant difference among control group and Experimental group, where the effect of usage of Energizing Text Books is higher than the students who are got traditional method of teaching as $m=4.80$ for Control Group and $m=10.60$ for Experiment Group with t -value 4.72, $p \leq 0.01$

It is observed that Impulse control of Telugu medium students showed a significant difference among control group and Experimental group, where the effect of usage of Energizing Text Books is very less than the students who are got traditional method of teaching as $m=9.65$ for Control Group and $m=7.50$ for Experiment Group with t -value 3.55, $p \leq 0.01$

In academic performance and all rest of sub scales (Academic success and Academic productivity) the two groups Control Group and Experiment Group are not significantly differing.

Table-5

Residing		Group	N	Mean	Std. Deviation	t
Home (Day scholar)	Final Assessment	Control Group	22	5.50	2.52	3.47**
		Experimental Group	29	9.83	5.41	
	Academic performance	Control Group	22	56.27	9.23	1.01
		Experimental Group	29	59.24	11.26	
	Academic Success	Control Group	22	21.41	4.70	0.99
		Experimental Group	29	22.79	5.09	
	Impulse Control	Control Group	22	9.27	2.10	0.59
		Experimental Group	29	8.93	2.00	
	Academic productivity	Control Group	22	34.36	6.15	1.27
		Experimental group	29	37.03	8.24	
Hostel	Final Assessment	Control Group	18	5.39	1.50	3.41**
		Experimental Group	11	9.09	4.23	
	Academic performance	Control Group	18	57.67	9.04	3.22*
		Experimental Group	11	48.00	5.25	
	Academic Success	Control Group	18	21.72	4.24	2.21*
		Experimental Group	11	18.55	2.77	
	Impulse Control	Control Group	18	9.67	1.53	4.19**
		Experimental group	11	7.27	1.42	
	Academic productivity	Control Group	18	34.89	6.28	2.73*
		Experimental group	11	29.27	3.29	

Table-5 shows that the final Assessment of students who are residing at home has higher significant difference among control group and Experiment Group, as the effect of using of Energizing Text Books is very high than the traditional method of teaching as $m=5.50$ for control group and $m=9.83$ for Experiment Group with t -value 3.80, $p \leq 0.01$. In academic performance and all rest of sub scales (Academic success, Impulse control, Academic productivity) the two groups Control Group and Experiment Group are not significantly differing.

It also revealed that, Final Assessment of students who are residing at hostel has higher significant difference among Control and Experimental Group, where the impact of Energized Text Books is high than the traditional method of teaching as $m=5.39$ for Control Group and $m=9.09$ for Experiment Group with t -value 3.41, $p \leq 0.01$

The table figures shows that, when we considered Academic Performance of the students who are residing at hostel, there is a significant difference among Control and Experimental Group, where the impact of Energized Text Books is less than the traditional method of teaching as $m=57.67$ for Control Group and $m=48.00$ for Experiment Group with t -value 3.22, $p \leq 0.05$

The table figures shows that, when we considered Academic success of the students who are residing at hostel, there is a significant difference among Control and Experimental Group, where the impact of Energized Text Books is less than the traditional method of teaching as $m=21.72$ for Control Group and $m=18.55$ for Experiment Group with t -value 2.21, $p \leq 0.05$

It is noticed that, when we consider Impulse control of the students who are residing at hostel, there is a higher significant difference noticed among Control and Experimental Group, where the impact of Energized Text Books is less than the traditional method of teaching as $m=9.67$ for Control Group and $m=7.27$ for Experiment Group with t -value 4.19, $p \leq 0.01$

It is observed that, when we consider Academic productivity of the students who are residing at hostel, there is a significant difference noticed among Control and Experimental Group, where the impact of Energized Text Books is less than the traditional method of teaching as $m=34.89$ for Control Group and $m=29.27$ for Experiment Group with t -value 2.73, $p \leq 0.05$.

Table-6

Gadgets		Group	N	Mean	Std. Deviation	T	
No	Final Assessment	Control Group	19	5.84	1.46	2.64*	
		Experimental Group	16	8.94	4.88		
	Academic performance	Control Group	19	56.53	8.45	2.11*	
		Experimental Group	16	50.63	7.97		
	Academic Success	Control Group	19	20.95	3.81	1.15	
		Experimental Group	16	19.44	3.92		
	Impulse Control	Control Group	19	9.37	1.46	3.22**	
		Experimental Group	16	7.63	1.75		
	Academic productivity	Control Group	19	34.53	5.88	1.79	
		Experimental Group	16	31.06	5.52		
	Yes	Final Assessment	Control Group	21	5.10	2.53	3.78**
			Experimental Group	23	9.87	5.25	
Academic performance		Control Group	21	57.24	9.77	0.63	
		Experimental Group	23	59.26	11.45		
Academic Success		Control Group	21	22.10	4.98	0.49	
		Experimental Group	23	22.83	5.01		
Impulse Control		Control Group	21	9.52	2.18	0.83	
		Experimental Group	23	9.00	2.00		
Academic productivity		Control Group	21	34.67	6.49	1.03	
		Experimental Group	23	37.00	8.33		

Table-6 shows that when we considered Final assessment of the students who haven't gadgets, there is a significant difference noticed among control Group and Experiment Group where the effect of usage of Energized Text Books high than the traditional method of teaching, as $m=5.84$ for control Group and $m=8.94$ for Experimental Group with t value 2.64, $p \leq 0.05$.

The table figures shows that, when we considered Academic Performance of the students who haven't gadgets, there is a significant difference among Control and Experimental Group, where the impact of Energized Text Books is less than the traditional method of teaching as $m=56.53$ for Control Group and $m=50.63$ for Experiment Group with t-value 2.11, $p \leq 0.05$.

The table figures shows that, when we considered Impulse control of the students who haven't gadgets, there is a significant difference noticed among Control and Experimental Group, where the impact of Energized Text Books is less than the traditional method of teaching as $m=9.37$ for Control Group and $m=7.63$ for Experiment Group with t-value 3.22, $p \leq 0.05$.

In rest of sub scales (Academic success, Academic productivity), the two groups Control Group and Experiment Group are not significant differing. when we considered Final assessment of the students who have gadgets, there is a significant difference noticed among control Group and Experiment Group, where the effect of usage of Energized Text Books higher than the traditional method of teaching, where $m=5.10$ for control Group and $m=9.87$ for Experimental Group with t-value 3.78, $p \leq 0.01$.

In academic performance and all rest of sub scales (Academic success, Impulse control, Academic productivity), the two groups Control Group and Experiment Group are not significant differing.

Findings:

Accepting or rejecting the significance of null hypothesis constructed for the study determined the effectiveness of Energizing Text Books as compared to traditional method of teaching in mathematics in secondary schools. The findings of the study were observed from the calculated values of t-test against the null hypothesis to achieve the objectives of study. All null Hypotheses are rejected. Followings are the findings of the study.

1. There is a significant difference in the mean scores of secondary school students in Mathematics among those exposed to teaching with Energizing Text Books and those exposed to teaching with Traditional Text Books.
2. There is a significant difference in the mean scores of secondary school Girl students in Mathematics among those exposed to teaching with Energizing Text Books and those exposed to teaching with Traditional Text Books.
3. There is a significant difference in the mean scores of secondary school Boy students in Mathematics among those exposed to teaching with Energizing Text Books and those exposed to teaching with Traditional Text Books.

4. There is a significant difference in the mean scores of secondary school English medium students in Mathematics among those exposed to teaching with Energizing Text Books and those exposed to teaching with Traditional Text Books.
5. There is a significant difference in the mean scores of secondary school Telugu medium students in Mathematics among those exposed to teaching with Energizing Text Books and those exposed to teaching with Traditional Text Books.
6. There is significant difference in the mean scores of day-scholar secondary school students among those exposed to teaching with Energizing Text Books and those exposed to teaching with Traditional Text Books in Mathematics.
7. There is a significant difference in the mean scores of hosteller secondary school students among those exposed to teaching with Energizing Text Books and those exposed to teaching with Traditional Text Books in Mathematics.
8. There is a significant difference in the mean scores of secondary school students who do not use Gadgets among those exposed to teaching with Energizing Text Books and those exposed to teaching with Traditional Text Books in Mathematics.
9. There is a significant difference in the mean scores of secondary school students who use Gadgets among those exposed to teaching with Energizing Text Books and those exposed to teaching with Traditional Text Books in Mathematics.

Discussion:

The present situation in regard to the Indian Education system is not promising in terms of using technology in class rooms. The major constraints are the lack of necessary equipment in all schools, poor network infrastructure, up gradation of equipment and software. Another important point to be considered is that teachers are not well trained in integrating technology in to class room instruction. To overcome some of these problems, it will be necessary to incorporate use of Energizing Text Books in schools. QR Codes which are printed inside the text books in Andhra Pradesh state in India are readable by smart phones. Energizing Text Books provides an opportunity to the students for better learning by scanning the QR Codes anytime, anywhere in and outside of the class room and even after schooling.

The findings of the present study from as shown in table-2 presents, the students who are exposed to the teaching through Energizing Text Books improved their achievement levels in Mathematics compared to the students who are exposed to the traditional method of teaching. It indicates clearly the use of Digital Technology in Education shows the positive effect on students. Their concentration for learning, and understanding of concepts have also gone up. So, Achievement in mathematics is high among students who are in experiment group. New learning paradigms and the entry of technology based new education had far reaching effects on the students.

Girls in secondary schools showed significant improvement among those taught through Energizing Text Books in terms of Achievement over the traditionally taught students. The findings of study show in Table-3 that the Boys in secondary schools, who are taught through Energizing Text Books are higher achievement scores than those are taught through traditional method of teaching. Compared to gender differences, who are taught through Energizing Text Books, the girls scored high mean scores ($m=11.90$) than the boys ($m=7.35$). This is in agreement with the findings of the studies of Lingling Ma, Kelly D. Bradley (2009), the gender gap in mathematics achievement appears early in secondary education, where female students were found to have a higher initial mathematical scores than male students. However gender differences in mathematics achievement become less substantial as students progress through secondary school.

According to the analysis conducted with the mean scores of the performance of English medium students, the use of Energizing Text Books (experimental Group) had a positive effect on their Achievement in Mathematics. The findings of the study from as shown in Table-5 presents, Telugu medium students who are exposed to the teaching through Energizing Text Books having high mean scores than the students who are taught by traditional method of teaching. These research findings of Bitter and Legacy (2008), found that students got higher comprehension scores after reading electronic stories versus printed texts of the same stories. Comparing the medium of instruction, the students who are taught by Energizing Text Books (experimental Group), Telugu medium students ($m=10.60$) have high scores than English medium students ($m=8.65$).

The findings presented in this study demonstrated that among students who are staying at home, the use of Energizing Text Books (experimental group) had a positive effect on their performance in mathematics. Comparing the stay of the students, It is noticed that day-scholars in experimental group showed higher performance than hostlers in the same group. Staying at hostel is an indicator of socio economic status of the students. It is observed that the students with lower socio economic status were disadvantaged in their mathematical skills. The students who are staying at home got parents support to perform high achievement in the school. The results of present study showing the same as Lingling Ma, Kelly D. Bradley (2009) observed earlier, that Parent mathematical push has a positive effect on the growth of student's mathematical Achievement in secondary schools.

To meet the demand of present era, in the field of technology, it is suggested to make its application more effective in Education. QR Codes which are printed inside the text books are readable by smart phones. The students who have gadgets (smart phone, notebook, and computer) may see the content videos which are linked with QR Codes in Energizing Text Books. It is evident from the study the students who have watched the videos related to "Exponents and powers" got high score in an Academic test. The present study shows that students who have gadgets exposed to use Energizing Text Books got high scores than the students those exposed to teaching with traditional method. The control group having gadgets but there is no proper guidance to them how to utilize the gadgets. They watch unnecessary content and waste time, as their performance is low compared to the students those exposed to Energizing Text Books could watch the mathematics videos by scanning the QR Codes. It is also found that the students who do not have gadgets exposed to teaching with Energizing Text Books had high mean scores than the students those are taught by traditional method of teaching. The students who watched videos by scanning QR Codes in Energizing Text Books pay attention and got good academic results. But the students who are taught by the traditional method got poor academic results due to lack of attention in learning. The findings from the present study had shown that from as shown in Table-6, that the students who exposed to the teaching with Energizing Text Books (experiment group) who have gadgets performed high in mathematics than the students

who haven't gadgets. This supports the study of Manoj Kumar (2011) found that mobile phone usage in education is here to stay. While not a panacea for the education system in India, the smart phones would be one way to engage and motivate student learning.

Conclusions and Recommendations:

Based on this study, positive effect of Energizing Text Books on Achievement levels of secondary school students in Mathematics was found. From the findings of the study, the following recommendations were made.

1. Teachers should be Trained and encourage to incorporate the use of Energizing Text Books.
2. Energizing Text Books should be provided to all classes and all the subjects
3. Professional bodies like APMF should put more effort in organizing workshops and conferences to subject teachers.
4. It is necessary to incorporate use of digital technology in to Teacher Training Institutions and to supply teachers with adequate information about digital technology in Education.
5. Sufficient number of DIKSHA app installed Smart phones should be supplied to all the School Libraries , where the students are allowed to use these smart phones at leisure time to see the content by scanning QR Codes in Energizing Text Books.
6. The scope of this study is limited to Visakhapatnam urban secondary schools and on only one subject (mathematics) so, further research should be needed.

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