CLI

CONNECTED LEARNING INITIATIVE

CLIx Intervention in Rajasthan

Second Midline Review

Consolidated report of the Midline Survey (2017-18)

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The **Connected Learning Initiative (CLIx)** is a technology enabled initiative at scale for high school students. The initiative was seeded by Tata Trusts, Mumbai and is led by Tata Institute of Social Sciences, Mumbai and Massachusetts Institute of Technology, Cambridge, MA USA. CLIx offers a scalable and sustainable model of open education, to meet the educational needs of students and teachers. The initiative has won UNESCO's prestigious 2017 King Hamad Bin Isa Al-Khalifa Prize, for the Use of Information and Communication Technology (ICT) in the field of Education.

CLIx incorporates thoughtful pedagogical design and leverages contemporary technology and online capabilities. Resources for students are in the areas of Mathematics, Sciences, Communicative English and Digital Literacy, designed to be interactive, foster collaboration and integrate values and 21st century skills. These are being offered to students of government secondary schools in Chhattisgarh, Mizoram, Rajasthan and Telangana in their regional languages and also released as Open Educational Resources (OERs).

Teacher Professional Development is available through professional communities of practice and the blended Post Graduate Certificate in Reflective Teaching with ICT. Through research and collaborations, CLIx seeks to nurture a vibrant ecosystem of partnerships and innovation to improve schooling for underserved communities.

Collaborators:
Centre for Education Research & Practice – Jaipur, Department of Education, Mizoram University – Aizawl, Eklavya – Bhopal, Homi Bhabha Centre for Science Education, TIFR – Mumbai, National Institute of Advanced Studies – Bengaluru, State Council of Educational Research and Training (SCERT) of Telangana – Hyderabad, Tata Class Edge – Mumbai, Inter-University Centre for Astronomy and Astrophysics – Pune, Govt. of Chhattisgarh, Govt. of Mizoram, Govt. of Rajasthan and Govt. of Telangana.

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Introduction

The second Midline study conducted in January- February 2018 aimed at assessing the impact of CLIx, a program implemented from the year 2016 in the state of Rajasthan. This report attempts to make a comparison between the schools that have implemented CLIx[1] (Treatment group) with a subset of school that do not follow the CLIx program (Control Group).

The study also surveyed teachers and attempted to provide the status of teachers' access to technology and assess their usage of technology in teaching. It also examined teacher's beliefs regarding the integration of technology in education and also their overall subject preparedness.

School principals were also surveyed in the state of Rajasthan wherein they were asked to report on their access to technology, usage of technology, beliefs about using technology in education, the role technology plays in improving education and also gauge an understanding into some of the concerns they perceive while integrating technology in school education and so on.

The table provided below gives the total number of students, teachers and principals that were surveyed in the state of Rajasthan.

Table 1.1: Sample size for the survey in Rajasthan

Designation	Total Number
Students	1375 (Treatment), 377 (Control)
Teachers	42 (Treatment), 12 (Control)
Principals	42 (Treatment)

1.1. Students survey in Rajasthan

In Rajasthan, a total of 1375 students from the treatment schools and 377 students from control schools were surveyed. Students were questioned about their access to technology and its usage. Students were asked the ease with which they were able to do the tasks on computer/mobile- do them on their own, do them with help and had never done before. For all the technical skills but one (internet based technology) students from treatment schools, on an average, are reported to have more technical skills compared to the control schools. Students from treatment schools use computer more often in schools (50.48 percent) while students from control schools tend to use it more often in their home (29.07 percent). Majority of the students (more than 50 percent from the

[1] These were schools were implementation of CLIx had been initiated but actual details of module completion at the time of data collection is not available.

valid responses) from treatment and control schools are in agreement with most of the concerns for using technology except for the items - 'surfing on internet is a waste of time'. Among the four concerns, students from treatment schools are mostly in agreement with the fear that they 'break or damage' computer (68.4 percent) followed by the fear of making a mistake (66.1 percent). In control schools, students are mostly afraid of breaking a computer (65.1 percent) followed by the fear of making mistake (63.3 percent). Based on the raw score, students from treatment schools, unlike the control schools, are found to disagree with the concerns about internet and computer usage. Students from treatment schools scored marginally lesser than the control school. Similar learning assessments were conducted to measure the level of understanding the students have in English, Mathematics and Science.

1.1.1. Performance of Students in Mathematics

- Students from treatment schools answered around 34% of the questions correctly and on an average student from the Control group scored higher than those students from the Treatment group in the mathematics assessment conducted.
- With respect to specific skills, on an average student from the control schools scored more than the treatment schools in the knowledge and application-based sections.
- Inequality in performance among treatment schools was lower across all skills.

1.1.2. Performance of students in Science

- 38 percent of the questions were answered correctly by the students from treatment school. On an average student from treatment schools scored more than control schools in Science assessment.
- On average, students from treatment schools outperformed students from control schools only in the reasoning- based section.
- Inequality of performance in treatment schools was lesser across all skills.

1.1.3. Performance of students in English

- Students from treatment schools secured marginally lower scores on an average, in comparison to control schools.
- Students from treatment schools and control schools performed better in both language specification and reading comprehension skills on an average.
- Inequality of performance was higher among control schools for reading comprehension.

1.1.4. Caste- Wise average scores

- In English, students from the SC category, General category and the OBC category in the treatment group displayed better performances and students from the General category and OBC performed better in the control group.
- In Mathematics, students from OBC category and the SC Category performed best in the treatment group. While in the control group, General, ST and OBC students showed the best performances.
- In Science, students from the OBC and General categories performed best in the treatment group and from the control group the General, OBC and SC categories showed better performances than the others.

1.2. Teacher's survey in Rajasthan

1% of teachers from treatment schools and 10% of teachers from control school reported never having used computers or laptops, while 71% of teachers from treatment utilized computers in the classrooms frequently as opposed to the 53% of teachers from the control group.

Teachers were also surveyed about their beliefs regarding the use of technology and majority reported (Treatment (T) - 95% & 97% / Control (C) - 95% & 90%) that computers have helped students create better projects and helped improve students' learning respectively. Treatment school teachers stated that training and workshops, enthusiasm of the students and availability of working computers were the factors that influenced them to use technology in teaching, while control group teachers on the other hand indicated that teachers sharing their past experiences with technology and resource and support and mentoring were the factors that influenced them to integrate technology into their teaching

After implementing CLIx, English teachers (27 out of 31) reported that students were more confident to speak in English,20 out of 24 Math teachers agreed that children were more interested in solving problems and Science teachers (26 out of 29) established that children began asking more questions.

Around 54% of treatment school teachers and 57% of control school teachers considered slow internet and large classroom sizes as an extreme challenge while trying to integrate technology into teaching.

Equal percentage of teachers from both the groups also feel that use of technology will make it difficult to manage students in the class as they have difficulties with operation of a computer. Apart from this, teachers from all 3 domains agreed that shortage of computer hardware, shortage of support for using computers and shortage of instructional equipment for students' use, shortage of equipment for use in demonstrations and other exercises and inadequate physical facilities were some of the other challenges they would face.

Most teachers were somewhat prepared in most areas, some reported being relatively less prepared in topics such as communication and language teaching (English teachers), and Math teachers were somewhat prepared to teach relationship between three-dimensional shapes and two- dimensional shapes and so on. Finally, Science teachers felt less prepared to teach motion, light and variation (Physics), adaptation (Biology) and solutions (Chemistry).

There was a higher reported participation of teachers from treatment schools (62%) than control schools (43%) in the TPD workshops. Teachers expressed the need to include pedagogical tools and techniques and integration of technology in teaching as part of their TPD course. The most favorable modes of TPD training reported are interaction with peers, referring to books and hands-on activities, face- to face lectures and computer-based trainings.

1.3. Principal's survey in Rajasthan

71.87% of the principals in Rajasthan have had access to a computer. In terms of the importance of different stakeholders in the adoption of technology in education, 40.62% of the teachers conferred the first rank to the computer teachers and 34.38% accorded the first rank to school principals, however 37.5% of the accorded the 4th rank to the school principal. 13% accorded the second rank to subject experts, while 34.38 accorded third rank to the subject expert and 40.62% of them to the third rank to class teacher.

With regard to perceiving the role technology plays in improving education, most principles (98.87%) agreed that digital devices can help improve student's board exam results, deepen the student's understanding of the subject and can help them practice the work done in class (96.88%). In terms of factors that help facilitate technology integration in school, most principals (96.87%) believed that receiving support from teachers and educational officials would be helpful; apart from they also found receiving support in handling repairs (87.5%) would be another very helpful factor in integrating technology into classrooms. Almost all of the principals also agree that it is essential to integrate technology in high schools, and a majority (93.76) of them did not feel that technology would disturb the student teacher relationship or that it would increase workload (68.74%). 75% of the principals agreed that their schools had inadequate teachers for the integration of technology.

Principals were also asked to report their dependency on field resource and 98.87% of them agreed that high interest among teachers with regards to utilization of digital content and resources would reduce dependency, 84.38% believed higher sense of ownership among teachers to keep upkeep of lab functionality would reduce dependency and 93.76% agreed that student initiative in basic CLIx activities would reduce dependency.

2. STUDENTS GENERAL SURVEY

This report is based on the Second Midline study that was conducted in the period January-February, 2018 to assess the impact of CLIx that has been underway since 2016 in 461 schools in the states of Chhattisgarh, Mizoram and Rajasthan.

The impact study of CLIx comprises of a Baseline - Endline survey. First Midline study was conducted in April - May 2017 (Report Link). Data for the present study was collected in January-February 2018 in schools where teachers and students had been exposed to CLIx for a minimum of 1.5 academic years. The sample was selected purposively to cover schools where at least 4 CLIx student- modules had been rolled out. Telangana was not part of the Midline 2 survey as CLIx modules had not been implemented sufficiently enough for an evaluation. Along with the CLIx schools (treatment) a random sample of a subset of schools from the control group surveyed during baseline were also surveyed.

At the student level, the general survey was administered along with the learning assessment including the listening and speaking tool for communicative English. At the teachers' level, the general tool was administered along with the subject specific tools.

This second Midline will serve as a further data point for analysis of changes at the level of students and teachers in the states of Chhattisgarh, Mizoram and Rajasthan. The Baseline tool was altered to include new items, rephrase a few or add response options as was deemed necessary. The purpose of the second Midline is to presents findings from treatment schools in comparison with the control schools in the respective states. This is a report on the students' survey in Rajasthan.

2.1. Demographics

In Rajasthan, a total[1] of 1375 and 377 students were surveyed from Treatment and control schools respectively. Almost 50 percent of the students surveyed were girls. Approximately, 33 and 28 percent of the students surveyed in treatment and control schools have history of repeating grade. Majority of the students surveyed belong to Other Backward Community (OBC) in both treatment (29 percent) and control groups (47 percent).

2.1.1. Parental Education

Unlike control schools, Students from treatment schools are reported have higher level of education pursued by their parents. In treatment and control schools, majority of the students have their parents educated till primary or middle school. (Refer Table A1 in Annexure 1)

1 Since students have often given no response to few items, Total count of students and Total response (T.R.) does not match always. Every table on percentage distribution of students, reports the respective T.R. for the reporting purpose.

2.1.2. Parental Employment

With regard to parental employment, majority of the students from control schools are reported to have unemployed parents. Both 'Mother's unemployment' (53.82 percent) and 'Father's unemployment' (12.50 percent) is higher among control school. While parents with self-employment are higher among control school, parents who are regular salaried income or earn daily wage are in higher proportion in treatment schools. (Refer Table A2 in Annexure 1)

2.1.3. Educational and Economic Assets

Students were surveyed on a list of items to gauge their educational and economic background. While educational assets considered include seven items like internet, computer and the like, economic assets comprise of 11 items like car, livestock and others. On an average, treatment schools are reported having more of both the educational and economic assets in comparison to the control schools. (Refer Table A3 in Annexure 1)

2.2. Access and usage of Technology

This section tries to understand the different types of technical skills that students possess across the 3 states. Students were asked the ease with which they were able to do the tasks- do them on their own, do them with help and had never done before. Items on technical skills range from basic computer literacy like ability to start a computer to higher level skills like using simulations. This section further goes ahead to answer if there is any difference in the technical skills possessed by students in treatment and control schools.

2.2.1. Technical skills

The construct on Technical Skills constituted of 30 items of various levels of competence which ranges from ability to start a computer to use simulation. Based on Factor analysis, 4 factors emerged. The 4 factors refer to 'Application based technology', 'Basic technical skills', 'Internet based technology' and 'Intermediate computer skills'. Higher score for a skill would imply greater engagement (with or without help) with the items that factor together.

Table 2.1: Average level of Technical skills among Student

Items	Factors	Treatment				Control			
		Mean	SD	Min	Max	Mean	SD	Min	Max
Application based	F1= items 16, 17, 19, 20, 21, 23, 24,	21.59	5	11	36	19.89	5	8	35

technology	25, 26, 27, 28								
Basic technical skills	F2= items 1,2,3,5,7,8,9, 22	18.36	3	8	24	16.75	4	8	24
Internet based technology	F3=items 11,12,13,14,29,30	12.47	2	4	18	12.06	3	4	17
Intermediate computer skills	F4= items 4,6,10	5.53	1	2	9	4.89	1	2	9

- For all the technical skills students from treatment schools, on an average, are reported to have more technical skills compared to the control schools.

2.2.2. Access to Computer

Students were enquired on the places where they have used computers frequently in the last three months prior to the survey.

Table 2.2: Frequency of Access to Computers by Students at Various Place

Places of Access	**Treatment**			**T.R.**	**Control**			**T.R.**
	Often	**Sometimes**	**Never**		**Often**	**Sometimes**	**Never**	
At home	25.15	30.21	44.65	1364	29.07	28.27	42.67	375
At school	50.48	37.71	11.81	1363	21.6	28.8	49.6	375
In an N.G.O or resource centre	12.14	26.86	61	1359	9.28	18.04	76.28	377
Elsewhere (e.g. Public kiosk, friends' home, internet cafe)	16.59	37	46.4	1362	17.6	36.27	46.13	375

In Rajasthan, students from the treatment and control schools have used computers mostly in their schools followed by home. While students from treatment schools use computer more often in schools (50.48 percent), students from control schools tend to use it more often in their home (29.07 percent). Also, students from treatment schools, unlike the control schools, reported having used computers more often in a resource center (12.14 percent) and elsewhere like internet cafe (16.59 percent).

2.3. Fear and Concerns about Use of Technology

Students from treatment and control schools were asked to rate their concerns and fears of using computer and internet on a 4-point scale ranging from strongly agree to strongly disagree.

Majority of the students (more than 50 percent from the valid responses) from treatment and control schools are in agreement with most of the concerns for using technology except for the items - 'surfing on internet is a waste of time'. Among the four concerns, students from treatment schools are mostly in agreement with the fear that they 'may break or damage' computer (68 percent). In control schools, students are mostly afraid of breaking a computer (64 percent) followed by the fear of making mistake (62 percent). (Refer Table A4 in Annexure 1)

2.3.1 Who are the most concerned to use technology?

For an overall understanding of how students fare on their level of fear across treatment and control school, raw score about 'fear' was generated. This score takes a maximum of 16 if a student is in 'strong agreement' with all the 4 items. On the other hand, if a student is in 'strong disagreement' with all the 4 items, 'fear' gets a minimum of 4. Higher the score, greater is the agreement with the fear or concern as a whole.

Table 2.3: Average level of fear and concern about technology between Treatment and Control

Treatment		**Control**	
Average	S.D	Average	S.D
10.45	2	10.48	3

Based on the raw score, students from treatment schools, unlike the control schools, are found to disagree with the concerns about internet and computer usage. Students from treatment schools scored marginally lesser than the control school.

2.4. Academic Aspiration among Students

This section tries to understand how the students fare on their aspirations across states. This is mainly understood in terms of 1) whether they have any choice about the course they would like to pursue after 10th and 2) the highest educational qualification they wish to achieve.

Students were asked about their choice of course that they would like to study after 10th grade. In Rajasthan, there is no difference in the preferred choice of courses by students from treatment and control schools. Majority of students from both treatment (33.11%) and control (38.84%) schools indicated that they would like to study Science after tenth. Second highest percent of students from treatment (33.11) and control (30.58) schools expressed that they have not decided what they want to do after tenth. 13.45% students from treatment schools want to study Arts followed by 8.3% who expressed interest in studying commerce. (Refer Table A5 in Annexure 1)

Students were asked about how far they would like to study after 10th grade. By and large, students from treatment were more aware of the higher educational qualification they wish to possess. Compared to control, more students from treatment schools (23.39 percent) indicated lack of clarity in their choice. Among those who indicated a specific degree of their choice, majority of them wanted to aspire for at least completing senior secondary level of education, both from treatment (21.92 percent) and control (25.13). (Refer Table A6 in Annexure 1)

Student Aspiration is analyzed with the help of a categorical variable which takes the value of 2, 1 and 0 which denotes that students have an idea of both the course and degree or at least 1 of the two or none. While 15.6 percent students from Treatment are not sure about either the course or degree they wish to pursue after 10th, 56.8 percent are reported to be clear about both. In the control schools, on the other hand, more students (58.6 percent) are clear about both the choices and relatively smaller number of students (12.2 percent) tends to have no such clarity. (Refer Table A7 in Annexure 1)

3. STUDENTS LEARNING ASSESSMENT

Students were also surveyed to gauge their level of understanding in English, Math and Science. This section includes 1) Question specific analysis of student response, 2) performance of students in terms of total score attained in each domain, 3) performance of students in skills of specific interest and 4) Level of difficulty student faced to answer these questions. The objective of this section is to understand how different the students from treatment schools are in comparison to those of control schools. The analysis is presented domain-wise.

The analysis of the student learning assessment is done in two parts: Firstly, for each domain, total scores were analyzed for each question and for each skill. The purpose is to compare average performance of students between treatment and control schools on each of the skill and on the overall domain performance. Secondly, skill-wise scores have been also compared in each domain for a general understanding of how students fare in each skill. Since the purpose of this report is to have an elaborate understanding of student responses, this section considers all the 40 domain questions for the purpose of preliminary analysis[2.]

3.1 Performance of Students in Mathematics

3.1.1 Question specific analysis of student response

- By and large below 60 percent of the students, in both treatment and control, have answered majority of the questions correctly.
- Approximately around 10 percent of the students indicated option ‘Don’t Know, Can’t Say’ for most of the questions.
- From the category of top 30 percent students in treatment schools, above 65 percent of the students could correctly answer Q2, Q3, Q5 and Q6. Q9 was the most difficult for the top 30 percent students. Among the bottom 30 percent, Q3 was the easiest and Q9 was the most difficult.
- For the control schools, above 65 percent of the students could give correct answers for Q1, Q2, Q3, Q5, Q6, Q7 and Q10 and Q4 was the most difficult for the top 30 percent students. For the bottom 30 percent students, Q3 and Q8 were the easiest and Q2,Q4, Q9 and Q10 were the most difficult.

The table below gives a detailed understanding of how students performed on each item.

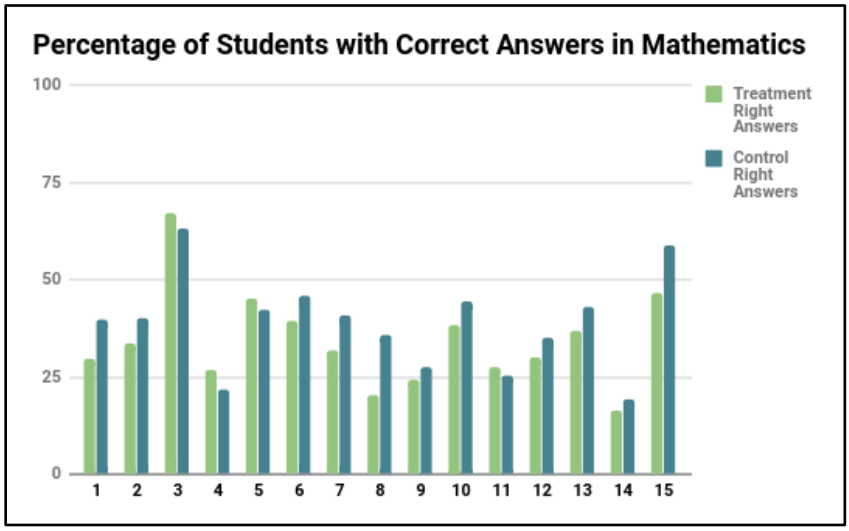
2 This analysis is not based on Item Discriminant analysis

Table 3.1: Itemized student response to Mathematic Assessment

Question No	Question-wise Responses						Percentage of Students with Correct Response from Top and Bottom 30 %			
	Treatment			Control			Treatment		Control	
	Right Answers	Wrong	Don't Know	Right Answers	Wrong	Don't Know	Top 30 %	Bottom 30%	Top 30 %	Bottom 30%
1	29.64	65.04	5.33	39.89	55.85	4.26	46.12	13.59	69.03	17.70
2	33.6	62	4.4	40.32	55.37	4.3	68.20	10.92	78.76	7.08
3	67.08	30.21	2.71	63.27	33.25	3.49	95.39	31.80	94.69	22.12
4	26.73	69.31	3.96	21.93	72.19	5.88	47.57	11.41	40.71	7.08
5	45.31	49.92	4.77	42.29	55.32	2.39	78.88	16.50	74.34	21.24
6	39.37	55.51	5.11	45.82	50.14	4.04	68.69	10.19	81.42	19.47
7	31.78	59.81	8.41	40.7	56.06	3.23	44.17	19.17	71.68	13.27
8	20.35	70.86	8.78	35.68	57.03	7.3	18.20	13.83	56.64	24.78
9	24.47	68.09	7.44	27.42	64.51	8.06	36.41	9.22	51.33	9.73
10	38.26	57.76	3.97	44.62	51.88	3.49	60.44	18.93	80.53	8.85
11	27.63	68.38	3.98	25.54	68.01	6.45	55.83	11.41	53.10	8.85
12	30.13	64.18	5.69	35.04	61.46	3.5	64.81	8.50	74.34	7.08
13	36.82	58.46	4.71	42.9	55.23	1.88	62.62	14.81	76.11	17.70
14	16.52	78.34	5.14	19.25	76.48	4.28	31.07	7.77	38.94	6.19
15	46.64	44.37	8.99	58.98	34.85	6.17	77.18	18.20	89.38	23.01

Total	**1375**	**377**	**412**	**412**	**113**	**113**

Figure 1: Percentage of students with Correct Answers in Mathematics



- Out of 15 questions, students from treatment schools have out-performed in few questions those from control schools.
- Above 50 percent of the students in treatment schools could correctly answer Q3 and Q15.

3.1.2 Performance of students in Mathematics

This section discusses the analysis of total score attained in Mathematics and how they fare on skills of specific interest. This is to understand if students from treatment are any better than those in control schools. Skills of interest in Mathematics domain include - Knowledge (5 items), Application (5 items) and Reasoning (5 items).

Table 3.2: Skill-wise Performance of Students in Mathematics

Mathematics skills	**Treatment**				**Control**			
	Lowest score	Highest Score	Mean	SD	Lowest score	Highest Score	Mean	SD
Total score obtained	0	86.66	33.99	18	0	100	38.39	24
Knowledge-based items	0	100	36.98	24	0	100	37.66	27
Application-based items	0	100	31.63	24	0	100	34.96	29

Reasoning-based items	0	100	33.35	23	0	100	42.54	29

Total Score:

- On an average, students from control schools performed better in Math
- Highest marks obtained were 100 and 86.66 in case of Control and Treatment schools, respectively.

Knowledge-based items:

- On an average, students from control schools performed better in Math
- Highest score obtained was 100 percent, both for treatment and control schools

Application-based items:

- On an average, students from control schools performed better in Math
- Highest score obtained was 100 percent, both for treatment and control schools

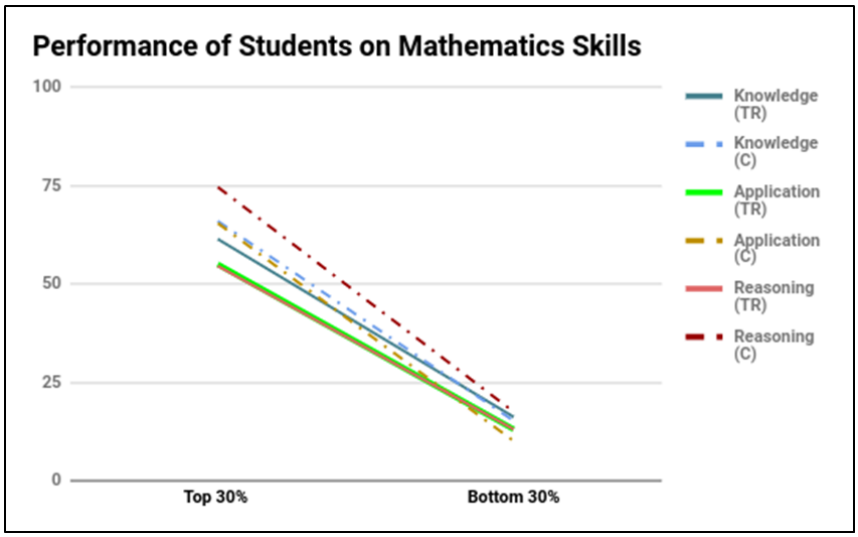
Reasoning-based items:

- On an average, students from control schools performed better in Math
- Highest score obtained was 100 percent, both for treatment and control schools

3.1.3 Level of difficulty student faced to answer these questions

Skill-wise performance graphs for 2 groups - treatment and control schools were constructed to understand 1) how diversified were student performance within each group and 2) how the performance varies across the groups. Performance graphs constitute of percentage of total correct answers by the top 30 percent and the bottom 30 percent within each group. A steeper curve represents more dispersed performance (inequality of performance) within a group. On the other hand, a horizontal curve represents a case of perfect equality. Higher the curve better is the overall performance for the particular group. Dotted lines refer to Control Schools and the bold lines refer to treatment schools.

Figure 2: Performance of Students in Mathematics



Knowledge-based items:

- Students from the top 30 percent in the treatment have scored lesser than the top 30 percent in the control schools. On the other hand, students from the bottom 30 percent in the treatment have scored little more than the bottom 30 percent in the control schools
- Inequality of performance was higher among control group.

Application-based items:

- Students from the top 30 percent in the treatment have scored lesser than the top 30 percent in the control schools. On the other hand, students from the bottom 30 percent in the treatment have scored little more than the bottom 30 percent in the control schools
- Inequality of performance was higher among control group.

Reasoning-based items:

- Students from the top 30 percent in the treatment have scored lesser than the top 30 percent in the control schools. Also, students from the bottom 30 percent in the treatment have scored lesser than the bottom 30 percent in the control schools
- Though the overall level of mathematical reasoning is poor in treatment schools, inequality of performance is higher among control group

3.2. Performance of students in Science

3.2.1 Question specific analysis of student response

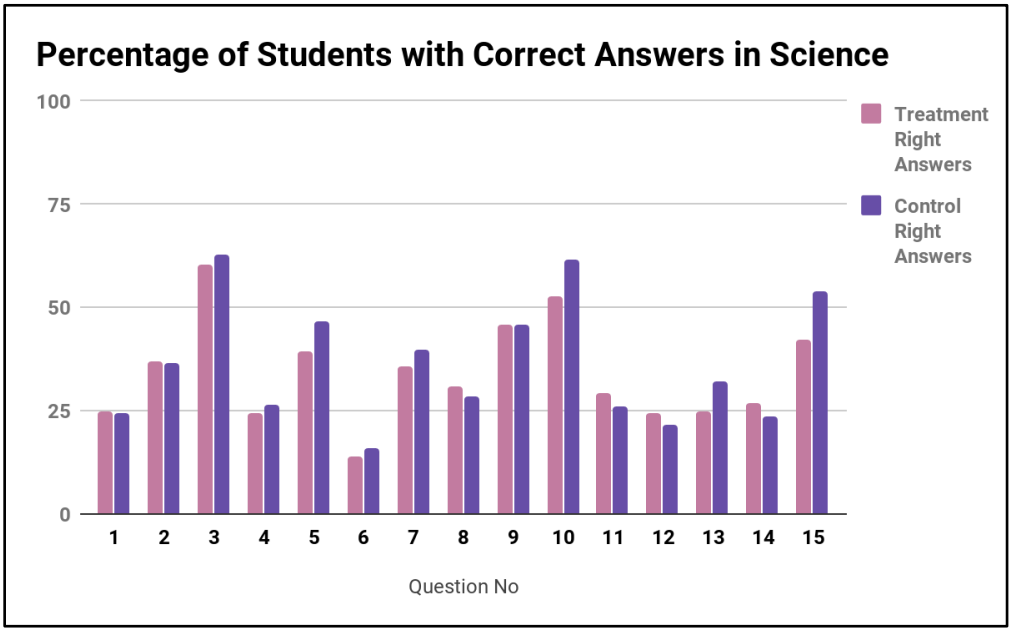
The table below gives a detailed understanding of how students performed on each item.

Table 3.3: Itemized student response to Science assessment

	Question-wise Responses						Percentage of Students with Correct Response from Top and Bottom 30 %			
	Treatment			**Control**			**Treatment**		**Control**	
Q.No.	Right Answers	Wrong	Don't Know	Right Answers	Wrong	Don't Know	Top 30 %	Bottom 30%	Top 30 %	Bottom 30%
1	24.69	68.57	6.74	24.46	71.51	4.03	32	15	33	8
2	36.89	58.24	4.86	36.63	59.09	4.28	57	16	54	18
3	60.49	36.26	3.25	62.94	33.78	3.27	88	31	92	31
4	24.56	71.84	3.6	26.27	71.31	2.41	44	8	58	7
5	39.22	56.37	4.42	46.52	51.34	2.14	49	27	77	27
6	13.75	79.93	6.32	15.78	80.48	3.74	13	12	22	10
7	35.78	57.46	6.76	39.78	54.3	5.91	58	17	68	15
8	30.69	63.14	6.17	28.49	67.74	3.76	54	14	80	10
9	45.92	47.54	6.54	45.99	50.53	3.48	75	18	73	15
10	52.74	41.48	5.78	61.66	34.85	3.49	83	24	89	38
11	29.37	60.74	9.89	26.06	68.88	5.05	36	18	35	13
12	24.23	64.95	10.82	21.74	64.95	13.32	32	13	20	14
13	24.98	67.57	7.44	32.17	61.66	6.17	34	12	50	14
14	26.91	67.22	5.88	23.53	72.19	4.28	48	10	41	10
15	42.02	40.85	17.13	53.87	30.13	16	64	21	78	35
Total	1375			377			412		113	

- By and large 30 percent of the students from Control and Treatment schools have answered majority of the questions correctly.
- About 5 to 10 percent of the students indicated option 'Don't Know Can't Say' for almost every question.
- In the category of top 30% of the students in treatment school, above 50 percent of the students found 7 questions (Q2, Q3, Q7, Q8, Q9, Q10 and Q15) easier. Q6 in the Science was found to be difficult by most of the students belonging to the top 30 percent. In the category of bottom 30 percent, majority of the students found Q4, Q6, Q13 and Q14 difficult.
- In the category of top 30 percent of the students in control schools, above 50 percent of the students found 10 questions (Q2, Q3, Q4, Q5, Q7, Q8, Q9, Q10, Q13 and Q15) easier. Q6 in the Science was found to be difficult by 78 percent of the students. In the category of bottom 30 percent, majority of the students found Q1, Q4, Q6, Q8 and Q14 difficult.

Graph 3: Percentage of Students with Correct Answers in Science



- In 6 out of 15 questions, students from treatment schools have out-performed those control schools
- More than 50 percent of the students from treatment schools have answered 2 questions correctly. For 3 other questions close to 50 percent students made a correct attempt.

3.2.2 Performance of students in specific Skills in Science

This section discusses the analysis of total score attained in Science and how they fare on skills of specific interest. This is to understand if students from treatment are any better than those in control schools. Skills of interest in Science domain include - Knowledge (5 items), Application (7 items) and Reasoning (3 items).

Table 3.4: Skill-wise Performance of Students in Science

Science skills	Treatment				Control			
	Lowest	Highest	mean	SD	Lowest	Highest	mean	SD
Total score obtained	0	73.33	33.86	14	0	80	36.76	17
Knowledge-based items	0	100	36.50	20	0	100	38.81	23
Application-based items	0	83.33	34.89	20	0	100	41.37	24
Reasoning-based items	0	100	26.52	25	0	100	23.43	25

Total Score:

- On average, students from control scored better than the Treatment schools
- Highest score obtained was 73.33 and 80 percent, for treatment and control schools respectively.

Knowledge-based items:

- On average, students from control scored better than the Treatment schools
- Highest marks obtained were 100 percent both for control and Treatment schools.

Application-based items:

- On average, students from control scored better than the Treatment schools
- Highest score obtained was 83.33 and 100 percent, for treatment and control schools,

respectively.

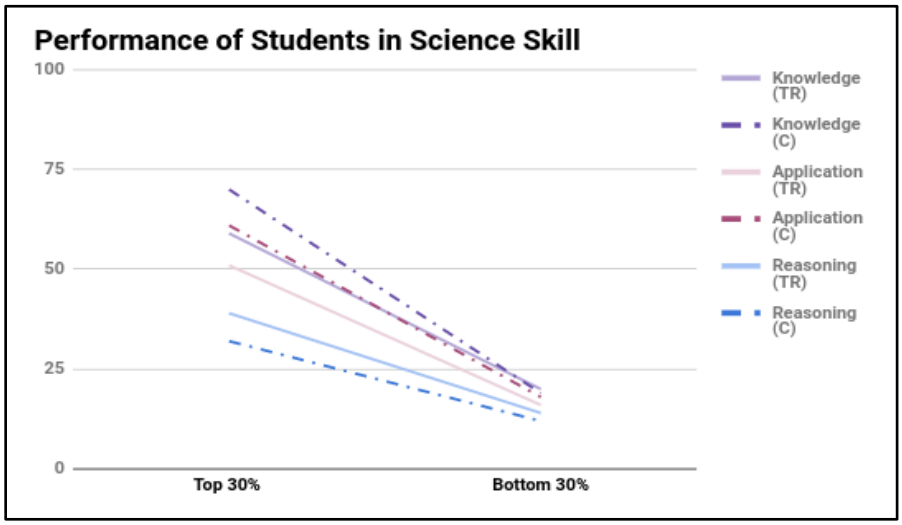
Reasoning-based items:

- On average, students from Treatment scored better than the control schools
- Highest score obtained was 100 percent, both for treatment and control respectively.

3.2.3 Level of difficulty student faced to answer these questions

Skill-wise performance graphs for 2 groups - treatment and control schools were constructed to understand 1) how diversified were student performance within each group and 2) how the performance varies across the groups. Performance graphs constitute of percentage of total correct answers by the top 30 percent and the bottom 30 percent within each group. A steeper curve represents more dispersed performance (inequality of performance) within a group. On the other hand a horizontal curve represents a case of perfect equality. Higher the curve better is the overall performance for the particular group.

Graph 4 : Performance of Students on Science Skills



Knowledge-based items:

- Students from the top 30 percent in the treatment have scored lesser than the top 30 percent in the control schools. Students from the bottom 30 percent in the treatment have scored little higher than the bottom 30 percent in the control schools
- Inequality of performance was higher among control group.

Application-based items:

- Students from the top 30 percent in the treatment have scored lesser than the top 30 percent in the control schools. Also, students from the bottom 30 percent in the treatment have scored lesser than the bottom 30 percent in the control schools

- Though overall levels of application in Science are lesser among the students from the treatment group, inequality of performance is higher in the control group.

Reasoning-based items:

- Students from the top 30 percent in the treatment have scored lesser than the top 30 percent in the control schools. Also, students from the bottom 30 percent in the treatment have scored lesser than the bottom 30 percent in the control schools
- Though overall levels of reasoning in Science are lesser among the students from the treatment group, inequality of performance is higher in the control group.

3.3 Performance of Students in English

This Section includes analysis of subject specific understanding of the students from both treatment and control schools followed by a brief understanding of how students from treatment school fare on their listening and speaking skills. The second exercise has been conducted for a smaller sample selected randomly from the students surveyed for the first exercise.

3.3.1 Question specific analysis of student response

The table below gives a detailed understanding of how students performed on each items.

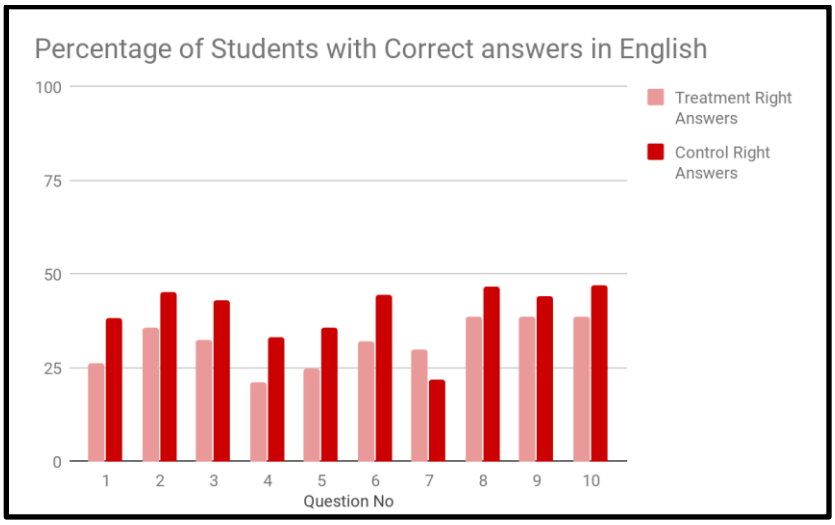
Table 3.5: Itemized student response to English Learning assessment

Question No	Question-wise Responses						Percentage of Students with Correct Response from Top and Bottom 30 %			
	Treatment			Control			Treatment		Control	
	Right Answers	Wrong	Don't Know	Right Answers	Wrong	Don't Know	Top 30 %	Bottom 30%	Top 30 %	Bottom 30%
1	26.17	63.78	10.04	38.46	55.71	5.84	39.56	9.47	64.60	80.53
2	35.8	56.66	7.54	45.09	46.95	7.96	58.50	8.74	92.04	13.27
3	32.4	60.3	7.31	42.86	54.99	2.16	45.39	15.53	57.52	15.93
4	21.21	64.82	13.97	33.07	61.07	5.87	26.21	12.38	59.29	15.04
5	24.67	60.07	15.26	35.64	52.66	11.7	48.06	8.98	70.80	11.50
6	32.11	55.89	12	44.62	44.89	10.48	52.67	11.17	83.19	12.39
7	29.73	57.03	13.25	21.89	61.89	16.22	55.10	13.59	23.89	13.27
8	38.54	51.59	9.87	46.51	48.65	4.84	66.75	9.95	87.61	9.73

9	38.79	51.69	9.51	44.09	49.2	6.72	73.54	12.62	82.30	15.04
10	38.64	49.34	12.02	47.06	40.37	12.57	69.90	9.22	84.96	11.50
Total	**1375**			**377**			**412**	**412**	**113**	**113**

- By and large, less than 50 percent of the students have answered questions correctly in both treatment and control schools.
- On each of the item of assessment, 10 to 16 percent of the students indicated the option 'Don't Know Can't Say'.
- In top 30 percent[3] of the students in treatment school, above 65 percent of the students found questions Q8, Q9 and Q10 easier and Q4 difficult. Whereas in the bottom 30 percent, Q1, Q2, Q5, Q8 and Q10 are the most difficult questions.
- In the control schools, above 70 percent of the students in top 30 percent found questions Q2, Q5,Q6, Q8, Q9 and Q10 easier and Q7 easier. In the bottom 30 percent Q5, Q8 and Q10 are the most difficult questions and Q1 the easiest question. It is also interesting to see that in control schools the top 30 % student found Q1 slightly difficult as compare to bottom 30 percent students.

Figure 5: Percentage of students with Correct Answers in English



- For none of the questions, 50 percent of the students were found to answer correctly, in both treatment and control.
- Out of 10 questions being asked, students from control schools scored more than those in the treatment schools.

3.3.2 *Performance of students in English*

This section discusses the analysis of total score attained in English and how they fare on skills of specific interest. This is to understand if students from treatment are any better than those in control schools. Skills of interest in English domain include - Language specific skill (6 items), Reading comprehension skill (3 items) and Writing skill (1 item). Owing to presence of only one item under Writing Skill, this item is only assessed in terms of descriptive analysis.

3 Each student has been scored according to the number of the correct answer they have chosen out of the total questions in each domain. The category is made by taking the total number of the students and grouped them into three categories, such as top 30% , middle 40% and bottom 30% according to the highest score .

Table 3.6: Student Scores in Skills of Specific Interest

English skills	**Treatment**				**Control**			
	Lowest	Highest	mean	SD	Lowest	Highest	mean	SD
Total Score obtained	0	90	31.45	18	0	90	39.46	24
Language specification	0	83.3	29.27	19	0	83.3	37.22	24
Reading Comprehension	0	100	38.23	34	0	100	45.26	38

Total Score:

- On average, students from control scored better than the treatment schools
- Highest score obtained was 80 percent, both for treatment and control schools.

Language Specification:

- On average, students from control scored better than the treatment schools
- Highest score obtained was 83.33 percent for both control and treatment schools.

Reading Comprehension:

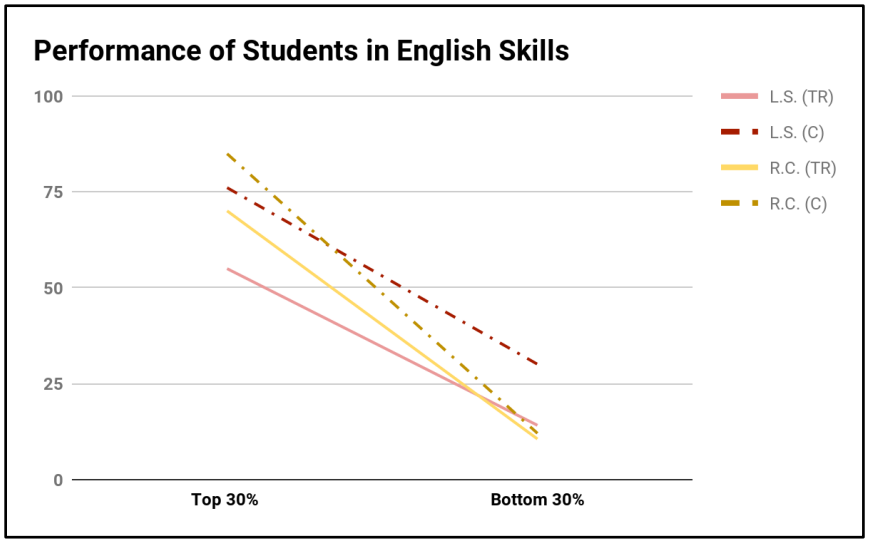
- On average, students from control scored better than the treatment schools.

- Highest score obtained was 100 percent, both for treatment and control schools.

3.3.3 Level of difficulty student faced to answer these questions

Skill-wise performance graphs for each group - treatment and control schools, were constructed to understand 1) how diversified were student performance within each group and 2) how the performance vary across the groups. Performance graphs constitute of percentage of total correct answers by the top 30 percent and the bottom 30 percent within each group. Bold lines denote the performance in language specification and reading skill, within treatment group and dotted lines represents performance within control group. A steeper curve represents more dispersed performance within a group and higher curve represents overall better performance. On the other hand a horizontal curve represents a case of perfect equality.

Figure 6: Performance of Students in English



Language Specification:

- Students from both the categories of top 30 percent and bottom 30 percent category scored more in control schools compared to treatment schools.
- Both the Control and Treatment schools have similar variation in overall student performance in terms of Language specification

Reading Comprehension:

- In terms of reading comprehension skill, students from the top 30 percent in the treatment have scored lesser than the top 30 percent in the control schools. However there difference in performance for the bottom 30 percent across treatment and control group, was less.
- Inequality of performance was higher among control group

3.3.4. Performance of students in English Listening and speaking

Listening and Speaking Assessment was administered on the Open Data Kit (ODK) to assess the Listening and Speaking skills of students. This assessment was done for 94 students from 10 randomly selected treatment schools in Chhattisgarh. Five listening comprehension questions (refer to Annexure 3b.2) were based on simple audio situations and tested students on global comprehension, listening for specific information and inferential skills. Here again students had to choose the right answer after listening to the audio clips a maximum of two times.

Table 3.7: Performance of students on listening comprehension questions

Item	**Item Type**	**Percent of students who marked the right answers:**
1	Listening for specific information	21
2	Listening for specific information	33
3	Global Comprehension	14
4	Inference	20
5	Global Comprehension	40

Students' overall performance in listening was also below satisfactory levels. More than 50 percent of the students answered all the items incorrectly. There is a scope of improvement in their listening skills. Students' performance was poor on Item number three and very high in item number 5 compared to other items also could be because item 5 options are generally used and by the tone of the audio also one can guess.

The 8 questions (refer to Annexure 3b.1) in the speaking section assessed ability in understanding instructions in English, pronunciation, word choice, grammatical accuracy, fluency and presentation of ideas. Here is the rating given by FSPs on the rubric.

Table 3.8: Performance of Students on Speaking skills

Student performance as rated by FSP						
Usage of English	**Very**	**Poor**	**Average**	**Good**	**Very**	**Excellent**
Understands instructions in English	37	37	19	6	0	0

Pronunciation	57	21	14	7	0	0
Word Choice	60	19	16	5	0	0
Grammatical Accuracy	67	13	18	2	0	0
Fluency	64	16	16	4	0	0
Presentation of Ideas	62	16	18	4	0	0

The feedback above indicates poor levels in speaking with nearly half of the students very poor in the speaking test. Only few are at good level and at an average level in pronunciation and presentation of ideas.

3.4. Who are the achievers?

- In the treatment group, for English domain, students from the SC category performed the best in the reading comprehension type questions followed by General and SC category students who scored equally. In the language specification section, students from 'Other' category performed the best followed by students from OBC and BC category.
- In the control group students form the General category performed the best in the reading comprehension section followed by OBC and 'Other' category students. While in the Language Specification section, the OBC category students performed the best followed by General and ST category students.
- In terms of total scores across treatment and control groups, the control group fared better across all categories.

Table 3.9: Caste-Wise Average Score in English Domain

		ST	SC	BC	OBC	General	Other
Treatment	**Total Score**	31	32	29	33	32	28
	Language	28	29	30	30	29	31
	Reading	37	43	30	41	41	23
Control	**Total Score**	37	38	35	42	42	38
	Language	37	35	34	40	38	32
	Reading	39	41	33	49	52	49

Table 3.10: Caste-Wise Average Score in Mathematics Domain

		ST	SC	BC	OBC	General	Other
Treatment	**Total**	26	34	28	38	27	28
	Knowledge	21	30	29	36	26	36
	Application	31	33	29	40	29	28
	Reasoning	27	37	25	37	28	20
Control	**Total**	36	30	28	36	39	17
	Knowledge	32	21	29	36	27	12
	Application	39	35	30	33	33	24
	Reasoning	38	33	24	39	27	16

- In mathematics, students from the OBC category in the treatment group performed the best

in all sections (Knowledge, Application, Reasoning) . The SC students scored equally to the OBC students in the Reasoning section and were second best in the Application

- In the control group the OBC students performed best in Knowledge and Reasoning sections while students of the ST category performed the best in the Application section. The students from ST category came second in the Knowledge and Reasoning sections

Table 3.11: Caste-Wise Average Score in Science Domain

		ST	SC	BC	OBC	General	Other
Treatment	**Total Score**	30	33	30	38	34	24
	Knowledge	37	35	35	43	43	33
	Application	34	36	31	37	37	32
	Reasoning	23	30	25	25	28	30
Control	**Total Score**	33	36	31	36	40	19
	Knowledge	31	30	28	44	22	24
	Application	36	42	32	45	44	34
	Reasoning	21	21	21	24	26	27

- Variations in total scores were minor across treatment and control groups except for ST and other category where control performed considerably better than treatment

- In the Science domain, students of the OBC and General category of the treatment group performed the best and scored equally in both Knowledge and Application section of the questions. Students from the SC and 'Other' category performed the best in the Reasoning part and scored equally.

- In the control group students from the OBC category performed the best in both the Knowledge and Application section of the questions. While students of the 'Other' category performed best in the Reasoning section of the questions. The General category students came in second in both Application and Reasoning sections.

- In terms total scores, control group students fared better than treatment group students in almost all categories except OBC and 'Other' category

4. KEY FINDINGS (STUDENTS)

Some key findings from the Midline study for CLIx schools in Rajasthan are as under:

General

- Students from Treatment Schools are better versed with most of technical skills.
- Students from treatment schools reported using computers more than those in control schools. In particular, they tend to use it more often in schools.
- On an average student from treatment schools are less concerned about use of technology.
- Compared to control schools, students from treatment schools fare better in their academic aspiration.

Performance in English:

- For 10 percent of the questions, students from treatment schools have outperformed those in control schools. On average students from treatment schools scored lesser than Control schools in English assessment.
- Students from treatment schools on an average scored lesser in both Language specification skills and reading comprehension skills as compared to control.
- With similar level of inequality in performance, in language specification skill, higher level of difficulty is noted for treatment schools. With regards to reading comprehension skill, inequality of performance of students from treatment schools was lesser than the control schools.

Performance in Mathematics:

- For 27 percent of the questions, students from treatment schools have outperformed those in control schools. On average students from treatment schools scored lesser than Control schools in Mathematics assessment.
- In terms of specific skills, students from treatment schools on an average scored lesser than control schools in all the three skills.
- Inequality in performance in lower in treatment schools across skills. However students from treatment school found the reasoning based questions more difficult

Performance in Science:

- For 13 percent of the questions, students from treatment schools have outperformed those in control schools. On average students from treatment schools scored less than Control schools in Science assessment.
- Only in reasoning based skill, students from treatment schools on an average scored more than the control schools.
- Inequality in performance in lower in treatment schools across skills. Also students from treatment schools found the reasoning based question easier, compared to control schools

ANNEXURE -1

A1: Parental Education Levels in Treatment and Control Groups

Education level	Treatment		Control	
	Mother	Father	Mother	Father
Never attended school	54.36	18.35	57.99	23.71
Studied only until primary school (Grade 1-5)	18.49	18.2	17.34	17.71
Studied only until middle school (Grades 6-8)	9.17	16.64	9.21	18.8
Studied only until high school (Grade 9-10)	4.88	20.88	5.96	16.89
Studied only until Grade 12/ PUC/ Junior College	5.7	11.96	3.79	11.17
Studied in a Polytechnic college (Diploma)	0.67	2.15	1.08	1.91
Studied in a degree college (B.A./B.Com./B.Sc./B.E.)	1.26	2.67	0	2.45
Studied in a University (M.A./M.Sc./M.Tech.)	1.11	3.71	0.27	2.18
I do not know	4.36	5.42	4.34	5.18
T.R.	1352	1346	369	367
N.R.	23	29	8	10
Total students	1375		377	

A2: Parental Employment Categories in Treatment and Control Groups

Occupation	Treatment		Control	
	Mother	Father	Mother	Father
Regular salaried	5.01	14.25	3.97	14.58
Self-employed	25.06	45.14	27.48	46.13
Daily wage earner	18.09	29.22	14.73	26.79

Unemployed	51.84	11.39	53.82	12.50
Total	1,277	1,256	353	336
Total	**1375**		**377**	

A3: Distribution of Educational and Economic Assets amongst Students

Control/treatment	Assets	No of students	Lowest score	Highest	Mean	SD
Treatment	Educational	1375	0	7	3.41	1
	Economic asset		0	11	6.30	2
Control	Educational	377	0	7	3.2	1
	Economic asset		0	11	6.21	2

A4: Levels of Fear and Concerns Regarding Technology Use Amongst Students

Questions	Treatment				T.R	Control				T.R
	S.A.	A	D	S.D		S.A.	A	D	S.D	
If given an opportunity to use a computer, I am afraid I may break or damage it.	33.0	35.4	15.1	16.3	1362	32.7	32.4	15.8	19.0	372
I hesitate to use computer because I may make a mistake.	22.5	43.6	19.1	14.5	1351	22.4	40.9	19.5	17.1	373
I don't think computers can help me with my studies.	27.7	27.3	17.7	27.1	1356	29.1	26.6	18.8	25.3	370
Surfing on internet is a waste of time.	19.8	31.1	22	26.9	1358	24.4	32.7	17.9	24.9	372

A5: Percentage of students Opting for Various Courses

	Science	Arts	commerce	Vocational	Fine	Get	Undecided	TR
Treatment	33.11	13.45	8.3	6.13	3.44	2.47	33.11	1338
Control	38.84	11.85	7.16	7.16	1.65	2.75	30.58	363

A6: Percentage of students Indicating their preference for Various academic qualification

	Grade 10th	Grade 12th	Vocational course	General Graduation	Graduation in Professional course	Post-Graduation	Don't Know	T.R.
Treatment	10.19	21.92	9.97	11.8	10.63	12.1	23.39	1364
Control	11.76	25.13	12.03	13.64	9.36	9.09	18.98	374

A7: Aspiration level across Treatment and Control

	No idea about degree or course	Some idea about either degree or course	Clear about both degree and course
Treatment	15.6	27.4	56.8
Control	12.2	28.9	58.8

ANNEXURE -2

Technical Skills:

How well can you do the following activities on computer? Choose the most appropriate response from the 3 options for each of these activities:

(Options- i) Can do it on my own, ii) Can do it but with some help, iii) Have never done it

Items under F1, F2, F3 and F4 in Technical skills

Application based technology (F1)	**Basic Technical Skills** (F2)	**Internet based technology** (F3)	**Intermediate computer skills** (F4)
Use GeoGebra	Start a computer	Use email	Work on spreadsheet
Use Turtle logo	Handle a mouse	Use chat online	Work on a Word file
Use simulation	Save files	Download/upload files	Use hyperlinks (links that directs to another site)
Use online maps	Drawing using Inkscape (paint)	Record audio/video	
Book a ticket online	Type in English	Download & use apps on the mobile phone	
Fill online form	Type in Hindi/Mizo/Telugu	Shop online	
Logging into platform	Use internet browser (for e.g. Google Chrome)		
Use buddy login	Play computer games		
Rate comments on platform			
Write comments on platform			
Use video conferencing tools like Skype			

Annexure -3

A. Student Learning Assessment Tool

Section A: English

1. The clouds are dark. It …… rain soon. *[Language based]*

1. can
2. may
3. should
4. must
5. Don't know the answer

2. Anam: We had to submit the Science homework yesterday.
Sara: Oh, I forgot! What day _____ it yesterday? *[Language based]*

1. is
2. were
3. was
4. will
5. Don't know the answer

3. City life is different …… village life. *[Language based]*

1. than
2. from
3. to
4. then
5. Don't know the answer

4. You are in a park. You need to get to the toilet. How would you ask for help? *[Language based]*

1. I am looking for the toilet. Can you find it for me?
2. Could you please show me the way to the toilet?
3. I want a toilet. Help, please!
4. Tell me where is the toilet.
5. Don't know the answer

5. Sohum was late to school. The Principal scolded him. Which of the following is the best way to rewrite this in one sentence? *[Writing based]*

1. In spite of being late, Sohum was scolded.
2. Although he was late, Sohum was scolded.
3. Sohum was late, but he was scolded.
4. Sohum was scolded because he was late.
5. Don't know the answer

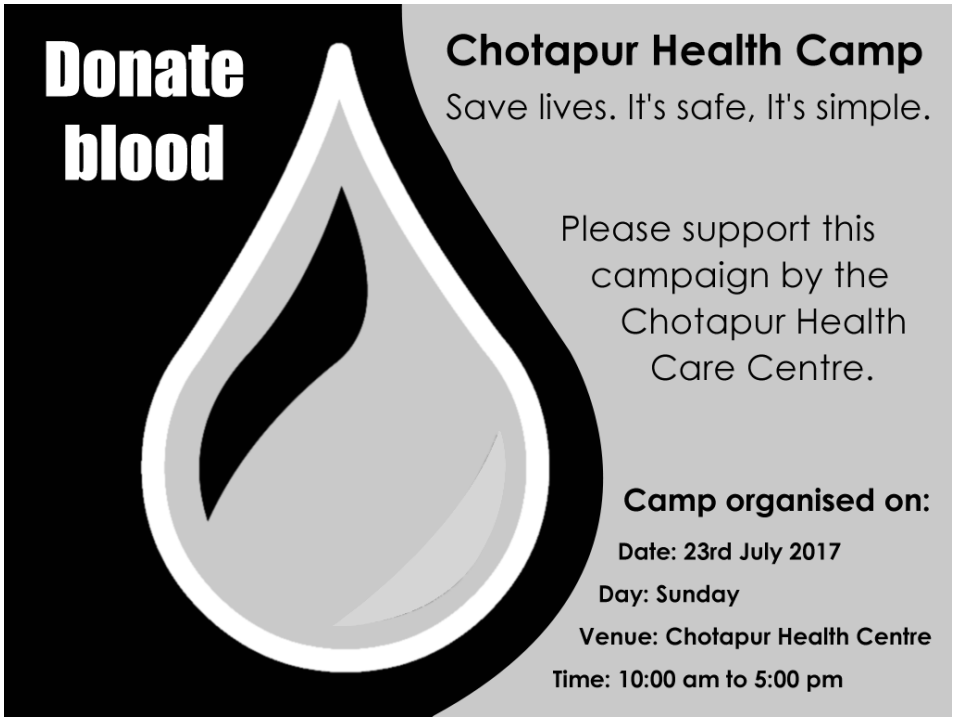
6. Sunithi rode her bicycle rashly and hit an old man on the road. What is the correct thing to say in this case? *[Language based]*

1. Why can't you walk on the pavement, uncle?
2. Thank you for stopping me, uncle.
3. I'm very sorry, uncle. I hope you aren't hurt.
4. Will you please let me pass?
5. Don't know the answer

7. Sunithi said sorry to the old man. He forgave her and wanted to know her name. How will Sunithi introduce herself? *[Language based]*

1. Don't you know who I am?
2. Myself, Sunithi, studying in 7th standard.
3. Hello, I'm Sunithi. I study in the 7th standard.
4. Why do you want to know my name?
5. Don't know the answer

Look at the Poster and answer the questions 8-10



8. Look at the Poster and answer the question:
What is the poster about? *[Reading comprehension]*

1. Being safe
2. Saving lives
3. Donating blood
4. A health care camp
5. Don't know the answer

9. Look at the Poster and answer the question:
When will the event end? *[Reading comprehension]*

1. 3 p.m
2. 5 p.m.
3. 9 a.m.
4. 10 a.m.
5. Don't know the answer

10. Look at the Poster and answer the question:
Who is organising the campaign? *[Reading comprehension]*

1. Chotapur Health Care Centre
2. Chotapur District Collector
3. Chotapur Government Hospital
4. Chotapur Gram Panchayat
5. Don't know the answer

Section B: Science

1. Pick the correct option to fill in the blank:
Phases of the moon are caused because……. *[Application based]*

1. something covers the moon.
2. the earth's shadow falls on the moon.
3. only a part of lit half of the moon is visible from the earth.
4. the moons orbit makes an angle of 5 degrees with the orbit of the earth.
5. Don't know the answer.

2. Pick the correct option to fill in the blank:
The maximum number of electron in L (2nd) shell of an atom is ….. *[Knowledge based]*

1. 18
2. 2
3. 8
4. 4
5. Don't know the answer

3. If a cycle travels with the average speed of 50 meter/minute, what distance it would cover in 5 minutes? *[Knowledge based]*

1. 150 m
2. 250 m
3. 2250 m
4. 100 m
5. Don't know the answer

4. Pick the correct option to fill in the blank:
Sound does not travel through…… *[Knowledge based]*

1. Solids
2. Liquids
3. Air
4. Vacuum
5. Don't know the answer

5. Which is the part of the body where blood and air mix? *[Knowledge based]*

1. Heart
2. Lung
3. Liver
4. All of the above
5. Don't know the answer

6. If you cover the cycle bell by putting your palm on it and ring the bell, sound becomes fainter because: *[Application based]*

1. frequency becomes less.
2. amplitude becomes less.
3. number of vibrations becomes less.
4. None of the above.
5. Don't know the answer.

7. Below are feet of birds. Which of these is likely to be that of a water bird? *[Knowledge based]*

1. **2.** **3.** **4.** **5.** Don't know the answer

8. How you can control mosquitoes in your surrounding using the knowledge of ecology? *[Application based]*

1. Increase the predators of mosquito.
2. Increase the predators of mosquito larva.
3. Avoiding ecological situations promoting growth of mosquito larvae.
4. All the above.
5. Don't know the answer.

9. You would have noticed that some aged people like your grandma or grandpa do not take salt in their food? Can you think why? *[Application based]*

1. Salt lowers the blood pressure.
2. Grandma does not like salt taste.
3. Salt increases blood pressure.
4. Salt is not available in the market.
5. Don't know the answer.

10. You get a stirred mixture of oil, sand and water in a glass. In which order from top to down they will settle down once the mixture stabilizes? *[Application based]*

1. Oil, water, sand,
2. Sand, oil, water
3. Water, sand, oil
4. Water, oil, sand
5. Don't know the answer

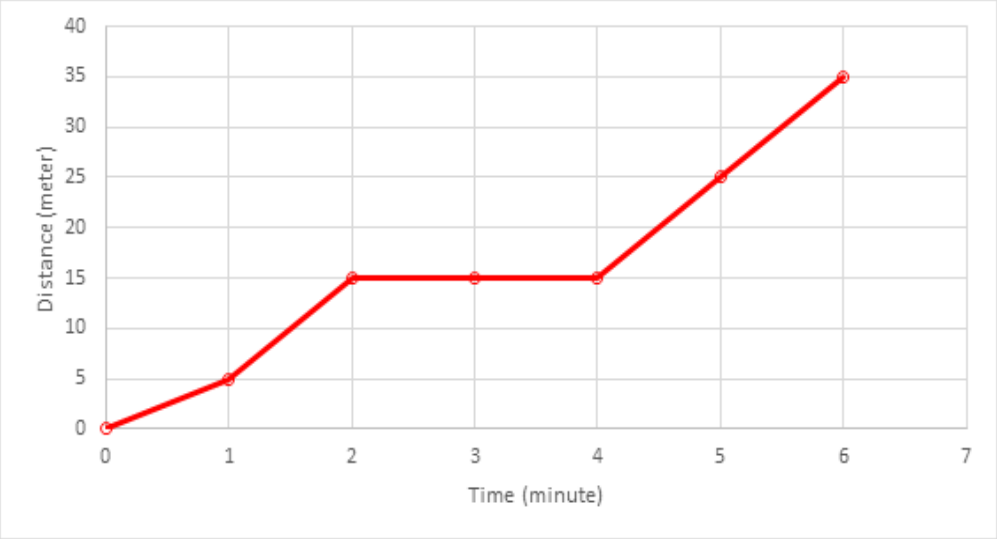
11. When you increase or decrease the number of proton in the nucleus of an atom, what happens? *[Reasoning based]*

1. The element remains the same but it gets positively charged.
2. We get a new element.
3. We need to add more electrons to balance its charge.
4. All the above statements are wrong.
5. Don't know the answer

12. Three students measured the length of a table using a 6 inch scale in the pencil-box . Their measurements come out to be 95.3 cm, 95.6 cm and 96 cm. Please see the statements below and tick the most appropriate answer. *[Reasoning based]*

1. They did not carry out the measurement correctly.
2. The problem was definitely with the scale.
3. Since variation is inevitable in measurement, it is ok to have this variation in their measurement.
4. The length of the table cannot be precisely determined from this data.
5. Don't know the answer.

13. Look at the graph given below and tell between which time interval the train was not moving: *[Application based]*



1. Between 0th and 2nd minute
2. Between 2nd and 4th minute
3. Between 4th and 6th minute
4. The train was constantly moving. It did not stop anywhere.
5. Don't know the answer

14. What can cause vibrations: *[Reasoning based]*

1. Blowing
2. Plucking
3. Hitting
4. All the above

5. Don't know the answer

15. Planets which are closer to the Sun take more time to complete one revolution than the planets which are farther away from the Sun. *[Application based]*

1. True
2. False
3. Don't know the answer

Section C: Mathematics

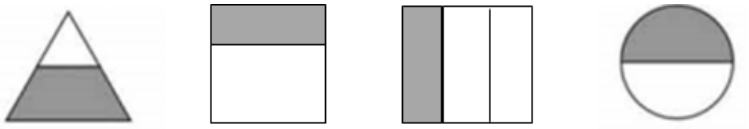
1. Which number is equal to $\frac{3}{5}$? *[Knowledge based]*

1. 0.8
2. 0.6
3. 0.53
4. 0.35
5. Don't know the answer

2. $3 + 8 = \square + 6$ *[Application based]*
What number goes in the box to make this number sentence true?

1. 17
2. 11
3. 7
4. 5
5. Don't know the answer

3. Which figure is $\frac{1}{2}$ shaded? *[Knowledge based]*



1 **2** **3** **4**

Don't know the answer
5

4. A shirt that costs Rs.200/- is available at a price of Rs.160/- in a sale. What is the discount on the shirt? *[Application based]*

1. 20%
2. 40%
3. 60%
4. 80%
5. Don't know the answer

5. Which of these expressions is equivalent to y^3? *[Knowledge based]*

1. $y + y + y$
2. $y \times y \times y$
3. $3y$
4. $y^2 + y$
5. Don't know the answer

6. There were m boys and n girls in a parade. Each person carried 2 balloons. Which of these expressions represents the total number of balloons that were carried in the parade? *[Reasoning based]*

1. $2(m + n)$
2. $2 + (m + n)$
3. $2m + n$
4. $m + 2n$
5. Don't know the answer

7. A sequence of four figures is shown below. Observe the circles in each figure. If the figures were continued, how many circles would there be in Figure 10? (Do not draw the figures.) *[Reasoning based]*

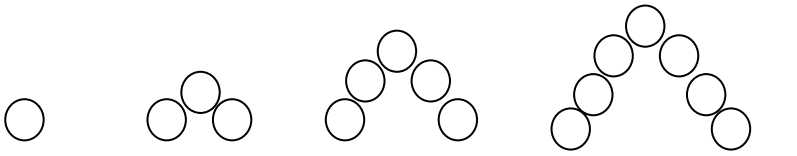


Figure 1 Figure 2 Figure 3 Figure 4

1. 10
2. 13
3. 19
4. 20

5. Don't know the answer

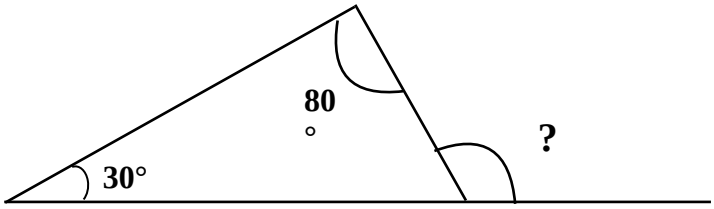
8. If t is a number between 6 and 9, then (t + 5) is between which two numbers? *[Reasoning based]*

1. 1 and 4
2. 10 and 13
3. 11 and 14
4. 30 and 45
5. Don't know the answer

9. A class has 35 students in the classroom. If there are 15 girls in this class, then what is the ratio of girls to boys? *[Application based]*

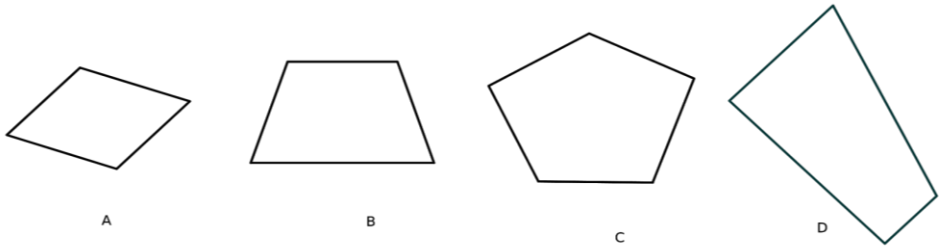
1. 3:7
2. 4:3
3. 4:7
4. 3:4
5. Don't know the answer

10. In the following figure, what will be the measure of the angle marked '?' *[Application based]*



1. 30°
2. 80°
3. 70°
4. 110°
5. Don't know the answer

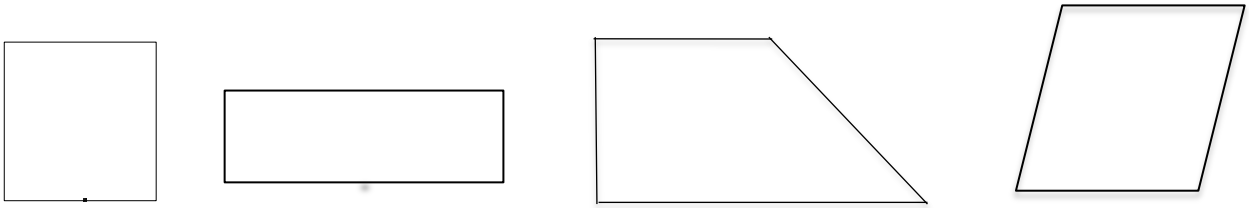
11. Which of the following shapes has a right angle? *[Knowledge based]*



1. A
2. B
3. C
4. D
5. Don't know the answer

12. A shape has the following properties:
Two pairs of opposite sides are parallel; No right angle

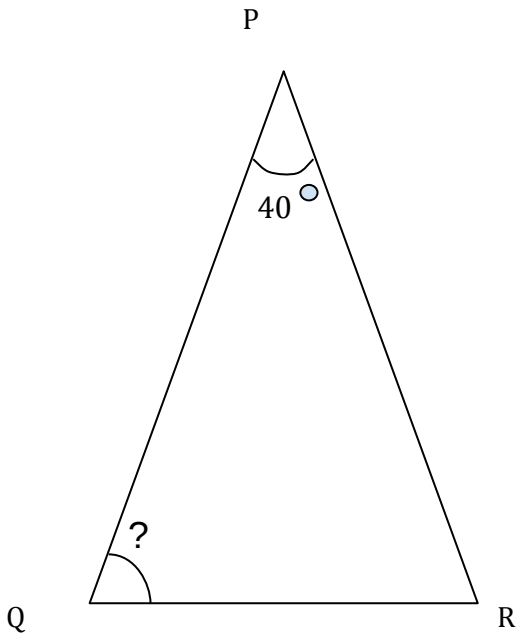
Which of the following shapes it can be? *[Reasoning based]*



P Q R S

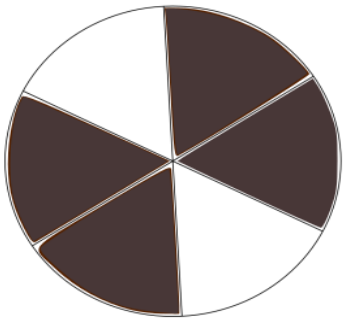
1. P
2. Q
3. R
4. S
5. Don't know the answer

13. PQR is an isosceles triangle. What is the measure of angle Q? *[Application based]*



1. 40^0
2. 70^0
3. 140^0
4. 180^0
5. Don't know the answer

14. Which of the following is equivalent of the fraction represented by the shaded part in the figure? *[Knowledge based]*



1. 2/3
2. 2/4
3. 1/6
4. 1/3
5. Don't know the answer

15. A car is moving at the speed of 60 kilometers per hour. How much distance will it cover in 1 and a half hour (1.5 hour)? *[Reasoning based]*

1. 1.5 kilometer
2. 30 kilometers
3. 60 kilometers
4. 90 kilometers
5. Don't know the answer

B. English Listening & Speaking Assessment tool

B.1 Speaking Task

Personal Interview Question

Listen to the questions and answer in complete sentences.

Q1) What is your name?

Q2) Please spell your name.

Q3) How old are you?

Q4) Name any two things you like about your school.

Q5) What TV programs do you like?

Naming Things and Describing Actions

Q6) Look at the picture. Name any five things in the picture.

Q7) Look again at the same picture. Now, describe any two actions in the picture.

Task 3

Narrating a story

Q8) This is a storybook cover. Guess what the story is and speak about it in a few sentences.

B.2 Listening Comprehension

Listen carefully to the conversations and answer the questions

Conversation 1:

Sangeeta saw a snake in the park near Susy's house.

1) Where was the snake?

(a) Near the park
(b) In Susy's house
(c) In the park
(d) Near Sangeeta's house

Conversation 2:

V1: Guddu, look what I found on my way to school this morning!
V2: Is that a 1000 rupee note?
V1: No! It is a 100 rupee note. It was lying near the coconut tree.
V2: I wonder who dropped it.
V1: I also found this at the same spot.
V2: Oh! That is a huge paint brush! Looks like the one I've seen with the village painter. Did you find a can of paint too?

V1: No, I didn't. I just saw a few spots of paint on the ground. Perhaps the brush fell off the painter's cycle.
V2: Poor man! Let's go find him and return his money and paint brush.

2) What did the girl find on her way to school?

(a) A coconut tree, a 1000 rupee note and a cycle
(b) A 100 rupee note and a paint brush
(c) A 100 rupee note, a can of paint and a paintbrush
(d) A 1000 rupee note, a cycle, a paint brush and a can of paint

Conversation 3:

V1: Excuse me! I have to go to the Model Govt. High School. I am late for an interview. Could you please give me directions?
V2: Certainly. Keep walking along this street, you will come to a big junction. Take a right at the junction.
V1: Take a right..okay...
V2: Keep walking along that road. When you see a huge banyan tree on your left, stop. You'll see the school on the opposite side.

3) What was the conversion about?

(a) going for an interview
(b) introducing oneself
(c) visiting a new place
(d) giving directions

4) Where was the banyan tree?

(a) To the school's right.
(b) To the school's left.
(c) Across the school.
(d) Next to the school.

5) The woman who gave directions was-

(a) helpful
(b) cheerful
(c) careful
(d) grateful

5. TEACHERS SURVEY

5.1. Demographics

The average age of teachers in the state was 40.57 for treatment and 41.09 for control schools. The percentage of male teachers in the control was higher (67) as compared to treatment (59). The percentage of OBCs were higher in treatment (38) compared to control (29).

Table 5.1: Demographics of teachers

Demographics	Treatment	Control
AVG AGE	40.57	41.09
MALE %	59	67
FEMALE %	41	33
ST %	13	5
SC %	11	14
OBC %	38	29
General %	39	52
Other %	0	0

B.Ed was the highest qualification for 92.94% teachers in the treatment schools and 95.24% teachers in the control.

Table 5.2: Professional Qualification of teachers

Education	Treatment	Control
M.Ed	7.06	4.76
B.Ed	92.94	95.24
D.Ed	0	0
other	0	0
None	0	0

5.2. Access to and use of technology

Teachers in control and treatment schools varied little in terms of their access to devices and technology such as mobile phones, internet and computers. Their scores were very similar with the treatment school teachers having a slight advantage (Table 5.3).

Table 5.3: Teachers' access to technology

Access to technology	Treatment (%)	Control (%)
Teachers with Mobile phone	95	95
Teachers with internet access	88	81
Teachers with computer/laptop	53	47
Total	85	21
Overall score	8.82	9.9

Teachers in the treatment school and control school reported very similar access to technology in their schools (3.8 & 3.7). In terms of use of the technology in their schools too there was difference between the two groups (Table 5.4).

Table 5.4: Teachers' usage of technology devices

Usage of Technology Devices:	**Total/Raw Score range**	Treatment				Control			
		Mean	SD	Min	Max	Mean	SD	Min	Max
Access to Technology in school	**0-11**	3.6	2	0.0	11.0	3.5	2	0.0	9.0
Use of technology in school	**0-44**	6.3	5	0.0	33.0	5.4	5	0.0	23.0

Teachers' responses to use of digital technology in their everyday life were computed as scores which were very similar for the treatment and control school teachers. The mean scores of teachers in treatment and control with regard to digital citizenship was 17.7 and 17.4 respectively. With

regard to their beliefs about the use of technology, their mean scores for treatment and control were 16 and 15 respectively (Table 5.5).

Table 5.5: Teachers' scores on various aspects related to technology

Items	Factors	Raw score/Range	Treatment				Control			
			Mean	SD	Min	Max	Mean	SD	Min	Max
Digital	NA	10-30	17.7	5	10.0	29.0	17.4	5	11.0	28.0
Beliefs about use of Technology	F1= items 3, 11, 12, 15,16	**5-20**	15.6	1	12.0	20.0	15.2	2	10.0	19.0
	F2=items 1, 4,6,7	**4-16**	12.8	1	9.0	16.0	12.8	2	8.0	16.0
Challenges in Integrating Technology	F1= items 7, 8, 9, 10, 11 , 12, 13	**7-35**	27.4	5	8.0	35.0	26.8	7	9.0	35.0
	F2= items 4, 5, 6	**3-15**	13.3	2	4.0	15.0	13.6	2	8.0	15.0
	F3=items 1, 2, 3	**3-15**	12.6	2	5.0	15.0	12.2	2	7.0	15.0
Self-financed/ Informal training	NA	-	2.3	2	0.0	10.0	3.2	2	0.0	7.0

Table 5.6: Teachers' digital activities in past three months

In the past three months, how often have you done the following activities?	Never (%)		Several times (%)		Once in a week (%)		Almost every day (%)	
	T	C	T	C	T	C	T	C
Browsed/ searched the internet for personal use	13	19	56	43	13	14	18	24
Browsed/ searched the internet to collect teaching materials to prepare lessons	21	43	52	19	22	38	5	0
Use power point /slides for presenting in conference/district meeting/other	81	90	12	10	5	0	2	0
Created digital learning materials for students	42	57	38	24	19	14	1	5
Searched for courses/ activities for professional development	21	33	47	33	21	24	11	10
Interacted with online teachers' communities	28	29	34	29	18	19	20	24
Documented your class-work using video/audio	64	71	27	14	6	14	4	0
Attended EduSat classes	46	81	32	10	16	10	6	0
Used Smart-boards	79	81	13	10	2	10	6	0
Taken clippings on mobile phone for showing it	48	76	40	24	11	0	1	0
Participated in an online course	66	90	27	5	5	5	2	0
Participated in COP discussions (Telegram)	62	90	29	10	7	0	1	0

In terms of frequency of usage of a digital device for classroom teaching, 24% teachers in both the treatment and control schools had used TVs for teaching. 28% treatment school teachers used satellite classrooms as compared to 0% control school teachers. 98% of treatment school teachers and 90% control school teachers reported that they do not have overhead projectors and tablets in school. (Table. 5.7)

Table 5.7: Teachers' usage of technology devices in school

In the past three months, how often have you used the following technology devices in classroom/school?	No, we do not have this (%)		We have it, used before, but now it is not in working condition (%)		We have it, but we never or almost never use it (%)		Several times a month (%)		At least once a week (%)		Every day or almost every day (%)	
	T	C	T	C	T	C	T	C	T	C	T	C
LCD Projector	91	67	0	0	2	14	2	5	1	10	4	5
TV	19	48	5	0	6	5	39	19	8	5	24	24
Digital Camera	88	76	2	0	5	14	2	5	1	5	1	0
Overhead	98	90	0	0	1	5	0	5	0	0	1	0
CD/DVD Player	75	81	6	10	4	0	12	5	1	0	2	5
Radio	81	76	7	0	2	0	7	10	0	5	2	10
Satellite	20	76	6	0	1	5	36	19	8	0	28	0
Computer/Laptops	27	29	1	10	1	10	39	19	8	24	24	10
Smart Boards	89	71	0	0	2	5	4	10	1	10	4	5
Mobile phone	21	19	2	5	6	5	25	29	7	0	39	43
Tablet	98	90	0	0	0	5	0	5	0	0	2	0

With regards to specific digital activities on computers / smartphones, higher percentage of teachers in the treatment schools have reported using applications such as word (45 / 43), spreadsheets (31 / 19), email (47 / 38). Compared to control school teachers, higher percentages of treatment school teachers had done online activities such as using hyperlinks (25 / 14), downloading and using apps (52 / 43), using Skype (21/ 14). (Table 5.8)

Table 5.8: Teachers' activities on computer/phone

Which of the following activities have you done with computer/phone in the past 3 months:	Have done it without any difficulty on my own, without any help		Have done it on my own with some difficulty, but without any help		Have done it, taking some help from others		Have done it with difficulty, with lot of help		Have never done it on my own or with help from others	
	T	C	T	C	T	C	T	C	T	C
Started a Computer	68	52	11	5	13	19	5	5	4	19
Typed in English on computer	60	43	20	19	7	14	8	14	5	10
Handled Mouse	78	57	11	5	5	5	4	14	4	19
Saved Files	56	48	14	10	14	10	7	5	8	29
Used Word/Notepad	45	43	11	19	11	5	7	0	27	33
Used a spreadsheet	31	19	14	14	22	10	11	0	22	57
Used power point	24	24	20	14	9	10	8	5	39	48
Used Inkscape/ Paintbrush	27	24	12	5	25	0	16	5	20	67
Typed in Hindi/Mizo/Telugu	21	10	15	19	8	29	16	5	39	38
Used Internet browser	59	43	20	10	8	14	6	10	7	24
Used E-mail	47	38	15	19	22	14	8	29	7	0
Played computer games	32	38	20	5	15	10	4	10	29	38
Used Hyperlinks# (links from one site to another site)	25	14	7	5	4	5	8	0	56	76
Downloaded/uploaded files (including on Telegram/whatsapp)	44	43	18	5	9	10	12	10	18	33
Recorded audio/video on phone/camera	53	43	9	10	8	10	9	10	20	29

Which of the following activities have you done with computer/phone in the past 3 months:	Have done it without any difficulty on my own, without any help		Have done it on my own with some difficulty, but without any help		Have done it, taking some help from others		Have done it with difficulty, with lot of help		Have never done it on my own or with help from others	
	T	C	T	C	T	C	T	C	T	C
Clicked pictures with digital camera	41	43	7	0	9	10	6	10	36	38
Programmed a task	15	14	7	5	16	5	8	0	53	76
Used simulation	7	0	4	5	8	10	5	5	76	81
Used online maps	28	29	12	5	11	14	6	5	44	48
Booked ticket online	24	24	8	5	9	14	6	5	53	52
Downloaded & used apps on the mobile phone	52	43	12	5	13	14	9	5	14	33
Used video	21	14	2	5	6	10	7	0	64	71
Used online course platform - TISSx	24	0	8	5	21	0	11	0	36	95
Used mindmap	18	5	12	5	24	0	7	0	40	90

5.3. Use of technology- Beliefs and challenges

This section explores beliefs reported by teachers with regard to use of technology in a teaching learning context. Teachers' beliefs about technology with respect to student learning were similar across treatment and control groups in several cases. Both groups disagreed that computers make students lazy (T-82 % / C- 85%). Similarly, both groups agreed that integrating technology improves classroom instruction (T-97 / C-91%) and that collaboration with peers and experts makes their instruction most effective (T-98% / C-95%). A higher percentage of teachers in the treatment groups agreed that students grasp difficult topics better with the use of computers (T-78% / C-62%) and also that students interact with each other more while working with computers (T-90% / C-72%). (Table 5.9)

Table 5.9: Teachers' beliefs on technology and student learning

Beliefs on technology & student learning	S.Agree		Agree		Disagree		S.Disagree	
	T	C	T	C	T	C	T	C
Integrating technology in teaching can improve students' learning	42	38	55	52	2	10	0	0
Computers make students lazy	5	10	13	5	66	71	16	14
Computers help students grasp difficult curricular concepts	22	19	69	76	8	5	0	0
Integrating technology in teaching will improve classroom instructions.	19	29	78	62	4	10	0	0
Instruction is most effective when teachers collaborate with other teachers or experts	29	33	69	62	1	5	0	0
Students create better projects with computers than with other traditional material.	22	24	73	71	4	5	1	0
Integrating technology in teaching will increase collaboration among students	21	19	71	71	8	10	0	0
Students working in groups is very time consuming	5	5	46	43	48	52	1	0
Students working in groups is often not very useful	5	24	14	67	73	10	8	0
Student learning during group work is worth the extra time that it takes	7	5	71	57	22	38	0	0
Students interact with each other more while working with computers	16	5	74	67	9	29	0	0
Integrating technology might increase healthy competition among students	22	33	74	62	4	5	0	0
Integrating technology in teaching in schools will satisfy parents' interest	15	19	80	71	5	5	0	5
Students' writing quality is worse when they use computers to type.	7	10	49	48	40	33	4	10

Using technology like internet, digital cameras, computer applications can help students apply and practically relate to concepts they learn in textbook	14	19	82	67	4	14	0	0
Some of the computer applications allow doing the tasks again and again which reduces the fear of failure among students	15	10	79	81	6	10	0	0
Use of Technology is mostly for developing technical skills and it is not useful in applying or drawing out real life examples of concepts in textbook	2	5	40	38	54	52	4	5

With respect to challenges in integrating technology for teaching learning, higher percentage of treatment teachers agreed that not having enough computers in lab (T-49% / C-29%), using technology will take time away from completion of syllabus (T-40% / C-24%) are extremely challenging for integrating technology in education.(Table 5.10)

Table 5.10: Challenges in Integrating Technology in Teaching

Challenges in Integrating Technology in Teaching	Extremely challenging;		To some extent challenging		Not sure whether it is really a challenge		Not a challenge		Not a challenge at all, rather it is an opportunity to convert the scenario	
	T	C	T	C	T	C	T	C	T	C
Not enough computers in the Computer Lab	48	48	40	33	1	0	6	5	5	14
Not enough training for teachers to use Computers	49	29	38	52	6	19	2	0	5	0
Not enough opportunity to practice Computers in curriculum	47	33	29	57	15	5	6	0	2	5
Unstable/ intermittent power supply.	67	67	26	29	4	5	1	0	2	0
Frequent crashing of computers or outdated computers	49	71	39	24	5	5	5	0	2	0
Internet is too slow	54	57	40	29	4	5	2	10	0	0

Challenges in Integrating Technology in Teaching	Extremely challenging;		To some extent challenging		Not sure whether it is really a challenge		Not a challenge		Not a challenge at all, rather it is an opportunity to convert the scenario	
	T	C	T	C	T	C	T	C	T	C
Too many students in the class (difficult to give individual attention to students)	56	48	33	33	4	5	5	5	2	10
Don't know how to use computers for subjects I teach	20	29	35	33	19	19	18	10	8	10
Leadership is not supportive	16	38	41	33	16	14	22	10	4	5
Students are at different levels	35	29	38	48	19	19	7	0	1	5
Computer teacher is not available	56	62	21	14	13	10	5	10	5	5
Use of technology will take time away from completion of syllabus	40	24	36	38	18	19	4	10	2	10
Use of technology will make it difficult to manage students in the class as they have difficulties with operation of a computer	27	19	45	48	16	14	11	0	1	19

The factors that influenced the treatment school teachers to a large extent in use of technology in their teaching was the training and workshop (61%), enthusiasm of students (64%) followed by availability of working computers (57%) and access to experienced persons (57%). The factors that influenced the control group were on the other hand teachers sharing of how they had used technology (61%) followed by resource support and mentoring (54%). (Table 5.11)

Table 5.11: Influence upon decision to use technology in teaching

Influence upon decision to use technology in teaching	Influenced to a large extent		Influenced to some extent		Not influenced at all		Not applicable	
	T	C	T	C	T	C	T	C
Seeing other teachers using it in their classes	49	43	35	33	7	0	8	24
Other teachers sharing examples of how they have	39	29	48	48	7	10	6	14
Resource support & mentoring	40	38	45	38	12	5	4	19
Availability of working computers to apply my	41	38	54	43	4	5	1	14
Training/workshop	54	33	39	43	7	10		14
Enthusiasm and interest of students.	48	48	49	38	2	10		5
Access to experienced teachers or other experts.	45	43	45	33	6	14	5	10
Availability of a reliable support system.	45	29	39	48	8	5	8	19
Working lab with relevant resources.	39	43	49	43	8	0	4	14
Enthusiasm and interest of parents.	38	52	41	33	14	5	7	10

5.4 PEDAGOGY AND TECHNOLOGY

In terms of factors that will influence their abilities to integrate technology, the ranking given by both treatment and control groups was same. ‘Receiving training in technology-based teaching’ was ranked highest by both the treatment and control school teachers followed by ‘time to practice and plan’. (Table 5.12)

Table 5.12: Influencing factors for ability to integrate technology into education

Which of the following will make the most difference in your ability to integrate technology into education?	**T**	C
Having a computer in school meant for teachers	315	315
Having a computer at home	301	301
Time to practice and plan	327	327
Receiving training in using computer	329	329
Receiving training in technology-based teaching	282	282
It is difficult to improve one's ability at this stage	231	231

Teachers' levels of preparedness across domains in control schools for all the three subjects were similar to the treatment school teachers. This score was also slightly similar for both the groups with respect to participation in TPD workshops. In terms of use of computers, the scores of Science teachers from control group were lower as compared to the treatment school teachers (T-41% / C-30%) and those of English teachers were much lower (T- 67% / C-42%) (Table 5.13).

Table 5.13: Teachers' scores with respect to TPD and related aspects

Items	Domain	Treatment		Control	
		Scores%	SD	Scores%	SD
Preparedness to teach the specific topics	**Science**	85	11	77	13
	English	85	12	77	17
	Maths	44	10	49	15
Participation in TPD workshops (other than CLIx)	**Science**	47	41	43	47
	English	52	41	57	46
	Maths	42	38	43	38

Use of computers in the last year for specific topics	**Science**	41	33	30	39
	English	67	34	42	50
	Maths	37	30	30	41
Need for specific topics as part of the TPD Course	**Science**	56	39	67	30
	English	68	39	61	40
	Maths	57	40	83	30

6. ENGLISH DOMAIN TEACHERS

With respect to beliefs on English teaching, all 31 teachers[4] from treatment group agreed that their teaching was about connecting textbook material with students' experience and making students listen to and speak English. 7 out of 9 control school teachers believed that teaching English is about making students repeatedly write out answers to questions in the textbook. All of the control school teachers were also in agreement with approach of making students memorize the rules of grammar. (Table 6.1a)

As regards their actual teaching in the past year all teachers said they had students discuss in groups and relate to real life as well as memorize rules and facts for some lessons at least (Table 6.1b).Most of the teachers believed that students can learn on their own, if given guidance and also that students need exposure to more spoken English to improve. (Table 6.2a)

English teachers reported frequent use of non-traditional approaches in language teaching such as watching English programs (9) and encouraging students to come up with their own responses (10) (Table 6.2c). Importantly, nearly all teachers reported using technology for all areas of English teaching, vocabulary (9), conversation (8) & listening (8) (Table 6.3b). All 10 teachers reported using computers to look up information, videos on computers for teaching English sometimes or often. They had sometimes or often used features such as recording voices (8), create stories (8) and sentence construction (7) (Table 6.3c)

7. MATHS DOMAIN TEACHERS

Math teachers' responses with regard to subject pedagogy showed similar beliefs with respect to traditional and non-traditional practices. For example, all teachers in the treatment group agreed to the statements that math teaching was about reasoning and solving problems as well as practicing and arriving at correct answers (Table 7.1a). Most of the treatment school teachers and control group teachers reported that they asked students to practice some of the math pedagogies like relate what they are learning in mathematics to their daily lives (T-8, C-3) and apply facts, concepts and procedures to solve routine problems (T-8, C-3) and practicing adding, subtracting, multiplying, dividing without using calculator (T-6 out of 9, C-4 out of 4) for almost every or half of the lessons (Table 7.1b)

With respect to certain persistent negative beliefs about Maths learning, most teachers in the treatment and control group disagreed with statements such as, geometry does not have any practical use for students and students who find math difficult do not have the ability to do mathematics. 4 out of 6 teachers in control group and 17 out of 24 in treatment group disagreed with statement such as discussions in class disrupts discipline and distracts students. (Table 7.3c)

4 For English domain, the comparison with control group is not included as there was just one respondent in the control group.

With regards to teaching using technology, 15 out of 24 treatment school teachers used technology for geometric reasoning and 12 teachers used computers for proportional reasoning (all CLIx module topics). None of the teachers from the control group used computer to teach any of these 5 topics. (Table 7.3b).

During this academic year, 20 out of 24 teachers in the treatment schools said they sometimes (or often) used computers for math activities such as, playing mathematics based games and 17 teachers used computers for watching instructional videos. Most of the teachers from the control group had never used computer for most of the activities. (Table 7.3c)

8. SCIENCE DOMAIN TEACHERS

With regard to characterizing of Science teaching, nearly all teachers in both treatment and control groups agreed with statements such as science is about thinking and reasoning, carrying out experiments and learning new technology. (8.1a).

Most of the treatment school teachers and control group teachers reported that they asked students to practice some of the science pedagogies like relating what they are learning in science to their daily lives and give explanations about something they are studying for almost every or half of the lessons. The pedagogies which were used never or in some lessons were asking students to watch the teacher demonstrate an experiment and conducting experiments or investigations (Table 8.1b). Teachers' own belief about learning science, showed positive beliefs with respect to perceived student ability, class discussions, gender and science teaching etc. Interestingly however, all teachers in both the groups also agreed to the statement with regard to student mistakes. They believed that students' mistakes must be corrected immediately (Table 8.2a).

In terms of specific practices, almost all the Science teachers from both the groups said they always encouraged their students to come up with their own ideas to solve problems and try to maintain discipline because students must concentrate and individually work. 20 treatment school teachers and 2 control group teachers reported they sometimes or never solved one/two exercise and ask students to solve the rest. (Table 8.2c)

In the case of use of technology in science teaching, all teachers from both treatment and control groups had used computers to teach all the topics given in table 8.3b. Most of the teachers from treatment used computers for teaching motion, astronomy and atomic structure. (Table 8.3b)

In terms of using technology for their own teaching preparation, most teachers in the treatment and control groups had used technology to look up ideas and information and watched and analyzed videos. (Table 8.3c)

9. COMPARISON ACROSS DOMAINS

With regard to classroom teaching, almost all English teachers from both the treatment and control groups agreed that when students make mistakes, the best remedy is to give them repeated practice. Most of the teachers from both groups (Treatment-25 out of 31, Control-7 out of 9) disagreed with the statement that making students give personal opinions about the text is not useful (Table 6.2b). 22 out of 24 Math teachers in the treatment group and 5 out of 6 teachers in the control group felt that they have no time to do additional activities, because they have to cover all the content in the textbook and also that only one concept should be taught at a time because discussing many concepts together confuses students. 14 treatment school teachers and 4 control school teachers disagreed with the statement that when students make mistakes, the best remedy is to give them repeated practice of similar problems. Both the groups disagreed that connecting math taught with out-of-school situations is not useful (Table 7.2b). Similar to English teachers, almost all the Science teachers from both treatment and control groups agreed that when students make mistakes, the best remedy is to give them repeated practice of similar problems (Treatment- 27 out of 29 and Control- all 6) and almost all teachers also disagreed that connecting Science with out-of-school contexts is not useful (T-26, C- 4). More than half of the teachers reported having no time to do additional activities, because they have to cover all content in the textbook (Table 8.2b).

On use of technology for English teaching, 26 out of 31 English teachers from treatment schools and 6 out of 9 control group teachers felt that their students were more confident of speaking in English after the CLIx classes (Table 6.3a). 20 out of 24 Math teachers from treatment schools and 4 out of 6 control group teachers believed that children are more interested in solving problems after CLIx class in Mathematics (Table 7.3a). All 6 Science teachers from control group and 26 out of 29 treatment school teachers agreed that children ask more questions after Science CLIx classes (Table 8.3a). Majority of teachers from both groups across the 3 domains said they do not mind if students ask questions or interact with each other during the Lab classes.

With respect to challenges in using computers for teaching, most of the English teachers from treatment schools reported a lot or some challenges with respect to shortage of computer hardware and computer software, shortage of support for using computers and lack of audio-visual aids. For the control group teachers, shortage of equipment for use in demonstrations and other exercises was reported as a challenge (Table 6.4a). 20 out of the 24 Math teachers from treatment schools reported inadequate physical facilities as a lot (or some) challenging while shortage of computer hardware/software was felt as a challenge by most of the teachers from both the groups (Table 7.4a). As far as integration of technology is concerned for Science teachers, 17 out of 29 treatment school teachers and 5 out of 6 control school teachers regarded shortage of support for using computers as ‘a lot challenging’. Shortage of textbooks for student use and large class size were seen as ‘not at all challenging’ by most of the treatment school teachers. (Table 8.4a)

English teachers in the treatment schools perceived students with different academic abilities (25) and students’ diverse backgrounds (28) as being ‘a lot’ challenging to their teaching learning. The control group teachers also thought of these as the main challenges (Table 6.4b). Math teachers in the treatment schools perceived students with different academic abilities (19 out of 24) and uninterested students (17 out of 24) as being a lot challenging to their teaching learning. The control

group teachers thought of students with special needs as the main challenge (Table 7.4b). Science teachers from both treatment and control groups also reported similar challenges as English and Math treatment groups (Table 8.4b).

With respect to their own preparedness, most of the English teachers from both treatment and control groups reported being relatively less prepared on areas pertaining to literal and figurative speech and literary language (Table 6.5). Math teachers from treatment schools (21 out of 24) reported being 'very well prepared' to teach simple linear equations and inequalities and 20 teachers said that they felt very well prepared to teach geometric properties of angles and geometric shapes. All the 6 control school teachers felt well prepared to teach direct and inverse proportion and using appropriate measurement formulas for perimeters, circumferences, etc. (Table 7.5). Teachers' level of preparedness in Science (Tables 8.5 a,b,c) as reported by treatment school teachers showed them feeling overall less prepared on topic of trends in human population and its effects on the environment in Biology (15 out of 29) followed by solutions in Chemistry (14) and physics topic of forces and motion (11).

Barring observations of a peer teachers' classroom, all the English teachers from both treatment and control groups had clarified doubts about the subject, shared resources or teaching ideas and shared experiences. Most of the teachers from treatment schools (26) had done informal observations of their classrooms by another teacher and worked on preparing lesson plans (24). 8 control school teachers had discussions about how to teach a particular concept (Table 6.6). 18 out of 24 Math teachers from treatment schools had discussions with other teachers on children's learning and experience while 15 teachers had interactions with other teachers about working on preparing lesson plans and instructional materials, sharing resources or teaching ideas and experiences. Almost all the control school teachers had discussions about each topic given in Table 7.6. Most of the treatment school teachers did not have interaction about observations of other teachers' classes or observation of their own classes. Majority of the Science teachers from treatment school teachers had discussions about working on preparing lesson plans (22 out of 29), informal observations of their classroom by another teacher (18) and on children's learning and experience (16). Responses for control school teachers were similar to treatment school teachers (Table 8.6).

More than half of the treatment school teachers and control school teachers had received training in all the areas like English content, pedagogy and integration of ICT in teaching given in table 6.7a. Majority of the English teachers from treatment schools (24) and control schools (7) felt the need to receive training for integration of technology in teaching while 12 teachers from treatment group and 5 from control group said they do not need training in student assessments (Table 6.7b). Almost all the teachers from treatment schools said they would like to receive training in the form of interaction with other teachers while all the control school teachers preferred face to face lectures and referring to books, magazines. Hands-on activities for teachers were also preferred form of TPD by both the groups (Table 6.7c). About half of the Math teachers from treatment schools had received training in curriculum, integration of ICT in teaching and ICT whereas most of the control school teachers had received training in content and pedagogy (Table 7.7a). 17 out of 24 teachers in the treatment schools reported need for training in pedagogical tools and techniques while 15 teachers from treatment and all 6 control school teachers felt the need to get training in technology integration. 17 teachers from treatment group said they do not need training in student assessments (Table 7.7b). 21 teachers in treatment and all 6 teachers from control group preferred computer based training session. All treatment school teachers and 5 out of 6 control school teachers would like to receive training in the form of interactions with other teachers (peer learning) (Table 7.7c).

As regards TPD in Science, 15 out of 29 treatment school teachers and 3 out of 6 control group teachers reported receiving training in science content and science curriculum (Table 8.7a). 4 out of the 6 control school teachers did not receive trainings in integration of technology, improving students' critical thinking or inquiry skills and student assessments. All the 6 control school teachers and 19 treatment school teachers said they need training in integration of technology in teaching. 17 out of 29 treatment school teachers and 3 out of 6 control school teachers said they did not need training in student assessments (Table 8.7b). Almost all teachers from both treatment and control groups preferred all the modes of TPD given in table 8.7c.

The following tables shows the areas in which majority of teachers from all the three domains in both treatment and control groups feel very well prepared to teach:

Table 9.1: Teacher preparedness

Domain	Treatment	Control
English	Polite expressions, Grammatical correctness, comprehension, Understanding and speaking for functional purposes (directions, instructions)	More than half of teachers very well prepared for all areas except practicing social conversations
Math	Simple linear equations and inequalities and simultaneous; Geometric properties of angles and geometric shapes; Using appropriate measurement formulas for perimeters, circumferences, areas of circles, surface areas and volumes	Direct and inverse proportion; Geometric properties of angles and geometric shapes
Science	Biology: Interaction of living organisms and the physical environment in an ecosystem; Impact of natural hazards on humans, wildlife, and the environment Physics: Basic properties/behaviors of light and sound; Chemistry: Properties and uses of common acids and bases; Chemical change; Particulate structure of matter	Same as treatment

10. Key findings (Teachers)

This report gives the status of teachers with respect to their access to technology, its usage in teaching, their beliefs regarding integration of technology in education and their overall subject preparedness based on a survey conducted in 54 schools: 42 treatment and 12 control in Rajasthan.

Access and usage of technology: It was found that more than 80% teachers from both treatment and control schools have mobile phones with internet access. With regard to their use of technology for teaching-learning activities in the 3 months before survey, 38% of teachers from treatment schools and 43% from control group interacted with online teachers' communities every day or almost once a week whereas 31% of teachers from treatment schools and 38% from control group browsed/ searched the internet for personal use. 81% of the treatment school teachers and 90% of control school teachers never used smart-boards and equal percentage of control teachers never participated in any online courses.

Activities on digital devices: Data on teachers' digital activities on computers/smartphones shows that 59% of the treatment school teachers and 43% of control school teachers said they were able to use internet browsers without any help while equal percentage of the control group and 52% of treatment school teachers reported downloading and using apps on mobile without any difficulty. 45% of treatment school teachers and 43% control school teachers said they could use Word/notepad while only around 24% teachers from both groups could use spreadsheet.

Pedagogical practices: Teachers were asked to give their opinion on statements connected to their practices in the classroom. Majority of English (23 out of 31), Math teachers (14 out of 24) and Science teachers (18 out of 29) from treatment schools and almost all control school teachers agreed that did not have time to do additional activities because they need to complete syllabus.

Pedagogic pillars: In accordance with the 3 pedagogic pillars of CLIx, i.e. peer discussion, learning from mistakes and relevance, teachers were asked their views on related statements. Majority of the English and Science teachers from treatment group and almost all the control school teachers reported doing activities involving group work for students sometimes. Most of the Math treatment teachers reported that they always encouraged group activities.

Almost all English and Science teachers from treatment and control schools agreed that when students make mistakes, the best remedy is to give them repeated practice of similar problems. Math teachers from both the groups did not agree with this statement. Interestingly, almost all teachers from both the groups in Math and Science domains agreed that connecting the subjects with out-of-school contexts is useful. However, majority of English teachers from both treatment and control groups said they had no opinion on this.

Beliefs about use of technology: Teachers were also asked about their beliefs with regard to use of technology in a teaching learning context. 82% treatment and 85% control school teachers disagreed that computers make students lazy. Almost all teachers from both groups believed that integrating technology improves classroom instruction and that collaboration with peers and experts makes their instruction most effective. Regarding their belief about technology's

usefulness for students, more than 90% of teachers in both groups agreed that students are able to create better projects using computers and also that students grasp difficult topics better with the use

of computers. 78% of teachers in the treatment schools and 62% from control schools agreed that doing group work can be time consuming, but is worth the time spent.

Views about using technology in subject teaching: Almost all treatment school teachers and control school teachers agreed that children were more confident to speak after English CLIx classes. Majority of the Math teachers from both treatment and control groups agreed that children were more interested in solving problems after CLIx class in Mathematics. Similarly, majority of Science teachers from both the groups agreed that children ask more questions after Science CLIx classes.

All the teachers across all three domains from both the groups also disagreed with the statement that they do not like their students asking questions or interacting with each other during the Lab classes.

Challenges in integration of technology: Teachers' views about challenges for integration of technology in teaching shows that 67% of teachers from both the groups think that intermittent power supply is extremely challenging. Slow internet, too many students and unavailability of computer teacher were also reported by most of the teachers as extremely challenging. 48% teachers from both treatment and control groups reported that not having enough computers in lab was the most challenging factors for integration of technology in teaching.

Physical conditions as a challenge for teaching: With respect to challenges in using computers for teaching, most of the treatment school teachers in all the 3 domains reported a lot or some challenges with respect to shortage of computer hardware and computer software and inadequate physical facilities. For the control group teachers, shortage of equipment for use in demonstrations and other exercises, Shortage of other instructional equipment for students' use, shortage of support for using computers and large class sizes were reported as challenges.

Students as a challenge in teaching: Teachers in the treatment schools perceived students with different academic abilities and students' diverse backgrounds as being 'a lot' challenging to their teaching learning in all the 3 domains. The control group teachers also thought of these as the main challenges in addition to uninterested students.

Preparedness, Participation in TPD, Use of computers: Teachers' levels of preparedness across domains in control schools for Science and English was lower (77%) compared to the treatment school teachers (85%). With respect to participation in TPD workshops, Maths and English teachers in treatment schools scored lower as compared to their counterparts in control school.

Majority of teachers across all the 3 domains expressed the need to include integration of technology in teaching, pedagogical tools and techniques and subject understanding as part of their TPD course. With regard to the mode of TPD training, all teachers reported interactions

with other teachers (peer learning), referring to books and hands-on activities as the preferred mode of training.In terms of use of computers, the scores of teachers in control group were much lower than treatment school across all 3 domains.

ANNEXURE 4

Table 6.1a: Beliefs about teaching English

Teaching of English is about:	**Strongly agree**		**Agree**		**No opinion**		**Disagree**		**Strongly Disagree**	
	T	**C**	**T**	**C**	**T**	**C**	**T**	**C**	**T**	**C**
Making students read aloud from the textbook.	6	3	22	6	0	0	3	0	0	0
Making students memorise the rules of grammar.	2	0	27	9	0	0	2	0	0	0
Teaching the content given in the textbook.	7	2	23	7	0	0	1	0	0	0
Connecting the textbook material with students' experience.	12	4	19	4	0	1	0	0	0	0
Making students listen to and speak English.	15	3	16	5	0	0	0	1	0	0
Focusing on literature.	3	1	22	6	5	1	1	1	0	0
Focusing on language use (Grammar, etc).	8	3	21	5	0	1	2	0	0	0
Making students repeatedly write out answers to questions in the textbook.	4	7	24	2	1	0	2	0	0	0
Helping students understand different types of communication.	5	1	25	8	1	0	0	0	0	0

Table 6.1b: English teacher's practices in classroom for students

During this academic session, while teaching English to the students in class 9, how often did you usually ask them to do the following?	Never		Some lessons		About half the lessons		Almost every lesson	
	T	C	T	C	T	C	T	C
Memorize rules and formulas (spellings, grammar rules, etc.)	0	1	12	4	3	0	16	4
Apply facts, concepts and rules to complete tasks (role play, letter writing,)	0	1	15	4	5	1	11	3
Explain their answers	0	1	9	4	4	0	18	4
Relate what they are learning in English lessons to their daily lives	0	0	16	5	1	2	14	2
Read their textbooks and other resource material.	0	1	12	2	4	0	15	6
Decide on their own procedures to complete tasks / answer questions.	0	2	17	3	4	2	10	2
Work on problems for which there is no immediately obvious method of solution	1	4	20	3	4	1	6	1
Work together in small groups	1	1	19	7	2	1	9	0
Find information and present to the class the next day. (Meanings, facts, etc.)	0	1	19	3	3	0	9	5

Table 6.2a. Beliefs about English learning

Beliefs about English learning	Strongly agree		Agree		No opinion		Disagree		Strongly Disagree	
	T	C	T	C	T	C	T	C	T	C
Students, who find English difficult, do not try enough to learn.	4	1	12	4	2	1	13	2	0	1
Students need exposure to more spoken English to improve.	9	0	20	9	2	0	0	0	0	0

Beliefs about English learning	Strongly agree		Agree		No opinion		Disagree		Strongly Disagree	
	T	C	T	C	T	C	T	C	T	C
Students' mother tongue should not be used in the English classroom.	3	0	11	2	0	6	17	1	0	0
Girls are better at using English than boys.	1	0	12	0	4	3	13	6	1	0
Games and activities are suitable for primary school, not for high school classes.	1	0	5	1	3	1	17	6	5	1
Discussions in class disrupt discipline and distract students.	0	0	8	4	0	4	21	1	2	0
Students can learn on their own, if given guidance.	6	0	22	8	0	1	3	0	0	0
My students can easily understand English films / TV Programs.	2	0	9	1	6	2	14	5	0	1
Students should be corrected for mistakes they make, as soon as they make these mistakes.	1	1	24	6	1	0	5	2	0	0
Teaching English is difficult.	0	0	8	4	2	1	19	4	2	0
We should spend more time teaching subjects other than English.	2	0	6	5	4	1	17	3	2	0
I need to improve my English, so that I can teach it better.	3	2	19	4	5	2	4	1	0	0
Students who like reading are good at English.	2	0	21	6	4	1	4	1	0	1

Table 6.2b: Beliefs about classroom practices in English

English teaching in the classroom	Strongly agree		Agree		No opinion		Disagree		Strongly Disagree	
	T	C	T	C	T	C	T	C	T	C
I have no time to do additional activities, because I have to cover all the content in the textbook.	4	1	19	5	1	0	7	3	0	0
Making students give personal opinions about the text is not useful.	0	0	4	2	2	0	24	7	1	0
When students make mistakes, the best remedy is to give them repeated practice	2	0	28	8	0	0	1	1	0	0
Films / Radio clippings are not necessary materials in the English	0	0	5	0	0	1	22	8	4	0
Students need to know only standard rules because alternative grammatical structures confuse them.	0	0	11	6	1	1	17	2	2	0
Connecting English with out-of-school contexts is not useful	0	0	6	2	20	6	5	1	0	0

Table 6.2c: Frequency of classroom practices in English

In the English classroom	Always		Frequently		Sometimes		Never	
	T	C	T	C	T	C	T	C
I discuss the answers and ask the students to write their own answers.	11	4	9	2	11	3	0	0
I organize learning activities (games, puzzles, role plays) with the students.	5	2	4	1	21	6	1	0
I do activities that involve group work that allow students to see, share and discuss their class work or home work with each other	6	2	8	3	16	4	1	0
I maintain silence/ discipline because students must concentrate and individually understand the English lesson / concept.	13	8	7	1	9	0	2	0

In the English classroom	Always		Frequently		Sometimes		Never	
	T	C	T	C	T	C	T	C
I encourage students to come up with their own ideas about how to answer questions.	21	7	4	2	5	0	1	0
I encourage students to watch news / TV programs / films in English.	19	5	8	3	3	1	1	0
I use recent newspaper articles as teaching materials.	8	2	6	1	14	5	3	1

Table 6.3a: Views about using technology in English teaching

What are your views about using technology in your subject teaching?	Strongly agree		Agree		Disagree		Strongly Disagree	
	T	C	T	C	T	C	T	C
Slow Learners get left out in Lab sessions	1	0	15	3	14	6	1	0
Watching videos is more useful than interactives on computers.	3	0	24	7	4	2	0	0
Fear of committing mistakes increases with computer-aided learning	1	0	13	5	17	4	0	0
Computer-aided lessons should be optional only.	1	0	15	4	14	5	1	0
I do not like my students asking questions or interacting with each other during the Lab	0	0	3	1	21	6	7	2
Children are more confident to speak after English CLIx classes	1	0	26	6	4	3	0	0

Table 6.3b: Topics for which computer was used to teach in English

For which of the following topics, did you use computers in the last year?	Yes		No	
	T	C	T	C
Vocabulary	21	4	10	5

Conversation skills	20	3	11	6
Grammar	21	4	10	5
Listening skills	26	4	5	5
Letter Writing	16	4	15	5

Table 6.3c: Activities for which computer was used in teaching English

In this academic year, while teaching English to class 9, how often have you used a computer for the following activities?	**Never**		**Sometimes**		**Often**		**Always**	
	T	**C**	**T**	**C**	**T**	**C**	**T**	**C**
Look up ideas and information	1	7	20	2	7	0	3	0
Watch videos	1	5	17	4	10	0	3	0
Look up word meanings	3	4	16	3	5	0	7	2
Record student voices	11	8	14	1	2	0	4	0
Create stories	5	7	21	2	1	0	4	0
Learn Sentence construction	3	6	16	1	5	1	7	1
Practice reading and/or comprehension	3	5	14	3	8	0	6	1
Answering assessment questions.	5	6	17	1	4	1	5	1

Table 6.4a Challenging conditions that limit teaching (English)

Challenges in use of computers	**A lot**		**Some**		**A little**		**Not at all**		**Not**	
	T	**C**	**T**	**C**	**T**	**C**	**T**	**C**	**T**	**C**
Shortage of computer hardware.	9	3	16	4	4	1	2	0	0	1
Shortage of computer software.	8	4	13	2	8	2	2	0	0	1
Shortage of support for using computers.	9	5	12	2	7	1	3	0	0	1

Shortage of textbooks for student use.	3	2	12	1	5	1	8	5	5	0
Shortage of other instructional equipment for students' use.	7	2	11	6	9	0	4	0	0	1
Shortage of equipment for your use in demonstrations and other exercises.	7	2	15	6	6	1	3	0	0	0
.Inadequate physical facilities.	4	1	19	3	5	3	1	1	2	1
Large class size.	8	2	10	4	6	0	7	3	0	0
.Lack of audio-visual aids.	11	5	16	2	2	1	2	0	0	1
Lack of support from peers and/or school administration.	5	0	9	3	9	3	8	2	0	1
Shortage of reference material (books, newspapers) in English.	9	2	12	0	7	3	2	3	1	1

Table 6.4b: Challenges with respect to students that limit teaching (English)

Challenges faced in teaching Math for class	**A lot**		**Some**		**A little**		**Not at all**		**Not applicable**	
	T	**C**	**T**	**C**	**T**	**C**	**T**	**C**	**T**	**C**
Students with different academic abilities	8	3	17	4	6	2	0	0	0	0
Students come from a wide range of backgrounds (example	15	4	13	4	1	0	2	1	0	0
Students with special needs (e.g., hearing, vision, speech	4	2	11	2	9	4	5	1	2	0
Uninterested students	3	0	15	5	9	4	3	0	1	0
Disruptive students	3	0	14	4	8	4	4	1	2	0

Table 6.5: Preparedness to teach English topics

How well prepared do you feel you are to teach the following topics?	Not well prepared		Somewhat prepared		Very well prepared		Not applicable	
	T	C	T	C	T	C	T	C
Comprehension	0	0	9	4	22	5	0	0
Note Taking	0	1	13	1	17	5	1	2
Practicing Social Conversation	2	2	11	5	17	1	1	1
Understanding and speaking for functional purposes (directions, instructions)	2	0	7	4	22	5	0	0
Describing / narrating / reporting	1	1	10	2	20	5	0	1
Debating / Presenting an argument	2	1	12	3	15	5	2	0
Grammatical correctness	1	0	8	3	22	6	0	0
Appropriate communication	1	0	11	3	19	5	0	1
Polite expressions	1	1	6	3	24	5	0	0
Literal and figurative speech	0	1	19	4	11	4	1	0
Literary language	2	2	13	3	14	4	2	0

Table 6.6: Types of interactions with other teachers (English)

Did you have the following types of interactions with other teachers either in	In my School		In Telegram		Both in School and in		Neither in school nor in	
	T	C	T	C	T	C	T	C
Discussions about how to teach a particular concept	21	8	2	0	7	0	1	1

Working on preparing instructional materials	24	7	1	0	4	1	2	1
Did you have the following types of interactions with other teachers either in	**In my School**		**In Telegram**		**Both in School and in**		**Neither in school nor in**	
	T	**C**	**T**	**C**	**T**	**C**	**T**	**C**
Visits to another teacher's classroom to observe his/her teaching	19	5	2	0	4	0	6	4
Informal observations of my classroom by another teacher	26	7	2	0	2	0	1	2
Working on preparing lesson plans	21	6	2	1	5	0	3	2
Discussions with other teachers on children's learning and experience	18	7	2	0	11	0	0	2
Clarifying doubts about the subject	18	8	3	0	10	1	0	0
Sharing resources or teaching ideas	14	8	4	0	13	1	0	0
Asking or answering on how to use technology in the class	11	7	5	0	11	1	4	1
Sharing experiences	14	7	2	1	15	1	0	0

Table 6.7a: Participation in TPD during last year (English)

During the last year, have you participated in professional development training/workshops (other than CLIx) in the following?	**Yes**		**No**	
	T	**C**	**T**	**C**
English curricular content.	16	6	15	3
English pedagogy/instruction.	17	6	14	3
Integrating information technology into English Teaching.	17	4	14	5

Improving students' critical thinking or problem solving skills.	16	5	15	4
Methods of Assessment.	15	6	16	3
ICT Training	16	4	15	5

Table 6.7b: Topics of TPD needed by English teachers

How strongly do you feel the need to have the following included as part of the English Teacher Professional Development Course?	**I strongly need training in this**		**I need some training in this**		**I don't need training in this**	
	T	**C**	**T**	**C**	**T**	**C**
Subject understanding	6	2	13	3	12	4
Pedagogical tools and techniques	6	2	16	4	9	3
Integration of technology in teaching	12	3	12	4	7	2
Student Assessments	4	3	15	1	12	5

Table 6.7b: Topics of TPD needed by English teachers

I would like teacher professional development to be offered in the form of	**Yes**		**No**	
	T	**C**	**T**	**C**
Face to face lectures	25	9	6	0
Computer based training sessions	27	8	4	1
Interactions with other teachers (peer learning)	30	7	1	2
Referring to books, magazines	29	9	2	0
Hands-on activities for teachers	29	8	2	1

Table 7.1a: Beliefs about teaching Math

I feel that teaching Maths is about:	Strongly agree		Agree		No opinion		Disagree		Strongly Disagree	
	T	C	T	C	T	C	T	C	T	C
Practicing lot of similar problems	8	2	10	3	0	0	2	0	4	1
Memorizing the rules and procedures	15	2	6	3	0	0	3	1	0	0
Completing the content given in the textbook	3	0	9	2	1	0	5	2	6	2
Trying out different types of problems	16	5	6	0	1	0	1	1	0	0
Connecting with students' experiences	17	5	5	1	1	0	1	0	0	0
Understanding connections between different Mathematical concepts	17	4	6	1	1	0	0	1	0	0
Arriving at correct answers.	17	4	5	1	2	0	0	1	0	0
Practicing calculations.	19	4	4	1	0	0	1	0	0	1
Learning to reason and solve problems.	19	6	5	0	0	0	0	0	0	0

Table 7.1b: Math teachers' practices in classroom for students

During this academic session, during teaching Mathematics to the students in the class 9, how often did you usually ask them to do the following	Never		Some lessons		About half the lessons		Almost every lesson	
	T	C	T	C	T	C	T	C
Practice adding, subtracting, multiplying, and dividing without using a calculator	4	0	2	2	2	1	16	3
Work on fractions and decimals	0	0	11	1	4	1	9	4
Use knowledge of the properties of shapes, lines and angles to solve problems	1	0	12	5	5	0	6	1

Interpret data in tables, charts or graphs	0	0	18	2	2	1	4	3
During this academic session, during teaching Mathematics to the students in the class 9, how often did you usually ask them to do the following	**Never**		**Some lessons**		**About half the lessons**		**Almost every lesson**	
	T	**C**	**T**	**C**	**T**	**C**	**T**	**C**
Write equations and functions to represent relationships	1	0	16	4	1	0	6	2
Memorize formulas and procedures	0	0	6	2	2	0	16	4
Apply facts, concepts and procedures to solve routine problems	0	0	5	0	2	0	17	6
Explain their answers	1	0	4	2	4	0	15	4
Relate what they are learning in mathematics to their daily lives	0	0	7	2	4	0	13	4
Decide on their own procedures for solving complex problems	1	0	12	3	4	1	7	2
Work on problems for which there is no immediately obvious method of solution	1	0	16	3	2	1	5	2
Work together in small groups	0	0	16	3	1	1	7	2

Table 7.2a: Beliefs about Math learning

Beliefs about Maths learning	**Strongly agree**		**Agree**		**No opinion**		**Disagree**		**Strongly Disagree**	
	T	**C**	**T**	**C**	**T**	**C**	**T**	**C**	**T**	**C**
Students who find math difficult do not have the ability to do mathematics	1	0	4	0	1	1	9	1	9	4
Students who stick to the procedures told in class do well in maths	3	1	12	4	3	0	5	1	1	0
Geometry does not have any practical use for our students	1	0	4	2	0	0	7	0	12	4

Boys are better at doing mathematics than girls.	1	0	5	1	3	1	6	0	9	4
Games and activities are suitable for primary school maths, not for high school maths	8	0	7	4	2	1	5	0	2	1
Discussions in class disrupt discipline and distract students.	3	0	4	2	0	0	7	0	10	4
Students can come up with mathematical solutions on their own without being told the procedure to solve the problem first.	2	1	17	2	1	0	4	3	0	0
Students' mistakes should be corrected by teachers, as soon as they are made.	17	4	6	1	0	0	1	0	0	1
Teaching Mathematics is difficult.	1	0	4	0	3	0	5	0	11	6
Continuous comprehensive evaluation of students is not useful in improving students' learning.	3	0	7	1	4	0	8	1	2	4
Mathematics as a subject is not useful for all students and they should be allowed to opt not to study it.	1	0	6	0	3	0	2	1	12	5
I feel the need to refresh and deepen my knowledge of mathematics to improve my teaching.	9	3	12	2	1	0	1	0	1	1
Students need to engage in a lot of practice to learn mathematics.	12	4	10	1	1	0	1	1	0	0
Students should be allowed to use calculators to find solutions.	0	0	9	2	3	0	4	1	8	3

Table 7.2b: Beliefs about classroom practices in Math

In the Mathematics classroom that I teach	**Strongly agree**		**Agree**		**No opinion**		**Disagree**		**Strongly Disagree**	
	T	**C**	**T**	**C**	**T**	**C**	**T**	**C**	**T**	**C**
I have no time to do additional activities, because I have to cover all the content in the textbook.	11	1	11	4	0	0	1	0	1	1
Students need to know only the standard procedures because alternative procedures confuse	4	0	9	3	0	0	6	2	5	1
Connecting maths taught with out-of-school situations is not useful.	0	0	5	0	2	0	9	1	8	5

When students make mistakes, the best remedy is to give them repeated practice of similar problems.	1	0	4	1	5	1	6	1	8	3
Only one concept is taught at a time because discussing many concepts together confuses students.	12	3	10	2	1	0	1	1	0	0
I suggest some simple questions for students poor in mathematics to help them pass in examination.	6	3	12	1	0	1	5	0	1	1

Table 7.2c: Frequency of classroom practices in Math

In the Mathematics classroom:	**Always**		**Frequently**		**Sometimes**		**Never**	
	T	**C**	**T**	**C**	**T**	**C**	**T**	**C**
I solve one/two problems on the board & ask students to solve the rest of the textbook exercises in their notebooks	7	1	4	0	11	3	2	2
I do learning activities (games, puzzles, materials) with	6	1	3	3	14	2	1	0
I do activities that involve group work that allow students to see, share and discuss their class work/maths problem solutions with each other	7	1	5	1	11	4	1	0
I maintain silence/ discipline because students must concentrate and individually do	15	4	3	1	4	1	2	0
I encourage students to come up with their own ideas about how to solve problems.	9	3	12	1	3	2	0	0
I use teaching learning materials and aids like paper folding, charts etc.	4	3	4	1	15	2	1	0
I use Information and Communication Technology (ICT) for teaching mathematics.	4	1	4	0	16	5	0	0

Table 7.3a: Views about using technology in Math teaching

What are your views about using technology in your subject teaching?	Strongly agree		Agree		Disagree		Strongly Disagree	
	T	C	T	C	T	C	T	C
Slow Learners get left out in Lab sessions	4	0	13	3	6	2	1	1
Watching videos is more useful than interactives on	7	2	10	2	5	1	2	1
Fear of committing mistakes increases with computer-	2	0	12	3	5	3	5	0
Computer-aided lessons should be optional only.	6	1	12	4	5	1	1	0
I do not like my students asking questions or interacting with each other during the Lab classes	0	0	6	2	5	0	13	4
Children are more interested in solving problems after CLIx class in Mathematics.	6	2	14	2	4	1	0	1

Table 7.3b: Topics for which computer was used to teach in Math

For which of the following topics, did you use computers in the last year?	Yes		No	
	T	C	T	C
Algebra	8	0	16	4
Proportional reasoning	12	0	12	4
Commercial Mathematics	2	0	22	4
Geometric Reasoning	15	0	9	4

Linear Equation	7	0	17	4

Table 7.3c: Activities for which computer was used in teaching Math

In this academic year, while teaching Mathematics to class 9, how often have you used a computer for the following activities?	Never		Sometimes		Often		Always	
	T	C	T	C	T	C	T	C
Practice solving mathematics problems	9	5	14	0	0	1	1	0
Play mathematics based games	3	4	16	2	4	0	1	0
Learn new mathematical concepts	6	2	12	3	4	1	2	0
For mathematical calculations	9	5	13	0	1	1	1	0
Making Graphs	11	4	9	1	2	1	2	0
Analyzing Data	8	4	12	1	1	1	3	0
Making Geometric figures	5	4	14	0	2	2	3	0
Watching instructional videos	7	3	13	2	4	1	0	0
Answering Assessment questions	9	4	13	1	1	1	1	0

Table 7.4a: Challenging conditions that limit teaching (Math)

Challenges in use of computers	A lot		Some		A little		Not at all		Not	
	T	C	T	C	T	C	T	C	T	C
Shortage of computer hardware	10	1	8	3	1	0	4	2	1	0
Shortage of computer software	5	3	12	2	4	1	3	0	0	0
Shortage of support for using computers	9	3	7	1	6	1	2	1	0	0
Shortage of textbooks for student use	3	1	7	1	4	3	9	1	1	0
Shortage of other instructional equipment for	5	2	11	1	6	2	2	0	0	1

Shortage of equipment for your use in	7	2	9	2	5	1	3	1	0	0
Inadequate physical facilities	7	1	13	2	3	1	1	2	0	0
Large class size.	7	3	9	1	3	0	4	2	1	0

Table 7.4b: Challenges with respect to students that limit teaching (Math)

Challenges faced in teaching Math for class 9	A lot		Some		A little		Not at all		Not applicable	
	T	C	T	C	T	C	T	C	T	C
Students with different academic abilities	9	2	10	2	4	2	0	0	1	0
Students come from a wide range of backgrounds (example economic, language).	5	3	9	1	7	0	1	2	2	0
Students with special needs (e.g., hearing, vision, speech impairment, physical disabilities, mental or emotional/psychological impairment)	6	4	7	2	5	0	5	0	1	0
Uninterested students	8	4	9	1	5	1	1	0	1	0
Disruptive students	3	2	9	2	9	2	2	0	1	0

Table 7.5: Preparedness to teach Math topics

How well prepared do you feel you are to teach the following topics?	Very well		Somewhat		Not well		Not applicable	
	T	C	T	C	T	C	T	C
Simple linear equations and inequalities, and simultaneous (two variables) equations	21	4	2	2	1	0	0	0
Direct and inverse proportion	19	5	4	1	1	0	0	0

Geometric properties of angles and geometric shapes (triangles, quadrilaterals, and other common polygons)	20	5	4	1	0	0	0	0
Congruent figures and similar triangles	14	4	10	1	0	1	0	0
Relationship between three–dimensional shapes and their two-dimensional representation	12	3	10	2	1	1	1	0
Using appropriate measurement formulas for perimeters, circumferences, areas of circles, surface areas and volumes	19	4	5	2	0	0	0	0
Cartesian plane - ordered pairs, equations, intercepts, intersections, and gradient Translation, reflection, and rotation	10	0	13	5	0	1	1	0

Table 7.6: Types of interactions with other teachers (Math)

Did you have the following types of interactions with other teachers either in your school or in your Telegram (COP) group?	**In my School**		**In Telegram**		**Both in School and in Telegram**		**Neither in school nor in Telegram**	
	T	**C**	**T**	**C**	**T**	**C**	**T**	**C**
Discussions about how to teach a particular concept	12	5	3	0	4	1	5	0
Working on preparing lesson plans	15	5	2	0	3	0	4	1
Visits to another teacher’s classroom to observe his/her teaching	13	5	0	0	0	0	11	1
Informal observations of my classroom by another teacher	13	6	2	0	1	0	8	0
Working on preparing instructional materials	15	4	3	0	1	1	5	1
Discussions with other teachers on children’s	18	5	2	0	2	1	2	0

learning and experience								
Clarifying doubts about the subject	13	5	3	0	3	1	5	0
Sharing resources or teaching ideas	15	5	2	0	4	1	3	0
Asking or answering on how to use technology in the class	13	5	2	1	6	0	3	0
Sharing experiences	15	5	2	0	6	1	1	0

Table 7.7a: Participation in TPD during last year (Math)

During the last year, have you participated in professional development training/workshops (other than CLIx) in the following?	Yes		No	
	T	C	T	C
Mathematics content	9	4	15	2
Mathematics pedagogy/instruction	9	4	15	2
Mathematics curriculum	11	2	13	4
Integrating information and communication technology into mathematics	11	1	13	5
Improving students' critical thinking or problem solving skills	8	2	16	4
Mathematics assessment	10	2	14	4
ICT training	12	3	12	3

Table 7.7b: Topics of TPD needed by Math teachers

Need to have the following included as part of the Math TPD Course	I strongly need training in this		I need some training in this		I don't need training in this	
	T	C	T	C	T	C
Subject understanding	3	0	13	5	8	1
Pedagogical tools and techniques	4	1	13	4	7	1
Integration of technology in teaching	6	3	9	3	9	0
Student Assessments	1	0	6	4	17	2

Table 7.7c: Form of TPD preferred by Math teachers

I would like teacher professional development to be offered in the form of	Yes		No	
	T	C	T	C
Face to face lectures	18	4	6	2
Computer based training sessions	21	6	3	0
Interactions with other teachers (peer learning)	24	5	0	1
Referring to books, magazines	22	5	2	1
Hands-on activities for teachers	23	5	1	1

Table 8.1a: Beliefs about teaching Science

Science teaching is about	Strongly agree		Agree		No opinion		Disagree		Strongly	
	T	C	T	C	T	C	T	C	T	C
Carrying out experiments	23	4	5	2	0	0	0	0	1	0
Memorizing the textbook	14	5	14	1	1	0	0	0	0	0

Learning new terminology	24	6	5	0	0	0	0	0	0	0
Connecting Science with	24	6	4	0	0	0	0	0	1	0
Understanding connections	23	4	5	2	0	0	1	0	0	0
Learning to collect data and	20	6	7	0	0	0	1	0	1	0
Thinking and reasoning	24	6	5	0	0	0	0	0	0	0

Table 8.1b: Science teachers' practices in classroom for students

During this academic session, during teaching science to the students in Class 9, how often did you usually ask them to do the following?	Never		Some lessons		About half the lessons		Every or almost every lesson	
	T	C	T	C	T	C	T	C
Observe natural phenomena and describe what they see	1	0	19	4	2	2	7	0
Watch me demonstrate an experiment or investigation	1	0	22	4	2	1	4	1
Design or plan experiments or investigations	2	0	18	5	5	0	4	1
Conduct experiments or investigations	2	0	19	4	4	1	4	1
Work together in small groups on experiments or investigations	4	0	16	4	6	0	3	2
Read their textbooks or other resource materials	1	0	14	1	3	0	11	5
Have students memorize facts and principles	1	1	13	2	3	1	12	2

Use scientific formulae and laws to solve routine problems	1	3	15	0	1	0	12	3
Give explanations about something they are studying	1	0	4	1	5	0	19	5
Relate what they are learning in science to their daily lives	1	0	6	1	4	0	18	5
Sometime deal with questions which are not the part of regular classroom discourse	1	1	15	3	2	0	11	2

Table 8.2a: Beliefs about Science learning

Beliefs about learning Science	**Strongly agree**		**Agree**		**No opinion**		**Disagree**		**Strongly Disagree**	
	T	**C**	**T**	**C**	**T**	**C**	**T**	**C**	**T**	**C**
Students who find Science difficult do not have the ability to learn Science	2	0	8	1	0	0	6	1	13	4
Students who stick to the procedures told in class do well in Science.	9	1	14	3	2	0	3	2	1	0
Boys are better at doing Science than girls.	3	0	6	1	3	1	6	0	11	4
Games and activities are suitable for primary school, not for high school classes.	7	1	11	1	0	1	6	1	5	2
Discussions in class disrupt discipline and distract students.	5	0	4	3	1	0	11	1	8	2

Students can learn on their own, if given guidance.	12	3	14	3	0	0	2	0	1	0
Students should be corrected for mistakes they make, as soon as they make these mistakes.	20	3	6	3	0	0	1	0	2	0
Teaching Science is difficult.	5	0	2	3	0	0	3	3	19	0
We should spend more time teaching subjects other than Science.	1	0	4	2	6	1	1	1	17	2
I need to improve my concepts, so that I can teach Science better.	13	3	10	2	2	1	3	0	1	0
Students need exposure to new discoveries, history of science to make sense of the existing knowledge in the textbooks.	19	4	7	2	0	0	2	0	1	0

Table 8.2b: Beliefs about classroom practices in Science

In the Science classroom	**Strongly agree**		**Agree**		**No opinion**		**Disagree**		**Strongly Disagree**	
	T	**C**	**T**	**C**	**T**	**C**	**T**	**C**	**T**	**C**
I have no time to do additional activities, because I have to cover all content in the textbook.	4	1	14	3	0	0	4	2	7	0
Students need to know only the standard procedures because alternative procedures confuse them	4	1	7	1	4	2	6	0	8	2
Connecting Science with out-of-school contexts is not useful	0	1	2	0	1	1	7	1	19	3

When students make mistakes, the best remedy is to give them repeated practice of similar problems.	15	3	12	3	0	0	2	0	0	0
Only one concept is taught at a time because discussing many concepts together confuses students.	13	3	8	1	1	0	6	1	1	1
Making students give personal opinions about the content is not useful.	2	1	6	1	4	1	4	2	13	1

Table 8.2c: Frequency of classroom practices in Science

In the Science classroom	**Always**		**Frequently**		**Sometimes**		**Never**	
	T	**C**	**T**	**C**	**T**	**C**	**T**	**C**
I solve one/two exercise and ask students to solve the rest.	5	1	4	3	16	2	4	0
I do learning activities (games, puzzles, quizzes) with students	7	1	3	2	19	3	0	0
I do activities that involve group work that allow students to see, share and discuss their class work solutions with each other	10	0	2	2	17	4	0	0
I maintain silence/ discipline because students must concentrate and individually work	14	3	7	3	6	0	2	0
I encourage students to come up with their own ideas about how to solve problems.	12	1	11	4	6	1	0	0

I use charts, models as teaching materials.	15	1	5	3	9	2	0	0

Table 8.3a: Views about using technology in Science teaching

What are your views about using technology in your subject teaching?	**Strongly agree**		**Agree**		**Disagree**		**Strongly Disagree**	
	T	**C**	**T**	**C**	**T**	**C**	**T**	**C**
Slow Learners get left out in Lab sessions	6	1	10	2	5	2	8	1
Watching videos is more useful than interactives on computers.	12	1	10	4	5	1	2	0
Fear of committing mistakes increases with computer-aided	0	2	6	2	11	1	12	1
Computer-aided lessons should be optional only.	4	2	13	1	8	2	4	1
I do not like my students asking questions or interacting with each other during the Lab classes	2	0	5	2	8	2	14	2

Children ask more questions after Science CLIx classes	10	2	16	4	1	0	2	0

Table 8.3b: Topics for which computer was used to teach Science

For which of the following topics, did you use computers in the last year	Yes		No	
	T	C	T	C
Motion	21	2	8	4
Light	9	2	20	4
Sound	12	2	17	4
Astronomy	15	2	14	4
Ecosystem	10	2	19	4
Respiration	10	1	19	5
Health and Disease	13	2	16	4
Chemical equation	9	1	20	5
Atomic Structure	14	2	15	4
Magnetism	5	2	24	4

Table 8.3c: Activities for which computer as used in teaching Science

How often did you use computers to teach the following topics	Never		Sometimes		Often		Always	
	T	C	T	C	T	C	T	C
Look up ideas and information	2	1	13	4	12	1	2	0
Process and analyze data	6	2	15	3	5	1	3	0
Watch and analyze videos	3	1	16	4	6	1	4	0

Play games	9	4	14	1	5	1	1	0
Work with Simulation	11	2	11	3	5	1	2	0
Record and analyze their voice	15	3	9	2	2	1	3	0
Read lessons on computer	6	4	14	1	6	1	3	0
Answer assessment questions	7	1	11	4	8	1	3	0

Table 8.4a: Challenging conditions that limit teaching (Science)

Challenges in use of computers for teaching	**A lot**		**Some**		**A little**		**Not at all**		**Not applicable**	
	T	**C**	**T**	**C**	**T**	**C**	**T**	**C**	**T**	**C**
Shortage of computer hardware	11	2	8	1	7	2	3	1	0	0
Shortage of computer software	9	3	11	3	5	0	4	0	0	0
Shortage of support for using computers	17	5	3	1	3	0	6	0	0	0
Shortage of textbooks for student use	3	1	6	2	3	3	17	0	0	0
Shortage of other instructional equipment for students' use	10	3	9	2	1	1	9	0	0	0
Shortage of equipment for your use in demonstrations and other exercises	10	2	9	3	2	1	8	0	0	0
Inadequate physical facilities	14	3	8	2	5	1	2	0	0	0
Large class size.	12	1	5	2	2	1	9	1	1	1

Table 8.4b: Challenges with respect to students that limit teaching (Science)

Challenges in teaching Science	**A lot**	**Some**	**A little**	**Not at all**	**Not applicable**

	T	C	T	C	T	C	T	C	T	C
Students with different academic abilities	11	2	14	2	3	1	1	0	0	1
Students come from a wide range of backgrounds (example, economic, language)	12	1	11	3	6	2	0	0	0	0
Students with special needs (e.g., hearing, vision, speech impairment, physical disabilities, mental or emotional/psychological impairment).	12	1	5	3	10	1	2	0	0	1
Uninterested students	7	2	9	2	11	2	1	0	1	0
Disruptive students	6	1	10	3	9	0	2	1	2	1

Table 8.5a: Preparedness to teach Science (Biology)

Preparedness in teaching the following topics - Biology	Not well prepared		Somewhat prepared		Very well prepared		Not applicable	
	T	C	T	C	T	C	T	C
Role of variation and adaptation in survival/extinction of species in a changing environment	1	0	8	4	17	1	3	1
Interaction of living organisms and the physical environment in an ecosystem (energy flow, food web, effect of changes, cycling of materials)	0	0	6	2	22	4	1	0

Trends in human population and its effects on the environment	1	2	14	1	13	3	1	0
Impact of natural hazards on humans, wildlife, and the environment	1	0	7	3	20	3	1	0

Table 8.5b: Preparedness to teach Science (Physics)

Preparedness in teaching the following topics - Physics	**Not well prepared**		**Somewhat prepared**		**Very well prepared**		**Not applicable**	
	T	**C**	**T**	**C**	**T**	**C**	**T**	**C**
Basic properties/behaviors of light (reflection, refraction, light and color, simple ray diagrams) and sound (transmission through media, loudness, pitch, amplitude, frequency, relative speed of light and sound)	0	1	10	3	18	2	1	0
Forces and motion (types of forces, basic description of motion, use of distance/time graphs, effects of density and pressure)	0	0	11	4	17	2	1	0

Table 8.5bc: Preparedness to teach Science (Chemistry)

Preparedness in teaching the following topics - Chemistry	**Not well prepared**		**Somewhat prepared**		**Very well prepared**		**Not applicable**	
	T	**C**	**T**	**C**	**T**	**C**	**T**	**C**
Classification and composition of matter (properties of elements, compounds, mixtures)	1	0	7	3	21	3	0	0
Particulate structure of matter (molecules, atoms, protons, neutrons, and electrons)	0	1	8	2	21	3	0	0

Solutions (solvent, solute, concentration/dilution, effect of temperature on solubility)	1	1	13	2	15	3	0	0
Properties and uses of common acids and bases.	0	1	3	2	26	3	0	0
Chemical change (transformation of reactants, evidence of chemical change, conservation of matter, common oxidation reactions - combustion and rusting)	0	0	8	3	21	3	0	0

Table 8.6: Types of interaction with other teachers (Science)

Did you have the following types of interactions with other teachers either in your school or in your Telegram (COP) group?	**In my School**		**In Telegram**		**Both in School and in Telegram**		**Neither in school nor in Telegram**	
	T	**C**	**T**	**C**	**T**	**C**	**T**	**C**
Discussions about how to teach a particular concept	12	2	4	0	9	2	4	2
Working on preparing instructional materials	13	4	4	0	7	0	5	2
Visits to another teacher's classroom to observe his/her teaching	13	3	6	0	2	1	8	2
Informal observations of my classroom by another teacher	18	4	2	0	3	0	6	2
Working on preparing lesson plans	22	4	6	0	0	0	1	2
Discussions with other teachers on children's learning and experience	16	4	2	0	10	2	1	0
Clarifying doubts about the subject	14	2	2	1	11	3	2	0
Sharing resources or teaching ideas	15	3	3	0	11	2	0	1

Asking or answering on how to use technology in the class	15	2	3	0	10	2	1	2
Sharing experiences	11	3	4	0	14	2	0	1

Table 8.7a: Participation in TPD during last year (Science)

During the last year, have you participated in professional development training/workshops (other than CLIx) in the following?	Yes		No	
	T	C	T	C
Science content	15	3	14	3
Science pedagogy/instruction	12	3	17	3
Science curriculum	15	3	14	3
Integrating information technology into science	13	2	16	4
Improving students' critical thinking or inquiry skills	15	2	14	4
Science assessment	12	2	17	4
ICT training	13	3	16	3

Table 8.7b: Topics of TPD needed by Science teachers

Need for TPD	**I strongly need training in this**		**I need some training in this**		**I don't need training in this**	
	T	**C**	**T**	**C**	**T**	**C**
Subject understanding	3	0	13	3	13	3

Pedagogical tools and techniques	4	0	14	4	11	2
Integration of technology in teaching	6	1	13	5	10	0
Student Assessments	3	0	9	3	17	3

Table 8.7c: Form of TPD preferred by Science teachers

For of TPD	**Yes**		**No**	
	T	**C**	**T**	**C**
Face to face lectures	24	5	5	1
Computer based training sessions	24	6	5	0
Interactions with other teachers (peer learning)	26	6	3	0
Referring to books, magazines	26	5	3	1
Hands-on activities for teachers	28	6	1	0

11. PRINCIPALS SURVEY

11.1. Demographics

Age: 46.88 percent of the principals in Rajasthan were above 50 years old. 40.62 percent of the principals were in the age group of 40 to 49 years. 12.5 percent of the principals were in the age group of 30 to 39 years

Gender: 78.12 percent of the principals were male and 21.88 percent were females

Social Category: 65.62 percent of the principals in Rajasthan belonged to the General category, 25 percent belonged to the OBC category, 6.25 percent belonged to the SC category and 3.12 percent belonged to the ST category

11.2. Access to Technology

75 percent of the principals accepted that they had full time access to the internet. 18.75 percent of the principals had limited access to the internet while 6.25 percent of principals had no access to the internet. 71.87 percent of the principals had access to a computer or a portable computer device.

15.62 percent of the principals had no access to a computer or any other portable computer device. 12.5 percent of the principals stated that they could access a computer through one of their family members

11.2.1. Usage of Technology by Principals

Questions were asked regarding the regularity and purpose of usage of applications such as Facebook and WhatsApp to the principals. Questions were also asked about the level of usage of these Applications. 56.25 percent of the principals claimed that they were avid users of applications such as WhatsApp, Facebook etc. 37.5 percent of the principals claimed that they used it occasionally.

Table 11.1: Purpose and Regularity of Usage by Principals

I use WhatsApp, messenger, Facebook...	On a daily basis	On a weekly basis	Rarely	Not Applicable
To communicate with Teachers	71.88	12.5	12.5	3.12
To communicate with other Principals	56.25	28.12	15.62	0
To communicate with Education Officials	43.75	31.25	25	0
To communicate with Superiors/Higher ups in the district/state level	15.62	25	46.88	12.5
To communicate with Family	56.25	18.75	25	0
To communicate with Friends	46.88	25	25	3.12

71.88 percent of the principals stated that they used applications such as WhatsApp, Messenger etc to communicate with teachers on a daily basis. 56.25 percent of the principals accepted to using these applications to communicate with other principals on a daily basis while 28.12 percent used them on a weekly basis.
43.75 percent of the principals stated that they used these applications to communicate with education officials on a daily basis while 31.25 percent used them on a weekly basis.

46.88 percent of the principals accepted that they rarely used these applications to communicate with their superiors. 56.25 and 46.88 percent of the principals accepted that they used these applications on a daily basis to communicate with their family and friends respectively.

11.3. Beliefs about Use of Technology in Education

Questions were asked about the importance of different stakeholders in the adoption of technology in education.

Table 11.2: Stakeholders' importance for adoption of technology as per Principal

Rank Conferred	Computer Teacher	Class Teacher	Subject Expert	School Principal
Rank 1	40.62	9.38	15.62	34.38
Rank 2	4	8	13	7
Rank 3	18.75	40.62	34.38	6.25
Rank 4	28.12	25	9.38	37.5

The principals conferred the highest importance to the computer teacher in the adoption of technology in education. The second most important professional in the adoption of technology in education was conferred to the Subject Expert. The third most important professional was conferred to the Class teacher. The least important professional in the adoption of technology in education was conferred to the School Principal.

11.4. Role of Technology in Improving Education

Table 11.3: Principals' views on role of technology in education

How technology can help improve education in each of the following areas?	Strongly Agree	Agree	Disagree	Strongly Disagree
To improve student's board exam results	28.12	68.75	3.12	0
To deepen student's understanding about a particular subject	28.12	71.88	0	0
To practice the work they have done in the class	25	71.88	3.12	0
To make classroom interesting and enjoyable	31.25	68.75	0	0
To prepare students for future jobs	59.38	40.62	0	0
To increase student's knowledge of the world	40.62	56.25	3.12	0
To increase teacher's knowledge about the subject and how it can be taught	28.12	71.88	0	0
To complement teachers' efforts in the class	25	71.88	3.12	0

96.87 percent of the principals believed that technology can help improve student's board exam results. All principals agreed and strongly agreed with the view that technology can help deepen a student's understanding of a particular subject. 96.88 percent principals agreed and strongly agreed with the view that technology can help them practice work they have done in the class. Almost all principals agreed and strongly agreed with the rest of the questions asked in this section.

11.5. Factors Facilitating Technology Integration in Schools

Table 11.4: Factors helpful in integration of technology in Schools (Principals)

Factors Helpful in Integration of Technology in Schools	Very helpful	Helpful	Unhelpful	Very unhelpful
Teacher support to integrate technology	28.12	71.88	0	0
Support of education officials in technology integration	53.12	43.75	3.12	0
Support in handling repairs	21.88	65.62	12.5	0
Support in classroom management and batching of	9.38	84.38	6.25	0
Support in teacher training management	18.75	81.25	0	0
Support in ensuring lab functionality	12.5	84.38	3.12	0
Support in maintaining teacher motivation	15.62	81.25	3.12	0
Support in using fund for repairs	6.25	78.12	15.62	0

Most of the principals found the support of teachers and education officials would be helpful or very helpful in integration of technology in schools. 87.5 percent of the principals reported that a support in handling repairs would be helpful or very helpful in the integration of technology in schools.

Almost all principals reported that a support in classroom management and batching, teacher training management, ensuring lab functionality and maintaining teacher motivation would be helpful or very helpful in integration of technology in education. 84.37 percent of the principals thought that a support in using funds for repairs would be helpful in integration of technology in education. 53.12 percent of the principals thought that support of education officials to the integration of technology were the most critical factor in the integration of technology followed by support of teachers (28.12 percent) and support in handling repairs (21.88 percent).

11.6. Concerns Related to Integration of Technology in School Education

Table 11.5: Concerns related to integration of technology (Principals)

Concerns	Strongly Agree	Agree	Disagree	Strongly Disagree
The use of technology in school will disturb the existing teacher-student relationship	9.38	84.38	6.25	0
Using technology in schools will add to my workload.	3.12	28.12	65.62	3.12
The use of technology will increase the time taken for completing the School Curriculum	3.12	43.75	46.88	6.25
Technology is likely to replace teachers from their job.	3.12	21.88	68.75	6.25
The school has inadequate physical space for integrating technology in the daily practice.	12.5	37.5	46.88	3.12
The school has inadequate resources of devices and electricity for the integration of technology in the daily	6.25	59.38	34.38	0
The school has inadequate teachers for the integration of technology in schools	15.62	59.38	25	0
Use of technology may not help to improve our board results.	0	21.88	71.88	6.25
I do not have access to dedicated human resources that can help me to integrate technology in my school.	3.12	53.12	43.75	0

Almost all principals reported that it is extremely important to integrate technology in high schools. 93.76 percent of the principals agreed to the concern that technology would disturb the teacher student relationship. 68.74 percent of the principals disagreed to the statement that technology use would increase their workload.

A fifty-fifty split in opinions was observed to the concern that technology would increase the time taken to complete the school curriculum. 75 percent of the principals disagreed with the concern that technology would replace teachers in the future. 50 percent of the principals agreed that there was lack of physical space for the integration of technology in schools. 65.63 percent of principals acknowledged that there were inadequate resources of device and electricity in the schools. 75 percent of principals agreed that their school had inadequate teachers for the integration of

technology. 78.13 percent of the principals disagreed with the statement that technology integration may not improve board exam results. 56.24 percent of the principals agreed that they do not have access to adequate human resources to integrate technology in schools.

11.7. Effective Integration of Technology

Table 11.6: Initiatives by Principals to integrate technology in school

To integrate technology effectively at my school, I would like to...	Strongly Agree	Agree	Disagree	Strongly Disagree
Learn how technology is a better way of doing things compared to conventional methods of teaching.	6.25	93.75	0	0
Learn how technology has been integrated in other schools and how it can be implemented at my school.	12.5	84.38	0	3.12
Learn how students will respond to the use of technology in classroom learning and then promote effective uses at my school.	12.5	87.5	0	0
Learn how to integrate technology in classroom teaching	12.5	84.38	3.12	0
To integrate technology effectively at my school, I would like to make sure that the new CLIx program does not clash with other new and innovative programs at my school.	9.38	81.25	3.12	6.25

11.8. Dependency on Field Resource Coordinator

Table 11.7: Dependency on field resource coordinator

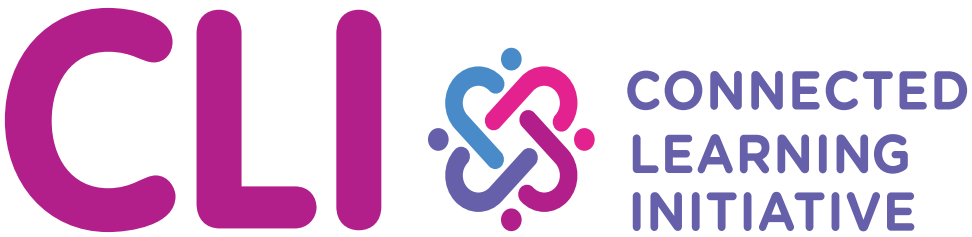
My dependency on field resource coordinator would be less...	Strongly Agree	Agree	Disagree	Strongly Disagree
If there is higher interest among the teachers with regard to utilisation of the digital content and resources provided.	18.75	78.12	3.12	0
If there is higher sense of ownership among teachers in the upkeep of lab functionality	12.5	71.88	15.62	0

If a few students take initiative basic CLIx related activities like student enrollment and logging	9.38	84.38	6.25	0
If there is easy to use reference material for basic troubleshooting	18.75	59.38	21.88	0

96.87 percent of the principals agreed that a higher interest among teachers with regards to utilization of digital content and resources provided would reduce their dependence on field resource. 93.76 percent of the principals agreed that student initiative in basic CLIx activities such as enrollment and logging would help reduce dependence.
84.38 percent of the principals agreed that a higher sense of ownership among teachers in the upkeep of lab functionality would reduce their dependence on field resource personnel. 78.13 percent of the principals thought that an easy to use reference material for basic troubleshooting would help reduce dependency

Key findings:

In Rajasthan, the following were the levels of internet penetration and access to computers observed; In terms of usage of applications such as Whatsapp, Messenger etc, 71.88 percent of principals agreed to use it to communicate with friends. Almost 84.38 percent of the principals agreed that they used these applications to communicate with teachers on a regular basis. In terms of importance of stakeholders in the integration of technology in education, most principals accorded the first rank to the Computer teacher. A positive perception of principals with respect to the role of technology in improving education emerged.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