CLI

CONNECTED LEARNING INITIATIVE

CLIx Intervention in Chhattisgarh

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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1. 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 Chhattisgarh. This report attempts to make a comparison between the schools that have implemented CLIx (Treatment group)[1] 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 Chhattisgarh 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 schools education and so on.

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

Table 1.1: Sample size for the survey in Chhattisgarh

Designation	Total Number
Students	466 (Treatment), 157 (Control)
Teachers	28 (Treatment), 9 (Control)
Principals	12 (Treatment)

1.1. Students survey in Chhattisgarh

In Chhattisgarh, a total of 466 students from the treatment schools and 157 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

[1] These were schools where an average of 0.7 modules were implemented in English and 1 module each in Maths and Science.

(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 (60.82 percent) while students from control schools tend to use it more often in their home (18.06 percent). 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 make mistake while using computer (65 percent) followed by the fear that they 'may break or damage' computer (63 percent). In control schools, students are mostly afraid of breaking a computer (65 percent) followed by the fear of making mistake (62 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 47% of the questions correctly and on an average student from the treatment group scored higher than those students from the control group in the mathematics assessment conducted.
- With respect to specific skills, on an average student from the treatment schools scored more than the control schools in the knowledge and application-based sections.
- Inequality in performance among treatment schools was lower across all skills except reasoning.

1.1.2. Performance of students in Science

- 53 percent of the questions were answered correctly by the students from treatment schools than those in control schools. 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 knowledge- based section.
- Inequality of performance in treatment schools was lesser across 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 scored better than students in the control schools for around 50% of the questions.
- Students from treatment schools performed better in both language specification and reading comprehension skills on an average, compared to control schools.
- Inequality of performance was higher among control schools for both language specification and reading comprehension.

1.1.4. Caste- Wise average scores

- In English, students from the BC category, General category and the 'Other' category in the treatment group displayed better performances and students from the General category BC and OBC performed better in the control group.

- In Mathematics, students from OBC category, the 'Other' Category and SC performed best in the treatment group. While in the control group, ST and OBC students showed the best performances.

- In Science, students from the OBC and 'Other' categories performed best in the treatment group and from the control group the OBC and BC categories showed better performances than the others.

1.2. Teachers' survey in Chhattisgarh

22% of teachers from treatment schools and 14% of teachers from control school reported never having used computers or laptops, while 72% of teachers from treatment utilized computers in the classrooms frequently as opposed to the 55% of teachers from the control group.

Teachers were also surveyed about their beliefs regarding the use of technology and majority reported (Treatment (T) - 93% & 100% / Control (C) - 77% & 96%) that computers have helped students create better projects and helped students grasp difficult concepts 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 (8 out of 10) reported that students were more confident to speak in English, Math teachers agreed that children were more interested in solving problems and Science teachers (6 out of 9) established that children began asking more questions.

Around 50% of treatment school teachers and 67% 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 Chhattisgarh

A larger percentage of principals in Chhattisgarh (33.33%) reported not having any access to computers, as opposed to only 25% of the principals who claimed to have had access to a computer. They were also asked about the importance that different stakeholders have with reference to integrating technology in education. The highest importance was given to subject experts followed by Computer Teacher, then Class teacher and lowest ranking was conferred to the School Principal.

With regard to perceiving the role technology plays in improving education, most principals agreed that digital devices can help improve student's board exam results (91.66%), deepen the student's understanding of the subject and can help them practice the work done in class. In terms of factors that help facilitate technology integration in school, most principals believed that receiving support from teachers and educational officials would be helpful, apart from that, they also found receiving support in handling reports be another very helpful factor in integrating technology into classrooms (91.67%).

Almost all of the principals also agree that it is essential to integrate technology in high schools, and a majority of them did not feel that technology would disturb the student teacher relationship (83.33%) or that it would increase workload (75%). 66.66 percent of principals agreed that their school had inadequate teachers for the integration of technology.

Principals were also asked to report their dependency on field resource and almost all of them believe that there would be a decrease on the field resource coordinator with the implementation of the CLIx program, dependency would also reduce if provided with easy reference material for basic troubleshooting, others also believed that dependency would reduce if teachers were more interested in utilizing digital content.

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 Chhattisgarh.

2.1. Demographics

In Chhattisgarh, a total[1] of 466 and 157 students were surveyed from Treatment and control schools respectively. Almost 46 percent of the students surveyed were girls. Approximately, 23 percent of the student 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 (49 percent) and control groups (42 percent). Students belonging to Scheduled Castes (SC) and Scheduled Tribes (ST) were in second majority in Treatment schools (18.16 percent) and control schools (22 percent) respectively.

2.1.1. Parental Education

Unlike control schools, Students from treatment schools are reported have higher level of education of 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. While 'Mother's unemployment' is higher in treatment (32.05 percent), 'Father's unemployment' is higher among control school (16.67 percent). While parents with regular salaried income is higher among control school, parents who are self-employed 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, control schools are reported having more of both the educational and economic assets in comparison to the treatment 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 Students

Items	Factors	Treatment				Control			
		Mean	SD	Min	Max	Mean	SD	Min	Max
Application based technology	F1= items 16, 17, 19, 20, 21, 23, 24, 25, 26, 27, 28	20	6	0	36	19	5	12	33
Basic technical skills	F2= items 1,2,3,5,7,8,9, 22	19	4	0	24	18	4	8	24

Internet based technology	F3=items 11,12,13,14,29,30	**Mean**	**SD**	**Min**	**Max**	**Mean**	**SD**	**Min**	**Max**
Items	**Factors**	**Treatment**				**Control**			
		Mean	**SD**	**Min**	**Max**	**Mean**	**SD**	**Min**	**Max**
Intermediate computer skills	F4= items 4,6,10	5.49	1	0	9	5.41	1	2	9

- 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.
- For the skill related to internet-based technology, students from both control and treatment, on an average has performed equally well.

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**				**Control**			
	Often	**Sometimes**	**Never**	**T.R.**	**Often**	**Sometimes**	**Never**	**T.R.**
At home	16.96	21.09	61.96	460	18.06	21.29	60.65	155
At school	60.82	33.12	6.06	462	40.38	42.95	16.67	156
In an N.G.O or resource centre	7.58	17.53	74.89	462	5.13	18.59	76.28	156
Elsewhere (e.g. Public kiosk, friends' home, internet cafe)	12.07	28.66	59.27	464	9.03	27.74	63.23	155

In Chhattisgarh, students from both 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 (60.82 percent), students from control schools tend to use it more often in their home (18.06 percent). Also, students from treatment schools, unlike the control schools, reported having used computers more often in a resource center (7.58 percent) and elsewhere like internet cafe (12.07 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 make mistake while using computer (65 percent) followed by the fear that they 'may break or damage' computer (63 percent). In control schools, students are mostly afraid of breaking a computer (65 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
9.96	3	10.24	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 Chhattisgarh, there is no difference in the preferred choice of courses by students from treatment and control schools. Majority of students from both treatment (41.87%) and control (43.51%) schools indicated that they would like to study Science after tenth. Second highest percent of students from treatment (24.05) and control (29.87) schools expressed that they have not decided what they want to do after tenth. 15.37% students from treatment schools want to study Arts followed by 9.8% 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, greater students from treatment were more aware of the academic qualification they wish to possess. Compared to treatment, more students from control (29.68 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 (28.54 percent) and control (23.87). (Refer Table A6 in Annexure 1)

Student Aspiration is analysed 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 13.95 percent students from Treatment are not sure about either the course or degree they wish to pursue after 10th, 64.16 percent are reported to be clear about both. In the control schools, on the other hand, fewer students (57.32 percent) are clear about both the choices and larger number of students (19.11 percent) tend 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 analysed 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 more than 30 percent of the students, in both treatment and control, have answered majority of the questions correctly.
- Approximately around 10 percent of the students in both treatment and control indicated option 'Don't Know, Can't Say' for most of the questions.
- Majority of the students belonging to the category of top 30 percent students in treatment schools, correctly answered 7 questions; Q2, Q3, Q5, Q6, Q10, Q13 and Q15. Q8 was the most difficult for the top 30 percent students. Among the bottom 30 percent, Q3 and Q10 was the easiest and Q12 was the most difficult.

For the control schools, Q3 and 15 were the easiest and Q14 was the most difficult for the top 30 percent students. But Q3 was also answered correctly by 71% in bottom 30% of treatment as compared to 26% in control. For the bottom 30 percent students, Q4 was the easiest and Q11 was the most difficult.

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

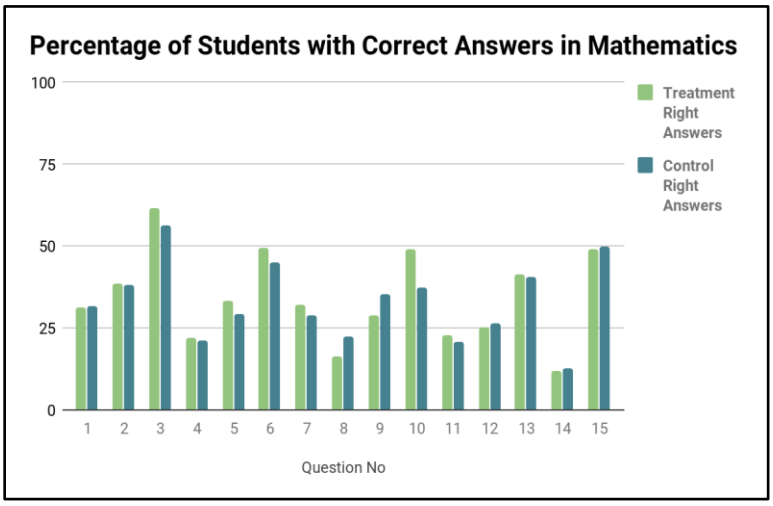
2 This analysis is not based on Item Discriminant analysis

Table 3.1: Itemised 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	Wrong	Don't Know	Right	Wrong	Don't Know	Top 30 %	Bottom 30%	Top 30 %	Bottom 30%
1	31.22	61.35	7.42	31.61	60.64	7.74	57	9	66	6
2	38.53	56.5	4.98	38.31	60.38	1.3	73	9	72	6
3	61.71	33.26	5.03	56.49	42.2	1.3	92	71	92	26
4	21.81	73.13	5.07	21.15	75	3.85	38	9	30	11
5	33.41	62.25	4.34	29.3	69.42	1.27	66	6	51	6
6	49.67	43.16	7.16	45.16	48.39	6.45	80	17	79	15
7	31.95	56.23	11.82	28.85	64.11	7.05	58	14	53	9
8	16.48	65.05	18.46	22.22	65.36	12.42	19	11	26	19
9	28.85	57.49	13.66	35.53	55.26	9.21	46	14	53	23
10	49.24	48.58	2.18	37.18	60.25	2.56	66	29	60	17
11	22.71	72.93	4.37	20.78	77.92	1.3	44	9	49	2
12	25.11	64.41	10.48	26.45	67.74	5.81	52	5	62	11
13	41.58	53.17	5.25	40.65	56.13	3.23	74	16	75	13
14	12.06	80.93	7.02	12.82	83.33	3.85	21	7	11	6
15	49.13	40.7	10.17	49.68	45.22	5.1	76	21	87	23
Total	466			157			140	140	47	47

- Out of 15 questions, students from treatment schools have out-performed those from control schools.
- At Least 50 percent of the students could correctly answer 4 questions.

Figure 1: Percentage of students with Correct Answers in Mathematics



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	100	33.67	19	0	86.66	32.65	19
Knowledge-based items	0	100	31.67	24	0	80	29.80	24
Application-based items	0	100	35.36	25	0	100	34.01	25
Reasoning-based items	0	100	33.99	23	0	100	34.14	25

Total Score:

- On an average, students from treatment schools performed better in Math
- Highest marks obtained was 100 in case of Treatment schools.

Knowledge-based items:

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

- Highest score obtained was 100 and 80 percent for treatment and control respectively.

Application-based items:

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

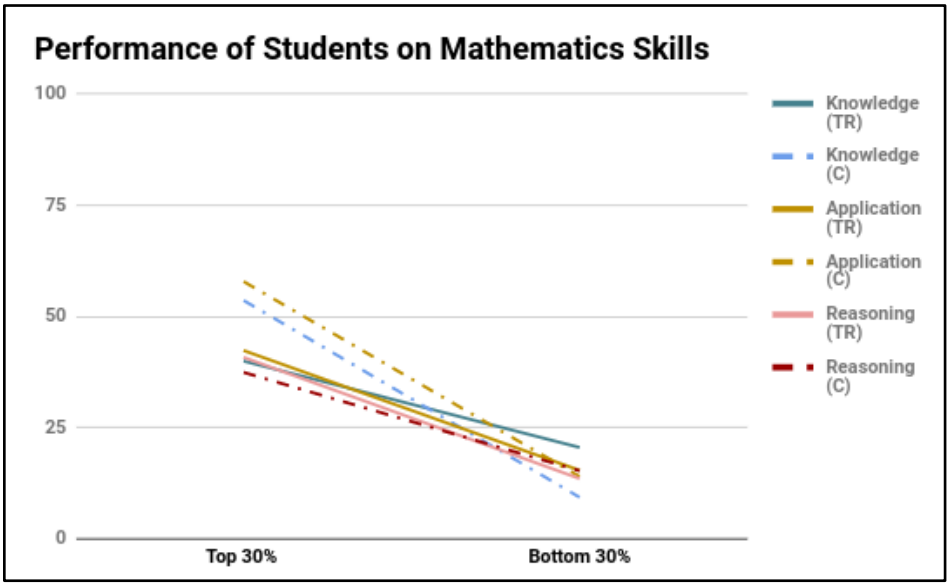
Reasoning-based items:

- On average, students from control scored better than the treatment schools
- 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 vary across the groups. Performance graphs constitutes 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 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 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 more than the top 30 percent in the control schools. On the other hand, students from the bottom 30 percent in the treatment have scored less than the bottom 30 percent in the control schools

Inequality of performance was higher among treatment group.

3.2. Performance of students in Science

3.2.1. Question specific analysis of student response

- By and large 30 percent of the students from Control and Treatment schools have answered majority of the questions correctly.
- More than 10 percent of the students in both treatment and control indicated option 'Don't Know Can't Say' approximately for almost 40 percent of the questions.
- In top 30% of the students in treatment school, above 65% of the students found questions Q3, Q7, 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. For the bottom 30 percent, Q4, Q6, Q13 and Q14 are the most difficult questions.
- For the top 30 percent students in the control schools, Q6 turned out to be the most difficult. In the bottom 30 percent of the control schools, Q11 and Q12 are the most difficult questions.

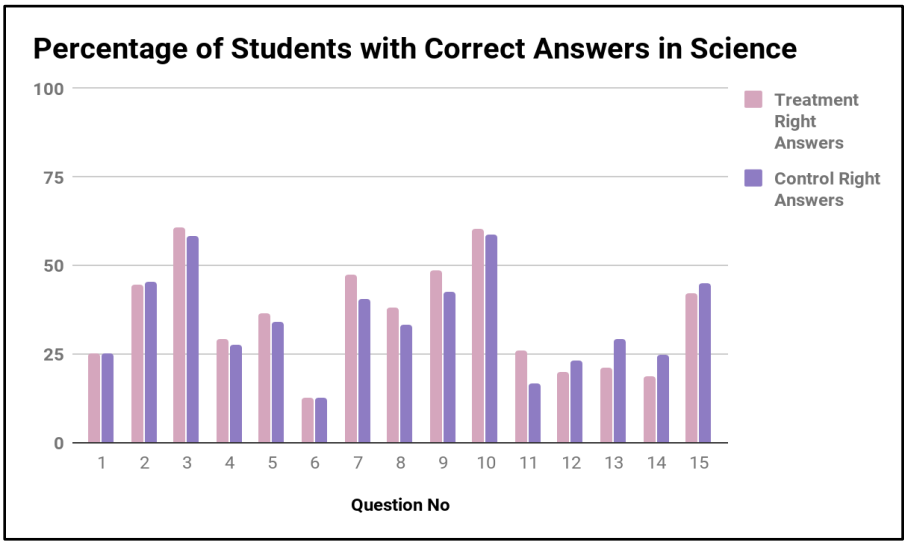
The table below gives a detailed understanding of how students performed on each item.

Table 3.3: Itemised 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	Wrong	Don't	Right	Wrong	Don't	Top 30	Bottom	Top 30	Bottom

			Know			Know	%	30%	%	30%
1	25.33	62.45	12.23	25.32	62.99	11.69	34	16	38	11
2	44.57	48.91	6.52	45.45	50.65	3.9	61	24	72	26
3	60.65	34.35	5	58.17	37.91	3.92	82	34	85	36
4	29.41	67.98	2.61	27.74	66.45	5.81	53	10	64	6
	Question-wise Responses						**Percentage of Students with Correct Response from Top and Bottom 30 %**			
	Treatment			**Control**			**Treatment**		**Control**	
	Right	**Wrong**	**Don't Know**	**Right**	**Wrong**	**Don't Know**	**Top 30 %**	**Bottom 30%**	**Top 30 %**	**Bottom 30%**
5	36.5	57.66	5.83	33.97	58.34	7.69	41	25	47	21
6	12.74	79.7	7.56	12.9	78.71	8.39	18	10	11	9
7	47.52	47.3	5.18	40.38	53.85	5.77	68	26	57	19
8	38.31	50.22	11.47	33.12	56.49	10.39	44	16	47	6
9	48.7	41.31	10	42.48	48.36	9.15	74	21	66	15
10	60.3	34.71	4.99	58.71	37.42	3.87	86	31	77	36
11	26.1	58.77	15.13	16.77	63.88	19.35	39	16	17	4
12	20	58.02	21.98	23.08	62.18	14.74	31	11	43	4
13	21.3	69.57	9.13	29.3	61.15	9.55	39	10	43	13
14	18.86	75.87	5.26	24.68	68.83	6.49	34	10	43	11
15	42.23	42.67	15.1	45.1	45.75	9.15	65	14	72	28
Total	466			157			140	140	47	47

Figure 3: Percentage of Students with Correct Answers in Science



- In 8 out of 15 questions, students from treatment schools have out-performed those control schools
- While more than 50 percent of the students have answered 2 questions correctly, for 4 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 score	Highest Score	Mean	SD	Lowest score	Highest Score	Mean	SD
Total score obtained	0	73.33	34.39	14	0	73.33	33.67	15
Knowledge-based items	0	83.33	40.20	20	0	100	37.89	24
Application-based items	0	83.33	35.19	20	0	83.33	35.66	20
Reasoning-based items	0	100	21.17	23	0	100	21.23	23

Total Score:

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

- Highest score obtained was 73.33 percent, both for treatment and control schools.

Knowledge-based items:

- On an average, students from treatment schools performed better in Science
- Highest marks obtained was 100 and 83.33 percent in case of control and Treatment schools respectively.

Application-based items:

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

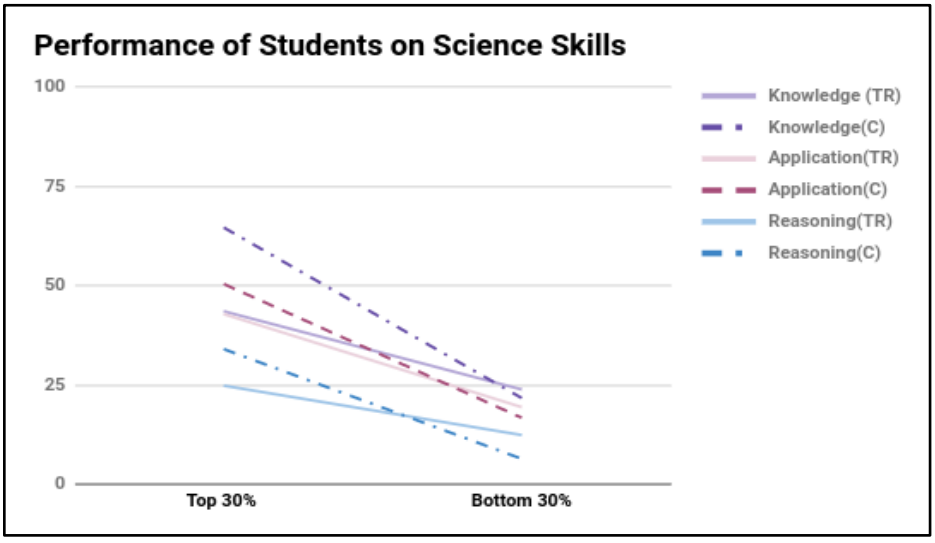
Reasoning-based items:

- On average, students from Treatment scored similar to 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 vary across the groups. Performance graphs constitutes 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.

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

Reasoning-based items:

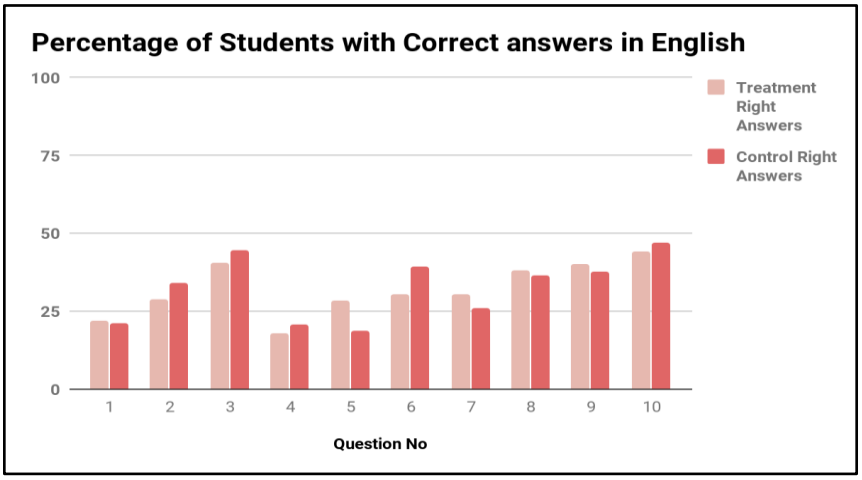
- Students from the top 30 percent in the treatment have scored lesser than the top 30 percent in the control schools. Students from the bottom 30 percent in the treatment schools have scored more than the bottom 30 percent in the control schools
- Inequality of performance was lesser among treatment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

Figure 5: Percentage of students with Correct Answers in English



- For none of the questions, even 50 percent of the students were found to answer correctly, in both treatment and control.

- Out of 10 questions being asked, students from treatment schools scored more than those in the control schools in 5 questions.

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, in both treatment and control schools, 10 to 20 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 is equally difficult for both top 30 percent and bottom 30 percent. Whereas in the bottom 30 percent, Q4 and Q5 are the most difficult questions. In the control schools, above 70 percent of the students in top 30 percent found questions Q6, Q8 and Q10 easier and Q1 and Q4 difficult. In the bottom 30 percent Q5, Q7 and Q9 are the most difficult questions.

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 .

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

Table 3.5: Itemised 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	Wrong	Don't Know	Right	Wrong	Don't Know	Top 30 %	Bottom 30%	Top 30 %	Bottom 30%
1	21.94	67.1	10.97	21.15	65.39	13.46	25	13	23	6
2	28.7	64.57	6.74	34	60	6	43	14	57	13
3	40.43	52.17	7.39	44.52	44.51	10.97	61	19	57	17
4	17.97	62.13	19.91	20.78	64.29	14.94	29	6	23	15
5	28.41	51.76	19.82	18.59	64.74	16.67	53	7	45	4
6	30.57	51.09	18.34	39.35	43.87	16.77	56	13	75	17
7	30.35	54.15	15.5	25.97	55.85	18.18	47	12	55	4
8	38.34	50.54	11.11	36.49	54.05	9.46	65	15	70	9

9	40.13	47.37	12.5	37.66	50.64	11.69	66	11	66	4
10	44.13	39.13	16.74	47.1	40.65	12.26	76	11	85	17
Total	466			157			140	140	47	47

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 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 skill is only assessed in terms of descriptive analysis.

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 100 and 83.33 percent for control and treatment respectively.

Reading Comprehension:

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

Table 3.6: Student Scores in Skills of Specific Interest

English skills	**Treatment**				**Control**			
	Lowest score	**Highest Score**	**Mean**	**SD**	**Lowest score**	**Highest Score**	**Mean**	**SD**
Total Score obtained	0	80	31.60	17	0	80	31.84	19
Language specification	0	83.33	27.96	19	0	100	30.36	21
Reading Comprehension	0	100	40.20	33	0	100	39.27	36

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 constitutes 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.

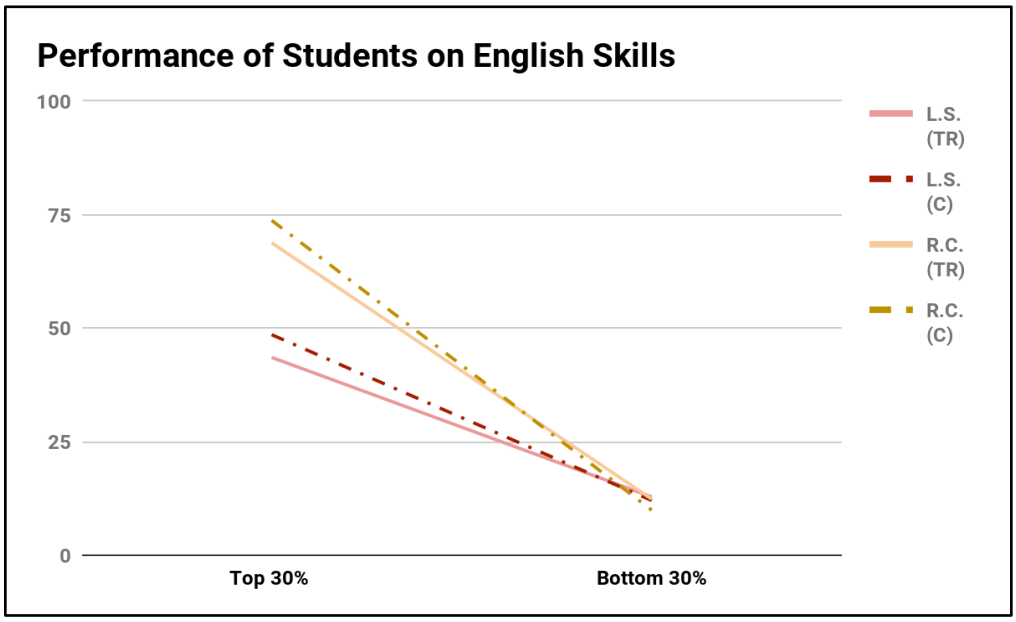
Language Specification:

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

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, the difference in performance between the bottom 30 percent across treatment and control group, was less.
- Inequality of performance was higher among control group.

Figure 6: Performance of Students in English



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 50 students from 5 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	26
2	Listening for specific information	26
3	Global Comprehension	16
4	Inference	26
5	Global Comprehension	30

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 compared to other items, as this item need listening and understanding on what the conversation was about and no direct words used in the conversation.

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**	**Poor**	**Average**	**Good**	**Very Good**	**Excellent**
Understands instructions in English	30	50	18	2	0	0
Pronunciation	32	46	20	2	0	0
Word Choice	38	54	6	2	0	0
Grammatical Accuracy	36	52	12	0	0	0
Fluency	36	56	6	2	0	0
Presentation of Ideas	24	50	24	2	0	0

The feedback above indicates poor levels in speaking with nearly half of the students faring poorly in the speaking test. For all these abilities almost, 50 percent of the students were rated as 'poor'. Only few are at an average level in pronunciation and presentation of ideas.

3.4. Who are the achievers?

Table 3.9: Caste-Wise Average Score in English Domain

		ST	SC	BC	OBC	General	Other
Treatment	**Total Score**	**27**	**33**	**30**	**33**	**31**	32
	Language Specification	25	29	31	28	31	26
	Reading Comprehension	**31**	**41**	**32**	**44**	**35**	53
Control	**Total Score**	34	38	30	33	30	30
	Language Specification	33	26	36	29	36	31
	Reading Comprehension	43	37	21	47	22	30

- In the English domain, students from the BC and General category performed the best in the Language Specification section and scored equally in the treatment group. In the reading comprehension section, the 'Other' category students performed the best followed by OBC students.

- In the control group students from the General and BC category performed the best and scored equally in the Language Specification section. In the Reading Comprehension section OBC students performed the best followed by ST students.
- In terms of total score, SC and ST from control schools scored more than those in treatment.

Table 3.10: Caste-Wise Average Score in Mathematics Domain

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

- In mathematics, OBC students performed the best in all three sections (Knowledge, Application, Reasoning) in the treatment group. The 'Other' category students and SC students were tied in first place with the OBC students in the Knowledge and Reasoning sections.

- In the control group students from ST category performed best in in the Knowledge and Application sections. While students from the OBC category scored best in the reasoning section followed by ST students.
- Except for ST and those belonging to 'Other' community, the total score shows minor variations across treatment and control groups

Table 3.11: Caste-Wise Average Score in Science Domain

		ST	SC	BC	OBC	General	Other
Treatment	**Total Score**	**29**	**32**	28	**37**	**34**	**24**
	Knowledge	**36**	**35**	**34**	**43**	**42**	33
	Application	27	35	31	39	32	10
	Reasoning	18	22	12	22	19	33
Control	**Total Score**	33	36	30	36	40	18
	Knowledge	39	41	42	38	41	21
	Application	36	36	27	39	41	23
	Reasoning	14	26	14	27	33	3

- In the Science domain, students from the OBC category performed the best in both Knowledge and Application based questions in the treatment group. The 'Other category students performed the best in the Reasoning type questions.
- In the control group, the General category students performed the best in both the Application and Reasoning section of the questions. Students from the BC category performed best in the Knowledge section of the question. The OBC category students came second in both Application and Reasoning section of the questions.
- For students belonging to ST, General and 'Other' communities, treatment schools scored better than the control schools.

4. Key findings (Students)

Some key findings from the Midline study for CLIx schools in Chhattisgarh 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:

- On an average student from treatment schools scored marginally lesser than Control schools in English assessment. However, in 50 percent of the questions, students from treatment schools have outperformed those in control schools.
- Students from treatment schools on an average scored more in both Language specification skills and reading comprehension skills as compared to control.
- Inequality of performance is less for both the skills in treatment schools.

Performance in Mathematics:

- On an average student from treatment schools scored more than Control schools in Mathematics assessment. For 47 percent of the questions, students from treatment schools have outperformed those in control schools.
- In terms of specific skills, unlike control schools, students from treatment schools on an average scored more in knowledge and application-based skills.
- Inequality in performance in lower in treatment schools across skills except for reasoning skill.

Performance in Science:

- For 53 percent of the questions, students from treatment schools have outperformed those in control schools. On an average student from treatment schools scored more than Control schools in Science assessment.
- Only in Knowledge 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.

Annexure 1

A1: Parental Education Levels in Treatment and Control Groups

Education level	Treatment		Control	
	Mother	Father	Mother	Father
Never attended school	26.09	13.02	26.14	17.22
Studied only until primary school (Grade 1-5)	23.48	22.74	16.34	18.54
Studied only until middle school (Grades 6-8)	23.48	18.98	22.88	15.23
Studied only until high school (Grade 9-10)	11.3	17.88	11.76	21.19
Studied only until Grade 12/ PUC/ Junior College	10	16.78	13.07	14.57
Studied in a Polytechnic college (Diploma)	1.09	1.99	1.96	3.97
Studied in a degree college (B.A./B.Com./B.Sc./B.E.)	0.65	3.53	1.96	3.31
Studied in a University (M.A./M.Sc./M.Tech.)	1.74	3.31	1.31	3.97
I do not know	2.17	1.77	4.58	1.99
T.R.	460	453	153	151

A2: Parental Employment Categories in Treatment and Control Groups

Occupation	Treatment		Control	
	Mother	Father	Mother	Father
Regular salaried	3.84	6.70	8.28	7.97
Self-employed	34.09	50.12	33.10	44.20
Daily wage earner	30.02	33.26	28.97	31.16
Unemployed	32.05	9.93	29.66	16.67
Total	443	433	145	138

A3: Distribution of Educational and Economic Assets Amongst Students

	Assets	No of students	Lowest score	Highest	Mean	SD
Treatment	Educational Asset	466	0	7	2.98	1
	Economic asset	466	0	11	5.27	1

	Assets	No of students	Lowest score	Highest	Mean	SD
Control	Educational Asset	157	0	7	3.16	1
	Economic asset	157	0	10	5.29	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.	29.4	34.1	14.1	22.4	460	29.5	35.3	20.5	14.7	156
I hesitate to use computer because I may make a mistake.	20.8	44.2	17.5	17.5	457	26.0	35.7	19.5	18.8	154
I don't think computers can help me with my studies.	23.3	29.6	16.3	30.9	460	26.6	25.3	17.5	30.5	154
Surfing on internet is a waste of time.	13.4	32.5	20.8	33.3	462	21.9	27.1	23.2	27.7	155

A5: Percentage of students Opting for Various Courses

	Science	Arts	Commerce	Vocational /technical courses	Fine Arts	Get job/get married	Undecided	TR
Treatment	41.8	15.3	9.8	3.3	3.1	2.4	24.1	449
Control	43.5	11.0	7.7	4.5	2.6	0.6	29.8	154

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
Treatment	6.7	28.5	9.5	12.6	12.8	7.8	21.9
Control	4.5	23.8	10.3	9.0	12.9	9.6	29.6

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	13.9	21.8	64.1
Control	19.1	23.5	57.3

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

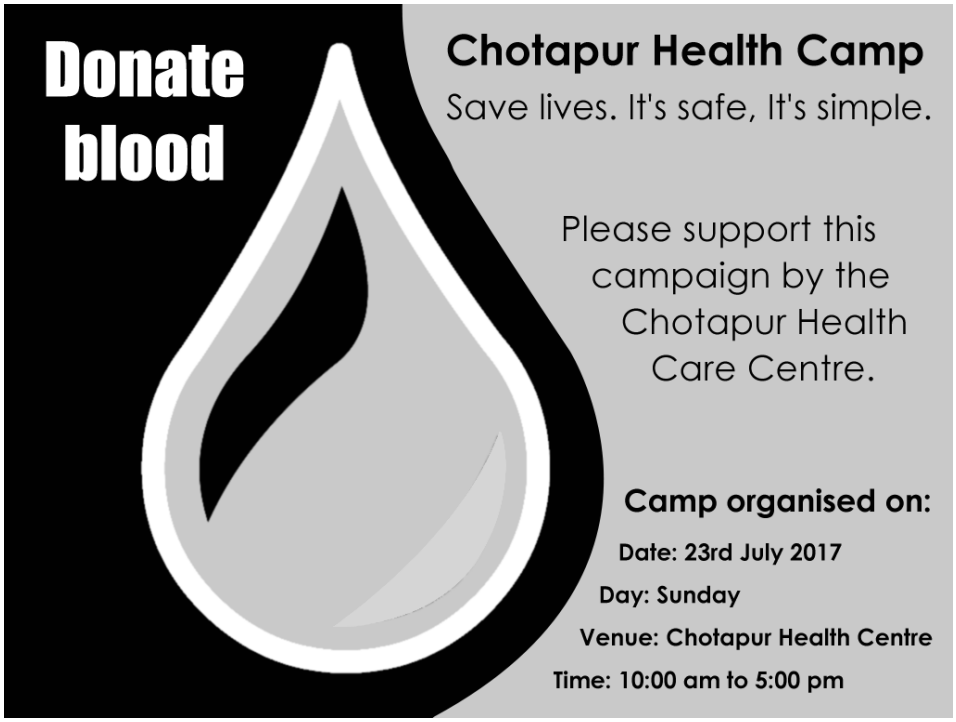
6. Sunithi rode her bicycle rashly and hit an old man on the road. What is the correct thing to say in this case? *[Language based]*

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

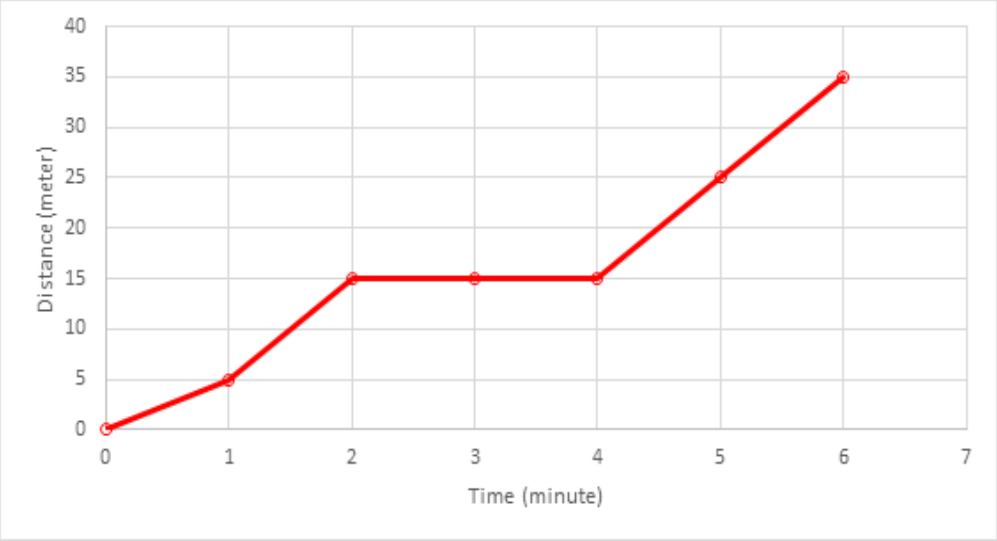
11. When you increase or decrease the number of proton in the nucleus of an atom, what happens? *[Reasoning based]*

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

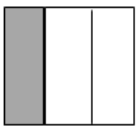
2. 3 + 8 = □+ 6 *[Application based]*
What number goes in the box to make this number sentence true?

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

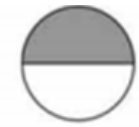
3. Which figure is $\frac{1}{2}$ shaded? *[Knowledge based]*

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]*

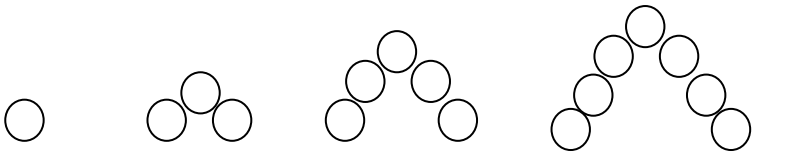


Figure 1 Figure 2 Figure 3 Figure 4

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

5. Don't know the answer

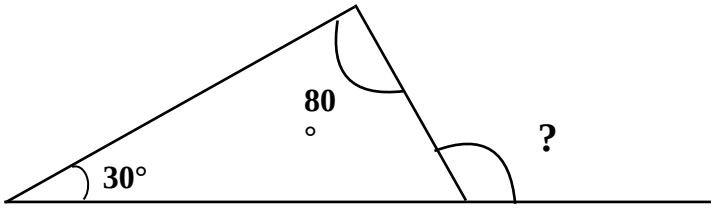
8. If t is a number between 6 and 9, then (t + 5) is between which two numbers? *[Reasoning based]*

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]*

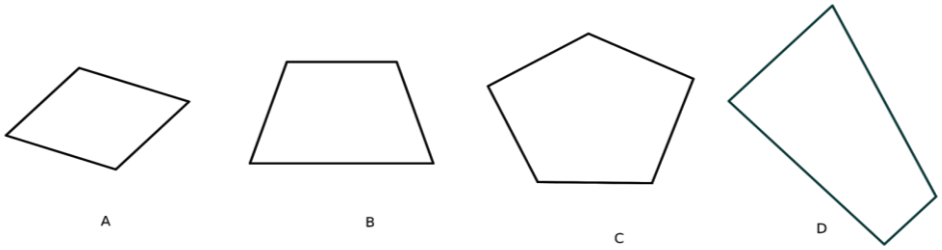
1. 3:7
2. 4:3
3. 4:7
4. 3:4
5. Don't know the answer

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

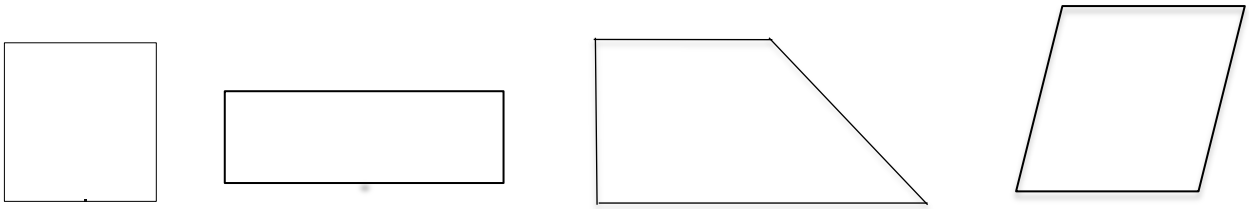
11. Which of the following shapes has a right angle? *[Knowledge based]*



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

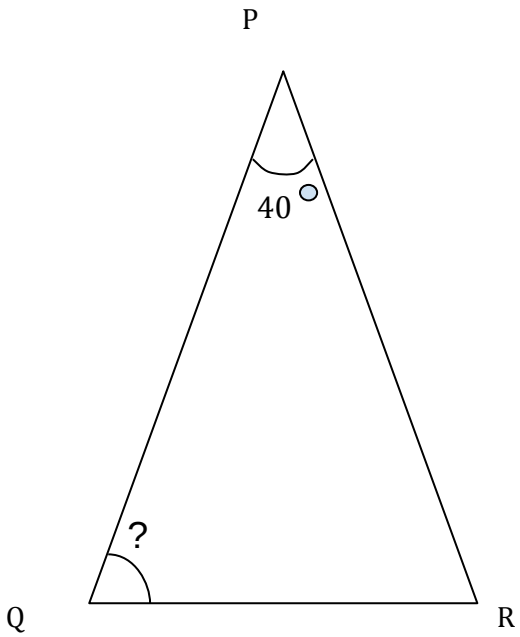
Which of the following shapes it can be? *[Reasoning based]*



P Q R S

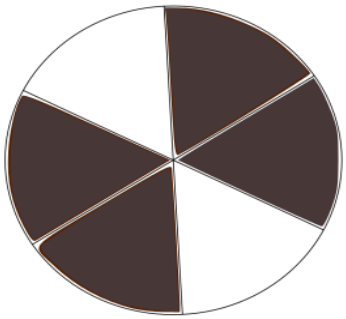
1. P
2. Q
3. R
4. S
5. Don't know the answer

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 36 for both treatment and control schools. The percentage of male teachers in the control was slightly higher (56%) as compared to treatment (50%). The percentage of OBCs were also lower in treatment (64%) compared to control (78%).

Table 5.1: Demographics of teachers

Demographics	Treatment	Control
AVG AGE	36.5	36.2
MALE %	50	56
FEMALE %	50	44
ST %	7.1	0
SC %	7.1	11.11
OBC %	64.3	78
General %	21.4	11.1
Other %	0	0

B.Ed. was the highest qualification for 50 % teachers in the treatment schools while both B.Ed. and D.Ed. was the highest for 44% teachers in the control. In terms of experience both the groups were nearly the same with an average 7 years of experience.

Table 5.2: Professional Qualification of teachers

Qualification (Highest)	Treatment	Control
M.Ed.	7.1	0
B.Ed	50	44.4
D.Ed	14.3	44.4
other	10.7	11.1
None	17.9	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	96	89
Teachers with internet access	93	67
Teachers with computer/laptop	50	44
Total	28	9
Overall score	2.4	2

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 very little 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**	3.8	2	2.0	11.0	3.7	2	1.0	9.0
Use of technology in school	**0-44**	6.1	5	0.0	22.0	6.8	6	0.0	22.0

Teachers' responses to use of digital technology in their everyday life was computed as scores. These scores were found to be very similar for the treatment and control school teachers. The mean scores of teachers in both treatment and control with regard to digital citizenship was 19.8 and 19.6 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 citizenship	NA	10-30	19.8	5	13.0	28.0	19.6	5	10.0	26.0
Beliefs about use of Technology	F1= items 3, 11, 12, 15,16	**5-20**	16.2	2	13.0	20.0	15.2	2	13.0	19.0
	F2=items 1, 4,6,7	**4-16**	13.6	1	11.0	16.0	13.3	2	10.0	16.0
Challenges in Integrating Technology	F1= items 7, 8, 9, 10, 11 , 12, 13	**7-35**	24.3	5	15.0	34.0	26.4	4	19.0	32.0
	F2= items 4, 5, 6	**3-15**	12.9	2	8.0	15.0	12.4	3	6.0	15.0
	F3=items 1, 2, 3	**3-15**	11.2	3	6.0	15.0	11.2	3	7.0	15.0
Self-financed/ Informal training in computer	NA	-	2.4	1	0.0	3.0	2.0	1	0.0	3.0

Table 5.6: Teachers' digital activities in past three months

In the past three months, how often have you done the following activities?	Never or almost 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	7	55.6	50	44	7	0	36	0
Browsed/ searched the internet to collect teaching materials to prepare lessons	11	100	61	0	11	0	18	0
Use PowerPoint /slides for presenting in conference/district meeting/other	75	89	14	0	7	11	4	0
Created digital learning materials for students	50	11.1	32	44.4	18	11.1	0	33.3

Searched for courses/ activities for professional development	14	0	61	55.6	11	11.1	14	33.3
	Never or almost never (%)		**Several times (%)**		**Once in a week (%)**		**Almost every day (%)**	
	T	**C**	**T**	**C**	**T**	**C**	**T**	**C**
Interacted with online teachers' communities (including WhatsApp groups)	18	66.7	46	0	18	22	18	11
Documented your class-work using video/audio	54	22.2	25	44.4	21	22.2	0	11.1
Attended EduSat classes	75	11.1	14	55.6	11	0	0	33.3
Used Smart-boards	79	22.2	11	44.4	0	0	11	33
Taken clippings on mobile phone for showing it to students in classrooms	29	44.4	46	11.1	25	44.4	0	0
Participated in an online course	61	66.7	18	22.2	14	0	7	11.1
Participated in COP discussions (Telegram)	32	66.7	46	22.2	7	11.1	14	0

In terms of frequency of usage of a digital device for classroom teaching, 22% teachers in the control schools had never used computers or laptops as compared to 14% of teachers in the treatment schools. 72% of teachers in treatment schools had used computers for teaching several times a month or more frequently while 55% of teachers in the control group reported the same (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	54	44.4	18	11.1	4	11.1	14	11.1	11	11.1	0	11.1
TV	32	44.4	4	11.1	18	11.1	25	11.1	7	11.1	14	11.1
Digital Camera	79	78	0	0	7	0	7	11	0	0	7	11

Overhead Projector	64	89	11	0	7	0	11	11	7	0	0	0
CD/DVD Player	86	78	0	0	4	0	4	0	7	11	0	11
	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**
Radio	86	67	4	0	0	0	4	22	4	0	4	11
Satellite Classrooms	89	100	0	0	4	0	4	0	4	0	0	0
Computer/Laptops	14	22	0	0	14	22	29	44	11	0	32	11
Smart Boards	86	78	0	0	4	0	4	0	0	11	7	11
Mobile phone	7	11	0	0	18	0	14	11	7	0	54	78
Tablet	86	100	0	0	0	0	4	0	4	0	7	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 (57 / 33), spreadsheets (36 / 11), mindmaps (25 / 0) email (54 / 33). Higher percentages of treatment school teachers had done online activities such as bookings (29 / 0), using hyperlinks (32 / 0), downloading and uploading files (64 / 33). (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	75	67		22	18	11	7	0	0	0
Typed in English on computer	64	56	25	33	4	0	4	0	4	11
Handled Mouse	86	100	11	0	0	0	0	0	4	0

Saved Files	75	78		0	21	11	0	0	4	11
Used Word/Notepad files	57	33	14	11	18	22	0	33	11	0
Used a spreadsheet	36	11	18	0	32	33	7	33	7	22
	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**
Used power point	32	22	4	11	32	22	14	22	18	22
Used Inkscape/ Paintbrush	46	67	18	11	25	0	4	11	7	11
Typed in Hindi/Mizo/Telugu	29	11	7	33	18	0	32	0	14	56
Used Internet browser (e.g. Google Chrome /Internet Explorer)	57	56	18	11	11	0	11	0	4	33
Used E-mail	54	33	14	11	14	11	7	11	11	33
Played computer games	39	44	18	11	11	11	4	0	29	33
Used Hyperlinks# (links from one site to another site)	32	0	7	11	18	11	7	0	36	78
Downloaded/uploaded files (including on Telegram/WhatsApp)	64	33	0	11	14	22	11	11	11	22
Recorded audio/video on phone/camera	64	67	7	11	11	11	4	11	14	0
Clicked pictures with digital camera	50	33	4	11	11	0	0	0	36	56
Programmed a task	29	0	4	0	21	11	7	11	39	78
Used simulation	21	0	4	0	18	0	11	0	46	100
Used online maps	39	44	4	11	14	11	11	0	32	33
Booked ticket online	29	0	7	11	11	11	7	11	46	67

Downloaded & used apps on the mobile phone	64	67	11	11	18	0	0	0	7	22
Used video conferencing tool like skype	32	22	4	22	7	11	11	0	46	44
	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**
Used online course platform - TISSx	32	0	21	11	4	0	14	11	29	78
Used mindmap	25	0	29	22	14	11	14	0	18	67

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 was similar across treatment and control groups in several cases. Both groups disagreed that computers make students lazy (T-93 % / C- 89%). Similarly, both groups agreed that integrating technology improves classroom instruction (T-97 / C-100%) and that collaboration with peers and experts makes their instruction most effective (T-93% / C-100%). With regard to other beliefs, teachers' beliefs varied across the two groups. A higher percentage of teachers in the treatment groups agreed that students are able to create better projects using computers (T-93% / C-77%), and also that students grasp difficult topics better with the use of computers (T-96% / C-78%). Disagreement on these belief statements was lower among the treatment school teachers. Some of the statements that are based on practical experience with implementing ICT based lessons, it is found that higher percentage of teachers in the treatment schools agree that doing group work can be time consuming but is worth the time spent (T-72%/ C-55%). Treatment school teachers also disagree that ICT is not useful in applying concepts in textbook to real life (T-75% / C-11%). (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	75	67	21	33	4	0	0	0
Computers make students lazy	4	0	4	11	57	67	36	22

Computers help students grasp difficult curricular concepts	32	22	64	56	4	22	0	0
Integrating technology in teaching will improve classroom instructions.	29	33	68	67	0	0	4	0
Instruction is most effective when teachers collaborate with other teachers or experts	57	67	36	33	0	0	7	0
	S.Agree		**Agree**		**Disagree**		**S.Disagree**	
	T	**C**	**T**	**C**	**T**	**C**	**T**	**C**
Students create better projects with computers than with other traditional material.	36	44	57	33	7	22	0	0
Integrating technology in teaching will increase collaboration among students	43	22	57	67	0	11	0	0
Students working in groups is very time consuming	0	0	43	22	57	67	0	11
Students working in groups is often not very useful	11	0	4	0	68	89	18	11
Student learning during group work is worth the extra time that it takes	4	11	68	44	29	33	0	11
Students interact with each other more while working with computers	14	11	71	56	14	33	0	0
Integrating technology might increase healthy competition among students	46	11	54	89	0	0	0	0
Integrating technology in teaching in schools will satisfy parents' interest	21	22	68	78	7	0	4	0
Students' writing quality is worse when they use computers to type.	4	0	29	11	64	89	4	0
Using technology like internet, digital cameras, computer applications can help students apply and practically relate to concepts they learn in textbook	32	33	68	56	0	11	0	0
Some of the computer applications allow doing the tasks again and again which reduces the fear of failure among students	29	22	61	67	7	11	4	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	4	22	21	67	61	11	14	0

With respect to challenges in integrating technology for teaching learning, higher percentage of treatment teachers disagreed that students being at different levels (T-14% / C-0%), or too many students (T-11%; C-0%), lack of availability of a computer teacher (T-32% / C-0%), time away from syllabus completion (T-32% / C-22%) were a challenge for them. (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	32	33	43	44	11	0	7	11	7	11
Not enough training for teachers to use Computers	25	22	46	56	7	11	18	11	4	0
Not enough opportunity to practice Computers in curriculum	29	22	39	56	4	0	21	0	7	22
Unstable/ intermittent power supply.	54	22	32	56	4	0	11	11	0	11
Frequent crashing of computers or outdated computers	39	56	50	33	4	0	7	0	0	11
Internet is too slow	50	67	43	22	4	11	4	0	0	0
Too many students in the class (difficult to	50	67	29	22	11	11	7	0	4	0

give individual attention to students)										
Don't know how to use computers for subjects I teach	7	11	36	22	7	22	32	22	18	22
Leadership is not supportive	4	22	43	33	21	11	21	33	11	0
Students are at different levels	32	44	43	44	11	11	7	0	7	0
Computer teacher is not available	25	33	39	56	4	11	32	0	0	0
	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**
Use of technology will take time away from completion of syllabus	18	22	36	44	14	11	21	11	11	11
Use of technology will make it difficult to manage students in the class as they have difficulties with operation of a computer	14	11	50	67	11	0	25	11	0	11

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	29	44	43	44	18	0	11	11
Other teachers sharing examples of how they have used technology	21	22	61	44	18	22	0	11
Resource support & mentoring	32	11	54	56	7	33	7	0
Availability of working computers to apply my knowledge.	57	33	25	33	18	33	0	0
Training/workshop	61	33	39	44	0	0	00	22
	Influenced to a large extent		**Influenced to some extent**		**Not influenced at all**		**Not applicable**	
	T	**C**	**T**	**C**	**T**	**C**	**T**	**C**
Enthusiasm and interest of students.	64	44	36	22	0	22	0	11
Access to experienced teachers or other experts.	57	22	29	56	11	0	4	22
Availability of a reliable support system.	39	44	39	11	14	22	7	22
Working lab with relevant resources.	46	33	43	33	7	11	4	22
Enthusiasm and interest of parents.	43	33	39	11	7	22	11	33

5.4. Pedagogy and Technology

In terms of factors that will influence their abilities to integrate technology, 'having a computer at school for teachers' was ranked highest by the treatment school teachers followed by 'having a computer at home' & 'receiving training in use of computers'. For the control group nearly all the factors were more or less equally important (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	114	38
Having a computer at home	105	31

Time to practice and plan	99	28
Receiving training in using computer	105	29
Receiving training in technology-based teaching	85	36
It is difficult to improve one's ability at this stage	80	27

Teachers' levels of preparedness across domains in treatment schools for Science was lower (73%) compared to the control school teachers (82%). This score was slightly higher for Math teachers from treatment schools (50%) compared to control schools (48%). With respect to participation in TPD workshops, teachers in treatment schools scored higher as compared to their counterparts in control school, i.e., 62% in treatment and 43% in control for Science teachers; 60% in treatment and 39% in control for Math teachers. In terms of use of computers, the scores of science teachers were much lower (T-24% / C-75%) and those of Math teachers were higher (T- 53%/ C-5%). (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**	73	16	82	13
	Math	50	11	48	12
Participation in TPD workshops (other than CLIx)	**Science**	62	38	43	26
	Math	60	39	39	39
Use of computers in the last year for specific topics	**Science**	24	26	75	19
	Math	53	26	5	10
Need for specific topics as part of the TPD Course	**Science**	92	18	94	13
	Math	94	11	69	31

6. English domain teachers

With respect to beliefs on English teaching, all 10 teachers[4] agreed that their teaching was about connecting textbook material with students' experience, helping them understand different kinds of communication. 9 out of 10 of them were however also in agreement with some of the more traditional approaches such as focusing on grammar and repeated writing of answers. (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 programmes (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)

However, with respect to certain persistent negative beliefs about Math learning, 6 out of 9 teachers in the treatment group disagreed with statements such as, students do poorly in math as they lack in ability and that boys are better at math than the girls (Table 7.2a). 8 out of 9 treatment teachers reported that they always let students come up with their own ideas of solving problems as opposed to 2 out of 4 control teachers (Table 7.2c).

All the 9 teachers from treatment schools said they had used computers to teach geometric reasoning last year while 6 of them used it to teach proportional reasoning. Only 1 out of the 4 control teachers had used computer last year to teach geometric reasoning (Table 7.3b)[2].

During this academic year, 8 out of 9 teachers in the treatment schools said they sometimes (or often) used computers for math activities such as, solving problems, learning new concepts, making geometric figures and assessment. 2 teachers in the control group had used technology for 2 math activities in the same period (Table 7.3c).

8. Science domain teachers

With regard to characterising of Science teaching, nearly all teachers in both treatment (9) and control (4) groups strongly agreed with statements such as 'science is about carrying out experiments (T-6/C-3), connecting with experience (T-7/C-4) thinking and reasoning (T-6/C-4). Whereas, 2 out of 9 treatment group strongly agreed to regarding science as memorising textbook content, while 3 out of 4 control group strongly agreed to the same statement (Table 8.1a).

7 out of 9 treatment school teachers and all control group teachers reported practicing all of the science pedagogies to teach some of the lessons. This included activities such as observations, demonstrations, design experiments, group activity etc. (Table 8.1b). Teachers' own belief about learning science, showed positive beliefs with respect to perceived student ability, class discussions, gender and science learning etc. Interestingly however, nearly all teachers in both 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, all Science teachers in the survey said they frequently or always encouraged their students to come up with their own ideas to solve problems. 7 treatment school teachers and all 4 control group teachers said they involved students in group work. However, the same number of teachers (7 and 4) also said they frequently maintain silence to ensure students concentrate (Table 8.2c).

7 out of the 9 teachers from treatment schools had used computer to teach motion last year while 4 teachers from treatment and 4 from control had used it to teach atomic structure. All the 4 control school teachers also used computer to teach respiration and chemical equation (Table 8.3b). In the case of use of technology in science teaching, motion was the topic where 7 out of 9 teachers had used technology in the treatment group. All 4 teachers in the control group had used technology to teach respiration, chemical equation and atomic structure. In terms of using technology for their own teaching preparation, 3 to 4 teachers in the treatment group had used videos, games and simulations often or always. Whereas control group teachers had done these activities sometimes (Table 8.3c).

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

9. Comparison across domains

With regard to classroom teaching, 9 out of 10 teachers disagreed with statement that connecting students' learning with out of school contexts is not useful. Teachers are strapped for time which is reflected in their varied response to the statement on having less time to do additional activities (Table 6.2b). Math teachers in the treatment group (8) felt that they did not have time to do additional activities. However, the treatment group strongly disagreed (T-8/C-0) that they would give repeated practice to students that made mistakes. It will be interesting to see what strategies they would recommend in place of more practice (Table 7.2b). Majority of the Science teachers from both treatment and control schools reported that they did not have time to do additional activities. 7 out of 9 teachers from treatment and 3 out of 4 from control also agreed that when students make mistakes, the best remedy is to give them repeated practice. Majority of teachers from treatment schools also agreed that connecting students' learning with out of school contexts is useful (Table 8.2b).

On use of technology for English teaching, 8 out of 10 English teachers felt that their students were more confident of speaking in English after the CLIx classes (Table 6.3a). Similarly, all the Math teachers from the treatment group agreed that children are more interested in solving problems after CLIx class in Mathematics (Table 7.3), whereas 6 out of 9 Science teachers from treatment schools said that their students ask more questions after Science CLIx classes (Table 8.3a). Almost all teachers from both the groups across the 3 domains said that 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 treatment school teachers reported a lot or some challenges with respect to shortage of computer hardware, shortage of support for using computers, shortage of equipment for use in demonstrations and other exercises, inadequate physical facilities, Shortage of reference material (books, newspapers) in English and shortage of other instructional equipment for students' use (Table 6.4a). With respect to challenges in using computers for teaching, interestingly, 5 out of 9 treatment school teachers that reported a lot of challenges with respect to shortage of computer hardware, instructional equipment, inadequate physical infrastructure. These were clearly experiences that came from practical use of the resources (Table 7.4a). As far as integration of technology is concerned, 5 out of 9 treatment school teachers regarded shortage of equipment for students as 'a lot challenging' as compared to student class size (2 out of 9) (Table 8.4a).

Teachers in the treatment schools perceived students with different academic abilities (8 out of 10), students' diverse backgrounds (7) and uninterested students (6) as being 'a lot' or 'some' challenging to their teaching learning (Table 6.4b). Teachers in the Treatment schools perceived students' diverse backgrounds (5 out of 9) and their special needs (6 out of 9) as being 'a lot' challenging to their teaching learning. This was different from the control school teachers that reported student disinterest (3 out of 4) and disruptive students (3 out of 4) as being 'a lot' challenging (Table 7.4b). Uninterested students were seen as a factor that was 'a lot limiting' by 4 out of 9 teachers (Table 8.4b).

With respect to their own preparedness, English teachers reported being relatively less prepared on areas pertaining to communication and language teaching (Table 6.5). The treatment school teachers (6-8) reported being only 'somewhat prepared to teach 'Relationship between three–

dimensional shapes and their two-dimensional representation' & 'Congruent figures and similar triangles' as well as 'Cartesian plane - ordered pairs, equations, intercepts, intersections, and gradient Translation, reflection, and rotation' (Table 7.5). Teachers' level of preparedness (Tables 8.5 a,b,c) as reported for biology, chemistry and physics showed teachers feeling overall less prepared on physics topics of motion (8 out of 9) and light (7 out of 9) followed by variation and adaptation in Biology (6 out of 9) and matter and solutions in chemistry (5 out of 9).

Barring observations of a peer teachers' classroom, all teachers reported having done activities such as discussions and interactions in their school or on the online communities of practice or both (Table 6.6). Most of the math teachers from treatment schools has discussed about working on preparing lesson plans and let other teachers observe their classroom informally. 6 of the teachers also reported that in both school and on Telegram they had interaction regarding resources and teaching ideas, experiences and also on how to use technology while teaching. Most of the control school teachers had discussions in school about how to teach a concept, clarify doubts and discussions with other subject teachers to integrate English with other disciplines (Table 7.6). Responses of Science teachers from both groups were similar to that of Math teachers (Table 8.6).

7 out of 10 English teachers from treatment schools had received training in improving students' critical thinking or problem solving skills, pedagogy and ICT. Only 3 out of 10 had received training in integrating information and communication technology into English teaching (Table 6.7a). 5 teachers strongly felt the need to include student assessment as part of TPD course while 4 teachers wanted pedagogical tools and techniques. 9 out of 10 felt needed inclusion of integration of technology in teaching as essential for TPD.

While all modes of TPD training were chosen by most of the teachers, 9 out of 10 English teachers preferred peer learning and hands-on-activities. 7 out of 9 Math teachers from treatment schools had received training in integrating information and communication technology into mathematics last year while 6 teachers had received training in math content, assessment and ICT. Except for math curriculum, teachers from control schools had received training in other areas and treatment school teachers got training for all areas given in table 7.7a. 4 out of 9 teachers in the treatment schools reported a strongly perceived need for training in technology integration, pedagogical tools, subject understanding. This was expressed less strongly by the control group teachers (Table 7.7b).

Teachers in both groups expressed preference for all modes of TPD training, through face to face interactions, online mode etc. (Table 7.7c). As regards TPD, 7 out of 2 treatment school teachers and 2 out of 4 control group teachers reported receiving training in science content (Table 8.7a). Interestingly, both groups perceived the need to receive training in the subject integration of technology (Table 8.7b) and preferred this training to be in multiple modes such as face to face and online (Table 8.7c).

The following tables show 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	Note taking; Describing / narrating / reporting; Practicing Social Conversation; Debating / Presenting an argument	Only 1 control teacher so not reported
Math	Simple linear equations and inequalities and simultaneous; Direct and inverse proportions; Using appropriate measurement formulas for perimeters, circumferences, areas of circles, surface areas and volumes	Same as treatment
Science	**Biology:** Impact of natural hazards on humans, wildlife, and the environment; Trends in human population and its effects on the environment; Interaction of living organisms and the physical environment in an ecosystem **Physics:** Basic properties/behaviors of light and sound; **Chemistry:** Classification and composition of matter; Chemical change; Properties and uses of common acids and bases	Almost all teachers very well prepared for all areas

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 16 schools: 12 treatment and 4 control schools in Chhattisgarh.

Access and usage of technology: It was found that almost all the teachers from treatment schools have mobile phones with internet access, whereas 89% teachers from control schools had mobile phone with only 67% teachers having internet access. Only 50% teachers from treatment schools and 44% from control schools had computer/laptop.

With regard to their use of technology for teaching-learning activities in the 3 months before survey, 43% of teachers from treatment schools browsed/ searched the internet for personal use while 36% interacted with online teachers' communities almost every day or at least once a week. 44.4% control school teachers took clippings on mobile phone to show to students at least once a week while same percentage of teachers created digital learning materials and searched for courses for professional development at least once a week or every day. 75% of the treatment school teachers never attended EduSat classes or used PowerPoint while 100% control school teachers never browsed the internet to collect teaching materials.

Activities on digital devices: Data on teachers' digital activities on computers/smartphones shows that 57% of the treatment school teachers and 56% of control school teachers said they were able to use internet browser without any help while equal percentage of the former group and 33% of control school teachers reported using Word without any difficulty. 46% of treatment school teachers and 67% control school teachers said they could use Inkscape/paintbrush while only around 32% treatment school teachers and none of the teachers from control group could use hyperlinks.

Pedagogical practices: Teachers were asked to give their opinion on statements connected to their practices in the classroom. Majority of Math and Science teachers from both treatment and control schools agreed that did not have time to do additional activities because they need to complete syllabus but English teachers did not have the same opinion.

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. 6 out of 10 English teachers from treatment group reported doing activities involving group work for students. 12 out of 16 Math treatment teachers and all 4 control school teachers reported that they also encouraged group activities. All 14 Science teachers from treatment group and 1 out of 3 control school teachers said they sometimes or frequently did activities that involved group work that allow students to see, share and discuss their class work solutions with each other. 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.8 out of 9 treatment school teachers in Math domain disagreed with this statement. Interestingly, almost all teachers from both the groups in English and Math domains agreed that connecting the subjects with out-of-school contexts is useful. 6 out of 9 treatment school teachers in Science domain and 3 out of 4 control school teachers also agreed to this.

Beliefs about use of technology: Teachers were also asked about their beliefs with regard to use of technology in a teaching learning context. Majority of the teachers from both treatment and control schools 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, 93% of teachers in the treatment group and 77% in control group agreed that students are able to create better projects using computers and 100% of control school teachers and 96% treatment group teachers agreed that students grasp difficult topics better with the use of computers. 72% of teachers in the treatment schools and 55% control group teachers agreed that doing group work can be time consuming but is worth the time spent.

Views about using technology in subject teaching: 8 out of 10 treatment school teachers agreed that children were more confident to speak after English CLIx classes. Almost all 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 50% teachers of treatment school teachers and 67% control school teachers think that slow internet and large class size are extremely challenging. 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.

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, shortage of support for using computers, shortage of other instructional equipment for students' use, shortage of equipment for your use in demonstrations and other exercises and inadequate physical facilities. For the control group teachers, apart from the challenges mentioned above, large class sizes and shortage of computer software were also 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. The Math control group teachers believed that uninterested and disruptive students are also a lot challenging to teach.

Preparedness, Participation in TPD, Use of computers: Teachers' levels of preparedness in control schools for Science was higher (82%) compared to the treatment school teachers (73%) whereas score for Math was similar for both groups (T-50% / C-48%). With respect to participation in TPD workshops, 62% teachers in treatment schools scored higher as compared to their counterparts in control school (43%) for Science.

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

mode of TPD training, all Math and Science teachers from both the treatment and control groups chose interaction with peers, referring to books and hands-on activities as the preferred mode of training. 8 out of 10 treatment school teachers also chose face-to-face lectures and computer based trainings.

In terms of use of computers, the scores of Science teachers in control group (75%) were much higher than treatment school teachers (24%) and those of Math teachers were lower, i.e. 5% control group teachers and 53% teachers in treatment group.

Annexure 4

Table 6.1a: Beliefs about teaching English

Teaching of English is about:	Strongly agree	Agree	No opinion	Disagree	Strongly disagree
Making students read aloud from the textbook.	3	5	0	2	0
Making students memorise the rules of grammar.	1	8	0	1	0
Teaching the content given in the textbook.	0	9	0	1	0
Connecting the textbook material with students' experience.	3	7	0	0	0
Making students listen to and speak English.	2	7	0	1	0
Focusing on literature.	2	6	1	1	0
Focusing on language use (Grammar, etc.).	1	8	0	1	0
Making students repeatedly write out answers to questions in the textbook.	0	9	0	1	0
Helping students understand different types of communication.	2	8	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
Memorize rules and formulas (spellings, grammar rules, etc.)	0	6	0	4
Apply facts, concepts and rules to complete tasks (role play, letter writing,)	0	7	0	3
Explain their answers	0	2	2	6
Relate what they are learning in English lessons to their daily lives	0	7	1	2
Read their textbooks and other resource material.	1	4	0	5
Decide on their own procedures to complete tasks / answer questions.	0	6	1	3
Work on problems for which there is no immediately obvious method of solution	0	7	1	2
Work together in small groups	0	7	0	3

Find information and present to the class the next day. (Meanings, facts, etc.)	1	4	1	4

Table 6.2a. Beliefs about English learning

Beliefs about English learning	Strongly agree	Agree	No opinion	Disagree	Strongly Disagree
Students who find English difficult, do not try enough to learn.	0	5	0	5	0
Students need exposure to more spoken English to improve.	2	7	1	0	0
Students' mother tongue should not be used in the English classroom.	1	2	1	6	0
Girls are better at using English than boys.	1	6	2	1	0
Games and activities are suitable for primary school, not for high school classes.	1	1	0	8	0
Discussions in class disrupt discipline and distract students.	0	5	1	4	0
Students can learn on their own, if given guidance.	2	8	0	0	0
My students can easily understand English films / TV Programmes.	0	4	2	4	0
Students should be corrected for mistakes they make, as soon as they make these mistakes.	1	7	0	2	0
Teaching English is difficult.	0	3	2	5	0
We should spend more time teaching subjects other than English.	2	5	2	1	0
I need to improve my English, so that I can teach it better.	2	6	1	1	0
Students who like reading are good at English.	1	6	0	3	0

Table 6.2b: Beliefs about classroom practices in English

English teaching in the classroom	Strongly agree	Agree	No opinion	Disagree	Strongly Disagree
I have no time to do additional activities, because I have to cover all the content in the textbook.	1	3	1	5	0
Making students give personal opinions about the text is not useful.	1	1	2	6	0
When students make mistakes, the best remedy is to give them repeated practice of	2	8	0	0	0

Films / Radio clippings are not necessary materials in the English class.	0	2	0	8	0
	Strongly agree	**Agree**	**No opinion**	**Disagree**	**Strongly Disagree**
Students need to know only standard rules because alternative grammatical structures confuse them.	1	2	2	5	0
Connecting English with out-of-school contexts is not useful	0	0	1	9	0

Table 6.2c: Frequency of classroom practices in English

In the English classroom	**Always**	**Frequently**	**Sometimes**	**Never**
I discuss the answers and ask the students to write their own answers.	3	3	4	0
I organise learning activities (games, puzzles, role plays) with the students.	2	2	5	1
I do activities that involve group work that allow students to see, share and discuss their class work or home work with each other	3	2	5	0
I maintain silence/ discipline because students must concentrate and individually understand the English lesson / concept.	4	3	3	0
I encourage students to come up with their own ideas about how to answer questions.	5	5	0	0
I encourage students to watch news / TV programmes / films in English.	6	3	1	0
I use recent newspaper articles as teaching materials.	3	2	4	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**
Slow Learners get left out in Lab sessions	0	4	6	0
Watching videos is more useful than interactives on computers.	1	7	2	0
Fear of committing mistakes increases with computer-aided learning	0	3	7	0
Computer-aided lessons should be optional only.	0	3	6	1
I do not like my students asking questions or interacting with each other during the Lab classes	0	0	10	0

Children are more confident to speak after English CLIx classes	1	7	2	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
Vocabulary	9	1
Conversation skills	8	2
Grammar	9	1
Listening skills	8	2
Letter Writing	7	3

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
Look up ideas and information	0	7	2	1
Watch videos	0	7	1	2
Look up word meanings	0	3	4	3
Record student voices	2	8	0	0
Create stories	2	7	1	0
Learn Sentence construction	2	5	3	0
Practice reading and/or comprehension	2	3	1	4
Answering assessment questions.	0	8	0	2

Table 6.4a Challenging conditions that limit teaching (English)

Challenges in use of computers	A lot	Some	A little	Not at all	Not applicable
Shortage of computer hardware.	2	5	1	2	0
Shortage of computer software.	2	4	3	1	0
Shortage of support for using computers.	1	8	1	0	0
Shortage of textbooks for student use.	2	2	2	4	0
Shortage of other instructional equipment for students' use.	3	4	2	1	0
Shortage of equipment for your use in demonstrations and other exercises.	2	7	1	0	0

Inadequate physical facilities.	7	1	2	0	0
Large class size.	1	3	2	4	0
Lack of audio-visual aids.	2	3	3	1	1
	A lot	**Some**	**A little**	**Not at all**	**Not applicable**
Lack of support from peers and/or school administration.	1	3	2	4	0
Shortage of reference material (books, newspapers) in English.	2	6	1	1	0

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

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

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**
Comprehension	2	3	4	1
Note Taking	1	4	5	0
Practising Social Conversation	0	5	5	0
Understanding and speaking for functional purposes (directions, instructions)	1	7	2	0
Describing / narrating / reporting	1	4	5	0
Debating / Presenting an argument	1	4	5	0
Grammatical correctness	0	6	4	0
Appropriate communication	1	5	4	0
Polite expressions	2	5	3	0
Literal and figurative speech	3	4	3	0
Literary language	1	7	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 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
Discussions about how to teach a particular concept	4	1	5	0
Working on preparing lesson plans	6	1	3	0
Visits to another teacher's classroom to observe his/her teaching	4	3	0	3
Informal observations of my classroom by another teacher	6	2	0	2
Discussions with other subject teachers to integrate English with other disciplines	3	1	5	1
Discussions with other teachers on children's learning and experience	5	0	5	0
Clarifying doubts about the subject	5	1	4	0
Sharing resources or teaching ideas	1	5	4	0
Asking or answering on how to use technology in the class	5	1	4	0
Sharing experiences	3	1	5	1

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
English curricular content.	6	4
English pedagogy/instruction.	7	3
Integrating information technology into English Teaching.	3	7
Improving students' critical thinking or problem solving skills.	7	3
Methods of Assessment.	5	5
ICT Training	7	3

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
Subject understanding	1	7	2

Pedagogical tools and techniques	4	6	0
Integration of technology in teaching	1	9	0
Student Assessments	5	4	1

Table 6.7c: Form of TPD preferred by English teachers

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

Table 7.1a: Beliefs about teaching Math

I feel that teaching Math 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	5	3	3	1	0	0	0	0	1	0
Memorizing the rules and procedures	4	2	3	1	1	0	0	1	1	0
Completing the content given in the textbook	0	0	1	0	2	0	1	1	5	3
Trying out different types of problems	6	3	1	1	0	0	1	0	1	0
Connecting with students' experiences	8	3	0	1	1	0	0	0	0	0
Understanding connections between different Mathematical concepts	9	4	0	0	0	0	0	0	0	0
Arriving at correct answers.	7	4	2	0	0	0	0	0	0	0
Practicing calculations.	8	4	1	0	0	0	0	0	0	0
Learning to reason and solve problems.	8	1	1	2	0	0	0	1	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	0	0	3	0	1	0	5	4
Work on fractions and decimals	0	0	4	2	2	0	3	2

Use knowledge of the properties of shapes, lines and angles to solve problems	0	0	6	2	1	0	2	2
Interpret data in tables, charts or graphs	1	0	5	3	0	0	3	1
Write equations and functions to represent relationships	0	0	8	3	0	0	1	1
Memorize formulas and procedures	0	0	3	1	1	0	5	3
	Never		**Some lessons**		**About half the lessons**		**Almost every lesson**	
	T	**C**	**T**	**C**	**T**	**C**	**T**	**C**
Apply facts, concepts and procedures to solve routine problems	0	0	1	1	1	0	7	3
Explain their answers	0	1	1	2	1	0	7	1
Relate what they are learning in mathematics to their daily lives	0	0	1	1	2	0	6	3
Decide on their own procedures for solving complex problems	0	0	6	3	2	0	1	1
Work on problems for which there is no immediately obvious method of solution	1	0	8	3	0	0	0	1
Work together in small groups	0	0	2	4	3	0	4	0

Table 7.2a: Beliefs about Math learning

Beliefs about Math 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	0	0	3	0	0	1	0	3	6	0
Students who stick to the procedures told in class do well in maths	0	0	3	1	0	0	3	2	3	1
Geometry does not have any practical use for our students	0	0	0	0	0	0	2	0	7	4
Boys are better at doing mathematics than girls.	0	0	2	0	1	2	0	0	6	2
Games and activities are suitable for primary school maths, not for high school maths	1	0	2	3	0	0	3	1	3	0
Discussions in class disrupts discipline and distracts students.	0	0	2	1	0	0	3	0	4	3
Students can come up with mathematical solutions on their own without being told the procedure to solve the problem first.	1	0	5	2	1	2	2	0	0	0
Students' mistakes should be corrected by teachers , as soon as they are made.	0	2	1	1	0	0	2	1	6	0
Teaching Mathematics is difficult.	0	0	1	1	0	0	1	0	7	3

Continuous comprehensive evaluation of students is not useful in improving students' learning.	0	1	1	0	0	1	0	1	8	1
Mathematics as a subject is not useful for all students and they should be allowed to opt not to study it.	0	0	1	1	0	1	0	0	8	2
	Strongly agree		**Agree**		**No opinion**		**Disagree**		**Strongly Disagree**	
	T	**C**	**T**	**C**	**T**	**C**	**T**	**C**	**T**	**C**
I feel the need to refresh and deepen my knowledge of mathematics to improve my teaching.	7	2	2	1	0	0	0	1	0	0
Students need to engage in a lot of practice to learn mathematics.	6	2	3	2	0	0	0	0	0	0
Students should be allowed to use calculators to find solutions.	0	0	4	1	0	2	3	0	2	1

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.	2	2	6	2	0	0	0	0	1	0
Students need to know only the standard procedures because alternative procedures confuse them	0	1	2	0	0	1	2	1	5	1
Connecting maths taught with out-of-school situations is not useful.	0	0	0	0	0	0	2	2	7	2
When students make mistakes, the best remedy is to give them repeated practice of similar problems.	0	1	1	0	0	1	2	0	6	2
Only one concept is taught at a time because discussing many concepts together confuses students.	4	1	3	3	1	0	1	0	0	0
I suggest some simple questions for students poor in mathematics to help them pass in examination.	5	1	2	2	1	0	1	0	0	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	3	1	2	1	3	2	1	0
I do learning activities (games, puzzles, materials) with students	0	1	3	0	6	3	0	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	3	0	1	2	5	2	0	0
	Always		**Frequently**		**Sometimes**		**Never**	
	T	**C**	**T**	**C**	**T**	**C**	**T**	**C**
I maintain silence/ discipline because students must concentrate and individually do maths	5	2	1	0	3	2	0	0
I encourage students to come up with their own ideas about how to solve problems.	8	2	1	2	0	0	0	0
I use teaching learning materials and aids like paper folding, charts etc.	1	1	3	2	5	1	0	0
I use Information and Communication Technology (ICT) for teaching mathematics.	1	0	2	1	6	3	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	1	0	6	3	1	1	1	0
Watching videos is more useful than interactives on computers.	1	0	6	3	1	1	1	0
Fear of committing mistakes increases with computer-aided learning	1	0	1	0	2	3	5	1
Computer-aided lessons should be optional only.	0	0	0	2	4	1	5	1
I do not like my students asking questions or interacting with each other during the Lab classes	1	1	1	0	3	2	4	1
Children are more interested in solving problems after CLIx class in Mathematics.	6	0	3	2	0	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	4	0	5	4

Proportional reasoning	6	0	3	4
Commercial Mathematics	1	0	8	4
Geometric Reasoning	9	1	0	3
Linear Equation	4	0	5	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	1	3	8	0	0	1	0	0
Play mathematics based games	8	3	1	1	0	0	0	0
Learn new mathematical concepts	1	3	6	1	2	0	0	0
For mathematical calculations	3	3	4	1	2	0	0	0
Making Graphs	3	4	4	0	1	0	1	0
Analysing Data	3	3	5	1	1	0	0	0
Making Geometric figures	1	2	6	2	1	0	1	0
Watching instructional videos	3	2	1	1	5	0	0	1
Answering Assessment questions	1	4	7	0	1	0	0	0

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

Challenges in use of computers	**A lot**		**Some**		**A little**		**Not at all**		**Not applicable**	
	T	**C**	**T**	**C**	**T**	**C**	**T**	**C**	**T**	C
Shortage of computer hardware	5	1	1	3	2	0	1	0	0	0
Shortage of computer software	4	1	2	3	1	0	2	0	0	0
Shortage of support for using computers	3	2	2	1	3	1	1	0	0	0
Shortage of textbooks for student use	1	2	3	1	1	1	4	0	0	0
Shortage of other instructional equipment for students' use	5	2	2	1	1	1	1	0	0	0
Shortage of equipment for your use in demonstrations and other exercises	3	2	2	2	3	0	1	0	0	0
Inadequate physical facilities	5	3	2	0	1	1	1	0	0	0
Large class size.	4	3	1	0	3	1	1	0	0	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	3	2	6	2	0	0	0	0	0	0
Students come from a wide range of backgrounds (example economic, language).	5	1	3	1	0	1	1	1	0	0
	A lot		Some		A little		Not at all		Not applicable	
	T	C	T	C	T	C	T	C	T	C
Students with special needs (e.g., hearing, vision, speech impairment, physical disabilities, mental or emotional/psychological impairment)	6	2	1	0	0	2	1	0	1	0
Uninterested students	4	3	2	0	2	1	0	0	1	0
Disruptive students	1	3	6	0	1	1	0	0	1	0

Table 7.5: Preparedness to teach Math topics

Preparedness 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	6	3	3	1	0	0	0	0
Direct and inverse proportions	6	2	3	2	0	0	0	0
Geometric properties of angles and geometric shapes (triangles, quadrilaterals, and other common polygons)	5	3	4	1	0	0	0	0
Congruent figures and similar triangles	3	3	6	1	0	0	0	0
Relationship between three–dimensional shapes and their two-dimensional representation	1	2	8	2	0	0	0	0
Using appropriate measurement formulas for perimeters, circumferences, areas of circles, surface areas and volumes	7	4	2	0	0	0	0	0
Cartesian plane - ordered pairs, equations, intercepts, intersections, and gradient Translation, reflection, and rotation	2	1	6	3	0	0	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 my School	In Telegram	Both in School and in Telegram	Neither in school nor in Telegram

in your Telegram (COP) group?	T	C	T	C	T	C	T	C
Discussions about how to teach a particular concept	4	3	2	0	3	1	0	0
Working on preparing lesson plans	6	3	0	1	3	0	0	0
Visits to another teacher's classroom to observe his/her teaching	5	1	1	0	0	1	3	2
Informal observations of my classroom by another teacher	6	2	0	0	2	0	1	2
	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**
Working on preparing instructional materials	5	3	0	0	4	0	0	1
Discussions with other teachers on children's learning and experience	5	2	0	0	4	2	0	0
Clarifying doubts about the subject	3	3	0	0	6	1	0	0
Sharing resources or teaching ideas	3	1	0	0	6	2	0	1
Asking or answering on how to use technology in the class	3	1	0	0	6	1	0	2
Sharing experiences	3	1	0	0	6	2	0	1

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	6	2	3	2
Mathematics pedagogy/instruction	3	2	6	2
Mathematics curriculum	5	0	4	4
Integrating information and communication technology into mathematics	7	1	2	3
Improving students' critical thinking or problem solving skills	5	2	4	2
Mathematics assessment	6	2	3	2
ICT training	6	2	3	2

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	4	0	5	4	0	0
Pedagogical tools and techniques	4	1	5	2	0	1
Integration of technology in teaching	4	1	4	2	1	1
Student Assessments	2	0	6	1	1	3

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	6	1	3	3
Computer based training sessions	9	4	0	0
Interactions with other teachers (peer learning)	9	4	0	0
Referring to books, magazines	9	4	0	0
Hands-on activities for teachers	9	4	0	0

Table 8.1a: Beliefs about teaching Science

	Strongly agree		Agree		No opinion		Disagree		Strongly Disagree	
Science teaching is about	**T**	**C**	**T**	**C**	**T**	**C**	**T**	**C**	**T**	**C**
Carrying out experiments	6	3	3	0	0	1	0	0	0	0
Memorizing the textbook content	2	3	5	1	0	0	2	0	0	0
Learning new terminology	7	2	1	2	0	0	0	0	1	0
Connecting Science with students' experiences	7	4	2	0	0	0	0	0	0	0
Understanding connections between different Scientific concepts	3	4	4	0	2	0	0	0	0	0
Learning to collect data and analyse	4	3	3	0	1	1	1	0	0	0
Thinking and reasoning	6	4	3	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	6	2	1	0	1	2
Watch me demonstrate an experiment or investigation	2	0	2	0	3	0	2	4
Design or plan experiments or investigations	1	0	4	1	1	1	3	2
Conduct experiments or investigations	2	0	4	2	0	1	3	1
	Never		**Some lessons**		**About half the lessons**		**Every or almost every lesson**	
	T	**C**	**T**	**C**	**T**	**C**	**T**	**C**
Work together in small groups on experiments or investigations	2	0	5	3	0	0	2	1
Read their textbooks or other resource materials	1	0	3	1	3	0	2	3
Have students memorize facts and principles	1	0	4	0	2	0	2	4
Use scientific formulae and laws to solve routine problems	1	0	4	1	1	0	3	3
Give explanations about something they are studying	1	0	1	0	0	0	7	4
Relate what they are learning in science to their daily lives	1	0	3	0	0	0	5	4
Sometime deal with questions which are not the part of regular classroom discourse	1	0	3	2	4	0	1	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	0	0	2	1	2	0	1	1	4	2
Students who stick to the procedures told in class do well in Science.	1	0	5	1	0	0	3	1	0	2

Boys are better at doing Science than girls.	3	0	1	0	1	0	0	0	4	4
Games and activities are suitable for primary school, not for high school classes.	0	0	3	0	0	1	0	1	6	2
Discussions in class disrupt discipline and distract students.	0	0	0	0	1	0	6	2	2	2
Students can learn on their own, if given guidance.	5	3	3	1	1	0	0	0	0	0
Students should be corrected for mistakes they make, as soon as they make these mistakes.	3	4	5	0	0	0	1	0	0	0
Teaching Science is difficult.	0	0	1	0	0	0	2	0	6	4
	Strongly agree		**Agree**		**No opinion**		**Disagree**		**Strongly Disagree**	
	T	**C**	**T**	**C**	**T**	**C**	**T**	**C**	**T**	**C**
We should spend more time teaching subjects other than Science.	0	2	2	1	1	1	3	0	3	0
I need to improve my concepts, so that I can teach Science better.	6	3	3	1	0	0	0	0	0	0
Students need exposure to new discoveries, history of science to make sense of the existing knowledge in the textbooks.	5	3	4	1	0	0	0	0	0	0

Table 8.2b: Beliefs about classroom practices in Science

	Strongly agree		**Agree**		**No opinion**		**Disagree**		**Strongly Disagree**	
In the Science classroom	**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.	1	0	4	3	0	0	3	1	1	0
Students need to know only the standard procedures because alternative procedures confuse them	1	0	3	0	1	1	2	1	2	2
Connecting Science with out-of-school contexts is not useful	0	0	2	1	1	0	3	0	3	3
When students make mistakes, the best remedy is to give them repeated practice of similar problems.	6	1	1	2	1	0	1	0	0	1

Only one concept is taught at a time because discussing many concepts together confuses students.	3	4	4	0	0	0	1	0	1	0
Making students give personal opinions about the content is not useful.	0	1	2	1	0	1	3	1	4	0

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.	4	1	1	3	4	0	0	0
I do learning activities (games, puzzles, quizzes) with students	2	2	3	1	4	1	0	0
	Always		**Frequently**		**Sometimes**		**Never**	
	T	**C**	**T**	**C**	**T**	**C**	**T**	**C**
I do activities that involve group work that allow students to see, share and discuss their class work solutions with each other	4	3	3	1	1	0	1	0
I do activities that involve group work that allow students to see, share and discuss their class work solutions with each other	4	3	3	1	1	0	1	0
I maintain silence/ discipline because students must concentrate and individually work	5	2	2	1	2	1	0	0
I encourage students to come up with their own ideas about how to solve problems.	5	2	4	2	0	0	0	0
I use charts, models as teaching materials.	3	4	3	0	3	0	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	0	0	3	3	4	0	2	1

Watching videos is more useful than interactives on computers.	1	1	7	2	0	1	1	0
Fear of committing mistakes increases with computer-aided learning	0	0	0	1	6	1	3	2
Computer-aided lessons should be optional only.	0	0	5	1	2	2	2	1
I do not like my students asking questions or interacting with each other during the Lab classes	1	0	2	0	3	1	3	3
Children ask more questions after Science CLIx classes	3	3	3	1	2	0	1	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	7	2	2	2
Light	2	3	7	1
Sound	1	3	8	1
Astronomy	1	3	8	1
Ecosystem	2	3	7	1
Respiration	1	4	8	0
Health and Disease	2	2	7	2
Chemical equation	1	4	8	0
Atomic Structure	4	4	5	0
Magnetism	1	2	8	2

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	2	4	2	3	0	0	0
Process and analyze data	3	1	3	3	3	0	0	0

Watch and analyse videos	1	0	3	4	4	0	1	0
Play games	1	0	4	4	2	0	2	0
Work with Simulation	3	0	3	3	1	1	2	0
Record and analyse their voice	6	1	2	3	1	0	0	0
Read lessons on computer	4	1	2	3	2	0	1	0
Answer assessment questions	4	2	3	2	1	0	1	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	3	1	5	1	1	2	0	0	0	0
Shortage of computer software	3	3	1	0	4	0	1	1	0	0
Shortage of support for using computers	2	2	3	0	3	0	1	2	0	0
	A lot		**Some**		**A little**		**Not at all**		**Not applicable**	
	T	**C**	**T**	**C**	**T**	**C**	**T**	**C**	**T**	**C**
Shortage of textbooks for student use	1	1	3	1	3	0	2	2	0	0
Shortage of other instructional equipment for students' use	5	2	3	1	1	0	0	1	0	0
Shortage of equipment for your use in demonstrations and other exercises	1	3	2	0	6	0	0	1	0	0
Inadequate physical facilities	1	3	5	0	2	0	1	1	0	0
Large class size.	2	2	4	1	2	0	0	0	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	3	2	4	1	2	1	0	0	0	0
Students come from a wide range of backgrounds (example, economic, language)	3	2	3	1	2	1	1	0	0	0

Students with special needs (e.g., hearing, vision, speech impairment, physical disabilities, mental or emotional/psychological impairment)	1	2	2	0	5	2	1	0	0	0
Uninterested students	4	2	1	1	3	1	1	0	0	0
Disruptive students	2	2	4	0	3	2	0	0	0	0

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	1	5	1	3	2	0	0
Interaction of living organisms and the physical environment in an ecosystem (energy flow, food web, effect of changes, cycling of materials)	1	0	3	2	4	2	1	0
	Not well prepared		**Somewhat prepared**		**Very well prepared**		**Not applicable**	
	T	**C**	**T**	**C**	**T**	**C**	**T**	**C**
Trends in human population and its effects on the environment	1	0	4	2	4	2	0	0
Impact of natural hazards on humans, wildlife, and the environment	1	0	3	2	5	2	0	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)	1	1	6	1	2	2	0	0
Forces and motion (types of forces, basic description of motion, use of distance/time graphs, effects of density and pressure)	1	1	7	1	1	2	0	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	3	1	5	3	0	0
Particulate structure of matter (molecules, atoms, protons, neutrons, and electrons)	1	0	4	1	4	3	0	0
Solutions (solvent, solute, concentration/dilution, effect of temperature on solubility)	1	0	4	1	4	3	0	0
Properties and uses of common acids and bases	1	0	3	1	5	3	0	0
Chemical change (transformation of reactants, evidence of chemical change, conservation of matter, common oxidation reactions - combustion and rusting)	1	0	2	2	5	2	1	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	1	3	0	0	8	0	0	1
Working on preparing instructional materials	5	3	1	0	2	1	1	0
Visits to another teacher's classroom to observe his/her teaching	4	2	1	1	1	0	3	1
Informal observations of my classroom by another teacher	8	3	0	0	0	0	1	1
Working on preparing lesson plans	9	2	0	0	0	2	0	0
Discussions with other teachers on children's learning and experience	5	3	1	0	3	1	0	0
Clarifying doubts about the subject	5	3	0	0	2	1	2	0
Sharing resources or teaching ideas	5	2	1	0	3	2	0	0

Asking or answering on how to use technology in the class	5	2	1	0	3	1	0	1
Sharing experiences	5	3	1	0	3	1	0	0

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	7	2	2	2
Science pedagogy/instruction	5	0	4	4
Science curriculum	6	1	3	3
Integrating information technology into science	5	1	4	3
Improving students' critical thinking or inquiry skills	5	2	4	2
Science assessment	5	2	4	2
ICT training	6	4	3	0

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	4	2	4	2	1	0 0
Pedagogical tools and techniques	4	2	4	2	1	0
Integration of technology in teaching	4	2	5	2	0	0
Student Assessments	3	2	5	2	1	1

Table 8.7c: Form of TPD preferred by Science teachers

Form of TPD	**Yes**		**No**	
	T	**C**	**T**	**C**
Face to face lectures	7	3	2	1
Computer based training sessions	8	2	1	2
Interactions with other teachers (peer learning)	9	4	0	0
Referring to books, magazines	9	4	0	0
Hands on activities for teachers	9	4	0	0

11. Principals survey

11.1. Demographics

Age : 50 percent of the principals in Chhattisgarh reported to be 50 years and above 33.3 percent of the principals were reported to be in the age range of 40-49 years. 8.33 percent of the principals reported being in the age group of 30-39 while another 8.33 percent of the principals fell in the age group of 25-29 years.

Gender: 66.67 percent of the principals were males and 33.33 percent were females.

Social Category: Majority of the principals belonged to the OBC category (58.33 percent) followed by SC category (33.33 percent) and General category (8.33 percent).

11.2. Access to Technology

58.33 percent of the principals accepted to having a data plan or access to internet while 8.33 percent of the principals had no access to the internet.41.67 percent of the principals had access to a computer or a portable computer device. 33.33 percent of the principals did not have access to a computer or any other portable computer. 25 percent of the principals claimed that they can access a computer of 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. 41.67 percent of the principals claimed that they were avid users of applications such as Facebook, WhatsApp etc. An equal proportion of the principals reported using the applications occasionally. 16.67 percent of the principals reported that they do not have these applications on their phones.

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	58.33	0	41.67	0
To communicate with other Principals	41.67	16.67	41.67	0
To communicate with Education Officials	41.67	16.67	41.67	0
To communicate with Superiors/Higher ups in the district/state level	33.33	8.33	58.33	0
To communicate with Family	33.33	16.67	50	0
To communicate with Friends	66.67	8.33	25	0

58.33 percent of the principals reported using Applications such as WhatsApp, messenger etc. to communicate with teachers on a daily basis. 41.67 percent of the principals reported using Applications such as WhatsApp, messenger etc. to communicate with other principals and Educational Officials on a daily basis.

33.33 percent of the principals accepted using these Applications to communicate with Superiors and family members. A majority of the principals (66.67 percent) accepted using these applications to communicate with friends.

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	25	8.33	41.67	25
Rank 2	33.33	25	16.67	25
Rank 3	25	50	16.67	8.33
Rank 4	16.67	16.67	25	41.67

The principals conferred the highest importance to the subject expert in the adoption of technology in education. The second most important professional in the adoption of technology in education was conferred to the Computer Teacher. 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	58.33	33.33	8.33	0
To deepen student's understanding about a particular subject	58.33	41.67	0	0
To practice the work they have done in the class	50	50	0	0
To make classroom interesting and enjoyable	58.33	41.67	0	0
To prepare students for future jobs	66.67	33.33	0	0
To increase student's knowledge of the world	83.33	16.67	0	0
To increase teacher's knowledge about the subject and how it can be	41.67	58.33	0	0
To complement teachers' efforts in the class	66.67	33.33	0	0

91.66 percent of the principals believed that technology can help improve student's board exam results. Almost all principals agreed and strongly agreed with the view that technology can help deepen a student's understanding of a particular subject. Almost all 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	58.33	41.67	0	0
Support of education officials in technology integration	50	50	0	0
Support in handling repairs	25	66.67	8.33	0
Support in classroom management and batching of students	33.33	66.67	0	0
Support in teacher training management	50	50	0	0
Support in ensuring lab functionality	25	75	0	0
Support in maintaining teacher motivation	33.33	66.67	0	0
Support in using fund for repairs	16.67	66.67	16.67	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. 91.67 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. 83.34 percent of the principals thought that a support in using funds for repairs would be helpful in integration of technology in education. 58.33 percent of the principals thought that teacher support to the integration of technology was the most critical factor in the integration of technology followed by support of education officials (50 percent) and support in teacher training management (50 percent).

11.6. Concerns Related to Integration of Technology in School Education

Almost all principals reported that it is extremely important to integrate technology in high schools. 83.33 percent of the principals disagreed to the concern that technology would disturb the teacher student relationship. 75 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. 58.34 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. 41.67 percent of principals

acknowledged that there were inadequate resources of device and electricity in the schools. 66.66 percent of principals agreed that their school had inadequate teachers for the integration of technology. 75 percent of the principals disagreed with the statement that technology integration may not improve board exam results. 50 percent of the principals agreed that they do not have access to adequate human resources to integrate technology in schools.

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

	Strongly Agree	**Agree**	**Disagree**	**Strongly Disagree**
The use of technology in school will disturb the existing teacher-student relationship	8.33	8.33	75	8.33
Using technology in schools will add to my workload.	0	25	58.33	16.67
The use of technology will increase the time taken for completing the School Curriculum	0	50	41.67	8.33
Technology is likely to replace teachers from their job.	16.67	25	41.67	16.67
The school has inadequate physical space for integrating technology in schools	16.67	33.33	41.67	8.33
The school has inadequate resources of devices and electricity for the integration of technology in the daily practice.	0	41.67	41.67	16.67
The school has inadequate teachers for the integration of technology in my school.	8.33	58.33	33.33	0
Use of technology may not help to improve our board results.	0	25	58.33	16.67
I do not have access to dedicated human resources that can help me to integrate technology in my school.	8.33	41.67	41.67	8.33

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.	41.67	58.33	0	0
Learn how technology has been integrated in other schools and how it can be implemented at my school.	25	66.67	8.33	0
Learn how students will respond to the use of technology in classroom learning and then promote effective uses at my school.	8.33	83.33	8.33	0
Learn how to integrate technology in classroom teaching	16.67	75	8.33	0
To integrate technology effectively at my school, I would like to make sure that the new CLIx program does not clash with	16.67	58.33	16.67	8.33

other new and innovative programs at my school.				

11.8. Dependency on Field Resource Coordinator

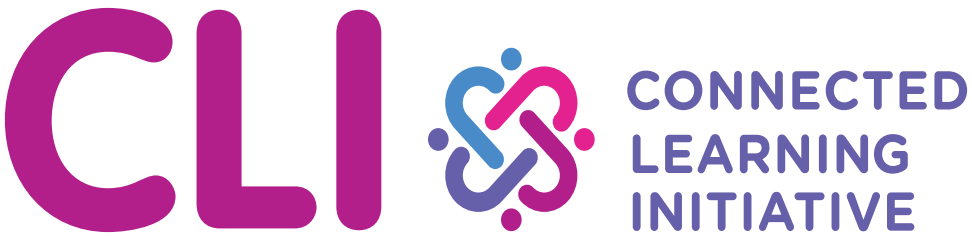
Table 11.7: Dependency on field resource coordinator

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.	16.67	75	8.33	0
If there is higher sense of ownership among teachers in the upkeep of lab functionality	16.67	66.67	16.67	0
If a few students take initiative basic CLIx related activities like student enrolling and logging	25	75	0	0
If there is easy to use reference material for basic troubleshooting	25	66.67	8.33	0

Almost 100 percent principals thought that the dependency on field resource coordinator would decrease if students took initiative of basic CLIx activities. 91.67 percent of the principals believed that the dependency on field resource coordinator would decrease if there is an easy to use reference material for basic troubleshooting.

83.34 percent of the principals agreed that a higher sense of ownership in the upkeep of lab functionality by teachers would reduce dependence on field resource persons. 91.67 percent of the principals agreed that the dependence would decrease if teachers were more interested with regard to utilisation of digital content.

Key findings: In Chhattisgarh, low levels of internet penetration and access to computers were observed. In terms of usage of applications such as Whatsapp, Messenger etc, 75 percent of principals agreed to use it to communicate with friends. Almost 59 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 subject expert. A positive perception of principals with respect to the role of technology in improving education emerged.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