

Improving Students' Achievement through Innovative Online Mode

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Introduction

We all are aware that pandemic covid-19 has disrupted the normal life style of everyone. It also affected our education system but virtual teaching came to the rescue for us. It wasn't easy to get shifted to virtual teaching from traditional teaching especially in countries like India where most of the schools are following physical ways of imparting education.

It was challenging for teachers as well as for students to get shifted to virtual methods of teaching. Continuous efforts were put for a smooth transition from traditional to virtual teaching which brought good results too. It involved up-skilling of educators by mentors, interactions with students and their parents to resolve the issues and their constant counselling by experts.

Students were enthusiastic about this new methodology but some students, who are slow learners and have difficulty in understanding, faced lots of challenges in getting good and satisfactory results.

So our first challenge is to identify such students and then put inputs in our teaching methods to get good results from these students too.

For this purpose sample data of the marks of subject SCIENCE of CLASSES VIII and IX were collected before putting innovative inputs. The data of bottom 20 students was collected at both the stages, viz the pre and post-experimental stages and were analysed for measuring the impact of the inputs.

Pre-experimental stage data is given in APPENDIX-1 for both the Classes - VIII and IX.

Data Analysis of Sample Size 20- Appendix-1

From the two sets of data, it is clearly seen that some students of Class VIII (that is, C, I, M, O) and of Class IX (that is E, F, G)— still have scope of improvement which can be seen by involving innovative inputs of teaching. (Please refer to data mentioned in Appendix-1.)

Formulation of Hypotheses (H_0) mean value of the pre-experimental data is

$$\mu(\text{MEAN}) \text{ VIII} = 13.05$$

$$\mu(\text{MEAN}) \text{ IX} = 9.35$$

H_0 : After implementing the innovative methods, the mean value of the scores of the students will be equal to the calculated value or less than that i.e., there won't be any significant rise in the value.

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Analysis of the Reasons of their Slow Learning Process

Characteristics of weak students need to be identified and should be worked on. Discussions were held with some teachers, teacher-educators and pedagogues. On the basis of these discussions, the following reasons of students' low achievements were identified:

Reasons for Unsatisfactory Results of Students who are Slow Learners:

- 1. Hesitate:** Generally weak students are hesitant that is, they feel shy or have low confidence in asking doubts or their queries. The reasons could be family background, lack of understanding, language problems or fear of being mocked by other students in the class.
- 2. Lack of interest:** Weak students generally do not show interest in the sessions and remain passive. The reason can be the lack of interaction with such students, medium of instruction, lack of interesting way of presentation and not being able to recall the content of the previous topics.
- 3. Distraction:** Slow learners are generally distracted and do not participate in the online teaching actively. This is due to lack of concentration and disinterest in the topic or they find the topic very difficult to absorb within the limited time of period.
- 4. Health issues:** The major reason of slow learning in students is poor health due to improper nutrition or same medical history in the past.

Keeping in mind the above areas in which as a teacher we can bring some improvisation in teaching - learning strategies and can get good results from the students who are slow learners too.

The Investigator, after discussing with experts, could list the following inputs for remedying the low scorers.

1. Positive Approach:

H₀: This will not improve the performance of the students as this input has nothing to do with the subject enhancement.

Teaching practices can be improved by keeping a positive approach towards the students. Each and every question should be welcomed and queries should be solved, this will help in developing confidence in slow learners and gradually they may overcome their difficulties and gain confidence and start showing interest in the session.

Teachers may also come to know the areas in which they (slow learners) need improvement.

H_a: By implementing positive approach it definitely improved the performances of students as this input helped them in enhancing their confidence and learning approach. This is clearly indicated in the result data collected after putting them to the test. Mentioned in APPENDIX-III. DATA OF TEST-2 (CLASSES VIII AND IX)

The null Hypothesis created is rejected and it is proved that keeping a positive approach in the class enhances the students result.

2. Improving Classroom Practices:

H₀: Implementing the input of improving classroom practices will not create much impact on slow learners as only top scorers would be benefitted by this method, so this will only create complexity in slow learners and this will reduce their scores.

In the present situation classroom teaching is not confined to blackboard teaching only but there is more emphasis on students' involvement and understanding. There are many ideas which can improvise the virtual teaching methods and can bring good results and better understanding too.

H_a: Implementing the improvised classroom practices created a much noticeable change in the performances of slow learners as it helped them to explore the subject, creates the interest in them to learn the subject and develops the urge to learn the subject with more enthusiasm. This definitely helped them to score good marks as proved by the data mentioned in APPENDIX-III

H₀: is rejected by analyzing the data after tests and implementing inputs creates significant enhancement in the performances of slow learners.

(i) Promoting critical and problem solving methods:

This may help learners to enhance their thinking skills which help them to learn certain topics critically. For instance students may know the facts and learn and understand the topic well, instead of cramming and mugging up. This helps in retaining and recalling the topic in students' mind for a longer time period.

(ii) Improving Questioning Skills:

Teachers may be expected to ask specific questions involving the students, keeping in mind their attitudes, aptitudes, their nature of being extroverts and introverts, etc.

(iii) Flipped classroom method:

Flipped classroom is a learner centred approach where a teacher and learners interact between/among themselves, without any inhibition and teaching-learning takes place smoothly.

This method is very helpful when we have ample time of teaching and learning the topic and this can be implemented during vacation or breaks.

(iv) Use of Multimedia and visual clues:

Certain topics in Science, like atomic structure, structure of cell or organelle and various systems in life processes can be well understood by providing visual description with animation. This helps students to retain the knowledge for a longer duration.

(v) Quoting Examples of Day to Day life:

In some subjects such as science, certain topics can be well explained by taking examples of day to day life. For example, laws of motion can be very well explained taking common examples which we experience in our daily life. Newton's second law can be explained by taking examples of sports such as cricket, karate and high jumping etc. Third law can be explained by example of rocket launching etc. This may help students in enhancing knowledge as well as better retaining abilities.

(vi) Story telling:

Many discoveries, inventions, facts and laws can be explained by telling the history and interesting story related to them.

For instance: How Benjamin Franklin kite flying led to the discovery of electric discharge and so on.

(vii) Computational thinking:

Difficult topics can be explained by solving them step by step. Very difficult or lengthy problems should be solved step by step. This may/shall help students to attack the problem systematically and effectively.

(viii) Encouraging students to ask questions in the class:

A feeling may be generated that the teacher is a friend and students should be encouraged to participate in healthy discussions.

(ix) Project based learning:

This method prevents memorisation and cramming and promotes knowledge enhancement, critical thinking, collaboration and communication skills among students.

(x) Increasing student participation in the class:

This can be achieved by providing students with the puzzle solving questions, asking them to recall the already taught topics, etc.

3. Remedial Classes/Improvement Classes:

H_0 : Implementing the remedial classes will not create much impact on slow learners as this will only burden them with extra work.

Planned remedial classes can help the weak students to come together with other students of the class and help them to clear their doubts more effectively. So remedial classes are the desirable option for improving performance of students who are slow learners.

H_a : Implementing the remedial classes will help slow learners to clear their doubts which they cannot do otherwise with the top scorers. Remedial classes also help educators to know and interact in a better way with slow learners which definitely enhances their results and learning abilities. This definitely helped them to score good marks as proved by the data mentioned in APPENDIX-III.

H_0 is rejected by analyzing the data after tests and implementing inputs creates significant enhancement in the performances of slow learners.

4. Availability and Eagerness of Teachers to Attend to the Queries of Students

This is a very essential and effective way of creating interest in the topic. This also develops confidence and eagerness to learn among students

5. Giving Extra Time to Slow Learners and Discussing with Their Parents as well

By doing so we can understand the reason for slow learning and poor performance and can remedify them. In this duration we can also discuss with parents about the specific reasons of low scores. If there are any health issues or medical history or any family issue is there which is hampering their performance, that can be enquired and accordingly that student can be taught.

6. Professional Growth:

It is very essential for an educator to increase his/her effectiveness in teaching. This can be achieved by enhancing the pedagogical skills and subject-matter knowledge, being updated with the latest discoveries and inventions. Teachers should be positive in approach too towards students while teaching.

The above mentioned inputs may bring difference in the performance of weak/slow learners and can help them to attain knowledge in a better and effective way.

Hypothesis (H_0)

After putting above inputs we expect the mean to be improved by at least 2 units only, although predicted mean would be much higher than the actual mean we will get after tests.

The predicted mean values are mentioned as below. This is calculated from the sample data mentioned in APPENDIX-II

$$\mu \text{ (mean) viii} = 17.9$$

$$\mu \text{ (mean) ix} = 16$$

We assumed and predicted the data for the students of class 8 and 9 for science subject mentioned in APPENDIX-II.

Verification of Hypotheses

For Testing the above Hypotheses, tests of 25 marks each were conducted in classes 8 and 9 .Time allotted was 30 minutes.

Each question paper was set from 2 Units. The question papers were MCQ type and were verified by experts and investigators for the norms, authenticity and standard. The question papers were sent to expert pedagogists and investigators for verification and improvisation.

I . Question Paper for Class -8

(<https://forms.gle/aeeUbjy6Nui2KHYA>)

II. Question Paper for Class -9

(<https://forms.gle/YN5sz3pjwUAMBnVx6>)

The Data Collected after Conduction of Tests in Both the Classes are Mentioned in Appendix-III:

$$\mu \text{ (MEAN) VIII} = 15.7$$

$$\mu \text{ (MEAN) IX} = 14.05$$

H_a = The actual mean we got after testing students is much higher as expected and is only little deviated and taking into consideration the mean value we can say that the inputs we added for the short duration of one month work effectively and they should be continued for the future also and will definitely cross the predicted scores.

The H_0 created is rejected after seeing the results of the inputs implemented, hence we can say that continuous efforts and with implementation of inputs will definitely enhance the scores of slow learners.

Calculation of T-Value and P-Value

The data mentioned in APPENDIX-III were used for calculating the t-value and p-value for further analysis of the Hypotheses research and inputs were verified accordingly.

The p-value should be equal to or less than .005 for better results.

CLASS -8

T-value and P-value by taking data of PT-1 AND TEST-2

(A)

CLASS-8, SUBJECT-SCIENCE VERIFICATION WITH ACTUAL DATA				
S.No.	Names	PT-1	TEST-2	Difference
1	A	17	19	2
2	B	16	13	-3
3	C	0	11	11
4	D	12	15	3
5	E	12	14	2
6	F	11	16	5
7	G	13	16	3
8	H	22	25	3
9	I	0	7	7
10	J	21	23	2
11	K	8	16	8
12	L	18	16	-2
13	M	0	8	8
14	N	13	11	-2
15	O	8	12	4
16	P	23	24	1
17	Q	19	15	-4
18	R	18	22	4
19	S	16	17	1
20	T	14	14	0
	t Stat	-3.04		
	P(T <= t) one-tail	0.003		
	P(T <= t) two-tail	0.007		

(B)

CLASS-VIII, SUBJECT-SCIENCE VERIFICATION WITH ACTUAL DATA				
S.No.	Names	Hypothesis	TEST-2	Difference
1	A	20	19	1
2	B	20	13	7
3	C	15	11	4
4	D	15	15	0
5	E	15	14	1
6	F	20	16	4
7	G	15	16	-1
8	H	24	25	-1
9	I	10	7	3
10	J	24	23	1
11	K	15	16	-1
12	L	20	16	4
13	M	10	8	2
14	N	15	11	4
15	O	15	12	3
16	P	25	24	1
17	Q	20	15	5
18	R	20	22	-2
19	S	20	17	3
20	T	20	14	6
	t Stat	3.92804407		
	P(T <= t) one-tail	0.00045154		
	P(T <= t) two-tail	0.00090307		

Analysis and Methodology Used:

T-value and P-value were calculated by using the “Data analysis” tab and by choosing the option of t-test for paired data in Excel sheet.

If the P-value is ≤ 0.05 , then the data is significant, and if the P-value is < 0.05 , then the data is highly significant.

Result of above data is highly significant.

CLASS-9

T-value and P-value by taking Data of PT-1 AND TEST-2

(A)

CLASS-9, SUBJECT-SCIENCE VERIFICATION WITH ACTUAL DATA				
S.No.	Names	PT-1 MM.25	TEST-2	Difference
1	a	1	13	12
2	b	12	7	-5
3	c	16	19	3
4	d	13	11	-2
5	e	8	9	1
6	f	3	9	6
7	g	4	12	8
8	h	12	17	5
9	i	14	12	-2
10	j	2	14	12
11	k	5	12	7
12	l	16	18	2
13	m	9	16	7
14	n	8	14	6
15	o	2	15	13
16	p	12	14	2
17	q	12	16	4
18	r	10	17	7
19	s	10	17	7
20	t	18	19	1
	t Stat	-4.366813		
	P(T $\leq$ t) one-tail	0.0001659		
	P(T $\leq$ t) two-tail	0.0003319		

(B)

CLASS-9, SUBJECT-SCIENCE VERIFICATION WITH PREDICTED DATA				
S.No.	Names	Hypothesis	TEST-2	Difference
1	a	15	13	2
2	b	15	7	8
3	c	20	19	1
4	d	15	11	4
5	e	10	9	1
6	f	10	9	1
7	g	15	12	3
8	h	20	17	3
9	i	15	12	3
10	j	15	14	1
11	k	15	12	3
12	l	20	18	2
13	m	20	16	4
14	n	15	14	1
15	o	15	15	0
16	p	15	14	1
17	q	15	16	-1
18	r	15	17	-2
19	s	20	17	3
20	t	20	19	1
	t Stat	4.12424748		
	P(T $\leq$ t) one-tail	0.00028845		
	P(T $\leq$ t) two-tail	0.00057691		

Analysis and Methodology Used:

T-value and P-value were calculated by using “Data analysis” tab and by choosing the option of t-test for paired data in the Excel sheet.

If the P-value is ≤ 0.05 , then the data is significant, and if the P-value is < 0.05 , then the data is highly significant.

Result of above data is highly significant.

APPENDICES

Data of Bottom 20 Students of Classes VIII and IX at Various Stages

Appendix-I

1. Data of Bottom 20 Students (before Testing)		
Subject: Science :: Class: VIII		
No. of Students Considered: 100		
PERIODIC TEST-1		
S.No.	Names	PT-1 MM :25
1	A	17
2	B	16
3	C	0
4	D	12
5	E	12
6	F	11
7	G	13
8	H	22
9	I	0
10	J	21
11.	K	8
12.	L	18
13.	M	0
14.	N	13
15.	O	8
16.	P	23
17.	Q	19
18.	R	18
19.	S	16
20	T	14

2. Data of Bottom 20 Students (before Testing)		
Subject: Science :: Class: IX		
No. of Students Considered : 150		
PERIODIC TEST-1		
S.No.	Names	PT-1 MM.25
1	a	1
2	b	12
3	c	16
4	d	13
5	e	8
6	f	3
7	g	4
8	h	12
9	i	14
10	j	2
11	k	5
12	l	16
13	m	9
14	n	8
15	o	2
16	p	12
17	q	12
18	r	10
19	s	10
20	t	18

Appendix-II

1. CLASS-8 Subject-Science Hypothetical Sample Data of Bottom 20 Students Out of 100 Students		
S.No.	Name	Marks Peditced Out of 25
1	A	20
2	B	20
3	C	15
4	D	15
5	E	15
6	F	20
7	G	15
8	H	24
9	I	10
10	J	24
11.	K	15
12.	L	20
13.	M	10
14.	N	15
15.	O	15
16.	P	25
17.	Q	20
18.	R	20
19.	S	20
20	T	20

2. CLASS-9 Subject-Science Hypothetical Sample Data of Bottom 20 Students Out of 150 Students		
S.No.	Name	Marks Peditced Out of 25
1	a	15
2	b	15
3	c	20
4	d	15
5	e	10
6	f	10
7	g	15
8	h	20
9	i	15
10	j	15
11	k	15
12	l	20
13	m	20
14	n	15
15	o	15
16	p	15
17	q	15
18	r	15
19	s	20
20	t	20

Appendix-III

1. CLASS-8 Subject-Science Verification Data of Bottom 20 Students Out of 100 Students		
S.No.	Names	TEST-2 (MM:25)
1	A	19
2	B	13
3	C	11
4	D	15
5	E	14
6	F	16
7	G	16
8	H	25
9	I	7
10	J	23
11.	K	16
12.	L	16
13.	M	8
14.	N	11
15.	O	12
16.	P	24
17.	Q	15
18.	R	22
19.	S	17
20	T	14

2. CLASS-9 Subject-Science Verification Data of Bottom 20 Students Out of 150 Students		
S.No.	Name	TEST-2 (MM:25)
1	a	13
2	b	7
3	c	19
4	d	11
5	e	9
6	f	9
7	g	12
8	h	17
9	i	12
10	j	14
11	k	12
12	l	18
13	m	16
14	n	14
15	o	15
16	p	14
17	q	16
18	r	17
19	s	17
20	t	19

The efforts which were put in online teaching methods to improve the students' performance were very fruitful and showed in most of the cases the positive results as can be clearly seen in the data mentioned in the APPENDICES- I, II AND III.

Some of the results are shown by the negative value of the difference calculated in the data obtained, which needs improvement. As these inputs were implemented for only one month and results were verified and showed drastic changes in the scores so with the regular and continuous inputs for longer duration will show much improvised results.

Some of the new projects implemented in the sector of education by the government of India are:

- a) Subject wise learning - amendment in the learning outcomes of all the subject.
- b) Conducting periodic surveys of learning outcomes.
- c) Programme for International Students Assessment (PISA) conducted by the organization for economic cooperation and development (OECD)
- d) E-Learning materials for teachers and students
- e) Rashtriya Avishkar Abhiyan - students are motivated through experimentation and observation method to learn subjects like mathematics and science.
- f) Massive Open Online courses (MOOCs)

Webpages and Websites

1. <https://study.com/academy/lesson/what-is-a-null-hypothesis>
2. <https://www.indiatoday.in/education-today/news/story/>
3. <https://www.scribbr.com/research-process/hypotheses/>
4. <https://www.public.asu.edu/~kroel/www500/hypothesis.pdf>
5. Erich Leo Lehmann (2005), Testing statistical hypotheses, Springer-Verlag, New York

Book

“Testing statistical hypotheses” - Author: Erich Leo Lehmann