



Perceptions of Educators Regarding the Impact of the COVID-19 Lockdown on the Academic Performance of Secondary Students in the Thoothukudi District of Tamilnadu

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Abstract

This study examined the perceptions of educators, in the Thoothukudi district of Tamilnadu, India, on how the public health lockdowns provoked by the COVID-19 pandemic could have affected the academic performance of high school students with specific reference to the science stream of studies and how this in turn could have affected their future orientations toward opting for higher education or a career in science subjects. A qualitative approach was taken, and data were collected through individual interviews, focus group discussions and an analysis of the pre-post pandemic performance of students studying science. The key findings of the study are that high school students have suffered significant learning loss in the foundations of science learning and that students' interest and confidence in the learning of science in their higher classes has declined. Based on these reports, the paper makes recommendations on how the impact of these losses could be mitigated.

Keywords: learning loss, pandemic, science learning, future consequences

Introduction

The COVID-19 pandemic as in almost all other parts of the world, caused the shutting down of schools in Tamilnadu, India beginning from the early part of March 2020 (Government of Tamilnadu, 25th March, 2020). Since this was an entirely unexpected situation, the process of education ground to a halt, particularly during the early periods of the lockdown. Although schools have sporadically opened, subsequent waves of the pandemic have led to severe disruptions in education all over the country (e.g., Lalloo & Kharkongor, 2020). Gradually, governments both central and state, began to make arrangements to cope with this situation. Supports from the school education system through online and

virtual modalities were formulated. Governments produced an enormous number of videos on educational subjects and broadcasted them through television and internet channels (e.g., Government of India (Ministry of Human Resource Development, 14th July 2020; Government of Tamilnadu (Department of School Education, 29th July, 2020). The State Council for Educational Research and Training (SCERT) in Tamilnadu produced worksheets and other learning material in the form of texts, audios and videos and made them available online, for all government school students in grades 1 to 12 (e.g., <https://www.kalvitholaikaatchi.com/>).

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The teaching-learning relationship shifted to the virtual, online modality almost by default. The teacher community put in significant efforts to use these materials to continue the process of teaching and learning. However, students' accessibility to smartphones, recharging costs, network speed, teachers' skills to handle digital classes, time to teach prescribed syllabus, online evaluation and many such factors limited the quality of educational interventions, resulting in severe learning losses (ASER, 2020).

Learning loss refers to *"...any specific or general loss of knowledge and skills or to reversals in academic progress, most commonly due to extended gaps or discontinuities in a student's education"* (The Glossary of Educational Reform (n.d.)). This loss in acquiring knowledge and understanding is understood to be beyond the control of the learner. This study focused on how teachers and educators perceived this loss and what future impact in their opinion this learning loss could have on high school students' learning, with particular reference to science subjects.

Research Questions

This study aimed at answering the following research questions:

1. How did the COVID-19 induced lockdowns affect the learning of science amongst secondary students?
2. Which areas of science learning are most affected by the COVID-19 induced lockdowns?
3. How did this learning loss in science influence students' decision to select science for further studies?

4. How did this learning loss in science affect the learning of science in higher studies?
5. What are the specific interventions that could be provided to reduce the adverse effects of the learning loss experienced by students?

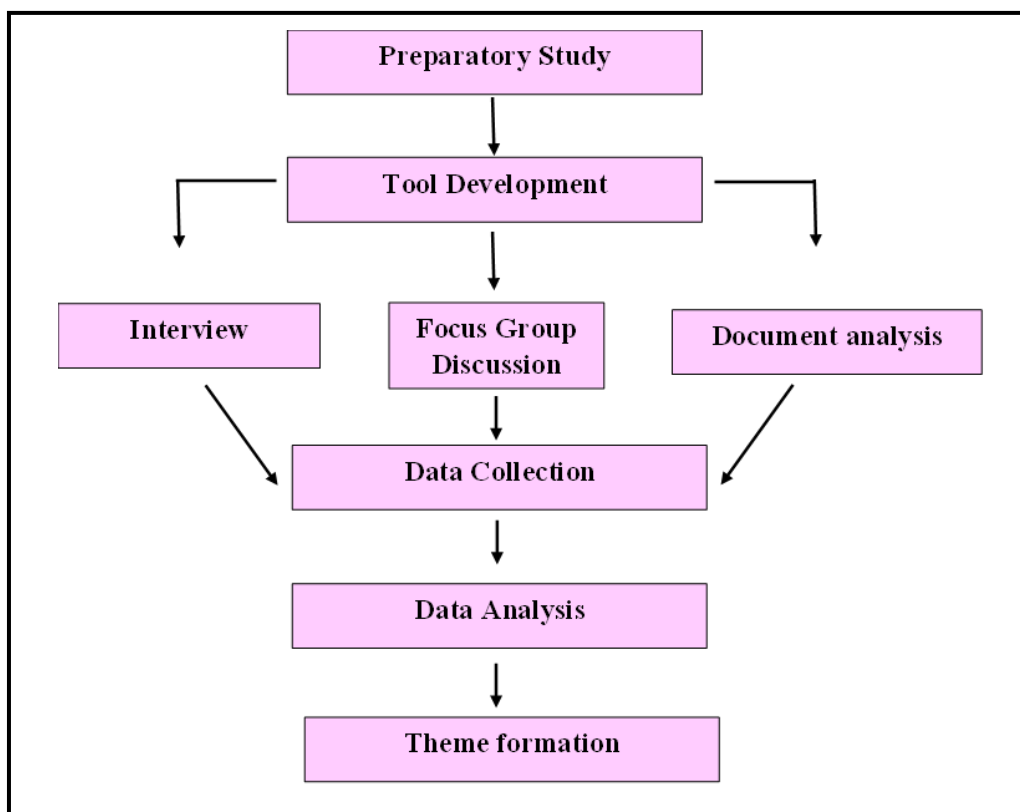
Research Setting

This study was conducted in the Thoothukudi district of Tamilnadu comprising 68 Government Schools and 126 Aided Schools with classes 9 to 12. Approximately 72,010 students in grades 9 to 12 (age 14 to 17 years) study in these schools. The district has 40 higher (collegiate) educational Institutes. The school and collegiate education systems were both included in the study. In summary the educational institutions included were: District Institute of Education and Training (DIET), Block Resource Centres (BRCs), Higher secondary schools, Arts and Science colleges, and Education colleges.

Research Design

The research followed the qualitative methodology. Data were collected using three strategies: a) interviews, b) focus group discussions and c) desk review of student attendance and academic performance. Data were analysed through organizing and coding techniques. The process followed is shown in Figure 1. Tools for the focus group discussion (FGD) preparatory studies. Data validation through triangulation and theme extraction were the main qualitative techniques applied.

Figure 1: Research Design



Participants

Professional educators from the school and collegiate education system were purposively selected based on their experience of the system and of students from this cultural and socioeconomic background. Selected participants were active professionals and well known for their contributions to the effective functioning of the district's school education system. They were experienced in curriculum development, learning material development and text book writing. They were also resource persons for in-service teacher training programmes. These persons were recruited on a voluntary, opt-in basis. Table 1 presents participant details.

Within the Indian system of education, a two year higher secondary period of study follows high school, namely, Grades 11 and 12. Students select specific streams of study. These include i) Science with Mathematics ii) Science with Biology iii) Humanities and iv)

vocational streams. The researcher planned to analyse the relationship between students' school attendance and their academic performance in science subjects using students' Grade 11 attendance registers and mark sheets. They were collected from three Higher Secondary schools of Thoothukudi district. These schools were purposively selected keeping in mind that well-functioning schools were required.

Tool Development

Data were collected using three tools: 1) Interview questionnaire, 2) Focus Group Discussion Objectives Questionnaire (for probed follow up) 3) Data collection form (for compiling the interviews). These tools were developed by the researcher and other two experts in educational research.

Prior to development of the tools the researcher developed the rubric for the tool, within which the dimensions of science education at the higher secondary level were articulated. A brief preparatory study

was conducted in the field. The researcher had informal conversations with school teachers, teacher educators, supervisors, college professors and students in the high school and higher secondary age range (i.e., 14-17 years) to understand the parameters for the rubrics of the tool. The researcher then conducted a tool

development workshop following which two experts with wide ranging experience in educational research worked together to finalise the rubrics for the development of the research tools. The finalised rubrics were converted into questions for the interview, focus group discussions and for the document data collection.

Table 1. Description of Study Participants

Type of Institution	Designation	No of participants
Block resource centre	Block Resource Teacher Educator (BRTE)	8
Higher secondary school	Post graduate Teacher	21
	Bachelor Teacher (BT) Assistant	6
High Schools	BT Assistant	15
Arts and Science College	Assistant professor	5
College of Education	Assistant Professor	2
District Institute of Education and Training (DIET)	Lecturer	2
Teacher Training Institute	Principal	1
Total		60

Procedure

Interview

Thirty participants were purposively selected and interviewed. Fourteen of them were school teachers, six were block resource teacher educators, eight were college professors and two were DIET lecturers. With careful attention being paid to public health issues, the interviews were conducted in person or through telephone calls. All interviewees were provided with a written orientation a few days prior to the research in order to familiarise them with the purpose and objectives of the study. The duration of the interview ranged from one hour to two hours. Care was taken to ensure that each participant had sufficient time to

express their opinions clearly and elaborately. Responses were recorded as well as written down verbatim by the researcher. The written notes were verified by corroborating them with the recorded version. The final notes were shown to interviewee for confirmation of their response.

Focus Group Discussions (FGD)

Thirty persons participated in the FGD. They comprised: fourteen high school teachers, thirteen higher secondary school teachers and three BRTEs. Three panels of 10 individuals each was formed. Two independent BRTEs and the researcher as acted as the moderators. Three independent script record writers noted the discussion responses by participant name.

The final written notes were shown to participants for confirmation of their response. Each panel was for a duration of about 90 minutes.

Document Review

This part of the study collated information pertaining to marks obtained by students in science subjects and their class

attendance. Marks obtained by individual students in grade 10 (academic year 2018-2019) who enrolled in the science stream in grade 11 (academic year 2019-2020) from selected schools and their attendance pattern against total working days were noted. Further details are provided in Table 2. These data were all were systematically collected into the data collection form developed for this purpose.

Table 2. School Details

S.No	Name of the school	Types	Number of students enrolled in science stream in standard 11 th in 2019-2020 academic year	Number of Students enrolled in science stream who obtained <i>more</i> than 90 % attendance in their 10 th class (2018-2019 academic year)	Number of Students enrolled in science stream who obtained <i>less</i> than 90 % attendance in their 10 th class (2018-2019 academic year)
1	School 1	Government School	37	34	3
2	School 2	Aided School	82	79	3
3	School 3	Government School	43	41	2

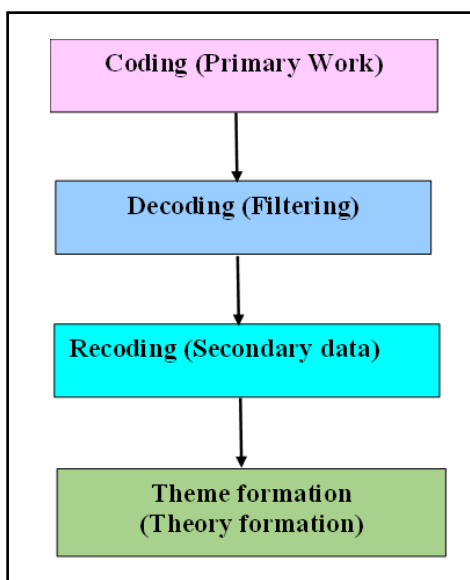
The three data sources were triangulated to verify internal validity.

Data Analysis

The data obtained from the interviews and FGDs were in the narrative form. The

Inductive coding technique was used to analyse the data. Figure 2 below shows the steps followed to code this data and extract the salient themes in the data.

Figure 2: Steps of Data Coding and Theme Extraction



Findings

The findings are presented below, against the research questions articulated for this study. Verbatim excerpts from interviews are presented to illustrate the findings. The original excerpts are presented in Tamil and paraphrased in English.

Research Question 1: How did the COVID-19 induced lockdowns affect the learning of science amongst secondary students?

Thematic extractions from the data firstly indicate that the foundations of science learning could have been weakened and students may have forgotten basic concepts. Given below are verbatim extracts from the interviews that illustrate this finding.

“10 ம் வகுப்பு மாணவர்களிடம் எளிய அறிவியல் கருத்துகளை பற்றி கேள்வி கேட்கப்படும் போது கூட பதிலளிக்க சிரமப்படுகின்றனர். அவர்கள் ஏற்கனவே கற்ற அடிப்படை கருத்துகளை நினைவுகூற சிரமப்படுகின்றனர்.”
உயர்நிலைப்பள்ளி அறிவியல் ஆசிரியர்.

English paraphrase: 10th graders find it difficult to answer even when asked about simple scientific ideas. They find it difficult to remember the basic concepts they have already learned. *High school science teacher.*

“ஆன்லைன் வகுப்புகளில் அறிவியல் பாடம் நடத்தும் போது அதனை புரிந்து கொள்ளவும் அறிவியல் வரையறைகள், கொள்கைகள் போன்றவற்றை சரியாக சொல்லவும் விளக்கவும் பெரும்பாலான மாணவர்களால் முடியவில்லை. பாடக்கருத்துகளை ஒன்றுடன் ஒன்றைப் பொருத்தி முழுமையான புரிதலை உருவாக்கிக் கொள்ள திணறுகின்றனர்.” ஆன்லைன் வகுப்பு எடுக்கும் ஒன்பதாம் வகுப்பு ஆசிரியர்.

English paraphrase: Most students are not able to understand and correctly define science definitions, principles, etc. during online science classes. They find it difficult to put together a complete understanding of the subject matter. *Ninth grade teacher taking online class.*

“அறிவியல் பாடங்களுக்கான செயல்தாளை பெரும்பாலான மாணவர்கள் சரியாக செய்யவில்லை. கொடுக்கப்படும் அலகுத்தேர்வுகளுக்கும் தவறான விடைகளையே எழுதுகின்றனர். இதிலிருந்து எங்கள் மாணவர்களின் அறிவியல் கற்றல் பாதிப்படைந்துள்ளது என்பதை அறிய முடிகிறது.” மேல்நிலை வகுப்பு ஆசிரியர் .

English paraphrase: “Most of the students did not do the worksheets for science subjects properly. They also write incorrect answers in the given unit exams. From this we can see that our students’ learning skills are affected.” *High School Teacher.*

Research Question 2: Which areas of science learning are most affected by the COVID-19 induced lockdowns?

Another common theme running through the data is that learning both at the level of theory as well as practicals have been affected by COVID-19 induced lockdown. Given below are verbatim extracts from the interviews that illustrate this finding.

“மாணவர்களால் புதிய பாடக்கருத்துகளை புரிந்து கொள்ள முடியவில்லை. நினைவில் வைத்துக் கொள்ள வேண்டிய அறிவியல் வரையறைகள், விதிகள், செயல்முறைகள், கொள்கைகள், கோட்பாடுகள் ஆகியவற்றை மனப்பாடம் செய்ய முடியாமல் உள்ளது.” 9ம் வகுப்பு ஆசிரியர்.

English paraphrase: Students could not understand the new syllabus. They found it hard to memorize the scientific definitions, rules, processes and principles that need to be memorized.” *9th grade teacher.*

“உயர்நிலை சிந்தனை வினாக்கள் அறிவியல் பாடக்கருத்துகள் தொடர்பான எழுப்பப்படும் போது அவ்வினாக்களை உள்வாங்கி சிந்தித்து பதில் அளிக்க ஒன்று இரண்டு மாணவர்களால் கூட முடியவில்லை. இதன்மூலம் அவர்களின் அறிவியல் பாடகற்றல் பாதிப்படைந்துள்ளது என அறிய முடிகிறது.” 10ம் வகுப்பு ஆசிரியர்.

English paraphrase: When questions requiring higher order thinking are raised in relation to science subjects, not even one or two students are able to absorb and answer those questions. *10th grade teacher.*

“ஆன்லைன் வகுப்புகளில் ஆய்வுச் செயல்பாடுகளுக்கு போதுமான முக்கியத்துவம் கொடுக்கமுடியவில்லை. நேரமின்மை காரணமாக சில செயல்பாடுகளை மட்டுமே காட்ட முடிகிறது. மேலும் எந்த அளவிற்கு நாம் ஆன்லைன் மூலம் செய்முறைப் பயிற்சிகளை காட்டினாலும் நேரடி ஆய்வக செய்முறைப் பயிற்சி இல்லாமல் மாணவர்களுக்கு அறிவியல் கற்பித்தல் முழுமை அடையாது.” மேல்நிலை வகுப்பு ஆசிரியர்.

English paraphrase: Exploratory and investigative lessons are not given enough importance in online classes. We are only able to use limited methods due to lack of time. And no matter how much we use demonstrations online, teaching science to students would not be complete without direct lab tutorial.” *High school teacher.*

Research Question 3: How did this learning loss in science influence students' decision to select science for further studies?

The gap in the learning of science among the secondary students, seems to reduce their interest and confidence in the learning of science in their higher classes. Given below are verbatim extracts from the interviews that illustrate this finding.

“மாணவர்களின் அறிவியல் கல்வி மீதான ஆர்வம் மிகக் குறைவாக உள்ளதால் அவர்கள் மேல்நிலைக் கல்வியில் அறிவியல் பாடம் தேர்ந்தெடுப்பது குறைவாக தான் இருக்கும். மாணவர்களிடம் பேசும் போது பெரும்பாலானோர் கலை, வணிக பாடங்களை தேர்ந்தெடுத்து படிக்கப் போவதாக சொல்கின்றனர்.” 10ம் வகுப்பு ஆசிரியர்.

English paraphrase: Students' interest in science education has decreased and they are less likely to choose science as a subject for specialisation in higher education. When I talk to students, most of them say that they are going to study humanities or business subjects. *10th grade teacher.*

“10ம் வகுப்பு முடித்து வரும் மாணவர்களில் அறிவியலில் அதிகமான மதிப்பெண் எடுத்தவர்கள் தான் 11ம் வகுப்பில் அறிவியல் பாடங்களை தேர்ந்தெடுப்பார்கள். தற்போதைய சூழ்நிலையில் எங்கள் பள்ளி 10ம் வகுப்பு மாணவர்கள் அறிவியல் பாடங்களை பார்த்து

பயப்படுவது தெரியவருகிறது. அதனால் அவர்கள் 11ம் வகுப்பில் அறிவியலை பாடமாக தேர்ந்தெடுக்கும் வாய்ப்புகறைவாகத்தான் இருக்கும் என்று நினைக்கிறேன்.” மேல்நிலை வகுப்பு உயிரியல் ஆசிரியர்.

English paraphrase: Only those students who get high marks in science at grade 10 will choose science subjects for higher secondary studies. In the current situation, it seems that the 10th class students of our school are afraid to look at science subjects. So, I think they will be less likely to choose science as a subject for higher secondary studies.” *High school biology teacher.*

மாணவர்களின் அறிவியல் கற்றல் அளவு குறைவதால் அவர்கள் மேல்நிலை அறிவியல் பாடங்களை புரிந்து கொள்ள சிரமப்படுவார்கள். மேலும் மேல்நிலை இயற்பியல், வேதியியல், உயிரியல் பாடங்கள் அளவு அதிகம் என்பதால் அதனை படிக்க சிரமமாக இருக்கும் என்று நினைக்கின்றனர். இது அவர்களுக்கு அச்சத்தையும் நம்பிக்கை குறையையும் ஏற்படுத்துவதால் அவர்கள் அறிவியலை மேற்படிப்புகளுக்காக தேர்ந்தெடுப்பதில் நிச்சயமாக தாக்கத்தை ஏற்படுத்தும். ஒருவேளை அவர்கள் அறிவியல் பாடங்களை தேர்ந்தெடுத்தாலும் அவர்களது தற்போதைய கற்றல் இழப்பின் விளைவு மேல்நிலை வகுப்புகளிலும் பாதிப்பை ஏற்படுத்தக் கூடும்.” வட்டார வளமைய ஆசிரியர் பயிற்றுநர்.

English paraphrase: Students' levels of science learning are declining, making it difficult for them to understand higher concepts in science subjects. They also think that the higher the level of physics, chemistry and biology, the more difficult it will be to study. This will definitely have an impact on their choice of science for higher studies as it will cause them fear and lack of confidence. Even if they choose science subjects, the effect of their current learning loss may affect the upper classes as well. *Regional resource teacher trainer.*

Research Question 4: How did this learning loss in science affect the learning of science in higher studies?

A common theme in the discussions was that learning loss due to lockdown could have a significant impact on students' choice of science for higher studies. Even if

they had selected the science stream at higher secondary level, the current situation may have its effect on their continuation of higher education (collegiate) in science. Given below are verbatim extracts from the interviews that illustrate this finding.

“பள்ளியில் நேரடி வகுப்பறை சூழல் இல்லாமல் அறிவியல் கற்கும் இந்தநிலை மாணவர்களின் அறிவியல் கற்கும் திறனை ஆற்றலை கடுமையாக பாதிக்கும். அடுத்தடுத்த வகுப்புகளில் அவர்கள் கூடுதலாக படிக்க வேண்டிய சூழ்நிலை இருக்கும் போது அடிப்படை அறிவியல் கல்வியில் ஏற்படும் பாதிப்பு அவர்களது மேற்படிப்பை கட்டாயமாக தடை செய்யும். அவர்கள் அறிவியல் கல்வியை தங்கள் கல்லூரி மேற்படிப்பிற்கு தேர்ந்தெடுப்பது ஆகியவற்றில் மாற்றம் ஏற்படுத்தும்.” மேல்நிலை வகுப்பு வேதியியல் ஆசிரியர்.

English paraphrase: This way of learning science without a direct classroom environment at school can severely affect students' ability to learn science. Impact on basic science education will prevent them from pursuing higher studies in subsequent classes. It will change the way they choose science education for their college education. *High school chemistry teacher.*

“பள்ளி அளவில் அறிவியல் கற்றலில் இழப்பு ஏற்படுமானால் அது நிச்சயமாக மாணவர்கள் அறிவியலை தங்கள் எதிர்கால பணி வாய்ப்பிற்கான கல்வியைத் தேர்ந்தெடுப்பதிலும் ஒருவேளை தேர்ந்தெடுத்தாலும் அதனை நல்ல முறையில் கற்பதிலும் பாதிப்பை உண்டாக்கும்.” கல்வியியல் பேராசிரியர்.

English paraphrase: If there is a loss in science learning at the school level it will definitely affect students' selection of science for their future career choice. *Professor of Education.*

“போதுமான தீர்வுகள் கூடுதல் கற்பித்தல் மற்றும் பிற ஆதரவு உதவிகள் செய்யப்படாத பட்சத்தில் அது மாணவர்களின் எதிர்கால அறிவியல் கல்வியை பாதிக்கும் என்பதில் சந்தேகமில்லை. ஆனால் அவர்களுக்கு ஏற்படும் கற்றல் இழப்பு அளவிடப்பட்டு அந்த இழப்பினை சரிசெய்யும் வாய்ப்பு வழங்கப்பட்டால் இந்த நிலையில் மாற்றம் கொண்டு வரலாம்.” விலங்கியல் பேராசிரியர், கலை அறிவியல் கல்லூரி

English paraphrase: There is no doubt that it will affect the future science education of the students if adequate solutions are not made available for further teaching and other support. But that can change if they are supported to overcome their learning loss and given the opportunity to make up for it. *Professor of Zoology, College of Arts and Sciences.*

Research Question 5: What are the specific interventions that could be provided to reduce the adverse effects of the COVID-19 induced lockdown related to learning loss experienced by students?

Thematic extraction pointed to the common opinion that remedial teaching with more a supportive environment should be given to students to re-learn basic science concepts. Syllabus and text materials must be re-designed such that students have the opportunity to reacquaint themselves with essential concepts. Besides, there must be bridge courses in colleges to strengthen science learning among students. Given below are verbatim extracts from the interviews that illustrate this finding.

“கல்லூரி அளவில் ஒரு இணைப்புப்பாடம் வழங்கப்பட வேண்டும். அதன்மூலம் மாணவர்களின் அறிவியல் கற்றலை வலுப்படுத்தி அவர்கள் மேற்படிப்பை நல்ல முறையில் பயில வழி ஏற்படுத்தலாம்.” கல்வியியல் பேராசிரியர், கல்வியியல் கல்லூரி

English paraphrase: A supportive course should be offered at the college level. It can strengthen students' scientific learning and enable them to pursue higher education with greater motivation and confidence. *Professor of Education, College of Education.*

“உயர்நிலை மற்றும் மேல்நிலை அறிவியல் பாடங்களில் மிக மிக முக்கியமான அடிப்படை அறிவியல் கருத்துகளை மட்டும் பாடப்பகுதியாக வைத்து பாடப் புத்தகம் சிறிதாகப்பட வேண்டும். அதன்மூலம் பாட சுமை என்ற அறிவியல் பாடத்தின் மீதான அச்சம் மற்றும் நம்பிக்கையின்மையை குறைக்கலாம்.” மாவட்ட கல்வி மற்றும் பயிற்சி நிறுவன அறிவியல் விரிவுரையாளர்.

English paraphrase: The textbook should be shortened to include only the most important

basic science concepts in the higher and secondary science subjects. This will reduce the fear of science subjects. *Lecturer, District Education and Training Institution.*

“மாணவர்களுக்கு அறிவியல் கல்வியில் அறிவியல் சார்ந்த பணிகளில் ஆர்வம் ஏற்படும் வண்ணம் ஊக்கமளிக்கும் வகையிலும் புத்தாக்க பயிற்சி வழங்கலாம். மேலும் மாணவர்களுக்கு உளவியல் ரீதியான ஆலோசனைகளை வழங்க வேண்டும்.” இயற்பியல் பேராசிரியர், கலை அறிவியல் கல்லூரி.

English paraphrase: Innovative training can also be provided to encourage students to become interested in science-based work in science education. We also need to provide psychological counseling to students. *Professor of Physics, College of Arts and Sciences.*

Recommendations

The following recommendations emerged from the participants of current study, for implementation as schools return to normal levels of functioning.

1. Schools can extend working hours to increase teacher-students' personal hours. Extension may be 60 to 90 minutes as study hours. During this period science teachers can recap and revise basic principles and concepts which were lost during lock down.
2. Teachers can take a multidisciplinary approach to re-educate students in the basics of science learning.
3. Lessons must be planned such that practical sessions in the laboratory or in the field, are given more importance.

Conclusion

This qualitative study revealed that COVID-19 lockdown affected the science learning of high school students Thoothukudi District. According to the perceptions of the study participants, an outcome of this learning loss could negatively affect students' selection of science for further studies and higher education.

About the author

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