

Post Graduate Course in  
Reflective Teaching with ICT

S03 Interactive Science Teaching

Teacher Coursebook  
(Health and Disease)

This coursebook belongs to:

Name: .....

Class: .....

Section: .....



## A Note for Teachers

As teachers you are aware of the aspirations of the NCF 2005 document that students should not be restricted to limit themselves to the information given in their prescribed science textbooks. The same view has been expressed in the state curriculums too. The curriculum urges that science education should empower students to strengthen their skills of objective thinking, questioning, investigating, reasoning and sharing the evidences to prove a hypothesis with authentic evidence, and systematically arrive at conclusions. School curricula and textbooks need to be designed in a way to help students understand and experience the nature of science. This is one way to make a leap from a teacher-centric classroom that relies heavily on textbooks, to a more learner-centric classroom. An interactive student-centric classroom emphasises understanding of scientific concepts through the use of experiential learning. To make a class student-centric, teachers need to shift to being facilitators for which they need multiple ideas and strategies. Hence CLIX modules support you with the tools and techniques to teach science using novel strategies in addition to several other inputs you have received, including the use of technology.

The module 'Health & Disease' has a direct application and relevance in our daily lives. This module, comes under Biology and also has curricular connections with Chemistry and Physics. This module puts the topic of Health and Diseases under lens of scientific inquiry and aligns it with the concepts of nature of science. The module emphasizes that the concepts of human health, diseases, nutrition and diet need to be viewed with the same scientific lens as other science subjects. The issues of health should also be thought in the same scientific manner as one would think about other natural phenomena; that one should rely on scientific methods to arrive at conclusions regarding health and not believe in hearsay.

Since the concept of health and disease is introduced in all the states, lesson four in this topic, 'What does data tell us' is used as an exemplar to enable students to learn science using technology and the principles underlying the three pedagogic pillars. The main objective of this module is to enable students to experience and appreciate the nature of science through the topics of health and diseases. This module is a blend of digital and hands on activities to investigate. Wherever students need not use the computer, teachers are free to conduct the activity elsewhere other than in the computer lab.



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# The Health and Disease Module

## Section 1 : Basic Module Information

**Prior Knowledge:** Students are required to have a basic idea about

- Types of diseases
- An overview of the cardiovascular system in human body
- Basics of scientific method

Students should have completed parts of CLIX i2c module.

### Structure of the Module:

This module has one unit, divided into four lessons.

### Unit 1: Health and Disease

Pre-assessment

#### Lesson 1: Concept of Health

- 1.1 What is health?
- 1.2 Overlap of the three aspects of health
- 1.3 Overlap of the three aspects of health: stories of the people around us
- 1.4 From health to disease
- 1.5 How do diseases reach us?
- 1.6 Preventing ourselves from diseases

#### Lesson 2: The Story of Malaria

- 2.1 Malaria Discovery
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#### Lesson 3: Let's Investigate!

- 3.0.0 Finding answers to some questions
- 3.1 High blood pressure
  - 3.1.1 What causes high BP?
  - 3.1.2 How is BP measured?
  - 3.1.3 Smoking
    - 3.2.1 Lungs of people who smoke
    - 3.2.2 Lung capacity of smokers and non-smokers (part 1)
    - 3.2.3 Lung capacity of smokers and non-smokers (part 2)
    - 3.2.4 Your question, your investigation!- Smoking
- 3.3 Anemia
  - 3.3.1 Iron-deficiency can cause Anemia
  - 3.3.2 Food sources of iron (part 1)
  - 3.3.3 Food sources of iron (part 2)
  - 3.3.4 Your question, your investigation! - Anemia

## **Lesson 4: What Does Data Tell Us?**

4.1 Finding patterns in data: simulation tutorial

4.2 Finding patterns in data

### **Post-assessment**

### **Student Feedback Survey**

### **Credits and Citations**

#### **Expected timeline:**

#### **Preparation time for teacher: 1 Week (4 hours)**

Checking Lab readiness

Collecting Materials for field study

Preparations for classroom teaching

Grouping students and providing ground rules and instructions prior to each activity

#### **Time for classroom implementation : 3 weeks (12 class periods)**

Field Study: two class periods

Digital learning and discussion: four class periods

Experiments: three class periods

Activity-based learning in the classroom: three class periods

#### **Assignment : 1 Week**

#### **Total Time Required: 5 Weeks**

#### **Requirements:**

##### **General requirements:**

1. You should have access to a computer that has USB port, audio and video player and an Internet connection.
2. You should have a smartphone to receive the Telegram message you will get every day.
3. Assign a notebook (which we will call a journal) for this module. Assign one page to make notes for every day.
4. All materials for hands-on-activities
5. Familiarity with the local diseases, remedies, food habits etc. Also Teachers to be familiar with
  - Content in the textbook
  - Content of the health and disease CLIX module
  - Familiarity with the vegetation, flora and fauna, common health issues, food habits, hygiene in the area around school surroundings and the community in general.
  - Latest and current developments in epidemiology
  - Narrations of the past incidences of health scenario and how it has reached the present status: beginning from local, state level, countrywide and worldwide scenario.

##### **For lesson specific activities:**

6. For studying mosquito and their larvae:
  - a. Small cups (can use coconut shells, used water bottles etc) to collect the mosquito larvae
  - b. Piece of cloth or sieve to cover the cup
  - c. Rubber bands/ thread to tie
  - d. A hand lens if available. Else bubble lens, water lens etc can be used (ideas will be shared on telegram from time to time)
7. For 'Blood Pressure' experiment you will need:
  - a. Water
  - b. Two buckets
  - c. An old plastic bottle that can be easily pressed
  - d. Two pipes about 2 meters with different diameters

8. For 'Smoking' experiment you will need:
  - a. One large (5 liter) plastic bottle or container
  - b. A bucket in which the plastic-bottle can comfortably fit
  - c. Rubber or plastic pipe of about 2 meter
  - d. A 250 ml cylinder or beaker (to measure)
  - e. Small strips of paper
  - f. Adhesive Tape
8. For "Anemia" – testing for iron experiment you will need:
  - a. Tea leaves
  - b. One liter water (distilled)
  - c. About 10 grams of jaggery
  - d. Two large container to hold one liter water : one to boil water, another to collect tea decoction
  - e. Strainer
  - f. Whatmann filter paper
  - g. Two Small beaker (25ml to 100ml) (alternately glass bottle may be used)
  - h. Suitable glass or plastic funnel to fit into the beaker
  - i. Stove or burners to boil water
10. Small cups to collect water from different sources to repeat the above experiment with different water samples.
11. For teaching the concept of sampling, population, trials : small blank paper chits or red and blue coloured buttons (double the number of participants)

## Section 2: Pedagogic Approach

In an interactive, learner-centric classroom you need to play the role of a facilitator. This is essential for teaching science when the aim is not just the understanding of concepts but also to help students internalise the nature of science. Students' current knowledge may not be adequate for them to understand the cause and effect of natural phenomenon around them. Hence, you need to ensure that your students learn scientific terms and symbols through which they can communicate their learning.

Students are likely to have their own beliefs about the natural phenomenon which may not be sufficient to generalise into principles. Next, some macroscopic or microscopic natural phenomena are beyond students' direct perceptions. Third, explanations of some phenomena require the learners to be exposed to the use of tools from within the domain and also from other disciplines such as mathematics, physics, chemistry and social sciences. It is therefore desirable to help students to refine their ideas and beliefs. Encourage them to go beyond the information given in books. It is here that technology will help you to make best use of available time for an effective learning experience. Design activities to incorporate pedagogic pillars while using the authentic methodology of doing science.

### Collaboration

In scientific endeavour, collaboration is uniquely important. Peer review and replication of studies are standard practices in scientific research. The scientific community is dependent on one another for generation of valid scientific knowledge. Hence, it is important to provide opportunities for collaboration while learning science. The pillar of collaboration translates into the planning of activities that allow students to work in pairs or in small groups.

### Learning from mistakes

Mistakes and misunderstandings are important aspects of learning. We all have intuitive explanations for the phenomena around us. For example many people believe that bottled mineral water is safer than tap water. How far is this information true? What other factors need to be considered to determine the potability of safe drinking water? Examining our current understanding to eliminate mistakes and misunderstandings opens the door to critical understanding of scientific concepts. The activities in the modules lead students to the realization for the need to experiment, the need for repetition of experiment and verification before concluding.

### Authentic learning

In the context of 'Health & Disease' the term 'authentic' may be interpreted as relevant. Health is a topic that is not just familiar to every student, it is a topic of extreme relevance as everyone has encountered some form of a health problem in one's life. To make learning authentic, one may draw upon personal experiences and create activities that lead students to think about health and diseases in daily life. They may use personal data or data from local institutions as hospitals and clinics to think about the broader concept of health beyond their understanding of health to mean illness or physical disease.

### Objectives of the Health and Diseases Module:

- The primary aim of this module is to analyse health and disease from the perspective of scientific inquiry.
- Students get an opportunity to gain an in-depth understanding about health and its related concepts through digital and hands-on activities.
- Expected learning outcomes:
  - Students develop a wider perspective of understanding health issues and how it affects daily life.
  - Students understand the interconnectedness of physical and mental wellbeing along with control of illness and how it contributes to the overall social and economic health of the society.
  - Students develop the ability to assess health related information and data for its credibility and quality.
  - Students understand the importance of need for experimentation, testing and interpreting the test results.

- Students learn to engage in interactive discussions with peers and teacher about health issues thus enabling collaborative learning.

## Section 3: Notes for Implementing Student Module

### General tips to conduct activities efficiently

- Students may not get computer lab access to complete the entire module. Realistically, the best teachers should do is to conduct the hands-on activities and discussions in the modules in the classroom. They need to access the computer lab only for the exclusive digital activities. For example, during Lesson 4, 'What Data Tells Us' is when students must be in the computer lab and be able to do the virtual, computer simulation activities.
- In order to make optimum use of the resources provided for this module, you need to be familiar with all the lessons. Later you may guide students on how they may perform the digital and physical activities.
- Whether it is a classroom collective activity, outdoor activity or in the computer lab, you need to ensure that every student is given a chance to share their observations and views. So do not be in a hurry to reveal 'the correct' answer. For example in activity 1, lesson 1, after every student lists indicators of health, a consolidated table can be put up on a chart paper and displayed in the class. This will help you ensure peer learning and also help students to learn from mistakes, make self corrections and learn with understanding.
- State the ground rules and instruction for each activity clearly and explicitly before students begin their activity so that there is no loss of time. To prevent chaos in the classroom, make sure that students are not confused.
- By ensuring material readiness, weekly planning and organizing students-computer ratios efficiently you can ensure that time is managed effectively. This is one of the ways to help students derive optimum benefit from the interactive CLIX modules.
  - If there are more students then group them in such a way that they can take turns to do the digital and hands-on activities.
  - It would be helpful for you to be familiar with the entire module and the related lessons in the textbook before it is introduced to students. If a topic from the textbook is also present in the CLIX module, you may not need to teach that topic twice.
- Although in Biology, nature is the best site for learning, it may not be adequate. Certain experiments may be done in controlled spaces like laboratories and classrooms. For example, observing the life cycle of an insect, germination of seeds and so on .
- Certain observations and experiments may be done virtually using technology. For example, a slow motion video to observe how a mosquito larvae develops.
- For some activities you may involve your colleagues from other domains or people in the community. By doing this students will not only get first hand information but they will realise the need of collaboration even among adults. For instance in lesson three you can request a physics teacher to explain the concept of pressure. This helps students connect physics and biology.

### Lesson 1: Concept of Health

#### Learning Objectives:

At the end of this lesson, students will be able to:

- Use an example or scenario to show that health is not just an absence of disease.
- List three aspects that determine health and the indicators of health.
- Provide reasons for why we suffer from diseases.
- Suggest ways for prevention of diseases.

#### Activities:

- Classroom discussions: Discuss to arrive at the three aspects that influence health; physical, social and mental well-being. This is a collective activity involving peer learning and learning from mistakes, addressing alternate conceptions and misconceptions.

- Digital activity: Listening to/watching story followed by peer discussion
- Outdoor activity: Interaction with community members and sharing learning
- Classroom activity: Discussion and note taking, linking text book content with experience about agents and vectors that cause disease.
- Classroom thinking activity: Discussion about health and diseases, causes of diseases based on personal experience of students.

**For achieving the learning objectives for this lesson, you need to**

- Facilitate and moderate discussion by leading the students to ask questions to each other. The more you practice this form of discussion, more comfortable you will be for such discussions in the future.
- You can demonstrate how to interview for activity 3 called 'Let's talk'. It requires them to interact with people in their neighbourhood.
  - You need to draw their attention to the sample questions given at the end of the activity.
  - Demonstrate how to be sensitive to the respondents feelings and preferences whether to answer their questions or not.
  - Tell students that they can translate these to their local language
- In this unit some activities require students to share their life experiences as in activity 1, lesson 1. Some require them to read the lesson before doing the activity as in lesson 1, activity 4. Encourage them to read the entire lesson. To make it more inclusive, you may also group them in three or fours and divide the lesson into four parts and then collate the names of diseases they have found out in the text so that even students who are lagging will can contribute.
- This lesson incorporates activities involving all the three pedagogic pillars. Activity 1 is a classroom activity. This activity supports authentic learning as students get an opportunity to think and articulate their understanding of indicators of health to begin with and at a later stage when they do activity 2, Chanda's story they will be able to clarify their beliefs with peers. Thus it supports the second pillar - peer learning. Finally by the time they complete the activity 4 and 5, to some extent students get opportunity to realise the possibility of learning from mistakes

**Lesson 2: The Story of Malaria**

**Learning Objectives:**

At the end of this lesson, students will be able to:

- Understand that malaria is a communicable disease
- List agents that cause malaria and the vectors that spread it.
- Learn to verify observations by exploring the field
- Understand places to look for, observation, collection of samples.
- Understand the nature of science through history of science.

**Activities:**

- Reading, Listening/Watching story about Malaria Discovery: Depending on the availability of time and access to computer either students can read these illustrated stories or the teacher can project this on a common large screen and read out the story to the entire class.
- Whether students read the stories on their own, or whether you read them, perform the activities at the exact point where they are suggested
- Outdoor Activity 1a: Mapping and predicting prior to Mosquito Search. Searching for mosquitoes requires students to have a few prior knowledge of their whereabouts. Before sending the children explain students the precautions they need to take while hunting for mosquitoes.
- Outdoor activity 1b: Verification of the presence of mosquitoes, collection of a few mosquitoes alive or dead. Ask students if they know techniques to catch mosquitoes or suggest ways to collect mosquitoes.
- Outdoor Activity 2a: Mapping and predicting the possible location where mosquito larvae are found. To predict the possible location of mosquito larva briefly narrate the life cycle of a mosquito. Our

experience shows that some students are not familiar with how larvae look like. Before sending them to collect larvae, you may show them the video of a larva or you collect a few of them in a bottle and show it to children

- Outdoor Activity 2b: Observation of development of larvae in the laboratory or classroom. This activity needs at least two weeks. This exposes students to one of the methods of life science, namely systematic observation over an extended period of time in a controlled environment.
- Classroom discussion: Where do larvae live?: Spend 10 to 15 minutes in this activity. You will be surprised to see how children learn from mistakes and peer learning. They will share what they thought earlier, what new they learnt and so on.
- Predictions in classroom (group activity): Recalling the types of mosquitoes and guessing the possible differences in the type of disease they spread. You can probe by asking them to give reason for their claims.
- Activity 3: Collection of different kinds of mosquitoes from neighborhood: In particular focus to collect anopheles mosquito. Let students observe and discuss their structure, habitat, behaviour and so on before you give them additional information before moving on to activity 4.
- Activity 4: In this they present their observation and characters used for classification to identify different types of mosquitoes. Later in a collaborative manner they learn to consolidate individual observation and tabulate. This collective work can be displayed in the classroom.

**For achieving the learning objectives of this lesson you need to:**

- Encourage students to follow the sequence of activities in each lesson. This lesson for example,
  - Is organised in a way that one story is divided into three episodes.
  - Each episode asks students to perform activities to validate the authenticity of the information in that episode.
  - For example, activities three and four in lesson two should be done after reading the section of the story on how Dr.Lavern discovered evidences to show the connection between mosquitoes and malaria. This leads students to wonder if all mosquitoes cause malaria? If there is a way to know which mosquito causes which disease etc. For this students will need to do activities 3 and 4.
  - Students will derive maximum benefit of realising the nature of science and understanding the history of science by doing the activities they are asked to do after each episode.
  - So you must facilitate them to complete the activity before moving on to the subsequent episodes.
- To save time and ensure that students get time to do the activities, it is better that you read out the stories and instructions and let students do activities, present their results and participate in discussions
- Most of the activities in this lesson supports collaborative learning and learning from mistakes. Hence encourage peer discussion among students, working in groups and presentation of the results of their activities. This will enable the peer learning within the group and also across the groups in your class.

**Preamble to Lessons 3 and 4: Modern Day Health Hazards**

Here is a perspective based on what has been covered so far in this module and what we are about to cover. You have read and taught about malaria - a disease that can be avoided by keeping your surroundings clean, ensuring that mosquitoes do not get a chance to breed and so on. It is still very much possible that you would be bitten by a mosquito in a place you visit for just sometime. There is an element of chance that you may contract this disease no matter how careful you may try to be. However, there is class of diseases that we are about to touch upon, which, it can be said, is something we bring upon ourselves. High blood pressure, smoking, anemia are some conditions that we bring upon ourselves partly due to the habits we develop and partly due to our modern lifestyle. Let's consider smoking. What starts out as a harmless experiment in early stages of youth, goes on to become a dependency that is hard to give up. Very often smokers find that smoking helps them cope with the stress of modern day living. So they often continue smoking which increases their chances of getting cardiovascular diseases. Not just smoking, or chewing of tobacco, even poor nutrition can lead to diseases like anemia. All these are

symptomatic of a larger issue of mental well being.

When you view these health concerns with the view of the three aspects of health, it becomes a starting point for students to relook at how they may think about these issues for themselves and for those around them. Using real life stories have students reflect and debate aspects of health being a center point for the discussion around blood pressure and cardiovascular diseases. While the digital and hands on activities might enable an understanding of the mechanics of diseases, your role as a facilitator really would be to generate a deeper awareness within themselves about aspects of health. This awareness thus created may help them become healthier individuals and also become positive influences in their communities.

### **Lesson 3: Let's Investigate!**

#### **Learning Objectives:**

At the end of this lesson, students will be able to:

- Organise the data collected pertaining to lifestyle diseases like blood pressure, and habits like smoking and deficiency diseases like anemia.
- Analyse and interpret the data.
- Present the data using simple mathematical concepts in the form of percentages or graphs and tables.
- Learn to work in groups and present their findings to others.
- Understand the importance of modelling, simulations and actual investigation by designing simple experiment or conducting surveys.

#### **Activities**

##### **3.1 High blood pressure**

- Activity 1 involves reading a story and discussing it. This is not a digital activity. Even so, it is important to provide a context that is relevant to students' life. By doing this students will be able to connect classroom learning with what happens in the real world. You may read out the story in the classroom to save time.
- Activities 2 and 3 have been designed to show the flow of blood in blood vessels. These are not digital activities. These activities aim to demonstrate the relation between the diameter of the blood vessel and the rate of flow of blood. You simulate flow of blood through blood vessels using flexible pipes of different diameters, flexible bottles, buckets and water. By obstructing the flow of water in the pipe using clothespin, pipe you can even simulate variations in diameter of the blood vessels and its relation to variations in blood pressure. Teachers may read out the instruction to the entire class and students can conduct the experiment in smaller groups.
  - By doing these activities students will understand that using water bottle and pipe it is an easy way to demonstrate reasons for variations in blood flow. They understand the need for simulation.
  - The activity can be carried out either inside or outside the classroom: If you can set up 4 or 5 sets every student will get opportunity to do this experiment to demonstrate the relation between diameter of the blood vessel and the rate of flow of blood.
  - As this uses simple readily available local materials, it can also be repeated in their homes.
  - As teachers you can use this opportunity to go deeper by sharing the reasons for changes in diameter of blood vessels, role of valves in the veins, and so on.
- Activity four (outdoor activity): Interview people to know if they are diagnosed with BP and investigating the reasons for BP - Individual student to collect data from at least five persons in a given class.
- One suggestion is to get a health worker into your classroom and ask them to demonstrate the use of instrument to measure BP-sphygmomanometer.
- Presentation of results of survey: Students learn graphical representation. The graph so obtained can be discussed in the whole class for 10 minutes. Moderate discussion to find out if any observation are not included in the graph, if they are outliers, and what could be the reason for such exceptions and so on.

- Whole class Classroom/Digital: Students do data collation, analysis and classification based on age and incidence of high or low BP. This not only promotes collaborative learning but also helps students to realise the need for validation of their observations using large samples.

### 3.2 Smoking

These are also interconnected activities to help students understand the effects of smoking and that smoking is connected to health. These activities will also enable students on how to try to convince the larger community about the ill effects of smoking.

- Activity 1 (whole classroom discussion): Let students recall people who smoke and share their observations about smokers. Tell students that it is not important to disclose the name and other details about the person they are talking about.
- Activity 2: Is a digital activity on reading the narration of a smoker. Based on this students have to guess if there is a relation between inhaling smoke and the efficiency of lungs. After reading, have students discuss the points raised in the reading while you moderate their discussion.
- Activity 3: Lung capacity of smokers and non-smokers. This has two parts. First is a hands on activity and the second part is collation and analysis of result. Finally the results of the experiment is compared with what students understood from activity 2.
  - Activity 3a: this is a hands on activity to measure lung capacity of smokers and non-smokers. It is meant to verify the student's guess. It is better to introduce this activity on the previous day to inform students to find out if any person who smokes would be willing to volunteer to take part in this activity. You can also try to get a volunteer.
  - Activity 3b: This is a small group activity. Students tabulate their observations and try to answer a few questions. Encourage students to ask more questions.
- Activity 4: This is the stage of culmination of investigation on smoking. Based on the tabulated results and answers to the questions the groups present their results. Finally you can facilitate to wrap up the activity by comparing the results and record the final agreement that students would possibly come up with. This makes students to use authentic sources of information, look for patterns, generalise and put forward their views with conviction as to why certain habits have influence on the health of the community and how is it different from diseases.

### 3.3 Anaemia

This theme is taken as an exemplar of deficiency condition that affects health of an individual. Along with other steps of doing science such as guessing, hypothesising, there are activities that introduces students to the possibility of using digital simulations to experience the intangible concepts in the absence of sophisticated tools such as compound microscopes and when there is a need to learn about large samples to investigate the causes for certain natural occurrence.

- Activity 1: Is to establish a context which students can easily relate. Let students to read the story and guess the iron rich item in the list. Later encourage them to list more items used in their homes. This enables them to connect the story with their own life.
- Activity 2: Preparing solutions of food items to test if they contain iron.
- Activity 3: this is a hands on experiment to test the presence of iron. Keep the apparatus needed to do the activity ready. Depending on the quantity of availability of resources you either plan to demonstrate or allow children to do the activity in groups. Some of the food items the students should be able to bring from their homes.
- Activity 4: In this the outcome of the experiment carried out as activity 3 is further investigated. This requires your help as a moderator. During this activity, be prepared to answer students' unexpected queries such as how do you know that the stain on filter paper is iron? In what way the whatman filter paper is different from other papers? How did common people come to know whether the food item has iron content in it or not ? What other ways are there to test quantity of iron in different foods. If

you feel it's a question concerning chemistry, request a chemistry teacher to explain. You may even record the children's questions and answer them at a later point (feel free post them on telegram for others to respond.)

- Activity 5: Will be carried out as an extension of activity four. In this as teacher facilitator you add more to the existing understanding of students. For instance symptoms to identify anemia, causes of anemia if any other than iron deficiency in blood.

#### **For achieving the learning objectives you need to:**

- Allow students to experience how to do science by collecting authentic information and understand that health is not merely physical illness.
- Engage in discussions with students to help them connect the impact of diseases and illnesses in terms of social, economical, psychological wellbeing of the society.
- Try to facilitate the students to do all activities related to lifestyle diseases; blood pressure, smoking and deficiency diseases like anemia. Instead of students themselves reading out the introduction and instructions, you will save time for activities if you yourself read out the introduction and instructions to all students in one go.
- Divide the entire class into three groups. Each group can work on one of the themes and finally they can present their work to the entire class.
- Encourage them to do the activities of the other two themes during their leisure time.

#### **Lesson 4: What Does Data Tell Us?**

##### **Learning Objective:**

At the end of this lesson, students will be able to:

- Experience the role of technology in learning through this lesson.
- Look for patterns in data by watching the simulation tutorial followed by a digital Interactive activity which they themselves can do.
- Experience the excitement of handling large data, sampling and repeating the experiment.
- Students will come to know how and at what stage generalisations can be made.

##### **Activity:**

This is new to students and is an exemplar for digital simulation activity. This needs to be conducted in two parts.

#### **PART 1**

- Experiencing need for sampling using hands on activity. It might take at least 10-20 minutes depending on the class size.
  - First make sure that the students will understand the concept of sampling in a population, and the need for repeated experiments by drawing fresh samples from the same population pool.
  - To do this, demonstrate the following simple activity to help students understand total population and sample size. Two possibilities, using small chits on which the word either anemic or non-anemic is written or use blue and red coloured buttons /counters to represent non-anemic and anemic conditions respectively.
  - For variation add any one neutral parameter. For chits written as 'no idea', and some other colour buttons to represent no-idea.
    - If there are 30 students you need to have 30 each of the two kinds of chits or two kinds of buttons. This represents a population size of 60. Add 5 more for neutral ones- no-idea chits or no-idea buttons
    - Mix them up in a bowl. This will now have 65 chits.(this number varies as per your class strength
    - Pass the bowl around. Let each student pickup one chit.

- Take a count of number of anemic/ anemic. Record the numbers.
- Ask students to return the chits to the bowl and shuffle them again.
- Repeat the same for another two rounds.
- Each time note the numbers of anemic, non-anemic and neutral chits either on the black board or on a chart paper. Draw attention to the differences if any.
- Then briefly discuss the possibilities if it were to be a larger population and the need for sampling and repetition.

## **PART 2:**

Here students need to log into the computer for this. The activity lends itself for students to find patterns by changing the sizes of data samples and trying out various combinations of variables such as gender, age, and so on.

- Provide proper verbal introduction and demonstrate navigation to all in one go.
- Even before they begin the activity, show them how to tabulate their observation
- Preferably let students work in pairs.
- Do not forget to make time for sharing the results followed by discussion. This is the way students learn about validation of their results and you can ensure collaborative learning

For achieving the learning objectives you need to:

- Remember that this is the only lesson in health and disease module which requires computer as it consists of only digital activity. Hence you will need to ensure that the computer lab is ready.
- Explain the meaning of population and sampling to students before they go to the computer lab. Since this is a new concept, it will require your facilitation.
- To achieve the best results, it is better if you can arrange for two continuous consecutive class periods. So that at a stretch both part 1 and part 2 can be done.
- Part I is a hands on collective activity. This requires teacher's prior preparation.
- At the end of Part 2: set aside at least 20 minutes to consolidate the results and finally share with the larger group
- In case the class size is large (more than say one computer :3 students), let six students be in a group per computer. Give clear instruction that each student should take turns to do at least two trials and they should together consolidate their data and analyse it.
- The last 15 minutes of the session need to be set aside for conclusion of this lesson and discuss about the overall learning about health and disease.