APPENDIX — E

INSTRUCTIONAL HANDBOOK
FOR
THE SKILL OF DRAWING DIAGRAMS
SKILL OF DRAWING DIAGRAMS

Whatever may be the branch of biology, botany or zoology, physiology or histology, drawing diagrams is indispensable. A properly drawn diagram clarifies the morphology, anatomy, histology, physiology, algology, mycology, bryology, embryology and taxonomy. A neatly well labelled diagram teaches better than lengthy sentences and difficult technical terms.

A teacher has to draw diagrams on the blackboard, on the practical notebook of students (in order to correct their diagrams), on the transparency of overhead projector and on the charts.

Examine the way in which the teacher draws/does not draw diagrams in the following examples.

Episode 1

Teacher : What are the modifications of underground stem ?
Pupil : The modifications of underground stem are rhizome, tuber, bulb and corm.
Teacher : What is the structure of rhizome ?
Pupil : No response.
Teacher : I will draw diagram of rhizome on the blackboard. Look at the blackboard and start
drawing the diagram on your notebooks.
(The teacher starts drawing the structure of rhizome on the blackboard, pupils are also drawing, the teacher labels the diagram correctly and neatly and draws horizontal lines for labelling, each labelling starts one below the other. His speed is such that students may also draw but all the time they are busy. Different parts of rhizome are shown by different colours and the diagram is bold enough to be seen from the backbench. Side by side, he is speaking the names of different parts whenever he writes).

Episode 2

Teacher : What are modifications of underground stem ?

Pupil : Rhizome, tuber, bulb, corm.

Teacher : What is rhizome ?

Pupil : (No response)

(The teacher starts drawing the structure of rhizome on the blackboard remaining silent. Idle pupils talk to each other).

Teacher : Silence, no noise

(The teacher labels the parts with red chalk) Reena, you stand up, why are you
making a noise. (Pupils try to see the diagram as it is not visible to them due to reflection on the blackboard).

Episode 3

(The teacher starts dictating the types and definitions of various forms of modification of underground stem and at the end, asks students to mug up all this).

In the above examples, which of the three teachers do you think has made the students understand properly. You are right if you say that it is the teacher in episode 1. You will also say that the teacher has a skill of drawing diagrams because he is drawing diagrams in a way better than the teachers in example 2 and 3 whose teaching is not being accompanied by learning by the students.

What does this skill of drawing diagrams consist of? The answer to this forms the components of the skill of drawing diagrams.

COMPONENTS OF THE SKILL OF DRAWING DIAGRAMS

The skill of drawing diagrams has the seven components:

(1) Correctness
(2) Neatness
(3) Labelling
(4) Speed
(5) Colour
(6) Keeping students busy
(7) Visibility

Description of components:

(1) Correctness

Correctness means firstly, the diagram should be without errors in the parts or on the whole. If there is confusion, it is better to consult the book rather than to draw wrong. Secondly, it should fulfil the purpose for which it is drawn, thirdly, it should not be missed where it is needed, and fourthly, proportion of various parts should be correct.

Example 1

Cells of parenchyma are thin walled and those of collenchyma are thickened at the angles. Therefore, drawing thin lines for the cell walls of parenchyma is correct and drawing thick lines in incorrect.

Example 2

Drawing only the external structure of human heart will not show the four chambers and auricles and ventricles.
Example 3

Root hair drawn with lines as thick as the secondary roots is incorrect proportion.

(2) Neatness

The diagram should be neat, that is, different parts and/or labelling should not overlap but be drawn distinctly. Rubbing of blackboard properly should be ensured otherwise half rubbed diagrams below the newly drawn diagrams will mar the clarity. If a new diagram is to be drawn without rubbing the first one, the new diagram should be started at sufficient distance otherwise the teacher might be compelled to draw the new diagram on the parts or labelling of the first diagram in order to complete it.

(3) Labelling

Proper labelling has the two subcomponents namely, correctness, and proper way (or neatness).

(i) Correctness: The labelling should be correct and care should also be taken that the lines for labelling indicate the required parts and are not invisible due to overlapping of the parts of the diagram.

(ii) Proper way: Indicating lines for labelling as well as the words should be parallel to each other and horizontal
that is parallel to the lower margin of the page or blackboard and so far as possible on one side of the diagram.

Structure of Amoeba

Proper Way of Labelling

The labelling should be neat, that is, there should be no overlapping, no cutting and no crossing of lines. Writing inside the diagram may be the rare exception only and not the habit. The words should start from the same vertical lines, that is, first letter of each proceeding (next) word should start exactly below that of the preceding word above it.

(4) Speed

The speed of drawing diagrams should be such that students can also draw diagrams in their notebooks. Very fast or very slow speed cause loss of interest and gives students the opportunities of mischiefs. If the speed is faster than the desired one, the students do not understand. The teacher should adjust his speed according to the students and should
see that they have copied the diagrams before these are rubbed off. Speed of students may be adopted by the teacher in some cases.

(5) Coloured

To show different parts, the diagrams are coloured. So far as possible, these colours should correspond to the natural colours of specimens or the colours of stains of slices. In no case, the colours contrasting to the natural ones should be used e.g. chloroplasts should not be drawn with red colours.

(6) Keeping students busy

(i) Ask students to draw diagrams on their notebooks.

(ii) Invite some students to assist the teacher in drawing diagrams on the blackboard or labelling it

(iii) Explain some parts or go on speaking the names of parts etc. to avoid long silence.

(iv) Stand at an angle, do not turn your back towards students so as to see the students also.

(v) When students are not required to draw, take care that they observe the drawings on the blackboard.
(7) Visibility

(i) Size of the drawing should be suitable to the size of the group so that all students should see clearly.

(ii) The major parts to which students' attention is to be drawn should be drawn conspicuously.

(iii) The students should be positioned to see the drawings clearly.

(iv) The reflection of light should not be allowed to mar visibility.
MODEL LESSON FOR THE SKILL OF DRAWING DIAGRAMS

<table>
<thead>
<tr>
<th>Subject</th>
<th>Zoology</th>
<th>Class</th>
<th>IX</th>
</tr>
</thead>
<tbody>
<tr>
<td>Topic</td>
<td>Structure of Amoeba</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teacher</td>
<td>Our body is composed of many cells. Name the animals made up of one cell.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pupil</td>
<td>Amoeba, Paramecium.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teacher</td>
<td>What is the shape of amoeba.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pupil</td>
<td>(No response)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teacher</td>
<td>Okay, I will draw the diagram of amoeba on the blackboard. Look at the blackboard and start drawing on your notebooks (The teacher starts drawing the diagram, pupils are also drawing. The teacher labels the diagram correctly and neatly and draws horizontal lines for labelling, each labelling starting one below the other. His speed is such that students are also drawing. Different parts of amoeba are shown by different colours. Diagram is bold enough to be seen from the backbenches. He is also speaking the names of different parts. There is no crossing or cutting of indicating lines of labelling).</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
A glossary of the term used in the observation schedule is given below:

1. Diagrams are drawn correctly.
   It refers to correctness of the diagram and its part. Correctness here means 'no errors from the content point of view'. It also means that it fulfills the purpose for which it is drawn. For example, a diagram of external morphology of human heart (however correct it may be) is incorrect for showing internal structure of heart. The proportion of different parts should be appropriate.

2. Neat
   In a neat diagram, different parts and/or labelling does not overlap and are drawn distinctly. Further, there
are no half rubbed diagrams below the diagram which is being drawn.

3. Proper way of labelling

Labelling is proper if the indicating lines for labelling and the labels are parallel to each other and horizontal (parallel to the lower margin of the page/blackboard). The first letter of each label should start one below the other, that is from the same vertical line.

4. Appropriate Speed

Appropriate speed here means that the students can draw the diagrams by following the teacher, that is, students neither lag behind nor find spare time.

5. Parts coloured

It means that the different suitable colours are used and that choice of no colour is against the natural colour, for example, a tally is not to be marked when chloroplasts are drawn with red chalks.

6. Students are kept busy

Students are busy when they are drawing or writing or doing some purposeful activity related to that very topic.

7. Visible

The diagram is visible if it is visible from the last rows.
Instructions: Mark a tally when you notice any component of the skill being exhibited by the prospective teacher/teacher who is delivering the lesson.

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Components</th>
<th>Tallies</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Diagrams are drawn correctly.</td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>Diagrams are neat.</td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>Labelling - correct and way proper.</td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>Appropriate speed.</td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td>Parts coloured.</td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td>Students were kept busy.</td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td>Diagram visible.</td>
<td></td>
</tr>
</tbody>
</table>
Observation Schedule for the Skill of Drawing Diagrams

Name of the student teacher __________________ Roll No. ____________
Topic __________________________________________ Class _______
Name of the supervisor ________________________________
Date __________ Time duration ___________ Teach/Reteach

Instructions: This proforma is meant to ascertain the extent to which the student teacher exhibits or uses the skill of drawing diagrams. Judgements have to be given on a seven-point scale for various aspects of the skill. Indicate the extent of acquisition of the various aspects of the skill by crossing (X) the appropriate number you deem fit. The scale value '1' indicates that the student teacher did not use the concerned aspect(s) of the skill at all, whereas, the scale value '7' means that the student teacher used/practised the skill aspect(s) very much. Keeping these two extremes in view, examine carefully the teacher behaviour related to the various given aspects of the skill and cross (X) the appropriate scale value ranging from one to seven.
<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Components</th>
<th>Not at all</th>
<th>Very much</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>There was no error in the diagram or its parts or the proportion of size of its parts.</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>The diagram was neat</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>Labelling was neat and correct</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>Right colours were used</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td>Students were kept busy in purposeful tasks when the teacher was drawing diagrams.</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td>All parts of the diagrams were visible to all students</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td>The Speed was proper</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
</tbody>
</table>

Comments, if any

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