Appendix F

The Modern Mathematics Teaching Competence Scale
PART A - INSTRUCTIONS

This Scale consists of eleven statements regarding teaching behaviour of a teacher of modern mathematics. These statements reflect the assessment of a teacher to impart classroom instructions effectively. Each statement has five responses as below:

Weight Response

1. Not at all: When the said behaviour is not exhibited at all

2. To a little extent: When the said behaviour is exhibited a few times

3. To some extent: When the said behaviour is exhibited sometimes

4. To a considerable extent: When the said behaviour is exhibited many times

5. To a great extent: When the said behaviour is exhibited most of times

You are requested to put (X) under the most suitable response category for each statement after observing the entire lesson in a classroom situation.
<table>
<thead>
<tr>
<th></th>
<th>Provided a wholesome climate for learning problem solving (right situation, analysis, probable solution)</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>The mathematical models were illformulated (incorrect, lacked conciseness, irrelevant, not specific)</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>3</td>
<td>The writing on the blackboard was legible (ratio and proportion, neatness)</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
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<tr>
<td>4</td>
<td>Facilitated the process of problem solving (mathematical language, mathematical relationship, problem solving material, reasonableness of answer)</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>5</td>
<td>Could not use the mathematical instruments properly (inappropriate selection, wrong use, failure to detect error)</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>6</td>
<td>Lacked the skill of appreciation (lacked extrinsic appreciation, lacked intrinsic appreciation, lacked operational appreciation)</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>7</td>
<td>Fluently formulated mathematical models (clarity about fundamentals, clarity about goals)</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>
8.0 Exhibited skill of 1 2 3 4 5
Analysis
(Non-routine problem solving, discovering relationships, constructing proofs, criticizing proofs, generalizations)

9.0 Used the skill of 1 2 3 4 5
application
(solving similar problem, making comparisons, analysing data recognizing patterns)

10.0 Could not perform mathematical operations 1 2 3 4 5
(lack of fundamentals, lack of terminology, non-performing of manipulations)

11.0 Used the blackboard effectively 1 2 3 4 5

Any comments.........................

PART C
Observational Guidelines:

1 Establish sufficient rapport with the teacher/student teacher and pupils.

2 Carefully understand the glossary.

3 Jot down the critical incidences, if any.

4 Seek clarification from teacher/student teacher at the end of the lesson, if needed.

5 Use mechanical aids like videotap recorder, tape recorder etc., if available, to record the normal and critical incidents for helping the process of rating at the end of the lesson.
PART D

Glossary:
The meaning of the key terms used in the tool are as follows:

1.1 Wholesome climate for learning—refers to the climate where development of problem solving ability takes place readily.

1.2 Problem solving—finding an appropriate response to a situation which is unique and novel to the problem solver.

1.3 Right situation—creating the situation which is helpful to the process of problem solving.

1.4 Analysis—taking a set of information given in the statement of problem and making a sequence of decisions regarding solving the problem.

1.5 Probable Solution—refers to suggesting some probable solution to help the pupils to arrive at the right solution of the problem.

2.0 Mathematical Model—a mathematical model is not a visual aid or a piece of teaching apparatus but a piece of modern mathematics which behaves in the same way as does the concrete situation it models, and from which some hitherto untested reactions of concrete situation can be predicted theoretically.
Its working definition has been taken as "The consistent collection of statements dealing with space, time, quantity and relationships".

2.20 Formulation- refers to the process part of the mathematical model taken with purpose of the formulation of the model.

2.21 Incorrect- a mathematical model is said to be incorrect when it does not adhere to the principles of modern mathematics.

2.22 Lack Conciseness- refers to the size of the mathematical model that is when it contains redundant words or statements and consists of indirect statements.

2.23 Irrelevant- when it is not related to the topic in hand or to the purpose for which the model is originally meant for.

2.24 Not specific-- when a modal calls for many concepts at a time and takes the shape of a general or vague model.

3.10 Legible- refers to writing on the blackboard which can be readily read by the pupils.

3.11 Ratio and proportion- the blackboard work is said to have proper ratio and proportion if (a) every symbol, letter, figure and numeral is of desirable size and shape, and (b) there is a proper spacing between symbols, letters, figures and numerals.
3.12 Neatness—refers to straightness of lines, proper spacing, dissuasion of overwriting, and use of proper script for writing.

4.10 Facilitating the process of problem solving—refers to the attempts of the teacher which are helpful in the process of problem solving.

4.11 Mathematical language—refers to the development of mathematical language among pupils so as to facilitate problem solving.

4.12 Mathematical Relationship—refers to the establishment of those mathematical relationships which facilitate problem solving.

4.13 Problem Solving Materials—refer to the audio-visual teaching aids which facilitate problem solving.

4.14 Reasonableness of Answer—refers to checking whether the answer of the problem is a reasonable one.

5.1 Mathematical Instruments—refers to the instruments used in mathematics, such as geometrical instruments.

5.11 Inappropriate Selection—failure to select the instrument according to the needs of lesson to be taught.
5.12 Wrong Use—refers to improper way of using the instrument.

5.13 Failure to detect error—refers to failure to find the cause of wrong results.

6.10 Skill— is a meaningful set of definable, observable, measurable, and trainable behaviours.

6.20 Appreciation—appreciating the achievements of modern mathematics.

6.21 Lack Extrinsic Appreciation—failure to appreciate modern mathematics for social utility and for ordinary communication.

6.22 Lack Intrinsic Appreciation—failure to appreciate the structure, power and beauty of mathematical models.

6.23 Lack Operational Appreciation—failure to communicate mathematical contents to the other persons through various media.

7.10 Fluent—formulated mathematical models with reasonable speed.

7.20 Mathematical Model—the consistent collection of statements dealing with space, time, quantity and relationships.

7.21 Clarity about Fundamentals—refers to clarifying the fundamentals underlying a mathematical model.
Clarity about Goals- refers to the knowledge given to the pupils by the teacher about the nature and type of mathematical model to be formulated.

Skill of Analysis- refers to the set of behaviours involved in transference of previous mathematical learning to a context in which there has been no practice.

Non-routine Problem Solving- refers to solving problems unlike to which have been solved previously.

Discovering Relationships- refers to restructuring of the different elements of the problem in a way to formulate relationships. It involves the discovery of new relations.

Constructing proofs- refers to development of proofs as opposed to reproduction or recall of proofs.

Criticizing Proofs- it is a logical counterpart of the ability to construct proofs it involves checking the validity of assumptions and checking the organisation of assumptions.

Generalization- it refers to formulating and validating generalizations to discover and prove mathematical model.
9.10 Skill of Application—refers to the transformation of different elements of problem from one model to another.

9.11 Solving Similar Problems—refers to solving those problems similar to which have been encountered already.


9.13 Analysing Data—means taking a set of information from the problem and making a sequence of decisions to distinguish relevant from irrelevant, assess what additional information is required, determine which related solutions may be examined to help solving the problem being tackled and separate problem into its components.

9.14 Recognizing Patterns—refers to finding something familiar in a set of data, in given information, or in the content of the problem.

10.10 Performing Mathematical Operations—refers to doing mathematical operations requiring simple recall and routine manipulations.

10.11 Lack of Fundamentals—refers to lack of fundamental mathematical knowledge supposed to have been gained over a long period of teaching learning process.
10.12 Lack of Terminology- refers to lack of knowledge of terminology used in modern mathematics.
10.13 Non-Performing of Manipulations- refers to not performing the things according to set rules of modern mathematics.
11.10 Using the Blackboard Effectively- refers to the use of blackboard in a way which makes the classroom instructions effective.
11.11 Economic Use- refers to the proper division of the space of the blackboard, avoiding irrelevant matter, proper spacing.
11.12 Sequencing-Presenting the contents in such a manner that continuity of thought does not get disturbed.
11.13 Illustrations- refers to appropriate illustrations which are essentially needed to make the lesson clear to the pupils.
11.14 Non-Verbal Behaviour- refers to the non-verbal activities of the teacher while writing on the blackboard such as way of standing, checking the lighting arrangements, checking the seating arrangements, way of cleaning the board, and checking the availability of required material.
Any comment:

Observer is supposed to write down critical behaviour of teacher of pupils outside the scope of the above mentioned items. For purposes of feedback and increase in reliability, he may also write specific examples of occurred behaviours falling within the scope of the above items.