

## Planning In-service Training Programme: Report of a Need Assessment Survey

### Abstract

The present paper explains about 'why' and 'how' of assessing training needs of teachers for finalising the structure of professional development programmes with the help of empirical data. A Need Assessment Questionnaire (NAQ) has been administered to a sample of primary school teachers to collect information regarding the requirements of in-service training in the area of teaching primary mathematics. The analysis of the data shows that teachers require more orientations on student-centred, activity-based learning methods which are appropriate to the primary school level.

### Introduction

The National Curriculum Framework (NCF) 2005 highlights the importance of Mathematics and stated that the main goal of Mathematics education is mathematisation of the child's thought processes. Since mathematical understanding influences decision making in all areas of life, it is considered as the most important of all curriculum subjects. All the major commissions and committee reports on education since independence rightly emphasised the importance of mathematical knowledge and its utilitarian values. In spite of all these reports and recommendations still in India, many students still struggle with Mathematics and show disinterest in learning Mathematics. The National Achievement Surveys of NCERT being conducted time to time clearly bring out this declining trend in Mathematics over the years. The same is the case with board exam results in Mathematics of different states and central boards in India.

A number of factors may influence the learning of Mathematics but teachers play an important role in

the performance in Mathematics. The knowledge in Mathematics alone will not help a person to teach Mathematics. He/she needs to have sound knowledge in the area of teaching of Mathematics. The knowledge in Mathematics and how to teach Mathematics together is commonly known as Pedagogical Content Knowledge (PCK).

Primary Mathematics, being the base for later stage, is very crucial in mathematisation of child's thought process. If we are not able to provide opportunities to our young children to experiment with mathematical concepts, formulae, principles etc, we may not be in a position to realise the goal of mathematisation. Let me share my experience with students when I was teaching in a school as a part of a three month field visit programme.

A girl who was considered as excellent in all subjects including Mathematics performed a mathematical operation during one of the problem solving session in the following manner:

$113 - 64/113 - 49 = -64/-49 = 64/49$   
(By cancelling 113 from numerator and denominator)

Another student when asked to measure the three interior angles of a triangle using protractor measured the angles like this.

“ $\angle A = 68^\circ$ ,  $\angle B = 139^\circ$  and  $\angle C = 111^\circ$ ”  
What is wrong with these children? Can we say, this is due to the problem of child alone? As teachers are we responsible for these types of errors and misconceptions? Are we providing need based professional development programmes to the teachers? Having been confronted with these types of situations, author thought of developing a comprehensive plan for organising professional development programmes for various stake holders like teachers and teacher educators.

Professional development of teachers is central to improving the quality of education in schools. The way we organise these programmes also are equally important for realising the expected goals. It was felt that simply organising an in-service programme will not serve the purpose. In order to improve the basic mathematical abilities of our primary children, the first stage to be done is to understand the basic components to be included in the programme material. For this purpose, author has developed a questionnaire for assessing the training needs of teachers in various areas.

The Need Assessment Questionnaire (NAQ) has been administered to a sample of 100 primary school teachers. The responses were received from only 84 teachers and the same have been used for analysis and interpretation. The basic purpose of the NAQ was to collect information regarding the requirements of in-service training in the area of teaching primary Mathematics.

The major aspects included in the questionnaire are:

- ◆ Pedagogical practices being followed in the classroom.
- ◆ The current practices of student assessment.
- ◆ Active participation of student.
- ◆ The broad areas like content, pedagogy, child psychology, assessment, etc. to be covered in professional development programme.
- ◆ The content/topic/theme from primary Mathematics in which further orientation is required.
- ◆ Duration and modality of in-service training programme.

The purpose of the needs analysis was to identify the needs and requirements of primary school teachers in the area of content, pedagogical approaches, assessment procedures, etc. for developing the training package for using in the in-service training programme. The data collected through NAQ was analysed using percentage and is presented in the following subsections.

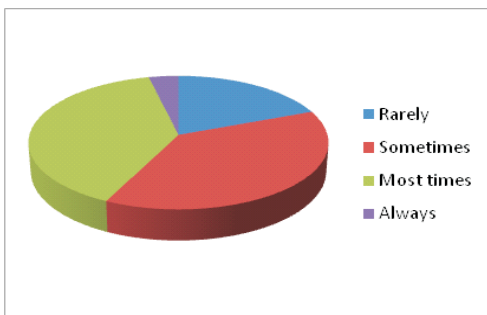
### **Pedagogical practices followed in the classroom**

Pedagogical approaches practiced by the teachers has to play crucial role in making the subject interesting or boring. To the question why most of the students show fear towards Mathematics, can be best answered with the help of pedagogical practices of the teacher. It is true that a teacher can make a big difference. In order to understand the practices followed by the teachers in their classroom transaction, the following question with 11 alternative strategies that could make the classroom process vibrant and constructive were posed to the teachers.

**About how often do you do each of the following in your Mathematics instruction?**

<b>S. No</b>	<b>Aspects</b>	<b>Rarely</b>	<b>Sometimes</b>	<b>Most times</b>	<b>Always</b>
1.	Introduce content through formal presentations	14(16.7)	16(19.1)	51(60.7)	3(3.6)
2.	Facilitate students individually and/ or group during various classroom activities	11(13.1)	21(25)	46(54.8)	6(7.1)
3.	Pose open ended questions	16(19.1)	32(38.1)	33(39.3)	3(3.6)
4.	Engage the whole class in discussions	4(4.8)	19(22.6)	49(58.3)	12(14.3)
5.	Ask students to explain concepts to one another	19(22.6)	28(33.3)	31(36.9)	6(7.1)
6.	Ask students to consider alternative methods for solutions	25(29.8)	27(32.1)	28(33.3)	4(4.8)
7.	Allow students to work at their own pace	15(17.9)	38(45.2)	23(27.4)	8(9.5)
8.	Help students see connections between Mathematics and other disciplines	19(22.6)	42(50)	21(25)	2(2.4)
9.	Assign Mathematics homework which helps to develop creativity	14(16.7)	34(40.5)	28(33.3)	8(9.5)
10.	Give tests requiring open ended responses (e.g., descriptions, explanations)	9(10.7)	17(20.2)	42(50)	16(19.1)
11.	Link mathematical concepts with children's lives	17(20.2)	39(46.4)	22(26.2)	6(7.1)

The responses given by the participants portraits the current situation of our Mathematics classroom. As mentioned earlier also, motivating students to ask more and more thought provoking question, is an important pedagogical strategy needs to be practiced by the teachers. The response shows that more than 57% of teachers use this either rarely or sometimes only.



**Figure 1:** How often teachers pose open ended questions

Creativity is an outcome of divergent thinking. If we are not giving opportunity to the child to provide alternative pathways, the divergent thinking will not happen. Same problem can be solved in different ways. How far the teachers are efficient to provide situations to the child to think about alternative perspectives is an important component for Mathematics learning? The response to this question shows that around 62% of the teachers responded were only did this either rarely or

sometimes in their classroom. That is only 38% of teachers are practicing this approach in their classroom seriously.

Students like Mathematics if they get ample opportunity to connect Mathematics with their real life situations. The response of the teachers towards this question also shows that most of the teachers (66%) are not linking mathematical concepts with child’s life or other discipline (57%).

What more is required is that the teachers need to get more and more opportunities for improving their abilities to use collaborative and constructivist approaches in the classroom.

**The current practices of student assessment**

Continuous and Comprehensive Evaluation (CCE) of students leaning is still a big challenge to many of the teachers. In fact, many central and state level institutions had organised orientation programmes to teachers at various levels. Still the implementation of CCE in majority of our classrooms is considered synonyms to the process of completing/filling various forms and schedules. This subsection in this survey focuses on the implementation of assessment strategies in the classroom and the areas of concerns to be addressed in the training programme.

**How often do you assess student progress in Mathematics in each of the following ways?**

S.No	Statement	Rarely	Sometimes	Most of the times	Always
1.	Previous knowledge checking to determine what students already know	0(0)	5(6)	38(45.2)	41(48.8)
2.	Observe students and ask questions as they work individually in each period	37(44.1)	44(52.4)	3(3.6)	0(0)

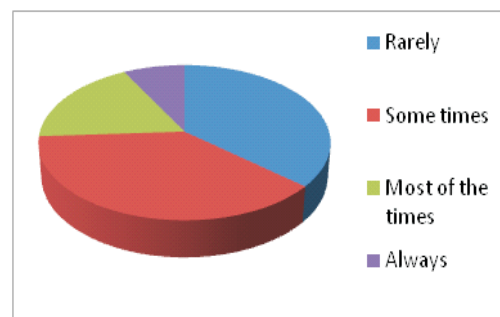
3.	Observe students and ask questions as they work in small groups in each period	23(27.4)	35(41.7)	17(20.2)	9(10.7)
4.	Motivate students to ask questions	49(58.3)	23(27.4)	8(9.5)	4(4.8)
5.	Use integrated assessment strategies in class activities	6(7.1)	15(17.9)	37(44.1)	16(19.1)
6.	Review student homework every day	3(3.6)	6(7.1)	47(56)	28(33.3)
7.	Review student portfolios	28(33.3)	29(34.5)	14(16.7)	6(7.1)
8.	Give predominately written tests (e.g., multiple choice, true/ false, fill in the blanks)	4(4.8)	8(9.5)	33(39.3)	29(34.5)

Responses of the teachers to these questions reflect their actual practice in the classroom. Mathematics learning requires constant support from the teacher. Individual attention of the teachers is very essential for the weak students. In this circumstance, teacher observation during individual problem solving situation as well as performing group activities play an important role in building confidence among children. In fact, observation can be considered as an important tool for formative assessment. But the data from the above table shows that most of the teachers use these strategies in their classroom rarely or sometime together (96% for individual observation and 69% group observation respectively). This in fact throws light on the need of more practical oriented capacity building programmes to the teachers for implementing observation as a tool for assessing student performance.

Constructivist classroom warrant more questions from the students. It is the responsibility of the teachers to motivate the students to come up with more and more questions. The creativity and critical thinking ability of the child will improve, if we can offer opportunity to question to our students. The data given shows how far the teachers responded in this

questionnaire utilised this strategy in their classroom. 85% of the teachers either rarely or sometimes used it in the classroom. This is a pertinent area of concern.

Student portfolio consists of the collection of various classroom related activities and works. Mere collection will not serve the purpose of assessment. How teachers are assessing this and providing appropriate feedback to the students are very crucial. More than two-third of the teachers (67%) responded that they reviewed the portfolios of the students either rarely or sometimes.



**Figure 2:** How often teachers review student portfolios

CCE advocates different strategies for student assessment apart from traditional written tests. One of the objectives of CCE is to reduce the examination phobia. Instead, in the



name of CCE if we organise more and more written tests, it will defeat the very purpose of CCE. The response given by the teachers shows that around 74 % of teachers uses written tests either most of the times or always during the assessment. This indicates that they seldom practice the other assessment strategies.

**Active participation of student**

In a constructivist classroom student should be more active and vibrant, they need to get chance to discuss, perform and ask question. This section discusses how far the classroom facilitates in providing opportunities to our children.

encouraging. Most of the teachers are practicing this either most of the times or always except in one aspect. Independent thinking is an important process through which one can address any issue without the support of anybody. How far the teachers are able to provide learning situations to the students to think independently is paramount important. The response provided by the teachers shows that working individually or in small group without the assistance from the teachers were not practiced most of the times in the classroom.

**In Mathematics class, how often do your students do the following?**

S. No	Statement	Never or almost never	Sometimes	Most of the times	Always
1.	Work individually without assistance from the teacher	16(19.1)	29(34.5)	32(38.1)	7(8.3)
2.	Work individually with assistance from the teacher	10(11.9)	27(32.1)	37(44.1)	10(11.9)
3.	Work together as a class with the teacher teaching whole class	4(4.8)	21(25)	41(48.8)	18(21.4)
4.	Work together as a class with students responding to one another	13(15.5)	27(32.1)	32(38.1)	12(14.3)
5.	Work in pairs or small groups without assistance from the teacher	26(30.9)	32(38.1)	26(30.9)	0(0)
6.	Work in pairs or small groups with assistance from the teacher	15(17.9)	21(25)	42(50)	6(7.1)

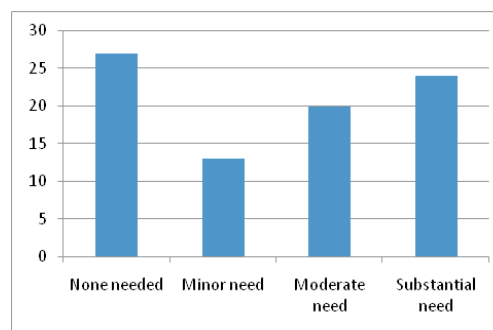
Teachers need to ensure active participation of students in the classroom process. The success of the teacher by and large depends how effectively teacher will transact curriculum with the active involvement of students. The responses given by the teachers in this area are quite

**The broad areas like content, pedagogy, child psychology, assessment, etc. to be covered in professional development programme**

When we talk about pedagogical content knowledge, one should consider its

various components. First one of course will be the content knowledge. Teachers naturally may not have much problem in this area since most of them are graduates or post graduates and content of primary Mathematics will not be difficult obstacles for teachers. For them the barriers may be in the other areas like pedagogical knowledge. Only awareness about some methods of teaching alone will not serve the purpose. One should know which strategies are better for this class or to the other class, etc. The strategy you are using for one class may not be suitable for the other class. Here one should have enough knowledge about child behaviour. This subsection discusses about the training needs of teachers in various components of pedagogical content knowledge.

Table gives the data collected about the professional development requirements of teachers in areas that are essential for a constructivist teacher. To the statement 'Learning how to use inquiry/ investigation-oriented teaching strategies', more than 50 % of the teachers responded that they require more exposure in this aspect.



**Figure 3:** Need for Professional development programme in learning how to use inquiry/ investigation-oriented teaching strategies

### How would you rate your level of need for professional development in each of the following?

S. No	Areas	None needed	Minor need	Moderate need	Substantial need
1.	Mathematics Content Knowledge	50(59.5)	21(25)	9(10.7)	4(4.8)
2.	The psychology behind developing the students' understanding	42(50)	16(19.1)	18(21.4)	8(9.5)
3.	Learning how to use inquiry/ investigation-oriented teaching strategies	27(32.1)	13(15.5)	20(23.8)	24(28.6)
4.	Learning how to use technology in Mathematics instructions	18(21.4)	25(29.8)	26(31)	15(17.9)
5.	Learning how to assess student learning in Mathematics	48(57.1)	14(16.7)	18(21.4)	4(4.8)
6.	Learning how to teach Mathematics in a class that includes students with special needs	19(22.6)	11(13.1)	23(27.4)	31(36.9)
7.	National Curriculum Framework-2005	37(44.1)	13(15.5)	21(25)	13(15.5)

Other areas, in which more than 50% teachers suggested the need of a training is 'learning how to use technology in Mathematics instructions' and 'learning how to teach Mathematics in a class that includes students with special needs'. Inclusion being the policy of the government to implement in a better way, we need to prepare the teachers to face the challenges of providing care and support to all students effectively.

### **The content/topic/theme from primary Mathematics in which further orientation is required**

It may not be possible to discuss all content topics from primary

Mathematics in an in-service programme. Being graduates and post graduates it may not be required to organise content specific in-service training programme in all topics. But it is still relevant that some of the teachers may have problems while teaching particular content /theme. This section examines the need of the teachers regarding the in-service programmes to focus on certain content areas/themes from primary Mathematics. The teachers were asked to suggest the topics from primary syllabus in which they feel some special improvement programmes are required. The table given below gives the data in terms of the number of teachers they require for further improvement in those areas.

### **Which of the following topics in Mathematics at primary level do you feel need further improvement is required?**

<b>S.No</b>	<b>Topics</b>	<b>No of Teachers responded the necessity of further improvement</b>	<b>Percentage</b>
1.	Whole numbers- Counting, Notation, Place Value, Ordering, etc	12	14.3
2.	Concept of Zero	43	51.2
3.	Basic operations on Whole numbers (+, -, ,/)	8	9.5
4.	Multiples of a number	8	9.5
5.	Factors of a Number	17	20.2
6.	Fractions and basic operations	32	38.1
7.	Ordering of fractions	37	44.1
8.	Money	30	35.7
9.	Data handling- Classification	37	44.1
10.	Data presentation	36	42.9
11.	Data interpretation	39	46.4
12.	Understanding Different Patterns	14	16.7
13.	Measurement of Length, Mass and Volume	36	42.9
14.	Measurement of Time	36	42.9
15.	2 D shapes	17	20.2



16	Angle and its Measurement	35	41.7
17.	Perimeter of simple shapes	17	20.2
18.	Area of simple shapes	20	23.8

The responses given by the teachers presented in the above table give us an idea about the primary school teachers' needs in content specific training. More than half of the teachers express their desire to have more content improvement programme in the topic 'concept of Zero'. The topics in which more than 40 percent teachers require training programmes are Ordering of factors, Data handling, Data Presentation, Data Interpretation, Measurement of Length, Mass and Volume, and Measurement of Time. As a first step we thought of taking these topics for developing training package.

The training package will be an integration of the content appropriate to pedagogical strategies for its transaction and coherent strategies for student assessment on a continuous basis.

### **Duration and modality of in-service training programme**

There are different modalities for organising in-service programmes. This section describes the opinion of the participant towards the modalities to be followed in in-service training and its duration.

### **How would you like the in-service training to be delivered per year?**

S.No	Mode of Training	No of Teachers*
1	Face-to-face long duration professional development programmes (a period of more than ten days)	16(19)
2	Face to face Short duration professional development programmes ( up to five days)	47(55.9)
3	Online	21(25)
4	Blended( online cum face to face)	35(41.7)
5	Any other (2-3 days)	12(14.3)
6	Any other (10 days face to face)	15(17.9)

### **\*Many teachers opted more than one response**

To assess the preferences in terms of different modalities of in- service training, the teachers were asked to indicate their likeness against each alternative. Face to face short duration

programmes up to five days turned out to be by far the most popular method. They were chosen by 47(55.9%) of the respondents. 35(41.7%) of respondents selected blended learning, that mixes conventional face-to-face methods and online components.

### **How often would you like to receive professional training?**

S.No	Frequency	No of Teachers* (Percentage)
1	Every Quarter	4 (4.8)
2	2 times/year	7(8.3)
3	Once/year	11(13.1)
4	Every two years	17(20.2)

5	As and when major changes are brought in curriculum/syllabus/TLM	26 (30.9)
6	Any other (Every Five Years)	19(22.6)

Regarding the frequency of organisation of in-service programmes, about one-third of the teachers responded that (30.9%), this should be organised as and when major changes are brought in Curriculum, Syllabus or Teaching Learning Materials (TLM). Around 22.6% expressed their interest of participating in in-service programmes every five years and 20.2 % opined that, the professional development programme needs to be organised every two years.

### Lessons Learned

The implications from this survey report are very direct. Teachers in primary schools are in urgent need of Mathematics pedagogical improvement if they are to be expected to teach Mathematics effectively and they are very much aware of their own needs in this respect. The classroom practices used by the teachers reported through this survey is an indicator for the importance of organising practical based in-service programmes to the teachers in various pedagogical strategies. It is clearly evident that there is a need for teachers to be trained in more student-centred, activity-based learning methods which are appropriate to the primary school level.

The training programmes to be organised for the teachers also should consider exemplary materials

on integrating student assessment with content and pedagogy. Various examples needs to be provided in the material and during the programme teachers needs to get opportunities to experiment in the real classroom. The training programmes needs to include practical sessions on engaging inclusive classroom as well as using ICT in teaching learning process.

The modality of the training also needs to be taken care off. Most of the teachers are interested in short term face to face programmes as well as blended programme. Longer duration face to face programmes need to be avoided and blended or face to face short duration (Five days) programmes may be planned instead of that.

The survey also helped in finalising the topics to be included in the training package apart from the framework of the package and modalities of the training. Care needs to be taken to develop the package in such a way that the content will be explained with the help of appropriate pedagogical strategy. The package should also give guidelines for assessing student performance through various formative assessment strategies.

In nut shell the Need Assessment Survey has given me enough confidence and motivation for developing the training package for primary Mathematics teachers.