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Sequencing of the Elementary Concepts of Recurring Decimal

Research Article

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Abstract: In this paper, some attempts have been made (a) to identify all the elementary concepts of the major concept, "recurring decimal" and, (b) to find the sequential order of these elementary concepts. Total 13 elementary concepts have been identified and sequenced through 'text book scanning process' and 'task analysis technique'.

Keywords: Major concepts, elementary concepts, recurring decimal, text book scanning process, task analysis technique.

1. Introduction

Mathematics is such a subject which nourishes the rational mind of human being. It is called a logical science and it creates a logical mind which directly or indirectly helps to enlighten the civilization. There is a beautiful flavor in mathematics for its abstraction in nature. To make the good citizen of each country to advocate the happy and prosperous life of each citizen, the role of mathematics is beyond the boundary. So, we can not deny that to make the nation as well as country that it plays a crucial role. For this, mathematics has been made compulsory for the first ten years of schooling in almost all countries in the world. But it is a matter that the presentation of the subject should be logical. Author has some contributions for identification and sequencing the elementary concepts of different major concepts up to secondary level using the 'text book scanning process' and 'task analysis technique' (25, 26).

In this paper, an attempt has been made for identification of the elementary concepts and their sequential order of major concept: recurring decimal.

2. Objective of the Study

The objective of the study is to identify different elementary concepts and their sequential order of recurring decimal.

3. Definitions

3.1. Major concept and Sub-concepts

A Major concept is an idea which is complete in itself and is comprehended through a sequential process of step-by-step partial comprehension of its related concepts. These related concepts are called sub-concepts which are not complete in

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itself but are parts of the major concept.

Examples of major concepts are 'addition of whole numbers including the familiarity of the numbers', 'subtraction of whole numbers', 'measurement of mass', 'fraction', 'decimal', 'rational number' etc.

For the major concept such as 'Addition of whole numbers including the familiarity of the numbers', its sub-concepts are 'addition of one-digit numbers including zero where the sum is one-digit number', 'addition of one-digit numbers where the sum is two-digit number' etc.

3.2. First level sub-concepts

The sub-concepts which are obtained after immediate derivation of a major concept are called first level sub-concepts.

3.3. Second level sub-concepts and others

When the derivation of first level sub-concepts are continued, the other sub-concepts so obtained stage by stage are called second level, third level etc.

3.4. Elementary concept

A sub-concept which can not be split further will be called an 'elementary concept'.

4. Materials and Methods

Procedure adopted has been discussed below:

4.1. Collection of Text Books

The prescribed text books of mathematics from Class-1 to 10 of West Bengal Board of Primary Education (WBBPE), West Bengal Board of Secondary Education (WBBSE), National Council of Educational Research and Training (NCERT) and other available books from the market were collected in the first stage (1 to 24).

4.2. Analysis of Text Books

These books were analyzed to identify 'recurring decimal' as a major concept and their elementary concepts of arithmetic mainly.

4.3. Task Analysis of Question Papers

In the identification and sequencing of basic concepts, task analysis technique has also been applied on arithmetical problems of mathematics question papers of 10^{th} standard: Madhyamik Pariksha (1999, 2000) of WBBSE, Indian Certificate of Secondary Education (ICSE) Examination (2005, 2006) of the Council for the Indian School Certificate Examinations, School Certificate Examination (1999, 2000) of Visva-Bharati (a Central University).

4.4. Sequencing of Concepts

The identified major concept and their elementary concepts were sequenced keeping in view the logical order of the subject and the psychological order of learners.

4.5. Experts' Opinions

The major concept and their elementary concepts with examples were given to experts for their comments. The experts were requested to add or omit or alter the sequence of concepts as they felt necessary.

Finally, the sequential form of elementary concepts of the major concept 'recurring decimal' incorporating the experts' opinion was developed.

5. Salient Points of the Study

The major concept: recurring decimal has been divided into seven first level sub-concepts which are expressed in tabular form in Table-1. Each first level sub-concept has been divided into different sub-concepts except first level sub-concept serial nos. 1, 2, 6 & 7 of Table-1. Total 13 elementary concepts have been identified. The splitting of sub-concepts is continued through different levels until elementary concepts are reached. In this investigation each sub-concept is numbered with a position value of different levels i.e. when a sub-concept is denoted by i.j.k. . . , then i indicates the first level sub-concept no., j indicates the second level sub-concept no., k indicates the third level sub-concept no. etc. The numbers of different elementary concepts of the each first level sub-concept are shown in Table-2.

Table 1. **List of first level sub-concept of Recurring Decimal**

Sl. No.	First level sub-concept
1.	Concept of finite decimal fraction
2.	Concept of infinite decimal fraction
3.	Concept of recurring decimal fraction
4.	Conversion of pure recurring decimal form into fractional form and vice-versa.
5.	Conversion of mixed recurring decimal form into fractional form and vice-versa.
6.	Simplification involving recurring decimal
7.	Finding the greatest and least number involving recurring decimal

Table 2. **Detailed list of different levels of sub-concepts of Recurring Decimal**

1	**2**	**3**	**4**	**5**
First level sub-concept sl. Nos.	Number of second level sub-concept	Number of third level sub-concept	Number of fourth level sub-concept	Total number of elementary concepts
1	-	-	-	1
2	-	-	-	1
3	1	2	5	5
4	1	2	-	2
5	1	2	-	2
6	-	-	-	1
7	-	-	-	1
			Grand Total	**13**

The process of detailing out of first level sub-concepts has been done. Some of the elementary concepts of the sub-concepts have been elaborated giving question (Q) and answer (A) for better clarification and rest of the elementary concepts have only been presented giving question (Q) only for due to economy of space.

The first level sub-concept no. 1: Concept of finite decimal fraction.

Q. Give an example of finite decimal fraction.

A. $\frac{11}{25} = 0.44$

The first level sub-concept no. 2: Concept of infinite decimal fraction.

Q. Give an example of infinite decimal fraction.

A. $\frac{14}{95} = 0.1473$

The second level sub-concepts of sub-concept no. 3: Concept of recurring decimal fraction.

3.1: Conversion of fraction into recurring decimal form.

Q. Convert the following fraction into recurring decimal form.

A. $\frac{1}{3} = 0.33\cdots = 0.\dot{3}$

3.2 Different types of recurring decimal.

The third level sub-concepts of sub-concept no. 3.2: Different types of recurring decimal.

3.2.1: Pure recurring decimal having whole number part.

Q. Give an example of pure decimal fraction having whole number part.

A. $3.\dot{3}$

3.2.2: Pure recurring decimal having no whole number part.

Q. Give an example of pure decimal fraction having no whole number part.

A. $0.\dot{3}$

3.2.3: Mixed recurring decimal having whole number part.

Q. Give an example of mixed decimal fraction having whole number part.

A. $3.1\dot{6}$

3.2.4: Mixed recurring decimal having no whole number part.

Q. Give an example of mixed decimal fraction having no whole number part.

A. $0.1\dot{6}$

The second level sub-concepts of sub-concept no. 4: Conversion of pure recurring decimal form into fractional form and vice-versa.

4.1: Having whole number part.

Q. Express the following recurring decimal into fraction.

A. $1.\dot{6}$

4.2: Having no whole number part.

Q. Express the following recurring decimal into fraction.

A. $0.\dot{6}$

The second level sub-concepts of sub-concept no. 5: Conversion of mixed recurring decimal form into fractional form and vice-versa.

5.1: Having whole number part.

Q. Express the following recurring decimal into fraction.

A. $1.1\dot{6}$

5.2: Having no whole number part.

Q. Express the following recurring decimal into fraction.

A. $0.1\dot{6}$

The first level sub-concept no. 6: Simplification involving recurring decimal**.**

Q. Simplify.

A. $10.6\dot{2}\dot{8} - 3.\dot{7}23\dot{0} - 2.23\dot{8}$

The first level sub-concept no. 7: Finding the greatest and least number involving recurring decimal.

Q. Write down the greatest and the least number.

A. 0.16, $\sqrt{0.16}$, $0.1\dot{6}$

6. Conclusion

1. This methodology will help to mark different types of conceptual gaps of mathematics in the syllabus, text books and entire teaching learning process.
2. Total 13 elementary concepts of recurring decimal have been identified and sequenced. These elementary concepts have been introduced in the prescribed text books of WBBSE and NCERT. So, there is no conceptual gap of that major concept of our text books of mathematics.
3. It will also help to diagnose the particular areas of weakness of students and also in planning for necessary remedial measures.
4. Backward learners can be detected easily and remedial method for them can be applied.
5. This study will help to develop sequentially the activities of recurring decimal for better understanding of learners.
6. Special interest for mathematics can be enhanced which will be helpful for entire science education.

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