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LIFE SKILLS IN THE DRY DESERT OF MATHEMATICS: PEEPING INTO THE TEXTBOOKS OF MATHEMATICS

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Abstract

Adolescence is considered as a period of greater vulnerability and pressures. Life skills play an important role in enabling adolescents to cope with the pressures and demands they are struggling with. Family, as an institution of building and inculcating life skills, is getting weak with the time. Therefore, life skill education becomes the responsibility of the school or formal education system. Taking in consideration the criticality of adolescent stage in the life of an individual, National Curriculum Framework (NCF) 2005 has also highlighted the importance of life skill education in school curriculum. All school subjects should promote life skills and values essential for living a better life. Similarly, Mathematics, as a core subject for study at secondary school level, in its content and processes should reflect on and support the acquisition of life skills among adolescent students. Thus, the present paper makes an attempt to analyse the content of the NCERT Mathematics text books of class X^{th}. The core of the exploration lies in looking at how well the content of the X^{th} class Mathematics text books manifests the life skills. The results of the exploration indicate that content of the X^{th} class NCERT Mathematics textbooks is primarily inclined towards critical and creative thinking, problem solving and effective communication while other categories of life skills found relatively little place in the content.

Key Words: Life Skills, Life Skill Education

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INTRODUCTION

School education helps in the formation of sound personality of the child. Today, the societal pressures, complexity, uncertainties and diversity, changes in the environment and continued deprivation put adolescent at the crossroads of their lives where they encounter with uncertain future, problem in assuring the responsibility of the adulthood and entry to the world of work. Life skills play an important role in enabling adolescents to cope with the pressures and demands they are struggling with in the present time. The importance of the life skills for adolescents can be highlighted as under –

- Life skills help in development of social and emotional competence and skills.
- Life skills help in the development of problem solving skills, which facilitate adolescents to form their own identity.
- Life skills promote development of positive social norms amongst adolescents.
- Life skills prevent development of misconception or miscommunication among adolescents.

Thus, it can be said that life skills promote the development of positive self-esteem among adolescents. However, it has been observed that over a period of time, family, as an institution of building and inculcating life skills, has become weak leading to the ingression of life skill education as the responsibility of school or formal education system. Formal education system is expected to (moreover, left as the single most suitable option to) inculcate values and life skill among students to make them good citizens.

LIFE SKILLS: CONCEPT AND COMPONENTS

Life skills have been defined by World health organization (WHO) in 1993 as "the abilities for adaptive and positive behaviour that enable individuals to deal effectively with demands and challenges of everyday life".

The term life skill education is being widely used encompassing all the dimensions of human life, be it economic, social or psychological as reflected and stressed through different prominent frameworks for life skill education followed by different countries world-wide. **Scottish Qualification Authority (SQA)** in its life skills framework proposes *Literacy, Numeracy, Health and wellbeing, Employability, enterprise and citizenship,* and *Thinking skills* as major life

skills to be focused at school levels. Similarly, **Massachusetts Adult Basic Education Curriculum Framework for Mathematics and Numeracy** stresses on *Communication Skills, Decision-making Skills, Interpersonal Skills,* and *Life-long Learning Skills* as the four domains under life skill education. **UNICEF's Right-Based Framework** advocates a child friendly educational system and schools that are characterized by inclusive, healthy and protective environment for all children. However, the **Framework for 21st century learning by Washington, DC** reflects that within the context of core knowledge instruction, students must also learn the essential skills for success in today's world, such as critical thinking, problem solving, communication and collaboration. While, **WHO's Life Skills Framework, 1999** highlights the ten core life skills which can be listed as *Self-awareness, Empathy, Critical thinking, Creative thinking, Decision making, Problem Solving, Effective communication, Interpersonal relationship, Coping with stress and Coping with emotion*. **The Create Skills Framework** follows in Britain again lays emphasis on Communication, Relation with others, Enterprise, Applied Thinking and Emotional intelligence as core skills to be developed among students through school education.

Therefore, it can be said that life skills are a large group of psycho social and interpersonal skills, which can help people to make informed decision, communicate effectively and develop coping and self-management skills that may help an individual to lead a healthy and productive life.

HIGHLIGHTING THE NEED

Adolescence is a turning point in one's life, a period of increased potential but also one of greater vulnerability. Taking in consideration the criticality of adolescent stage in the life of an individual, National Curriculum Framework (NCF) 2005 by NCERT highlighted the importance of life skill education in school curriculum. It was considered important to be introduced through formal school education due to the changing social context and family institution in India. The direction by NCF, 2005 got concretized through the adoption of Life Skill Framework (1999) of World Health Organization (WHO) by CBSE in the year 2006. This Framework highlights the ten core life skills which can be listed as *Self-awareness, Empathy, Critical thinking, Creative thinking, Decision making, Problem Solving, Effective communication, Interpersonal relationship, Coping with stress and Coping with emotion.* All school subjects should promote

life skills and values essential for living a better life. Similarly, Mathematics, as a core subject for study at secondary school level, in its content and processes should reflect on and support the acquisition of life skills among adolescent students. In the light of the discussion made above following questions were set to direct the analytic exploration:

- Do the X^{th} class NCERT textbooks of mathematics reflect the life skill in their content?
- To what extent the content of X^{th} class NCERT mathematics textbook reflects on life skills?
- Whether the content of the X^{th} class NCERT mathematics textbooks needs change for strengthening the manifestation of life skills?

Class X^{th} was found the fittest grade for the exploration made as the clientele of the grade usually represents the real picture of the peak of pressures and demands on the adolescents.

OBJECTIVES

The objectives formulated for the exploration are as under:

- To analyse content of mathematics text books for X^{th} class with respect to the adopted life skills framework for adolescent students in India.
- To suggest some measure for effective reflection on life skills in NCERT mathematics text books of X^{th} class.

DATA SOURCES

- NCERT's textbooks of mathematics for class X^{th}.
- Life skills framework of WHO as adopted by CBSE.

ANALYSIS OF DATA

Manifested Conceptual Content Analysis method was adopted for analysis of content present in the mathematics textbooks of class X^{th}.

The content analysis of mathematics textbook is done by breaking the content down into manageable categories on the basis of life skills framework used a variety of level. In identification of the concept and relationship are done and further examined. There were total ten life skills and each life skills is further divided in subparts for the purpose of looking at their

reflection through the content of mathematics textbooks. Then, each part and question was analysed and placed under the category.

Table 1: Abbreviations used in the tables of analysis

WORDS/TERMS	ABBREVATIONS
UNIT	UT
EXERCISE	EX
EXAMPLE	EG
ACTIVITY	ACT
PAGE	P

DETAILED REPRESENTATION OF LIFE-SKILLS IN THE TEXTBOOKS

A detailed representation of each life-skill is provided in this section in terms of their reflection in the content of Mathematics textbooks of Class X. Tabulation of examples (EG), exercises (EX), and figures (FIG) representing the specific core-area of life-skill is done for the purpose.

Table-2: Representation of 'SELF AWARENESS'

Grade	Recognition of self	Individual character	Individual strength & weakness	Desires & dislikes	Recognition of pressing situations
10TH	UT-INTRO UT-7 EG-7	UT-3 EG-6,11 UT-4 EX-4.3 Q-4 UT-9 EX-9.1 Q-3 EX-14.3 Q-3	UT-3 INTRO UT-6 EX-6.6 Q-10 UT 13 EG-3 EX-14.1 Q 2	UT-1 EG-4 EX-1.1 Q-3 UT-4 EG 1(II),12 EX-4.4 Q-3,5 UT-5 EG-10 UT-8 INTRO UT-12 EX-12.2 Q-9,11 EX-13.2 Q-3 EX-15.1 Q-6	EX-3.5 Q-4 (I) EX-3.6 Q-2

The data shown in the table 2 reflects that the content of books is more focused towards facilitating cognizance of 'desires and dislikes'. The other four components of the core skill have inadequate representation in the content. And also, the life skill values are not directed reflected in the content.

Table-3: Representation of 'Empathy'

Grade	Understanding others	Accepting other point of view	Social interaction	Care & assistance	Tolerance	Others' Care
10th	UT-9 EG-2 UT-14 EG-2	UT-3 EG-6 EX-4.4 Q-5 EX-9.1 Q-8,9,10 EX-14.4 Q-1	EX-1.2 Q-7 EX-1.3 Q-1 EX-3.3 Q-3(VI) EX-3.6 Q-2(II) EX-4.4 Q-4 EX-7.1 Q-5 UT-9 EG-4 UT-15 EG-6,7	EX-3.5 Q4(I) EX-5.3 Q-17 EX-9.1 Q-1,2 EX-12.2 Q-8 EX-14.1 Q-1,4,5,6 EX-14.2 Q-1 EX-14.4 Q-2	_____	UT-3 INTRO EX-3.1 Q-3 UT-4 INTRO EX-13.1 Q-7 EX-13.4 Q-3 EX-14.1 Q-3 EX-14.3 Q-1

As far as the core skill of *Empathy* is concerned, the content of the textbooks was found to be inclined in favour of the sub-components of social interaction and care and assistance.

Table-4: Representation of 'Critical Thinking'

Grade	Analysis of Information	Recognizing Factors Affecting Attitude And Behaviour
10TH	EX-1.2, Q-5&6 EX-2.3, Q-1-5 UT-3, INTRO EX- 3.3, Q-1 EG- 13 & 14 EX- 3.4, Q-1&2 EX- 3.5, Q-1,2,3,4 EX- 4.2, Q-6 EX- 5.1, Q-2,3 EX-5.2, Q3-15	UT-3, EG-2,6 UT-3, EG-19 EX-4.3, Q-5 UT-6, EG-7

	EX – 5.3, Q- 4& 18 EX-6.3, Q- 4 -16 EX- 6.5,E X- 9.1, EX-10.1 EX- 12.1, Q-1,2,4	

The data shown in the table 4 reflects that the content of books is more focused towards the analysis of information as a skill to be ingrained amongst the adolescent students. Recognition of factors that affect attitude and behaviour such as peer pressure and the media were found to be inadequately reflected in the content. The language used, to some extent, may be seen as the promoter of the critical thinking of the adolescent students.

Table-5: Representation of 'Creative Thinking'

Grade	Fluency	Flexibility	Originality	Elaboration
10TH	EX-5.2, Q-3-20	EX-3.1, Q-2,3 EG-6, EG-14 EX-8.2,EX-10.2 UT-13, EG-6 EX-13.2, Q-3,6,7,8 EX-15.1, Q-15-17,22-24	EX-3.1,Q-1 EX-3.3,Q-3 EX-3.4, Q-1,2 EX-4.3,Q-5,6,7 EX-8.1, EX-11.1, EX-11.2 UT-13,EG-1 EX-13.3, EX-14.1,Q-2 EX-14.3, Q-6	EX-2.2, Q-2: UT-4, EG-1,12 EX-5.1, Q-1,2;EG-10 EX-6.1, Q-3; EX-6.2,Q-1,2 UT-9, EG-2; EX-9.1,EX-12.1, EX-12.3, EX-13.1,EG-9,10 UT-15- INTRO

The data shown in the table 5 reflects that the content of books has been found revolving around the flexibility, originality and elaboration as sub-component of the core skill of creative thinking. However, the value of fluency seems to be ignored in the content of the mathematics textbook of class X.

Table-6: Representation of 'Decision Making'

Grades	Constructive decision	Effect of decision
10TH	EX-1.3, Q1-3; EX-3.2, Q2,3; UT-4, EG-2; EX-12.2, Q-1-7	EX-3.3, Q1; EX-3.5, Q2; EX-5.1, Q1; EX-13.3, EG-13;

The data shown in the table 6 reflects that the content of books is found to be more focused towards constructive decision rather than effect of that decision. However, scarce incidence of

the core value of decision making in the textbook cannot be veiled, clearly indicating the sheer ignorance of its relevance.

Table-7: **Representation of 'Problem Solving'**

Grade	Solving problem constructively
10th	EX-1.1 Q-3EX-1.2Q-5,6 EX-1.3 Q-1,2,3 EX-2.1 Q-1 EX-2.2 Q-2 EX-2.3 Q-1-5 UT-3 INTRO EX-3.2 Q-1,5-7 EX-3.3Q-3 EG-14 EX3.5Q-4 EG-19 UT-4 INTRO EG1(I),2 EX-4.1Q-2 EX-4.2Q-6 EX-4.3Q-11 EX-4.4Q-4,5 UT 5-EG-9EX5.1Q19-20 EX5.3 Q-4-14,19,20 UT 6 EX-6.2Q1,2 EG-7 EX-6.3Q4-16 EX-6.5 UT 9-EG-2 EX-9.1 Q-3 EX-10.2 EX-12.1 Q1-7,10,13 UT -13 EG1,6,9,10,13 EX-13.1 Q-2,5 EX-13.2 Q2,3,6,7,8 EX13.3 EX-13.4 Q-4 EX-14.1 Q-3-6 EX-14.2 Q-4,5 EX-14.3 Q-6 UT-15 EG-6 EX-15.1 Q15-17

It is the main objective of mathematics to develop the problem solving attitude of students. Though, the data shown in the table 7 reflects the inadequate coverage of the problem solving value in the content of textbook.

Table-8: Representation of 'Interpersonal Relationship'

Grade	Positive interaction	Good relation with others
10TH	EX-1.2 Q-7 UT-3 EG-6 EX-3.2 Q-1 EX-3.3 Q 3(VI)	EX-2.2 Q-1 UT-3 EG-2 EX-3.4 Q-2 (V) EX-3.6 Q 2(II) EX-6.3 Q-1 UT-6 EG-3 EX-7.1 Q-5 UT-15 EG-6,12 EX-15.1 Q-21

The data shown in the table 8 reflects the weak concentration around the value of interpersonal relationship on each of its dimension in the content of the mathematics textbooks.

Table-9: **Representation of 'Effective Communication'**

Grade	Verbal communication	Non- verbal communication	Express opinions and desires
10TH	EX-1.2, Q6; EX-2.2, Q1'; EX-3.1, Q1-3; EX-3.4, Q2(V);EG-14	UT-3, EG-2,5; EX-3.2, Q5-7; EX-3.5, Q4(IV); EX-9.1, EX-10.1, EX-11.1	EX-5.3, Q3; EX-6.1, Q1;

The data shown in the table 9 reflects that the content of book towards building the skill of communication for effective expression. The language that was used is easy but do not give chance to students to directly and unambiguously express their views (as expected by the most scientific language of the world i.e. mathematics).

Table-10: Representation of 'Coping with Stress'

Grade	Finding source of stress	Coping with stress	Controlling the stress
10TH	EX-9.1, Q5,15	UT-3, EG-14; EX-4.1, Q2(IV); EX-4.3, Q5,8,10; EX-5.3, Q20; EX-7.2, Q3; EX-12.1, Q3,4; UT-13, EG 5,6; EX-13.2, Q2,5; EG-13, UT-15, EG 5,4; EX-15.1, Q2	EX-5.3, Q15; EX-14.4, Q3;

The data shown in the table 10 reflects that the content of books is found to be more focused towards coping with stress rather than finding source of stress and controlling the stress. Though, the core value of coping with the stress, in totality, has a weak representation in the content.

Table-11: Representation of 'Coping with Emotions'

Grade	Emotional balance	Emotional awareness
10TH	EX-3.1, Q1; UT-4, EG-1; EX-4.1, Q2(III); EX-5.3, Q16; EX-14.2, Q4,5; UT=5, EG-10	UT-6, ACT-I; UT-13, EG1,3; EX-13.2, Q2; EX-13.3, Q9

The data shown in the table 11 reflects that the content of books is more focused towards emotional awareness rather than emotional balance.

CONSOLIDATION OVER THE MAJOR FINDINGS

It is evident from the analysis made that the ten core life skills, as mentioned in the Life Skills Framework proposed by WHO and adopted by NCERT, are not directly reflected in the mathematics textbook of X^{th} standard. The questions are not framed in the manner which directly promotes the life skills of students. The life skills are hidden in the question and teacher is required to present the content as per the context. Thus, the promotion of life skills amongst student through the content of mathematics text books is dependent on the individual capacities and abilities of the teacher. So, it should be attempted to directly indicate the life skills, in general and in specific forms, in the mathematics text books for their inculcation in students. The content should be more reflective to help the student to get hold of the life skills.

The content analysis of mathematics text books of X^{th} class of NCERT reflect that all the life skills have not given equal weightage as indicated through the average number of questions falling under each category of life skills as indicated by the following table (Table 12) and diagram.

Table 12: Magnitude of Representation of Different Life Skills

LIFE SKILLS	**Class X^{th}**	
	NO.OF QUESTION	**PERCENTAGE (OUT OF 563)**
Self Awareness	22	3.91%
Empathy	33	5.86%
Critical Thinking	92	16.34%
Creative Thinking	116	20.6%
Decision Making	15	2.66%
Problem Solving	135	23.97%
Interpersonal Relation	14	2.48%
Effective Communication	42	7.4%
Coping with Stress	45	7.9%
Coping with Emotions	11	1.95%

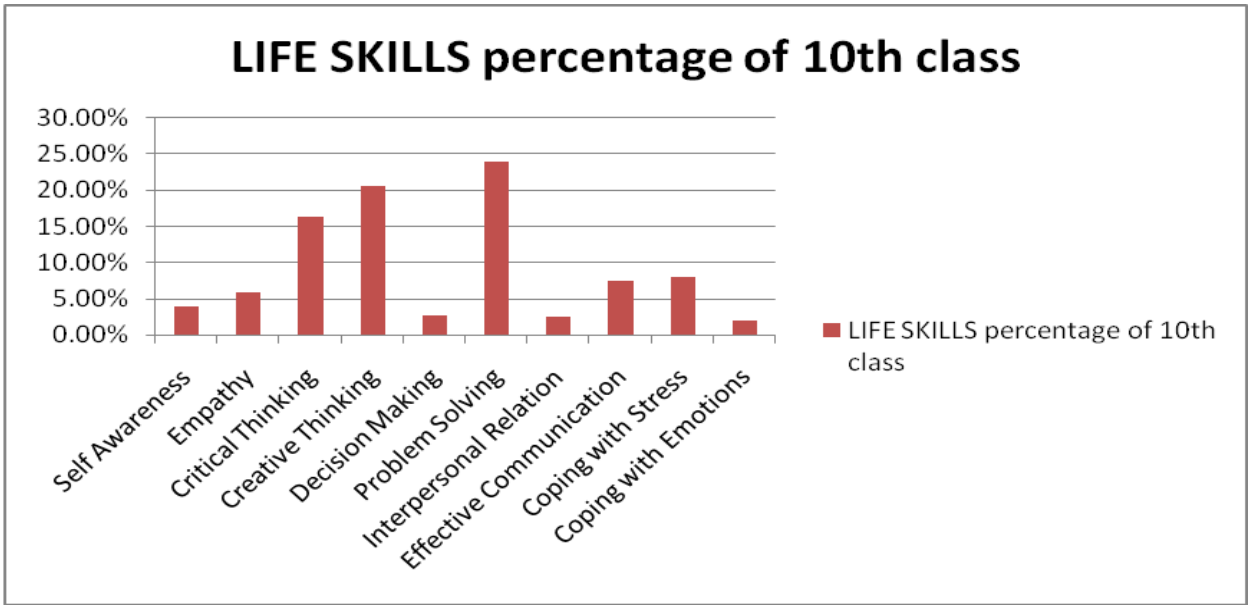

Fig. 1: Magnitude of Representation of Different Life Skills in Example and Exercise of Class Xth Mathematics Textbooks

The cluster of problems falling under each life skills category has different sizes. The following life skills categories are found to have the largest magnitudinal expansion:

- Problem solving (23.97%)
- Creative thinking (20.6%)
- Critical thinking (16.34%)

While the following categories of life skills have the nominal indirect representation in the content of mathematics text book of X class:

- Effective communication (7.4%)
- Coping with stress (7.9%)
- Empathy (5.86%)
- Self awareness (3.91%)
- Decision making (2.66%)
- Interpersonal relation (2.48%)
- Coping with emotion (1.95%)

The reason behind might be the very nature of mathematics which makes the representation of these life skills through the objective content difficult.

The skills of problem solving, creative thinking and critical thinking are the core skills related to mathematics. However, the skills of self-awareness, empathy, interpersonal relation, effective communication, decision making, coping with stress and coping with emotion, though not directly related to mathematics, are equally important. Therefore, the content of the mathematics text books of the secondary classes should have substantive and direct representation of these values.

As far as gender perspective is concerned most of the questions bear girls' name. That give fair indication towards the attempt which has been made to come out from the gender discrimination syndrome, with which content of the non-revised textbooks of NCERT were blamed to be suffered with. It is found that the gender of the characters have only been changed in the problems statements in earlier mathematics text books. The earlier statements had boy's names which have been replaced by girl's name now. Inspite of making an attempt to make the content fair towards the representation of female gender, the content can still not be considered as gender-fair as it is now focusing more on female gender.

Moreover, only names of the characters have been changed irrespective of the mention of situations, contexts and issues related to women in the content. Therefore, it is required that the content should become gender-sensitive and gender fair in its true sense to sensitize the students of both the genders for their unhindered acceptance of their own gender and the other gender.
The language of the content can be largely looked as monologue. The language part of the content imposes hidden limits on students' thinking. The language is required to be more democratic to make students feel free and to promote their exploration for knowledge in vivid directions and on all the dimensions. Languages part of the content in mathematics text books should also reflect the life skills to ensure and guarantee the inculcation of the life skills in the students. According to NCF 2005, constructive approach should be adopted, in which language should promote learning. Language should arouse the interest in the students to construct their knowledge by themselves.

The activities, constructive questions and open-ended questions in the mathematics of class X^{th} textbook are found to be very less in number. The presentation of the limited number of activities

in the books is also found to be restricted only to mathematical concepts and these are presented in the traditional manner. The number of the activities in the textbook is required to be increased and also the activities should be presented in a way which facilitates conceptual clarity and provision of opportunities to practice the life skills among the adolescent students.

SUGGESTIONS

In the backdrop of the above discussion following suggestions can be made to improve the manifestation of the life skills in mathematic textbook of class X^{th} and thereby for ensuring the inculcation of life skills amongst adolescent students:

- Questions in textbook of mathematics should directly reflect the life skill (proposed by the WHO and adopted by NCERT). The content should be more reflective to help the students to get hold on life skills.
- Each and every life skill should have average number of question. Each life skills should give equal weightage whether it is related to mathematics or not. The question should be framed in such a manner to reflect each life skills.
- The content should be free from gender biases. It should be gender- sensitive and gender fair.
- Language should be more democratic, easy and child centered. It should help the students to construct its knowledge in positive dimension. It should give chance to students to express themselves.
- More activities should be added to provide opportunities to students for practicing the life skills. They should be presented in an innovative manner.
- Content and exercises should be framed in such manner which reflects the life skills directly.

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