# An Inquiry into Fundamental Development Plan with Respect to Prerequisites of Natural Sciences in Primary Schools

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## *Abstract*

The present research aims to inquire into fundamental development plan with respect to prerequisites of natural sciences in primary schools and it has been carried out in two phases. Qualitative- inductive analysis was used in the first phase and quantitative content analysis was employed in the second phase of this study. Given the importance of the subject and limitation of research population, sampling was not done for statistical population in fundamental development plan in the first phase and total statistical population was studied. The textbook of natural sciences and validity of this technique was confirmed by means of judgment of experts. The resultant data were analyzed using descriptive statistical indices and by means of Shannon's entropy method. Among the studied dimensions in the second grade class, the highest rates of information weight and importance coefficient belong to item of placement of learner along with axis of learning activities i.e. 0.911 and 0.032. In third grade of primary school, variables of placement of learner on the axis of learning activities and familiarity and training thinking process skills, the importance coefficient rate and their information weight were ranked with 0.885, 0.829 and 0.029 and 0.029 respectively. The lowest information weight and importance coefficient belongs to paying attention to independent study, potential for working and use of digitalized sources and training CDs i.e. 0 (zero). Overall, paying attention to fundamental development plan in education is essentially important in production of content.

***Keywords***: Fundamental development plan, Natural sciences, Primary schools, Content analysis, Shannon's entropy

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## *Introduction*

The textbooks are considered as one of the most important and basic elements in educational system. The content of textbooks is one of the elements in textbooks in which the content should be proportional and coordinated with title of textbooks. As the main element, content is the main core of educational and training curricula and it has been always addressed by philosophers, scholars, educational instructors and educational theorists. Such attention may be due to this fact that to the extent training and educational goals are higher, precise and certain, these objectives will not be probably realized regardless of having good and favorable contents (Mirloohi, 2007).

Natural sciences are one the foremost lessons in primary schools and it is very important and thereby curriculum becomes suitable by being reviewed and tested by experts and it will play very vital role in training and teaching and learning and education. Codification of curriculum is deemed as an important step taken toward intellectual and training advancement and excellence in students and this will be effective with double importance when followed with evaluation and analysis of strong and weak points of a syllabus. Inter alia, fundamental development plan play important role and given the codified plans are done within the limited time processes and they are inefficient mainly and they are operational in short term therefore we had no high achievement for curriculum specified to syllabus of natural sciences while an important strep has been taken in this regard by codification of fundamental development plan in 2011 and it is hoped that the relevant experts, teachers and officials will be able to execute a comprehensible plan with the least defect and problem and to compensate for stability in curriculum and the existing defects and retardations.

It had been tried in preparation of national fundamental educational development plan to interpret teaching and training outlook and objective within the perspective for 2025 by inspiring from upstream documents and benefitting from their fundamental values and with respect to goals of strategies in Islamic Republic of Iran (Educational Supreme Council, 2011).

After five years of constant activity for design of educational fundamental development plan, it was presented in December 2011 and this important measure was taken in response to some requisites e.g. weakness of defects in educational system, inadequate attention to philosophy of teaching and training, lower level of productivity and effectiveness were proposed for that plan at the given time. In the process of spreading this plan, educational system has to inevitably link school to real world as the cornerstone of educational system and to help students to acquire knowledge and skills thereby they could succeed when exposing status of modern age

(Ataran, 2002; quoted from Asadollahi etc. 2016). Now, fundamental development plan for educational system serves as constitution for comprehensive and long-term transformations which have been approved by Cultural Revolution Supreme Council and Educational system supreme council and was put as the agenda for educational system; and all subsystems and micro and macro elements of educational system should be revised and reproduced (Strategic Development Plan, 2012).

During recent years, the necessity for a basic transformation in educational system and planning at macro level for coordination and consistency with national comprehensive development tests has produced national plan for educational system, national curriculum, and outlook plan and design of cultural and training approach. It is necessary that the implications and assertions of these plans are also influential in natural science curriculum.

The curricula are some of influential focal points for operationalizing of fundamental development plan. The curricula are one of the foremost elements and full-height mirror against achievement and failure and in most cases as directing factor for educational system and they are assumed as suitable position for presentation of knowledge and changing attitude and training of skills to the students, adults and primary decision-makers. The textbook is the product of curriculum. Analysis of status quo in textbooks is important because they may give an accurate image of quantity and quality of paying attention to the contents and themes and in order to determine current situation they may provide the necessary insights for planners and designing practitioners of curricula to codify syllabi and to cover hidden and overlooked fields and curricula (Mousavi & Nasr, 2014).

Focusing on this point that the fundamental development plan has been performed in educational system since 2011, but so far no integrated study has been conducted on an appropriate pattern for curriculum of natural science textbook in primary schools based on this plan and for this reason, the current research intends to formulate and design a model based on these documents and the main question is what are the prerequisites for curriculum of natural science textbook based on fundamental development plan?

### *Research question*

How much fundamental has development plan been duly addressed in text, image and work and group activity of natural science textbook in the second and third grades of primary schools?

### *Literature of researches*

Habibi Bordbari, Mohammadi, and Raeesi (2017) carried out a study titled "Analysis of the Content of the Relationship between Images and Text Writing of the Curriculum of the Experimental Sciences Sixth Basic Elementary School." They found

that in examining the images of the experimental science of the sixth elementary school. Out of 104 images in the entire book, 72 images were coordinated with the text, and 32 other images were inconsistent with the text, of which 15 were identified without emphasis, and 17 were identified with emphasis technique. According to the findings, it can be stated that the ratio of the consistency of images with the text is much higher than the total images. Approximately 69% of the total images of the book are consistent with the text, and can be less effective in creating creativity in the learners. Therefore, teachers should identify the main messages for students by identifying inconsistent images.

In a study titled 'analysis on way of execution of thematic approach in curriculum of natural science textbook of sixth grade of public primary schools in Alborz province according to viewpoint of teachers', Madanipoor (2014) showed that the results of data analysis have reflected in execution of natural science curriculum with thematic approach and according to attitude of teachers in the sixth grade of primary schools, one could achieve several objectives such as meaningful learning, acquisition of scientific competence, establishment of four fields including creator, self, creature and creation of scientific deductions. However due to shortage time and lacking of providing necessary arrangements for performance, involvement in building of workgroups for students and potential evaluation of students, this goal has not been realized in execution of curriculum of natural science textbook of sixth grade in primary schools.

In an investigation under title of 'content analysis of natural science textbooks in primary schools with respect to technological science literacy skills', Valizadeh (2014) indicated that the technological-scientific literacy skills have not be adequately addressed in natural science textbooks and also these skills have been classified in three specific skills i.e. observation, using tools and measurement, data collection, interpretation and conclusion, communication, research design, testing, prediction and hypothesizing and they were not also uniformly employed. The scientific- technological literacy skills include range of 7 to 973 cases in the studied textbooks in which the most attention is paid to observation skill and the least attention to hypothesizing skill in them. Other skills are also dispersed with heterogeneous and unbalanced frequency among these two fields.

In a survey titled 'review on necessity for changing textbooks and changing trend in natural science textbook in the first grade of primary schools in years (1994-2012)', Javadi (2012) showed that some factors including change in world training approach and changing of general police of the country and educational system for evaluation on curricula have affected changes in comments of teachers, change in learners, and

changing scientific knowledge content and educational goals and typically changes in textbooks. The curriculum of natural science textbook of first grade of primary schools also included basic and general changes in terms of thinking organization, approach, objectives, content, teaching-learning strategies and evaluation (during years 3131-3131) and numerous changes apparently in images, design of textbook cover (number of page, 06, 01-05, 02-03, and 01-35 and dimensions of books in years 31 to 31, 3403 to 33) in this book. The given results imply that natural science textbooks of first grade of primary schools have been comprised of the most changes in terms of apparent organization versus thinking organization.

In her study under title of 'study and analysis of natural science textbooks of primary schools based on cognitive growth in students', Jamshidipour (2011) indicated that the concept of ability for perceiving meaning of number and working with numbers has not been noticed in natural science textbooks of primary schools. The concept of ability for classification and organizing has been presented relatively poor while the potential for logical reasoning has been proposed according to tangible and subjective objects and activities at relatively suitable level.

## *Methodology*

The present study aims for an inquiry in fundamental development plan in terms of prerequisites of natural science textbooks in primary schools and it was carried out in two phases. Qualitative- inductive content analysis was used as method in the first phase and quantitative content analysis was utilized for the second phase. The inductive-qualitative content analysis technique was employed for extraction of prerequisites in qualitative phase. Sentences and paragraphs were extracted from the text of the Transformation Document (supervised by the supervisor and advisor). Items related to experimental sciences were extracted from the paragraphs. Then, the validity of items was examined through targeted sampling by 11 experts of the document on fundamental change, experimental sciences, and curriculum planners using the lawshe coefficient, which had a good result.

The content analysis started after preparation of checklists and calculation of validity and reliability of them. Namely, natural science textbooks (second and third grades) were studied using content checklist and the coordinated items were recorded. Then, frequency of any parameter was counted and precisely determined and to what extent any item has noticed this subject. Data were reviewed using descriptive parameters in analytical process of Shannon's entropy. In other words, research data were analyzed and described in analytical process of Shannon's entropy (normalization of data in frequency table, calculation of information weight of categories and acquiring

coefficient of their importance). Based on this technique, data analysis will act more strongly and credibly in content analysis. Entropy in information theory is a parameter that is expressed for measurement of uncertainty by a probability distribution. According to this technique, which is well-known as remedial model, content of natural science textbook has been classified by viewpoints from three respondents and fundamental development plan of educational system. Initially, messages are counted according to categories proportionally by any respondent as frequency. Then the following processes are done based on data in frequency tables:

*Step 1*:

$$P_{ij}=\frac{Fij}{\sum_{m=}^{i} 1F_j^i} \quad (i = 1,2,3,\dots,m, j = 1,2,$$

**Eq. 1:** Normalizer of frequency matrix in table of frequencies
M= Quantity of respondents; j= Category No; F+ Frequency of category; P= Normalized frequency matrix

*Step 2*: We calculate the information weight (loading) for any category and put them in the related columns and following equation is used for this purpose:

$$E_{j=-K}\sum_{i=1}^{M} P_{ij}\left[P_{ijlnp_{ij}}\right] \qquad (j= 1,$$

**Eq. 2**: Information weight (loading) for any category
M= Quantity of respondent; j= (1,2,n,) j= Category No; i= Respondent No; Ln= Napierian logarithm; P= Normalized frequency matrix

*Step 3*: Using information weight of categories (i= 1,2,…,n), importance coefficient is calculated for each of category and any category with higher information weight has the greater importance and weight (wj). The following formula has been utilized for calculation of importance coefficient:

$$W_{j=}\frac{E_j}{\sum_{j=}^{n} 1E_j}$$

$W_j$= Importance level (weight); $E_j$= Information weight for any category; N= Quantity of categories; J= Category No

### *Statistical population, sampling method and sample size*

In the first part of study, statistical population includes fundamental development plan in which it has been totally examined and sampling was not done.

The second part comprises of textbooks of primary schools out of which natural science textbooks of primary schools in second and third grades were selected as samples.

### *Research validity and reliability*

The researcher traditionally and arbitrarily refers to concepts of validity and reliability in order to show goodness or quality of his study. The question, which may be mentioned about validity, is that if researcher sees what he has imagined or not. During production process, prerequisites were put at disposal of six experts of natural science curriculum from Universities of Farhangian in Shiraz, Marvdasht and educational planning system for assessment of research tool and checklist of content analysis and approved by

them. To determine reliability of this tool, Method of Scott (2012) was utilized. Draft of content analysis was given to six experts and their agreement coefficient was calculated according to the following formula.

Total categories

$$\pi = \frac{P_O - P_e}{1 - P_O} = 89$$

Based on Scott formula, the agreement coefficient is 89 among experts concerning the given content analysis form and it is at high and noticeable level.

## *Findings*

*Question*: How much have the listed coefficients in fundamental development plan been noticed in the body, image and activity and teamwork of natural science textbooks in primary schools?

**Table 1: Frequency distribution of fundamental development plan in the body, image and activity and teamwork of natural science textbooks of the second and third grades.**

| Respondent Prerequisite | Third grade | | | Second grade | | |
|---|---|---|---|---|---|---|
| | Text | Image | Activity and teamwork | Text | Image | Activity and teamwork |
| | Frequency | Frequency | Frequency | Frequency | Frequency | Frequency |
| To help to find amazing creatures of creation world and looking at nature and phenomena as signs of God | 5 | 9 | 2 | 7 | 11 | 3 |
| Rising conception of students about world creator | 7 | 9 | 2 | 5 | 5 | 3 |
| To make students familiar with the necessary knowledge and insight for present and future life (communication between scientific teachings and real life) | 8 | 8 | 6 | 7 | 4 | 3 |

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|---|---|---|---|---|---|---|
| Acquaintance with acquisition of thinking skills (conceptualization (thinking in problem solving, analytical thinking, creative thinking, critical thinking) | 7 | 3 | 7 | 15 | 5 | 4 |
| Familiarity and training of thinking process skills (conceptualization, perception of meaning, perception of relations and hypothesizing) | 9 | 13 | 17 | 14 | 3 | 3 |
| Improving faith in God and permanent sense of need to God as servant | 8 | 10 | 4 | 7 | 3 | 2 |
| Paying attention and creating interest in science and technology relating to business and life and conversion to learning for lifetime | 1 | 3 | 2 | 3 | 3 | 3 |
| Believe in valuable position of human and attaching value for world creatures and environment | 8 | 13 | 1 | 2 | 3 | 1 |

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|---|---|---|---|---|---|---|
| Interest in Iranian and Islamic customs, traditions, great figures and scientific characters and sensitivity to observance of national and religious values and activities | 1 | 2 | 2 | 3 | 2 | 3 |
| Awareness of one's biological and mental potentials and talents and needs | 5 | 3 | 4 | 4 | 4 | 2 |
| Perceiving of beauties, events and rules of world of creation as God's signs | 11 | 9 | 3 | 3 | 7 | 2 |
| Acquisition of potential for employing of skills of scientific techniques (scientific observation, data collection, classification, hypothesizing, design of test, conducting test, analysis, and change in findings etc.) in treating with natural phenomena and environment | 17 | 4 | 6 | 20 | 3 | 10 |

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|---|---|---|---|---|---|---|
| Ability to do practical work and produce scientific information, deliberative benefitting from scientific-aesthetic-technical and professional and healthcare findings and effort for development and production | 22 | 6 | 11 | 9 | 5 | 6 |
| Trying to preserve individual and social healthcare (recognition of healthy edible materials and suitable for the age, observance of safety points in feeding, conducting activities and using various devices in life etc.) | 4 | 7 | 5 | 10 | 6 | 5 |
| Observance of consumption pattern in utilization form God-given sources | 2 | 3 | 1 | 5 | 3 | 4 |
| Paying attention to potential for suitable communication among student and others, exchange of thoughts, teamwork spirit | 16 | 8 | 9 | 27 | 12 | 7 |
| Using properly and rationally from natural resources | 3 | 2 | 2 | 3 | 3 | 3 |

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|---|---|---|---|---|---|---|
| Paying attention to effort for sympathy with the nature, environmental protection and from plants and animals, perception of natural phenomena and objects responsibly and morally | 4 | 9 | 6 | 6 | 9 | 4 |
| Paying attention to various learning and interactive contexts) classroom, laboratory, research centers, science and technology museums, developing scientific exploration and scientific interpretation of phenomena etc. | 8 | 8 | 5 | 8 | 7 | 4 |
| Attention to opportunity to exercise more experience for students | 7 | 10 | 8 | 8 | 6 | 4 |
| Improving research and study spirit (individual and group), curiosity and questioning, developing scientific exploration, scientific justification of phenomena etc. | 8 | 7 | 9 | 6 | 4 | 5 |
| Scientific outlook to problems and events | 8 | 10 | 2 | 1 | 1 | 1 |

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|---|---|---|---|---|---|---|
| Paying due attention to design of research and testing hypotheses and functional activities, design of hypothesis and modeling etc. | 2 | 2 | 2 | 4 | 1 | 2 |
| Observance of order and discipline in doing activities and plans | 5 | 8 | 8 | 8 | 9 | 7 |
| Attention to free discussion and teamwork and participatory work in activities and moving away from memory-centered approaches | 4 | 7 | 5 | 6 | 7 | 2 |
| Training of primary entrepreneurship principles and attention and motivation in participation in economic activities at familial, national and world scale | 4 | 6 | 4 | 4 | 3 | 3 |
| Attention to self-decoration and cleaning, surrounding environment and personal devices | 0 | 3 | 0 | 4 | 3 | 1 |
| Attention to prevention from disease and avoidance from risky behaviors | 9 | 4 | 0 | 12 | 2 | 2 |

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|---|---|---|---|---|---|---|
| Awareness of conservation of natural and urban environment and attention to differences caused by urban, rural, nomadic and geographic life environment etc. | 2 | 3 | 1 | 4 | 5 | 3 |
| Presentation of perceivable and local examples | 3 | 2 | 7 | 5 | 3 | 4 |
| Training of critical spirit and acceptance of critique | 0 | 0 | 0 | 0 | 0 | 0 |
| Utilization from scientific achievements and findings of Islamic- Iranian culture and civilization | 5 | 3 | 2 | 6 | 2 | 3 |
| Creating divergent paradigm and proposing divergent questions | 7 | 1 | 4 | 4 | 3 | 3 |
| Developing flexibility in answers | 6 | 3 | 6 | 3 | 2 | 4 |
| Creativity and innovation in doing activities for training of responsible, thoughtful and creative learners | 1 | 2 | 5 | 4 | 4 | 3 |
| Paying more attention to individual differences (self-concept and one's abilities, commenting and giving one's proposals to others) | 3 | 1 | 2 | 3 | 3 | 2 |

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|---|---|---|---|---|---|---|
| Data collection from various sources in giving answers to the questions | 9 | 2 | 1 | 6 | 5 | 7 |
| Placement of learner on the axis of all learning activities | 14 | 13 | 11 | 9 | 26 | 17 |
| Training of method and path of knowledge acquisition, awareness and ability | 7 | 10 | 6 | 6 | 5 | 3 |
| Preparation of ground for training types of thinking, self-learning, contemplation and seeking of excellence | 3 | 15 | 4 | 8 | 26 | 17 |
| Paying attention to executable testing and activities and relating to everyday life for students | 7 | 6 | 8 | 6 | 8 | 5 |
| Attention to various intelligences (verbal, spatial, intrapersonal, interpersonal, naturalist- music, computational, philosophical) in activities and concepts | 7 | 11 | 7 | 7 | 8 | 2 |
| Attention to internet search in activities and referral of learner to study on complementary sources | 0 | 0 | 0 | 1 | 0 | 0 |

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|---|---|---|---|---|---|---|
| Creation of opportunity to propose problem, design of opportunity and brainstorming and creation of opportunity for disturbing balance for learner | 1 | 2 | 1 | 0 | 0 | 0 |
| Prediction of activities for practical works | 9 | 5 | 6 | 6 | 4 | 4 |
| Creation of opportunity setup and holding of scientific exhibitions for hand-made objects of learners | 4 | 4 | 6 | 4 | 4 | 3 |
| Relating learning content to probable uses | 5 | 8 | 7 | 3 | 4 | 2 |
| To help to creating self- belief and self-reliance in playing one's role in learning science | 7 | 11 | 8 | 5 | 4 | 4 |
| Attention to use of clean energies in design of space and installations etc. | 2 | 4 | 2 | 1 | 4 | 2 |
| Prediction of functional questions in activities | 4 | 4 | 6 | 5 | 4 | 5 |
| Placement of learner in simulated positions in scientific subjects | 3 | 6 | 5 | 4 | 3 | 2 |
| Request for recognition and distinction between scientific concepts and phenomena | 2 | 3 | 2 | 3 | 3 | 3 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Creation of position in self-assessment (self-evaluation) for learner | 0 | 0 | 0 | 2 | 1 | 1 |
| Creation of situation for coeval-measurement in learners | 0 | 0 | 0 | 2 | 1 | 1 |
| Creation of insight toward effects and consequences of one's lifestyle | 4 | 6 | 6 | 8 | 7 | 5 |
| Ability for working and using digital sources and training CDs | 0 | 0 | 0 | 0 | 0 | 0 |
| Paying attention to independent study | 0 | 0 | 0 | 1 | 0 | 0 |
| Relevance of new subjects to prerequisites and cognitive structure of students | 7 | 10 | 6 | 8 | 11 | 6 |
| Creation of opportunity for integration of sciences in everyday life | 4 | 11 | 6 | 12 | 2 | 8 |
| Awareness of relations between human and environment and perceiving integration of world of existence | 4 | 11 | 5 | 4 | 3 | 2 |

The table above shows that prerequisites of natural science textbooks in body, image, activity and teamwork of the second and third grades of primary schools express in fundamental development plan this point the maximum frequency include items of acquiring ability to employ scientific method skills (scientific observation, data collection, classification, hypothesizing, design of test, conducting test, analysis and change in findings

etc.) in treating with natural phenomena and environment, familiarity and training of thinking process skills (conceptualization, perception of meaning, perception of relations and hypothesizing…) in third grade and paying attention to ability to suitable communication among student and others, exchange of thoughts, teamwork spirit, leading learner to all learning activities that prepare the ground for training types of thinking, self-learning, contemplation and seeking excellence in the second grade (their frequencies are 17, 17, 27, 26, and 26 respectively) to which the highest attention has been paid in the text compared to image, activity and teamwork while the lowest frequency is related to items of paying attention to self-decoration and cleaning, surrounding environment and personal devices, paying attention to internet search in activities and pervasive referral to study on complementary sources, creation of position for pervasive self-assessment, creation of situation for coeval-measurement in learners, ability to work use digital sources and training CDs, attention to independent study and training of spirit to accept critique and creating opportunity for expression of problem, design of opportunity and brainstorming and creating opportunity for disturbing balance for the learner (their frequency is zero and they are the same in both grades) where the aforementioned items have never been noticed in body, image, activity and teamwork.

**Table 2: Normalized data and rates of information weight and importance coefficient in prerequisites of development plan in body, image and activity and teamwork for natural science textbook of second and third primary grades**

| Respondent i | Third grade | | | Second grade | | | Third grade | | Second grade | |
|---|---|---|---|---|---|---|---|---|---|---|
| Prerequisite of development plan for j | Text | Image | Activity & teamwork | Text | Image | Activity & teamwork | EJ | WJ | EJ | WJ |
| 1-To help to find amazing creatures of creation world and looking at nature and phenomena as signs of God | 0.08 | 0.15 | 0.03 | 0.11 | 0.18 | 0.05 | 0.54 | 0.02 | 0.64 | 0.02 |
| 2- Rising conception of students about world creator | 0.11 | 0.15 | 0.03 | 0.08 | 0.08 | 0.05 | 0.57 | 0.02 | 0.050 | 0.02 |
| 3-To make students familiar with the necessary knowledge and insight for present and future life (communication between scientific teachings and real life) | 0.13 | 0.13 | 0.1 | 0.11 | 0.06 | 0.05 | 0.691 | 0.02 | 0.51 | 0.02 |

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|---|---|---|---|---|---|---|---|---|---|---|
| 4-Acquaintance with acquisition of thinking skills (conceptualization ( thinking in problem solving, analytical thinking, creative thinking, critical thinking) | 0.11 | 0.05 | 0.11 | 0.25 | 0.08 | 0.06 | 0.58 | 0.02 | 0.65 | 0.02 |
| 5-Familiarity and training of thinking process skills (conceptualization, perception of meaning, perception of relations and hypothesizing…) | 0.15 | 0.21 | 0.28 | 0.06 | 0.05 | 0.05 | 0.83 | 0.03 | 0.42 | 0.02 |
| 6-Improving faith in God and permanent sense of need to God as servant | 0.13 | 0.16 | 0.06 | 0.11 | 0.05 | 0.03 | 0.66 | 0.02 | 0.45 | 0.02 |
| 7-Paying attention and creating interest in science and technology relating to business and life and conversion to learning for lifetime | 0.10 | 0.05 | 0.03 | 0.05 | 0.05 | 0.05 | 0.44 | 0.01 | 0.41 | 0.01 |
| 8-Believe in valuable position of human and attaching value for world creatures and environment | 0.13 | 0.21 | 0.01 | 0.03 | 0.05 | 0.01 | 0.58 | 0.02 | 0.27 | 0.01 |
| 9-Interest in Iranian and Islamic customs, traditions, great figures and scientific characters and sensitivity to observance of national and religious values and activities | 0.01 | 0.03 | 0.03 | 0.05 | 0.03 | 0.05 | 0.23 | 0.01 | 0.37 | 0.01 |
| 10-Awareness of one's biological and mental potentials and talents and needs | 0.08 | 0.05 | 0.06 | 0.06 | 0.06 | 0.03 | 0.47 | 0.02 | 0.40 | 0.01 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 11-Perceiving of beauties, events and rules of world of creation as God's signs | 0.18 | 0.15 | 0.05 | 0.05 | 0.11 | 0.03 | 0.67 | 0.022 | 0.45 | 0.02 |
| 12-Acquisition of potential for employing of skills of scientific techniques (scientific observation, data collection, classification, hypothesizing, design of test, conducting test, analysis, and change in findings etc.) in treating with natural phenomena and environment | 0.28 | 0.06 | 0.1 | 0.33 | 0.21 | 0.16 | 0.69 | 0.02 | 0.9 | 0.03 |
| 13-Ability to do practical work and produce scientific information, deliberative benefitting from scientific-aesthetic-technical and professional and healthcare findings and effort for development and production | 0.36 | 0.1 | 0.18 | 0.15 | 0.08 | 0.1 | 0.82 | 0.03 | 0.61 | 0.02 |
| 14-Trying to preserve individual and social healthcare (recognition of healthy edible materials and suitable for the age, observance of safety points in feeding, conducting activities and using various devices in life etc.) | 0.06 | 0.11 | 0.08 | 0.16 | 0.01 | 0.08 | 0.56 | 0.02 | 0.66 | 0.02 |
| 15-Observance of consumption pattern in utilization form God-given sources | 0.03 | 0.05 | 0.01 | 0.08 | 0.05 | 0.06 | 0.27 | 0.01 | 0.47 | 0.02 |

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|---|---|---|---|---|---|---|---|---|---|---|
| 16-Paying attention to potential for suitable communication among student and others, exchange of thoughts, teamwork spirit | 0.15 | 0.13 | 0.26 | 0.45 | 0.2 | 0.11 | 0.82 | 0.03 | 0.84 | 0.03 |
| 17-Using properly and rationally from natural resources | 0.03 | 0.03 | 0.5 | 0.05 | 0.05 | 0.05 | 0.51 | 0.02 | 0.41 | 0.01 |
| 18-aying attention to effort for sympathy with the nature, environmental protection and from plants and animals, perception of natural phenomena and objects responsibly and morally | 0.08 | 0.15 | 0.06 | 0.1 | 0.15 | 0.06 | 0.6 | 0.02 | 0.58 | 0.02 |
| 19-Paying attention to various learning and interactive contexts) classroom, laboratory, research centers, science and technology museums, developing scientific exploration and scientific interpretation of phenomena etc. | 0.08 | 0.13 | 0.13 | 0.13 | 0.11 | 0.06 | 0.67 | 0.02 | 0.53 | 0.02 |
| 20-Attention to opportunity to exercise more experience for students | 0.11 | 0.16 | 0.13 | 0.1 | 0.13 | 0.06 | 0.73 | 0.02 | 0.60 | 0.02 |
| 21-Improving research and study spirit (individual and group), curiosity and questioning, developing scientific exploration, scientific justification of phenomena etc. | 0.13 | 0.11 | 0.15 | 0.01 | 0.06 | 0.08 | 0.72 | 0.02 | 0.55 | 0.02 |

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|---|---|---|---|---|---|---|---|---|---|---|
| 22-Scientific outlook to problems and events | 0.13 | 0.16 | 0.03 | 0.01 | 0.01 | 0.01 | 0.60 | 0.02 | 0.13 | 0.004 |
| 23-Paying due attention to design of research and testing hypotheses and functional activities, design of hypothesis and modeling etc. | 0.03 | 0.03 | 0.03 | 0.06 | 0.01 | 0.03 | 0.29 | 0.01 | 0.29 | 0.01 |
| 24-Observance of order and discipline in doing activities and plans | 0.08 | 0.13 | 0.13 | 0.13 | 0.15 | 0.11 | 0.67 | 0.02 | 0.72 | 0.03 |
| 25-Attention to free discussion and teamwork and participatory work in activities and moving away from memory-centered approaches | 0.6 | 0.11 | 0.08 | 0.01 | 0.11 | 0.03 | 0.56 | 0.02 | 0.53 | 0.02 |
| 26-Training of primary entrepreneurship principles and attention and motivation in participation in economic activities at familial, national and world scale | 0.06 | 0.1 | 0.06 | 0.06 | 0.05 | 0.05 | 0.515 | 0.02 | 0.42 | 0.02 |
| 27-Attention to self-decoration and cleaning, surrounding environment and personal devices | 0 | 0.05 | 0 | 0.06 | 0.05 | 0.01 | 0.14 | 0.004 | 0.33 | 0.01 |
| 28-Attention to prevention from disease and avoidance from risky behaviors | 0.15 | 0.06 | 0 | 0.2 | 0.03 | 0.03 | 0.41 | 0.01 | 0.48 | 0.02 |
| 29-Awareness of conservation of natural and urban environment and attention to differences caused by urban, rural, nomadic and geographic life environment etc. | 0.03 | 0.05 | 0.01 | 0.06 | 0.08 | 0.05 | 0.27 | 0.01 | 0.47 | 0.02 |
| 30-Presentation of perceivable and local examples | 0.05 | 0.03 | 0.11 | 0.08 | 0.05 | 0.06 | 0.81 | 0.03 | 0.78 | 0.03 |

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|---|---|---|---|---|---|---|---|---|---|---|
| 31-Training of critical spirit and acceptance of critique | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 32-Utilization from scientific achievements and findings of Islamic- Iranian culture and civilization | 0.01 | 0.05 | 0.03 | 0.1 | 0.03 | 0.05 | 0.27 | 0.01 | 0.44 | 0.02 |
| 33-Creating divergent paradigm and proposing divergent questions | 0.11 | 0.01 | 0.06 | 0.06 | 0.05 | 0.05 | 0.41 | 0.01 | 0.42 | 0.02 |
| 34-Developing flexibility in answers | 0.1 | 0.05 | 0.15 | 0.05 | 0.03 | 0.06 | 0.60 | 0.02 | 0.38 | 0.01 |
| 35-Creativity and innovation in doing activities for training of responsible, thoughtful and creative learners | 0.1 | 0.03 | 0.08 | 0.06 | 0.06 | 0.05 | 0.32 | 0.01 | 0.44 | 0.02 |
| 36-Paying more attention to individual differences (self-concept and one's abilities, commenting and giving one's proposals to others) | 0.05 | 0.01 | 0.03 | 0.05 | 0.05 | 0.03 | 0.27 | 0.01 | 0.37 | 0.01 |
| 37-Data collection from various sources in giving answers to the questions | 0.15 | 0.03 | 0.01 | 0.1 | 0.08 | 0.11 | 0.4 | 0.01 | 0.62 | 0.02 |
| 38-Placement of learner on the axis of all learning activities | 0.23 | 0.21 | 0.18 | 0.15 | 0.43 | 0.28 | 0.89 | 0.03 | 0.91 | 0.03 |
| 39-Training of method and path of knowledge acquisition, awareness and ability | 0.11 | 0.16 | 0.01 | 0.1 | 0.08 | 0.05 | 0.53 | 0.03 | 0.53 | 0.02 |
| 40-Preparation of ground for training types of thinking, self-learning, contemplation and seeking of excellence | 0.05 | 0.29 | 0.06 | 0.1 | 0.43 | 0.28 | 0.61 | 0.02 | 0.82 | 0.03 |

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|---|---|---|---|---|---|---|---|---|---|---|
| 41-Paying attention to executable testing and activities and relating to everyday life for students | 0.11 | 0.1 | 0.13 | 0.13 | 0.1 | 0.08 | 0.67 | 0.02 | 0.63 | 0.02 |
| 42-Attention to various intelligences (verbal, spatial, intrapersonal, interpersonal, naturalist- music, computational, philosophical) in activities and concepts | 0.11 | 0.18 | 0.11 | 0.11 | 0.13 | 0.03 | 0.72 | 0.02 | 0.56 | 0.02 |
| 43-Attention to internet search in activities and referral of learner to study on complementary sources | 0 | 0 | 0 | 0.01 | 0 | 0 | 0 | 0 | 0 | 0 |
| 44-Creation of opportunity to propose problem, design of opportunity and brainstorming and creation of opportunity for disturbing balance for learner | 0.01 | 0.03 | 0.01 | 0 | 0 | 0 | 0.18 | 0.01 | 0 | 0 |
| 45-Prediction of activities for practical works | 0.15 | 0.08 | 0.1 | 0.1 | 0.06 | 0.06 | 0.65 | 0.02 | 0.52 | 0.02 |
| 46-Creation of opportunity setup and holding of scientific exhibitions for hand-made objects of learners | 0.06 | 0.06 | 0.06 | 0.06 | 0.06 | 0.05 | 0.46 | 0.02 | 0.44 | 0.02 |
| 47-Relating learning content to probable uses | 0.08 | 0.13 | 0.11 | 0.05 | 0.06 | 0.03 | 0.68 | 0.02 | 0.38 | 0.01 |
| 48-To help to creating self-belief and self-reliance in playing one's role in learning science | 0.11 | 0.18 | 0.13 | 0.08 | 0.06 | 0.06 | 0.78 | 0.03 | 0.49 | 0.02 |
| 49-Attention to use of clean energies in design of space and installations etc. | 0.03 | 0.06 | 0.03 | 0.01 | 0.06 | 0.08 | 0.40 | 0.01 | 0.38 | 0.01 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 50-Prediction of functional questions in activities | 0.06 | 0.06 | 0.01 | 0.08 | 0.06 | 0.08 | 0.52 | 0.02 | 0.52 | 0.02 |
| 51-Placement of learner in simulated positions in scientific subjects | 0.05 | 0.1 | 0.08 | 0.06 | 0.05 | 0.03 | 0.44 | 0.01 | 0.38 | 0.01 |
| 52-Request for recognition and distinction between scientific concepts and phenomena | 0.03 | 0.05 | 0.03 | 0.05 | 0.05 | 0.05 | 0.33 | 0.01 | 0.41 | 0.01 |
| 53-Creation of position in self-assessment (self-evaluation) for learner | 0 | 0 | 0 | 0.03 | 0.01 | 0.01 | 0 | 0 | 0.18 | 0.01 |
| 54-Creation of situation for coeval-measurement in learners | 0 | 0 | 0 | 0.03 | 0.01 | 0.01 | 0 | 0 | 0.18 | 0.01 |
| 55-Creation of insight toward effects and consequences of one's lifestyle | 0.06 | 0.1 | 0.1 | 0.11 | 0.13 | 0.08 | 0.57 | 0.02 | 0.65 | 0.02 |
| 56-Ability for working and using digital sources and training CDs | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 57-Paying attention to independent study | 0 | 0 | 0 | 0.01 | 0 | 0 | 0 | 0 | 0 | 0 |
| 58-Relevance of new subjects to prerequisites and cognitive structure of students | 0.11 | 0.16 | 0.1 | 0.13 | 0.18 | 0.1 | 0.77 | 0.03 | 0.27 | 0.01 |
| 59-Creation of opportunity for integration of sciences in everyday life | 0.06 | 0.18 | 0.1 | 0.08 | 0.16 | 0.03 | 0.64 | 0.02 | 0.55 | 0.02 |
| 60-Awareness of relations between human and environment and perceiving integration of world of existence | 0.06 | 0.18 | 0.08 | 0.05 | 0.06 | 0.03 | 0,.62 | 0.02 | 0.38 | 0.01 |

The table in above indicates that in natural science textbooks for the second and third grades in primary schools, in terms of body, image, activity and teamwork, the highest level of information weight and importance coefficient belong to items of placement of learner on

the axis of all learning activities, acquiring ability for employing scientific technique skills (scientific observation, data collection, classification, hypothesizing, design of test, conducting test, analysis and change in findings etc.) in treating with natural phenomena and environment, paying attention to ability for suitable communication among student and others, exchange of thoughts, and teamwork spirit where their information weights and importance coefficients are 0.911, 0,896, 0.839, 0.032, 0.032 and 0.029 in the second grade respectively. The variables of placement of learner on the axis of all learning activities and familiarity and training of skills of thinking process (conceptualization, perception of meaning, perception of relations and hypothesizing etc.) include importance coefficients and information weights as 0.885, 0.829, 0.029 and 0.028 in third grade respectively. The least level of information weight and importance coefficient belong to variable of paying attention to independent study, ability of working and using digitalized sources and training CDs, creation of opportunity for expressing problem and brainstorming, and creation of opportunity for disturbing balance (preparation of students for challenging questions) for the learner, attention to internet search in activities and pervasive referrals to study on complementary sources and training of critical spirit and acceptance of critique foe which the level of importance coefficient and information weight is zero and it is the same in both second and third grades. As the information weight is closer to unit, the entropy is lesser and as a result it possesses more importance and weight.

## *Discussion and conclusion*

The present study aims to inquire the fundamental development plan in terms of paying attention to prerequisites of natural sciences in primary schools. The given findings indicated that in terms of text, image, activity and teamwork in natural science textbooks of second grade, variables of placement of learner on the axis of all learning activities, acquisition of potential for employing scientific method skills (scientific observation, data collection, classification, hypothesizing, design of test, conducting test, analysis and change in findings etc.) in treating with natural phenomena and environment, paying attention to ability of suitable communication among student and others, exchange of thoughts, teamwork spirit, the rates of information weight and given importance coefficients were 0.911, 0.896, 0.839, 0.032, 0.032 and 0.029 in the second grade respectively. Regarding variables of placement of learner on the axis in all learning activities and familiarity and training of thinking process skills (conceptualization, perception of meaning, perception of relations and hypothesizing etc.), the rates of importance coefficients and level

of information weight are 0.885, 0.829, 0.029 and 0.028 in third grade respectively. And the lowest rates of information weight and importance coefficient are zero (0) respectively for items of independent study, ability to work and use of digital sources and training CDs. As level of information weight is closer to unit (1), entropy is smaller and as a result, item has higher importance and weight. The fundamental development plan takes modern approach toward textbooks of natural sciences. Whereas this is novel plan and it needs to codification of performance plan for operationalizing at micro and macro levels thus no one could ignore position of natural science textbook in creating scientific status. Training of sciences also includes method and way of knowing in addition to properties of knowledge. In another point, Victor implies that the suitable scientific curriculum gives us insight regarding different methods about learning of children and this insight is what the scientists have benefited from it in solving their problem. The children may use these techniques in solving their own problems and this trend and improve their efficiency and contemplation in this trend and to obtain the potential to think more critical and abstract than ever (Victor, 1993; quoted from Hashemi & Rafaati, 2015). Thus, the highest weight of importance belongs to item of placement of learner on the axis of all learning activities on which fundamental development plan has emphasized in Strategy No 2-6 (p.21). The potential for employing scientific method skills (scientific observation, data collection, classification, hypothesizing, design of test, conducting test, analysis and change in findings etc.) in treating with natural phenomena and environment has gained the highest importance coefficient and it has been asserted in Strategy No 7-11 (p. 27) of the plan. Ability to employ scientific method skills is one of the foremost objectives and teaching and learning basis for natural science textbooks. The students should learn methods for acquisition of information, organizing, application and testing. These activities improve their potential in perceiving of their surrounding world and contribute them to make smart decisions and to solve the problems of their life. Brainstorming is a process for producing new theories under free conditions. Brainstorming is a technique for motivating creativity in a group and a structure or an artistic work that is utilized for producing a lot of ideas about a certain problem or subject. Brainstorming is one of the best techniques to achieve creative ideas and creativity in a group-related subject or problem and even personal subjects or problems. This issue has been addressed with respect to Strategy No 2-6 (p.24) in fundamental development plan. Thinking is one of the most important issues that has received special attention in education, so that the growth and development of thinking today is

one of the main tasks of the curriculum system. Essentially, innovation and creativity are the foundation of the advancement of a society and depend on the dynamics of educational content (Ranjbar and Rashidi, 2018).

The rate of study in communities is crucially important since it is assumed as one of the important parameters for development. The level of attention to study and book-reading indicates cultural growth for any country. During recent years, developing of latest technologies and advent of virtual networks on the field of technology has led to overlooking independent study where this trend proceeds faster than the past every day. Ignoring independent study indicates cultural and social weakness; and our country is placed at possible lowest level in terms of independent study. Therefore, it necessitates paying more attention and taking more efficient basic measures about culture-building for independent study since it has been referred to as a necessity for paying attention to independent study in Strategy No 1-6 (p.24) of fundamental development plan of educational system. Today, e-learning is especially important in schools and teaching and training. Nowadays, traditional form of classrooms is declining. It is added to number of smart schools every day. Smart schools are locations that provide access to enormous scientific sources and training contents for teacher and students by possessing adequate communication facilities and through connection to national and international networks. E-learning is presented in schools by the aid of computer via networks e.g. internet and intranet and thorough multimedia. It has been focused in this subject in Strategy No 1-6 (p.24) in fundamental development plan. Paying attention to self-decoration and cleaning, surrounding environment and personal devices which are related to personal and public health may determine physical and mental health of students. This item is much more important than education, teaching and training and family and education play undeniable role for this purpose. The educational method of students and trainings given by families to the children about individual and public healthcare has been highly addressed in Clause 6 (p.19) in fundamental development plan. However the contents of fundamental development plan have been ignored in content of natural science textbooks. Self-assessment and measurement of coevals are considered as descriptive evaluation elements. If these two elements are well performed in classroom they may favorably indicate strong or weak points of students. The advantage of this method lies in this point that the students find personally their strength and weaknesses and it is obvious that they may tend to improve or remove them by the aid of their teacher. This subject has been emphasized in Strategy 2-19 (p.30) in fundamental development plan. Training of critical spirit and acceptance of critique which has

been highly noticed in Clause B of Strategy No 1-1 (p.20) in fundamental development plan includes criticism and acceptance of critique in line with questioning and responding to achieve social perfection and reform that is very precious capital. This subject should be especially noticed for spreading spirit of criticism and acceptance of critique for the active educational system and in curricular texts at schools and the needed trainings should be presented to adolescents and youths of the society. The nature of educational training curricula in all careers should be in such a way that to enables trained student to perceive his/ her position in all fields and to correct constantly their individual and social positions. Realization of this subject requires for encouraging students to discussion and dialogue, criticism and participation about knowledge production. Creation of opportunity for problem solving and disturbing of pervasive balance on which it has been highly emphasized in Strategy No 4-23 (p.33) of fundamental development plan, denotes creation of question in student and learner that is the first movement toward knowledge while unfortunately the national schools attach less importance to research and study and students follow this suit by the end of their academic education as well. Holding of conference and presentation of research and investigation is not yet continually and constantly performed in classrooms and this issue has been followed by very negative side-effects on training of creative mind in learner. So far in many national schools, the lesson scores are given to the students based on their memorized knowledge and the student who can memorize more will receive higher marks so under such circumstances the learner is diverted from any innovation and creativity. Research and investigation is not assumed as valuable as memorization of lesson and under such conditions the innovative and inquisitive student may not have an opportunity to express his/ her ideas because of unrighteous labels. Curricula are so defective that the student may not record his/ her ideas as a result all innovations and projects may be accumulated in the mind of learner under such conditions but student has no opportunity to present them. In order to express his/ her ideas and projects, student needs to learn how to write them but writing composition class has not yet assumed serious and important in schools. Overall, given the fundamental development plan may become efficient for enrichment of syllabi, but the element of content of syllabus for natural sciences has not been duly addressed with respect to fundamental development plan and the related prerequisites. Such conscious or unconscious ignorance will be followed with hazardous consequences in training of learners based on Islamic system as criterion and cultural- training approach. Thus, it is suggested to pay attention to cultural- training approach in producing curricula.

According to the findings of the research, it can be said that the extraction of the curriculum of experimental sciences is very essential based on the fundamental transformation document and this necessity becomes greater when the items outlined in the document on the fundamental transformation have not been dealt with after 8 years as it should be and is not being implemented in the school curriculum. If we look at the curriculum, especially the empirical sciences, we find that the document of fundamental transformation is only apparently expressed in education and has not been taken into account during the implementation phase. According to the results and analysis of the researcher in the extraction of the items of the experimental science books based on the fundamental transformation document, it can be stated that the experimental science curriculum in the elementary period requires major changes based on upstream documents and culture, religion, and Islamic-Iranian beliefs. Therefore, it is suggested that cultural education should be considered in the production of curricula. Curriculum planners and textbook authors integrate all dimensions and components of the upstream documents and incorporate components that have been neglected in the content of the primary school experimental science books and focus on teaching these components. They should also have a more detailed and more sophisticated look at the components of the curriculum of experimental sciences based on the document of fundamental transformation.

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